Cities and Green Growth

Case study of the Paris/Ile-de-France region



Please cite this paper as:

Kamal-Chaoui, L. and M. Plouin (2012), "Cities and Green Growth: Case study of the Paris/Ile-de-France region", *OECD Regional Development Working Papers*, 2012/02, OECD Publishing, Paris. http://dx.doi.org/ 10.1787/5k9fd0fg78bs-en

OECD Regional Development Working Papers 2012/02

Lamia Kamal-Chaoui and Marissa Plouin

JEL Classification : O1, O3, Q2, Q3, Q4, Q5, R1, R2, R3, R4, R5

OECD REGIONAL DEVELOPMENT WORKING PAPERS

This series is designed to make available to a wider readership selected studies on regional development issues prepared for use within the OECD. Authorship is usually collective, but principal authors are named.

The papers are generally available only in their original language, English or French, with a summary in the other if available.

The opinions expressed in these papers are the sole responsibility of the author(s) and do not necessarily reflect those of the OECD or the governments of its member countries.

Comment on the series is welcome, and should be sent to gov.contact@oecd.org or the Public Governance and Territorial Development Directorate, 2, rue André Pascal, 75775 PARIS CEDEX 16, France.

OECD Regional Development Working Papers are published on
www.oecd.org/gov/regional/workingpapers

Applications for permission to reproduce or translate all or part of this material should be made to: OECD Publishing, rights@oecd.org or by fax +33 1 45 24 99 30.

© OECD 2012

ABSTRACT

This report, developed within the framework of the OECD Green Cities programme, is a pilot case study examining the green growth potential of the Paris-IDF region. In a context of stiff international competition and internal socio-economic and environmental pressures, green growth could be an appropriate path toward revitalising the regional economy and improving environmental outcomes. Building and transportation are among the urban sectors with the greatest potential. Several emerging approaches to a more flexible form of metropolitan governance show promise, yet would benefit from greater private sector involvement throughout the policymaking process. Financing green growth will require the further greening of public revenue sources and the creation of new ones. Adapting procurement processes and pursuing innovative coorerative arrangements with the private sector could also be considered.

JEL classification: O1, O3, Q1, Q2, Q3, Q4, Q5, R1, R4, R5

Keywords: Climate, Global Warming, Sustainable Development, Government Policy, Planning, Regional, Urban, Cities, Territorial, Regional Economics, Urban Sustainability, Green Growth

ACKNOWLEDGEMENTS

This report is part of the series of *OECD Working Papers on Regional Development* of the OECD Public Governance and Territorial Development Directorate, directed by Joaquim Oliveira Martins, Head of the Regioanl Development Policy Division.

The report was prepared in collaboration with the PUCA *(Plan Urbanisme Construction et Architecture*) of the Ministry of Ecology, Sustainable Development, Transport and Housing of France (MEDDTL). We especially wish to thank Emmanuel Raoul, Permanent Secretary of the PUCA, Alain Ayong Le Kama, Economic Advisor to the PUCA, and Evelyne Lemercier, Project Manager. A background report was prepared by a local team co-ordinated by Evelyne Lemercier and composed of Vincent Fouchier, Anne-Marie Roméra and Martine Liotard of the IAU-IdF *(Institut d'aménagement et d'urbanisme d'Ile-de-France);* Christian Curé and Pascale Rohaut of the DRIEA-IF *(Direction régionale et interdépartementale de l'équipement et de l'aménagement Ile-de-France)*, Anne-Laure Barbe of the ARD *(l'Agence régionale de Développement Paris-Ile-de-France);* Hélène De Largentaye of the City of Paris and Jacques-Olivier Bled of the Urban Ecology Agency of the City of Paris; Frédéric Guerrien of the Regional Council of Ile-de-France; Bertrand Lemoine of the *Atelier International du Grand Paris;* Eliane Dutartre of the DATAR *(Délégation interministérielle à l'Aménagement du Territoire et à l'Attractivité Régionale);* Patrick Petour of the Regional Department of INSEE *(Institut national de la Statistique et des Études Économiques);* Anne Charreyron-Perchet and Camille Blaudin de Thé of the CGDD (*Commissariat général au Développement Durable*) of the MEDDTL.

The study was undertaken within the framework of the OECD Green Cities programme of the Regional Development Policy Division. It was produced and edited by Lamia Kamal-Chaoui, Head of the OECD Urban Development Programme, and Marissa Plouin, Urban Policy Analyst. Adeline Pelletier and David Gierten contributed to the drafting of certains sections of the report.

The report benefitted from the contributions of external experts, notably Patrick Dubarle, consultant, and Benoit Lefevre and Vincent Renard of IDDRI *(Institut du développement durable et des relations internationales)*. It was further enriched by the sound advice of David Miller, Counsel for Aird & Berlis LLP, former mayor of Toronto and former Chair of the C40 Climate Leadership Group.

A team of international Peer Reviewers participated in the development of the report:

Portugal: Pedro Liberato, Counselor to the Permanent Delegation of Portugal to the OECD;

United Kingdom: Bert Provan, Deputy Director of the Department for Communities and Local Governments of the United Kingdom.

Within the OECD Public Governance and Territorial Development Directorate, the report benefitted from a number of internal contributions, including a comparative analysis of density and urban form produced by Tadashi Matsumoto, as well as the production and analysis of statistical data on metropolitan regions by Monica Brezzi, Head of the Statistical Unit, Daniel Sanchez-Serra and José-Luis Alvarez-Galvan. Claire Charbit, Deputy Head of the Regional Development Policy Division, provided valuable comments on the report.

We also wish to thank, from the OECD Environment Directorate, Chris Kennedy, who developed comparative analyses on energy and GHG emissions, and Xavier Leflaive, who participated in the expert mission and provided comments on the report.

Finally, we would like to thank the individuals consulted during the development of this report, notably: Danièle Luccioni, Vice President of the CESER *(Conseil Économique, Social et Environnemental Régional)*; Didier de Saint-Vincent, Vice President of the Territorial Development Commission of the CESER ; Marc Rémond, head of the Agriculture, Rural and Environment Commission of the Territorial Development and Transport Commission; Michèle Pappalardo, General Commissionner of Sustainable Development within the Ministry of Ecology, Sustainable Development, Transport and Housing of France (MEDDTL); Jean-Claude Ruysschaert, Regional Director of the DRIEA and Christian Curé, Deputy Director; Alain Amédro, Vice President in charge of Planning and Development for the Regional Council of Ile-de-France as well as Jean-Claude Gaillot, Director of Sustainable Development. Among those who provided helpful insights during the expert mission: representatives from local and departmental governments and regional planning actors, including the Regional Council of Ile-de-France, the General Counsel of Seine-et Marne, the General Counsel of the Yvelines, the Agglomeration Community of Plaine-Commune and the Public Enterprise for Planning and Development of the New Town of Sénart ; economic actors representing the Regional Chamber of Commerce and Industry (CRCI), the Regional Development Agency (ARD) of Paris-IDF, Veolia Environnement, Vinci, GDF Suez, *Orée-Entreprises* Association, "Finance Innovation" competitive cluster; as well as researchers, including Rémy Prud'homme, Sandrine Rousseau, Jean Laterrasse, Dominique Bureau and Vincent Viguié.

Jeanette Duboys prepared this report for publication.

TABLE OF CONTENTS

Tables

Figures

Boxes

CITIES AND GREEN GROWTH: CASE STUDY OF THE PARIS/ILE-DE-FRANCE REGION

ASSESSMENT AND RECOMMENDATIONS

Green growth as a path to revitalising the Paris-IDF region economy

With the objective of becoming Europe's first eco-region, the Paris/Ile-de-France (Paris-IDF) region has a number of assets to deploy in pursuing a green growth strategy. The region has a young, rapidly growing, productive and well-educated population. It boasts the best R&D and innovation performance in Europe. Its industrial base is in decline yet is still the most important in France. Its compact urban core means that CO_2 emissions are lower than those of other world metropolitan regions. It is also home to a number of urban sectors where greening has the potential to boost economic growth. To take advantage of its potential, the region will have to strengthen its green innovation system, adapt skills to meet the needs of the emerging green economy, and take a more systemic approach to urban planning. At the same time, the region will need to forge a common and shared vision of its future and do more to involve the full range of public and private stakeholders. Lastly, a transformation of this scale will demand significant upfront investments. Although some public initiatives, including urban taxes, could be better exploited, new forms of cooperation with the private sector will also have to be developed to ensure the sustainability of green growth initiatives in the Paris-IDF region.

A global metropolis…

With a population of nearly 12 million, the Paris-IDF region is the focal point for France's political, economic and cultural life and one of the most heavily populated metropolitan regions in the OECD. It ranks ninth among the 90 OECD metropolitan regions in terms of population, behind Tokyo, Seoul, Mexico, New York and London. The region's fast demographic growth in comparison to the rest of the country is due to the excess of births over deaths, to the departure of retirees to other French regions, and to strong immigration (the region has more than 2 million first- and second-generation immigrants).

... and one of the best performers...

With a GDP of EUR 552 billion in 2009, Paris-IDF accounts for nearly 30% of the national wealth, ranking 16th among the 90 OECD metropolitan regions for its level of GDP. *Per capita* wealth is well above the national average. This performance is supported by a relatively high level of labour productivity, compared both to the national average and to other OECD metropolitan regions. The capital region's economic drive is also evident in terms of business creation and the siting of foreign firms. It is regarded as one of the 27 OECD technological hubs and is ranked 13th for its contribution to the overall growth of the zone. The region has positioned itself as the leading European knowledge region, with more than 2.1 million jobs in knowledge-intensive sectors (KIS). Lastly, Paris-IDF ranks eighth among OECD regions for the percentage of the population with a higher education degree.

... particularly in innovation and R&D.

Paris-IDF is the leading European region for R&D and innovation. With 17 universities and over 300 research establishments employing nearly 90 000 researchers, the region is home to 18% of innovative SMEs, or almost 200 000 firms, especially in the computer science, architecture/design, electrical equipment, electronics and machine engineering sectors. The highly knowledge-intensive aspect of the Ile-de-France region is borne out by its increasingly strong record in the area of patents – around 34% of French patents originate in Paris-IDF, compared to 5% in Lyon, 2% in Marseille and just over 1% in Lille.

Yet recent trends suggest a sagging vitality

Although the Paris-IDF region remains internationally competitive, changes in the global attractiveness of the region are the subject of debate. In the 1995-2008 period, Paris-IDF came no higher than 31st out of 90 OECD metropolitan regions and 21st out of 39 in Europe, in terms of growth in *per capita* GDP. And while the population of the capital region is younger and is increasing faster than the national average, it is not growing nearly as fast as in the case of metropolitan regions in emerging countries, or indeed in comparison with most OECD metropolitan regions: between 1995 and 2007, the population growth rate of the Paris-IDF metro-region was just above the OECD average.

Losing ground in the industrial and technological spheres

While it remains France's leading industrial region, with 14% of the nation's industrial employment, Paris-IDF lost 100,000 such jobs between 2000 and 2007, after shedding 260 000 in the previous decade. This de-industrialisation is the outcome of France's loss of competitiveness, especially in the face of competition from emerging countries. The decline in jobs in the industrial sector may also be attributed to the gains achieved in productivity and to the outsourcing of many activities. The region's ability to innovate has been severely tested by international competition. Research intensiveness (R&D as a proportion of GDP) fell between 2000 and 2005 (from 3.5% to 3%). Many R&D units, especially in the public sector, were decentralised and the region lost young researchers to the provinces. De-industrialisation has meanwhile strengthened the process of tertiarisation in the region: 300 000 jobs were created in services during the 2000-07 period.

High unemployment and persistent social disparities...

Despite sound performances by the Paris-IDF economy, the regional unemployment rate has remained high, especially among young people. The unemployment rate in the capital region is lower than the national average (8.2% on average in 2010 compared to 9.3% in metropolitan France), yet remains nevertheless a cause for concern. In 2009, the regional unemployment rate (8.4%) was higher than the average for OECD metropolitan regions (8.0%). Even so, this rate has not changed much in recent years, during which other OECD metro-regions have experienced a significant jump in unemployment with the crisis. At the same time, the region has experienced persistent job insecurity, along with social and territorial inequalities. As a general rule, incomes are higher in the city of Paris and in the west of the region. These intra-regional disparities, which are explained in part by the presence of very high-income households concentrated in certain parts of the territory, have increased over time: the poverty rate ranges from 7.2% in Yvelines to 21.6% in Seine-Saint-Denis, in which households often encompass several families who are especially affected by poverty.

... place a burden on public resources

The growth in social and territorial inequalities in terms of income is a phenomenon common to many large metropolitan regions in OECD countries, which exhibit levels of inequality often higher than those

apparent between regions in the country to which they belong. However, as in London, levels of intra-regional inequality in the Paris-IDF region are especially pronounced, ranking above the average for OECD metropolitan regions. These intra-regional inequalities are also evident in the distribution of financial resources and the location of major employment centres within the region. The distribution of the financial resources of the *départements* and of their *per capita* GDP points to an imbalance, especially between the region's centre (the city of Paris and the inner belt) and outskirts (outer belt). Low-skill jobs represent 18% of employment in the Paris-IDF region, and they are strongly clustered in the outskirts (in Seine-et-Marne, Val-d'Oise and Seine-Saint-Denis).

An unrelenting housing crisis

For around 20 years, the Paris-IDF region has faced a housing crisis in quantitative, qualitative and financial terms that is undermining its economic competitiveness as well as its social balance. The region is building too few new dwellings to satisfy demand, and there is a glaring shortage of social housing. As prices in the centre of the capital region have soared out of reach, families of modest means, and even those in the middle classes, are obliged to look beyond the densely built areas, sparking urban sprawl despite recurrent policies to rein it in. Finally, the real estate boom at the beginning of the century has left families with less purchasing power. Housing is in fact a key factor in economic attractiveness: the problems that people encounter in finding accommodation in the central area and the increasingly long commuting distances they face from the outer belt are reducing the quality of life in the region. Bearing in mind that the region will undergo an occupational shift with the retirement of the baby boom generation, it will have to find new ways to attract and retain a high-quality labour force.

Spatial and environmental challenges are becoming more intense

In a context of increasingly threatened economic health and sharper social and territorial issues, the region must also face more intense spatial and environmental challenges. The periphery of the Paris-IDF region is rich in natural resources – water, forest, geological and agricultural – which represent important assets in both economic and environmental terms, and cover 76% of the regional surface area. Paris-IDF is still the leading French agricultural region, even though agriculture represents only 1.6% in terms of regional value added. The region has significant potential for organic farming, which represents at present only a very low share of agricultural output. Development of this promising activity is nonetheless threatened by excessive real estate pressure, which has led to the conversion of lands to non-farm uses.

The compact urban shape is succumbing to sprawl in the periphery

In 2008, Paris-IDF was the 18th densest OECD metropolitan region, after Tokyo, Mexico City, Seoul, London and Athens in terms of inhabitants per km², but well ahead of Lyon, Lille, Marseille, Melbourne, San Francisco and Munich. Especially striking in Paris-IDF is its very dense urban core (up to 48 210 inhabitants/km²) that covers a comparatively small urban land area, to which the centre of the region owes its compact urban form. Nevertheless, the density of the Paris core thins progressively in the inner and outer belts, where urban sprawl has been accelerating for four decades. Between 1995 and 2007, the periphery (including the inner and outer belts) grew more quickly than the centre of the region. There are also striking differences between the city of Paris and the inner and outer belts as regards type of housing and mobility. Compared to its periphery, the city of Paris has more blocks of flats and more small-scale dwellings, which consume less space. Moreover, while the public transport network represents an undeniable asset for the region, automobile use becomes more intense as the distance from Paris increases. The regional public transport network must also cope with rising demand, particularly in the inner and outer belt where trips are becoming more numerous.

Rising energy consumption

Paris-IDF is the region of France that consumes the most energy in absolute terms: energy consumption grew by around 1% a year between 1990 and 2005, a level higher than the annual national average. As regional energy production caters for only 11% of the region's energy needs, Paris-IDF depends on foreign sources for its fossil fuels supply, and on other regions of France for nearly all its electricity, most of which comes from nuclear energy. The building sector is the heaviest energy user, accounting for 48% of total energy consumption, while energy consumption in the transportation sector (44% of the total) has grown sharply over the past two decades. Reliance on renewable forms of energy is barely underway in the region; they currently represent only a minimal share of its total final energy. If the current trends toward single-family housing and increased automobile use continue in the region's periphery, energy consumption is bound to rise sharply and continuously.

High per capita GHG emission rates are nonetheless lower than those of many regions

While the capital region accounts for 8.9% of all greenhouse gas emissions in France, its performance in terms of emissions *per capita* is better than the national average and better than that of the many OECD metropolitan regions. Compared to other large cities with a similar climate, the Paris-IDF region records relatively low emissions from heating and the consumption of industrial fuels, because of the low level of fossil fuel combustion in the industrial sector and the comparatively extensive use of district heat networks, which supply 50% of heating in the region. This strong performance can be largely explained by the fact that, as in London or Barcelona, the main energy source in the Ile-de-France region is natural gas, whilst those cities with a higher level of emissions (such as Chinese cities) depend to a greater extent on fuel oil and/or coal.

Concerns over air and water quality

Air quality remains a constant concern of Ile-de-France residents. The density of human activities and the intensity of transport (especially road traffic) generate along traffic routes nitrogen dioxide (NO_2) levels that are twice as high as the regulatory limits. The region's PM 2.5 level also remains above the regulatory threshold of the World Health Organisation, and is just above the OECD metropolitan-region average. In the case of water, the impact of agriculture on water quality is limited, but localised pollution problems of various origins (organic pollutants, hydrocarbons) persist and require special treatment.

The green economy as an opportunity to revitalise the regional fabric

The survey of socio-economic trends in the Paris-IDF region highlights the importance of identifying fresh sources of economic growth in a highly competitive international arena, while confronting internal pressures that are no less social (unemployment, poverty, inequality) than environmental (high energy dependence, environmental damage, etc.). The green economy could thus be an especially appropriate means of revitalising the regional fabric. Economic activities linked to the environment have assumed increasing significance in the Ile-de-France economy, far exceeding their traditional role in supporting the activity of a large metropolis. The region has some comparative advantages in this field. It is home to half the French eco-technology industry and has significant research capacities in water, waste management and renewable energy. In fact, the region posted growth of between 18 and 20%, depending on the sector, between 2000 and 2008, and is one of the best performers in the OECD. It jumped from 20th to 8th position among OECD metropolitan regions for green patents issued over the last two decades.

The central government and the region have paved the way...

Although public authorities have not explicitly targeted green growth in recent policy frameworks, economic and environmental matters are nevertheless at the heart of strategic considerations. Many strategic and policy documents, national, regional and local, have gradually incorporated various aspects concerned with the issue of green growth. The Grenelle Environment Forum lays down the national benchmark in the area of environmental policy and action to combat climate change. The National Strategy for Sustainable Development institutionalises the objectives of Grenelle as they relate to the central government. The proposed Master Plan for the Ile-De-France Region (SDRIF) of 2008 offers a vision for regional development and urban planning, while the Regional Strategy for Economic Development and Innovation (SRDEI) spells out the viewpoint of the Regional Council for economic development and innovation. To all these documents has been added the Greater Paris Scheme, conducted by a dedicated governmental secretariat. That work is now being implemented by a public industrial and commercial institution.

...but sometimes from diverging approaches

In terms of strategic orientation, the Grenelle Environment Forum doubtless provides the fullest discussion so far of the green growth concept, yet its thrust is more ecological than economic. There is clearly a strong governmental interest in the environment question, but it is too often addressed in restrictive terms and in relation to aims regarding climate and energy issues, with attention focused primarily on answers involving infrastructure. Through the policies it has induced, however, Grenelle has generated new momentum. The issues relating to the greening of the building and transportation industries are reflected to some extent in the proposed SDRIF plan and the Greater Paris initiative. These approaches – the first stressing social cohesion, decent housing and solidarity, the second competitiveness and economic development in the context of international competition – bespeak different visions of the future of the Paris-IDF metropolis, even if they agree on some common objectives.

There are opportunities for green growth in many sectors, including building...

The building sector is an essential target for green growth, given its ecological footprint (accounting for 48% of regional energy consumption) and its economic weight, especially in terms of current and future employment. A study by CIRED, a national agency for research on environment and development, estimates that the greening of the building sector could create more than 40 000 direct and indirect jobs. Greening prospects in this sector stem first and foremost from improvements in energy efficiency in the existing housing stock, as spelled out in Grenelle's Building Development Plan (*Plan bâtiment*). To ensure that a green growth policy in this sector contributes to greater social balance, greening policies should focus on social housing, and care should be taken to ensure that energy retrofit projects of neighbourhoods do not penalise residents' access to housing. The transition to a greener building sector poses considerable financing challenges, with a national cost estimated at between EUR 185 and EUR 656 billion over 40 years. Coordinating public measures (regulations, financial support) and funding will be crucial, and greater use of public-private partnerships could make for faster greening, as demonstrated in the United Kingdom's experiment with the Zero Carbon Hub institutional platform.

... transportation...

The transport sector offers another key opportunity for green growth in Ile-de-France. Transport generates around 48% of regional CO_2 emissions and has significant job creation potential (more than 33,000 direct and indirect jobs by 2030, according to CIRED). Greening this sector green will involve, as a priority, a modal shift towards alternatives to private cars via the development of public transport and less-

polluting modes of transport, which could boost demand for green goods and services and reinforce the region's attractiveness. In the case of passenger transportation, this will involve extending public transport services, particularly in the suburbs, and making the existing network more efficient. Major projects are underway to expand the system, but much less is being done to green to freight transport. Green transportation infrastructure projects are a key focal point of the Grenelle exercise as well as the Greater Paris plan. As in the case of the building sector, the financing needs are considerable, amounting to nearly EUR 32.4 billion over 2010-2025, of which EUR 23.8 billion has been secured. A further missing element is an integrated approach on the part of operators, who instead tend to work in isolation.

... renewable energies...

The Paris-IDF region has considerable potential in renewable energy, but it is as yet under-exploited aside from surface geothermal energy for the heating and cooling of buildings. While renewable forms of energy do not yet account for many jobs – France has lagged behind other countries in this field – the sector has registered strong growth over the last decade, as the political commitment has intensified. Yet the results remain modest and the market still depends largely on government subsidies. In order to promote solar power, the government could encourage access to venture capital and adopt an active policy of fostering basic and applied research. This could be more effective than the preferential feed-in tariffs for infant industries. To boost the development of wind energy, the region could stimulate its re-industrialisation by taking advantage of its component manufacturing base, as Chicago has done. While surface geothermal energy is already well-established in the Paris-IDF region, there is considerable underexploited potential in deep geothermal energy, but it will require major investments. The biomass industry (based essentially on wood energy, or dendroenergy, in IDF) would benefit from better structuring, including the construction of a supplier network and the creation of multimodal platforms. As for waste-to-energy, the region could take industrial ecology initiatives further in such a way that waste from some firms constitutes resources for others, an approach demonstrated in cities such as Kalundborg (Denmark), Guigang (China) and Paju (Korea).

... agriculture and water.

A green growth strategy for the Paris-IDF region could also shift agricultural production toward organic farming, local agriculture, and short distribution circuits. As the leading agricultural region in France, which is in turn the leading agricultural producer in the European Union, Paris-IDF already possesses assets in organic farming, not to mention a strong growth potential. Development of this type of farming, which is generally more environmentally friendly than traditional agriculture methods, would serve to strengthen short delivery circuits, biodiversity, product quality, and hence the region's attractiveness. Despite strong growth of organic farming in Ile-de-France in recent years, it still lags behind some areas of Germany, and current output is not keeping pace with rising demand. With respect to water, the greatest potential for green growth lies in alternative water management (rainwater management, green roofs, rainwater harvesting, filtering gardens) and the development of clean technologies (nanotechnology, seawater desalination). In Ile-de-France, it is above all in the area of R&D that job creation may be achievable, thanks especially to the presence of many research laboratories attached to large companies.

The region is prioritising eco-innovation...

In its 2008 draft SDRIF plan, the Paris-IDF region set out to become Europe's first eco-region. On one hand, the region has clear assets for achieving this goal, in particular its sectoral diversity, its research capacities, its green patents record, and its solid industrial base. On the other hand, there are some less positive factors that could hinder the desired economic and environmental outcomes. Despite its strong potential, the region's R&D performance has been relatively weak in recent years. Moreover, the redistribution policy pursued by the central government for several decades has tended to push many

research teams into other regions of France. Lastly, the region's competitiveness relies on acquired positions rather than on dynamic positioning.

... relying on its competitive clusters and their research potential...

While it is difficult to identify highly localised green clusters in the Paris-IDF region, the regional innovation system has been strongly influenced by the deployment of seven competitive clusters (*pôles de compétitivité*). Advancity and Moveo are major clusters devoted to green growth and clean technologies. Advancity, for its part, deals with the sustainable growth of cities, starting with their characteristics as they relate to habitat, mobility and territorial organisation. It brings together nearly 100 organisations, public and private. The region is also boosting its firepower in the area of sustainable mobility with Moveo, an automotive cluster with 300 member firms that are developing electric or hybrid vehicles. Other clusters focus on different industries, but can have a significant impact on eco-innovation: OECD research has demonstrated that in the area of green technologies, innovation at both the national and regional level is often the result of work in sectors far removed from the environmental industries.

... yet faces some major challenges

There are still many obstacles to the proper functioning of the competitive clusters and their green dimension. These include insufficient professionalisation and an artisanal approach to management, sub-optimal involvement of SMEs, weakness in technology transfers, a shortage of international projects, a modest performance in eco-product and eco-technology exports, complex governance that hobbles the development of public-private partnerships, and conventional financing approaches and still-limited participation by investors and venture capital.

A green growth strategy is needed

In order to boost its green innovation potential, the region should focus on the following tasks: (i) develop a coherent and consistent strategy for green growth, one with a strong regional dimension; (ii) strengthen the governance structures of the regional innovation system and make them more professional, which would mean reviewing export subsidies for firms in the industry, promoting technological monitoring, and encouraging clusters to venture into foreign markets; (iii) develop interfaces and facilitate R&D activities, using financial incentives to encourage collaboration among schools and universities; and (iv) focus attention on local SMEs, to promote their innovation potential. The central government could facilitate this process by designing a framework conducive to such collaboration and initiating an SME eco-technologies pact. The region, for its part, could institute a sovereign fund to stabilise the most innovative SMEs, as has been done in the Loire Valley. Public research vouchers could be granted to small enterprises working in the area of green technologies.

Skills must adapt to meet the needs of the green economy

Although the Paris-IDF region has a young work force that is generally well-educated and highly qualified, there are still some glaring shortages in the area of green skills, and training does not always meet the needs of the labour market. The problems as well as the needs are not homogeneous across the different green sectors: the most urgent needs are to be found in the building and renewable energy industries. At the national level, a green growth trades plan is enlisting contributions from the five Grenelle environmental colleges and a national green employment observatory has been created in the region. At the regional level, two strategic documents target training policy: one of them, the Regional Strategy for Economic Development and Innovation (SRDEI), now includes the "ecological conversion" of the economy as a priority objective. Yet despite this new awareness, the means to act are lacking. Matching supply and demand more closely will be essential for facilitating recruitment, and will require greater

involvement by the private sector. The competitive clusters could make a real contribution to promoting green training.

Urban planning should move toward a systemic approach

To the extent that each green sector entails key spatial issues, urban planning tools need to be rethought in order to conceive and construct the metropolis of tomorrow as a whole. The current system of urban planning in France, structured since the 2000 "Solidarity and Urban Renewal" (SRU) law in accordance with a three-tier system, seems to frustrate such a systemic approach. The green growth objective announced in the Grenelle context constitutes a real opportunity to restore to urban planning the soundness and relevance that it has largely lost. Implementation will be difficult, because of the proliferation of new, uncoordinated planning mechanisms and the prescriptive approach of Grenelle, which runs counter to the current trend toward greater flexibility in planning (planning by *ordonnance*).

Actions must be placed within a multi-level governance framework

Implementation of a coherent strategy for green growth requires forms of cooperation and collaboration among the different stakeholders. In the Paris-IDF region, such coordination is bound to be complicated due to its position as a global metropolis viewed by the government as strategic, the many players involved in its governance, the fragmentation of fields of intervention, and the diffuse and often opaque nature of the decision-making process. This is all the more true when one attempts to describe "the system of green growth governance in Ile-de-France," as "green growth" is not currently the explicit object of governance. The region is characterised by a surfeit of administrations – the famous institutional *millefeuille* comprising nearly 1 300 communes – which frustrates horizontal and vertical coordination among public players. Consequently, it is difficult to strike a consensus on a coherent and shared vision of the region. This fragmentation of local authorities is a handicap for green growth, which requires coordinated spatial approaches.

Existing coordination tools are not very effective

The principal tool for horizontal coordination, the inter-communal structures, is only partly operational in the capital region. While there are several hundred inter-communal structures, most of them are small and rarely embrace a large population. Moreover the responsibilities of those structures are still poorly defined and their creation has tended to generate higher public spending, and thus higher taxes. Vertical coordination through the State-Region Planning Contracts (CPER) has had more success. In Ile-de-France, the CPER (2007-13) several core issues and actions integrate a green growth perspective, yet they do not constitute major initiatives. The emphasis on transportation in the investments planned under the CPER with a view to modernising public transport is certainly important (EUR 2.93 billion), but is far less ambitious than the actions undertaken under the Greater Paris Scheme, even if the latter are to be stretched out over a longer period.

Private sector involvement is marginal and piecemeal

In contrast to London, Toronto or Chicago, where the private sector occupies an important place in the decision-making and institutional system, the involvement of the business sector in the Paris-IDF region remains weak and most often confined to consultation by the authorities. The organisation of economic agents in Ile-de-France results moreover in a system based on organisations that have a monopoly of representation *vis-à-vis* the public authorities: the chambers of commerce and industry (regional and departmental) on one hand and the employers' unions on the other. Disputes between the chambers of commerce and industry (CCIs) and the business associations relate primarily to the chambers' monopoly in representing economic interests. There are sharp and long-standing conflicts between the CCI

of Ile-de-France and the Paris Chamber, and they will be difficult to resolve. The employers' unions such as Medef or the CGPME tend to be fragmented by branch, and the regional organisation carries little weight in comparison to the sector organisations.

To promote green growth, the region must adopt a shared vision of its future…

The future of the Paris-IDF region is still an open question, complicated by differing conceptions of its place in globalisation. While some put the emphasis on the territory's competitiveness, others fear that globalisation will bring with it social inequalities and regional disparities, placing the objectives of cohesion at the centre of their concerns. In this context, to move forward in evaluating the region's potentials, defining, financing and implementing a green growth strategy will require prior consensus on a shared vision of the future of the capital region. This will involve setting clear objectives concerning training, innovation and infrastructure investment, and coordination among the different stakeholders around a concrete plan endowed with adequate financial means. This vision must go beyond an urban development plan to include economic and social aspects.

... choose a leader to forge a consensus...

None of the three dominant players in the Paris-IDF region – the central government, the Regional Council or the City of Paris – seems for the moment to have the geographic legitimacy, the political clout or the financial capacity to assume the regional leadership role on its own. It is important, then, to come to an understanding. To this end, discussion forums are needed, but it must be recognised that there are not in large supply. *Paris Métropole*, a study group (*syndicat d'études*) that embraces 188 municipalities as well as the *départements* and the Regional Council, is an interesting example in this regard. A partnership was recently established with the Chamber of Commerce. By bringing together multiple stakeholders, *Paris Métropole* may be a first step towards the emergence of a new form of inclusive governance and a forum for negotiating a shared vision for green growth.

... involve socioeconomic stakeholders more effectively...

Generally speaking, private stakeholders in the Paris-IDF region need to be more closely associated with green governance. Provided the process can be kept transparent and open to all (from large companies to SMEs), it would be desirable to involve a variety of private sector representatives in public consultation for defining calls for proposals and to offer businesses the possibility of responding in an integrated way, through tendering for a combination of urban services (water, waste, Internet, etc.) that will allow for larger, higher-quality projects. The involvement of private stakeholders in metropolitan governance needs to be better organised in order to go beyond the simple advisory role *vis-à-vis* the national and local authorities (following the example of Greater London). One possible route would be to rely on forms of local governance that are emerging in the competitive clusters. Another possibility, as proposed by the *Conseil d'Analyse Stratégique* (an advisory body to the Prime Minister) would be to enlist all stakeholders, on the basis of equal rights and duties, in a commitment to the development of the region, with a deliberative body to set strategic guidelines and an executive unit to carry them out.

... and invent new forms of governance.

In order to improve overall governance, several conditions must be satisfied. First, approaches and tools will have to evolve. The revision of the draft SDRIF, now underway, could offer an opportunity to move in this direction, taking as its example the strategic document for Greater London, a much more concise regional planning document based on economic, ecological and social objectives that the various local authorities must respect and achieve. Next comes the question of the proper scale of governance.

Beyond the employment basin, a characteristic of world cities and mega-cities is that their zone of influence extends beyond their functional zone, and new forms of territories are emerging. As part of the considerations of the future of Greater Paris, it has been suggested that metropolitan planning could be addressed from a broader perspective, that of the Seine Corridor, linking the capital region to the sea and the ports of Le Havre and Rouen. Because of its crosscutting nature and the diversity of fields and stakeholders involved, green growth could contribute to territorial coherence at this broader scale.

There will be heavy demands for financing…

Green growth in the Paris-IDF region will require major investments. In a context of increasingly constrained resources, public authorities will have to do more – and to do more "green" – with less, and new sources of financing will have to be identified. Within the Paris-IDF region, three mechanisms of public finance for green growth currently exist: (i) the "grand loan," which earmarks EUR 1 billion for the Sustainable Cities programme, (ii) the regional co-investment fund, which has EUR 6 million and is devoted to financing innovative SMEs, and (iii) local taxes, including the greening of existing taxes and the introduction of new fiscal instruments. Currently, the various resources envisioned for greening the French economy are scattered, and several important proposed initiatives – such as the institution of a carbon tax in France or the establishment of an urban road toll in the Paris-IDF region – have subsequently been abandoned. The authorities could make better use of urban land taxes in order to encourage densification and urban renewal. This is the case with local taxation of building lots and the national government's taxation of property appreciation.

…requiring support from the private sector.

The problem of generating greater involvement of the private sector in the green growth of Paris-IDF lies not in the appetite of companies for new business models or the availability of clean technologies, but rather in the returns to be had from these new markets. One way to enhance the attractiveness of these new markets created by the environmental constraint might be to call upon so-called "energy service companies" (ESCO), which are specialists in the energy-savings business and offer a broad range of energy solutions. Another route is the public-private partnership, which allows for private co-financing on the basis of an effective sharing of financing and risks, as exemplified by the experiments of the City of Paris with Vélib' and Autolib'. There is also the possibility of issuing integrated calls for proposals, covering several urban services, as a way of improving environmental efficiency by sector and overall, and facilitating inter-sector synergies. Lastly, some cities have found innovative solutions for bringing private financing into urban projects. An example is the City of Toronto where, in the context of the Mayor's Tower Renewal programme, a regulatory amendment currently awaiting approval would allow the city to lend money to private owners for housing renovations and to treat the resulting debts as property taxes.

Introduction

For the world economy to emerge from one of the worst crises in recent history, there is a compelling need to devise new means of growth and progress, production and consumption. A green growth strategy may constitute a prism for examining a new growth model. Indeed, the terms "growth" and "green" are not mutually exclusive: on the contrary, sustainable development and economic growth are aims that reinforce one other and should be pursued interactively and consistently. Such an approach has the potential to address economic and environmental challenges and open up new sources of growth through optimising productivity, as well as opportunities for innovation and new markets. According to the OECD, green growth is indeed about fostering economic growth and development while ensuring that natural assets continue to provide the ecosystem services on which our well-being relies. To do this it must catalyse investment, competition and innovation, which will underpin sustained growth and give rise to new economic opportunities (OECD, 2011a).

Yet, quite clearly, green growth will be achieved in partnership with cities and urban areas – or not at all. Indeed cities, and particularly large conurbations, are both the problem and solution to the present economic and environmental challenges that countries must tackle. More than half of the global population (3.49 billion people) now lives in urban areas, a share that is expected to reach nearly 70% by 2050 (UNFPA, 2009; UN-Habitat, 2010). As we shall see in the case of Paris/Ile-de-France (Paris-IDF), metropolitan regions are often the driving force behind national economies as well as centres of innovation. As a result of specialisation and the range of industries and services present, they exhibit in most cases productivity levels higher than the national average (OECD, 2006). But at the same time they are significant consumers of energy and resources – 60-80% of world energy – and responsible for a major share of greenhouse gas emissions. Furthermore, cities bear a heavy responsibility for air pollution and undermining biodiversity. Urban form is instrumental in natural resource management and its environmental impact: the less dense a city, the greater its energy consumption *per capita* for electricity and transport (OECD, 2010a). Problems of congestion, pollution and the difficulties urban sprawl can cause in the delivery and management of public services have an influence not just on the quality of the environment, but on the efficiency of urban areas and on their ability to attract firms and a skilled labour force.

A green growth policy should not solely take account of the economic and environmental impact of cities – it should also capitalise on the potential of the urban scale. Cities plainly constitute a fitting environment from an economic standpoint to satisfy economic and environmental demands and encourage the mobilisation of the private sector. They are well placed to devise innovative strategies that can potentially be adapted to national or regional planning and to act as laboratories in implementing national pilot projects at the local level. They attract highly skilled people and high technology firms, and are responsible for the development of infrastructure and the building environment, as well as the provision of services in the areas of waste disposal, water and transport. Finally, thanks to synergies at the urban level, initiatives to support the environment have a positive impact on the urban economy. Indeed, local policies to cut pollution strengthen the attractiveness of cities, which is an essential facet of their competitiveness, especially in economies situated fairly high in the value chain.

Thus the OECD views urban green growth as "fostering economic growth and development through urban activities that reduce negative environmental externalities, the impact on natural resources and the pressure on ecosystem services. Greening the traditional urban economy and expanding the green urban sector can stimulate growth (through increased supply and demand), job creation and increased urban attractiveness, and contribute to better urban adaptation to climate change. These effects are in part the

result of stronger interactions at the urban level among economic efficiency, equity and environmental objectives" (OECD, 2011b).

This report examines the potential for green growth in the metropolitan region of Paris, demarcated by the Paris-IDF metropolitan region. A metropolitan region defined from a functional standpoint is generally determined by journeys between home and work. From this angle, the administrative Ile-de-France region is one of the rare examples of a metropolitan area in which the regional administrative divisions (the Ile-de-France region) correspond fairly closely to the functional definition of the region according to OECD criteria. "The Paris-IDF region", which consists of the city of Paris and its inner and outer suburbs (the "inner belt" and "outer belt"), will be the term most often used in this report to define the metropolitan region. The report will also refer to *Grand Paris* ("Greater Paris"), an initiative undertaken in 2009 by the President of the French Republic to devise a strategy for the future development of the Paris metropolis. While the precise boundaries of Greater Paris were widely debated by architects and urban planners during international consultation on the scheme, the Law of 3 June 2010 concerning Greater Paris identifies the Ile-de-France region as the action area.

- *Section 1* of the report examines socio-economic and environmental trends in the Ile-de-France region. While the capital region remains the mainspring of national growth and the one in which population growth in France is fastest, there are nevertheless signs that its drive and attractiveness are waning compared to other world metropolises, in a context of marked intra-regional inequalities.
- *Section 2* deals with spatial and environmental issues in the region: here it is noticeable that while Paris-IDF possesses a great many assets (a relatively compact urban form, an effective public transport network and a less marked environmental impact than in cities elsewhere in the world), progress is still nevertheless required, especially in regard to the energy efficiency of buildings and the negative effects of congestion.
- Public policy frameworks designed to promote green growth have been established in France and the Ile-de-France region, inspired notably by the *Grenelle de l'Environnement* (the "Grenelle Environment Forum", France's flagship environmental legislation. However, as will be discussed in *Section 3*, a full-scale green growth strategy could revitalise the regional fabric and in particular its declining industrial base.
- Indeed, there are many opportunities to be exploited in various green sectors, such as building, transport, renewable energy, and local and/or organic farming, which have the potential to create jobs, to help strengthen the attractiveness of the region, and to increase supply and demand of green goods and services. These opportunities will be examined in *Section 4*.
- *Section 5* will discuss policies in the area of eco-innovation and human capital, two vital factors in promoting green growth.
- Green growth cannot be understood solely in terms of promoting sectoral economic benefits; its effectiveness also depends on acknowledging the need for systemic spatial management and the interaction between economic, social and environmental aims and the ways in which they complement each other, as well as between the sectoral policies implemented. As will be discussed in *Section 6*, it is necessary to reform the tools of urban planning devised to prepare the cities of the future.
- Similarly the governance arrangements at work in the metropolitan region will have to adapt to the challenges raised by globalisation and to the special nature of Paris as a megalopolis, a world-famous city and the hub of France's economy. These challenges are daunting, as will be emphasised in *Section 7*, but innovative and viable approaches exist.

- Finally, to implement a fresh approach turning green growth into a new force to reinvigorate the region, it will be vital to reform existing tax mechanisms and find new sources of funding at a time when public resources are in increasingly short supply. Strategies for financing green growth will be considered in *Section 8*.

1. Overview of socio-economic and environmental trends in the Paris-IDF region

A global city and the economic, political and cultural lifeblood of France

With a population of almost 12 million, the Paris-IDF region is the focal point for France's main political, economic and cultural endeavour. It is ranked ninth among OECD metropolitan-regions (metro-regions) for its size in terms of number of inhabitants and has the largest urban population in Europe, after London. These two mega-cities are often described as Europe's two Global Cities.[1] The Paris-IDF region contains almost 1 300 local administrative entities, corresponding to the highest level of institutional fragmentation among OECD metro-regions. It is concentrically arranged around the capital with, first, an "inner" belt comprising three *départements* (Hauts-de-Seine, Seine-Saint-Denis and Val-de-Marne) and then a second "outer" belt of four *départements* (Val-d'Oise, Seine-et-Marne, Essonne and Yvelines) (Figure 1). In all, the region contains eight *départements* including Paris (which is both a *département* and commune) and 1 281 communes. As will be discussed in Section 7, this territorial complexity causes difficulty in terms of governance in general, and especially in the area of green growth.

Figure 1. Administrative map of the Paris-IDF region

2011

Note: This map is for illustrative purposes only and wholly without prejudice to the status of any territory shown on it or to that territory's administrative supremacy.

Source: IAU (2011).

1 . See Sassen (1991).

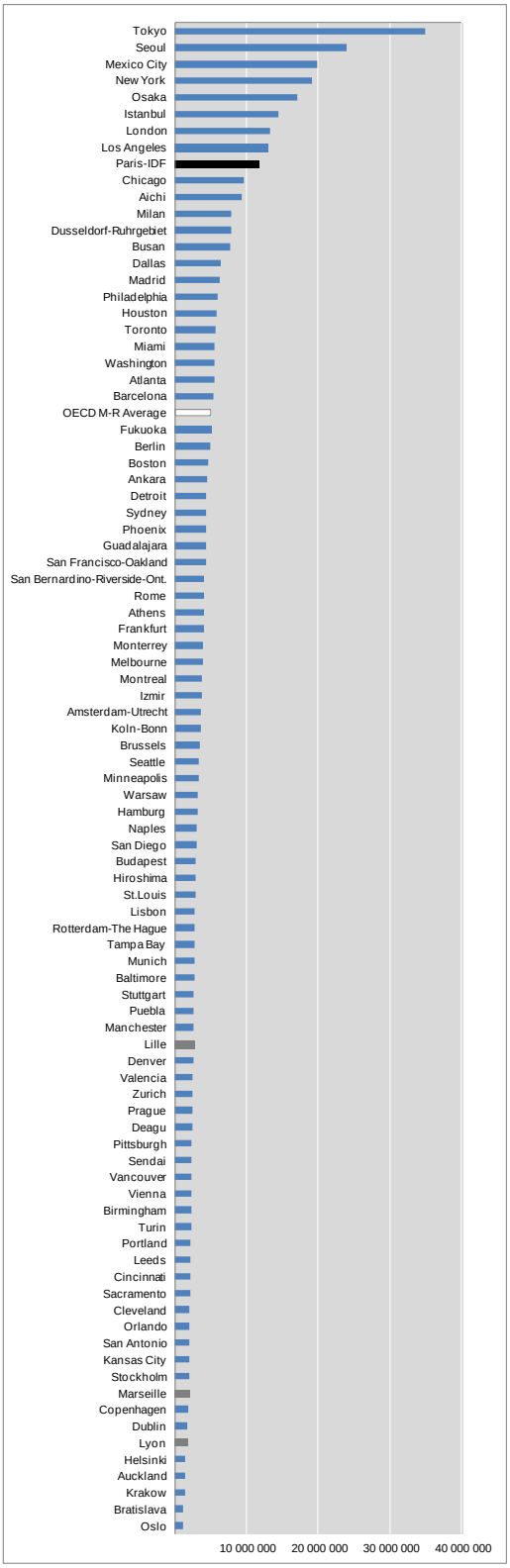
The fastest rate of demographic growth in France

The population of the Paris-IDF region is growing faster than that of any other region in France. In the French context, it has an important asset in that its population is both young and on the increase. Indeed this population is proportionally by far the youngest in any French region,[2] with just 17% of persons aged 60 or over. The region had 11.7 million inhabitants (19% of the national population) in 2008 – of whom 2.2 million lived in Paris, 4.4 million in the inner belt and 5.1 million in the outer belt (Insee, 2011a). This population is still growing. If recent demographic trends are maintained, the population of Ile-de-France will increase by 1.2 million between 2007 and 2040, reaching 12.8 million, while only 24% of its inhabitants will be aged 60 or over, as opposed to 31% among the French population as a whole (Insee, 2010a). Compared to other OECD metropolitan regions, the Paris-IDF region is one of the most highly populated (ranking ninth out of 90), behind Tokyo, Seoul, Mexico City, New York and London (Figure 2).

2. Data on France relate to metropolitan France, excluding the overseas *départements* and territories.

Figure 2. Population in OECD metropolitan regions

2009



Note: OECD M-R average: average for OECD metropolitan regions.

Source: OECD Metropolitan Database.

The fast-growing population in the Paris-IDF region compared to the rest of the country is the outcome of two opposing trends: on the one hand, net emigration from Ile-de-France compared to other regions in France, particularly because of people retiring and, on the other, population growth attributable to the greater number of births than deaths and its substantial level of immigration. In 2008, 1.1 million immigrants aged between 18 and 50 lived in Ile-de-France, representing 43% of all immigrants in metropolitan France. Furthermore, one million direct descendants of immigrants born in metropolitan France (at least one of whose parents was an immigrant) live in the region. They are younger than the Ile-de-France population as a whole, with 58% of them aged under 30, compared to 38% for the whole of Ile-de-France. There are thus over 2 million immigrants and descendants of immigrants in Ile-de-France (Insee, 2010a)[3]. Immigration to the region represents a very wide social spectrum, including both those with only modest qualifications and highly skilled immigrants. For example, among the newcomers of working age (15-64-year-olds) and excluding students, 27% have no secondary or higher education qualification and 32% have at least a second-cycle university degree. The latter proportion is higher than that for non-immigrants (25%). This situation should be borne in mind when considering the education and training needs of both the workforce in general, and in the area of green growth professional occupations in particular.

One of the most competitive of all global metropolises and the mainspring of national growth

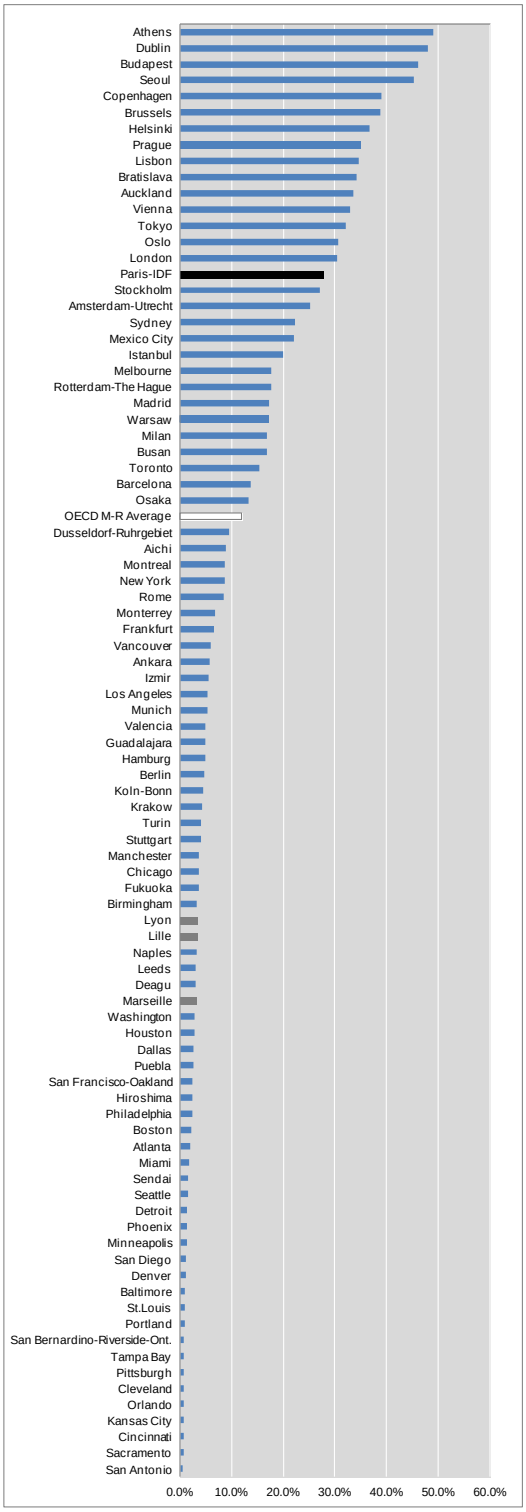
The powerhouse of the French economy and one of the biggest regional economies in the OECD, the Paris-IDF region constitutes the leading economic region in France and is among the most productive metro regions in the OECD.[4] It is for example the second global centre for the siting of the world's 500 biggest firms, and the leading European research location. The UN Human Development Indicator ranks it second for quality of life (IAU-Insee, 2011). With a GDP of EUR 552 billion in 2009, it is the source of almost 30% of national wealth, ranking 16th out of 90 OECD metro-regions for its level of GDP (Figure 3). Wealth *per capita* is well above the national average: in 2007, GDP *per capita* in the Ile de France region was 46% higher than the national level. In 2008, it came 22nd out of 90 OECD metropolitan regions in terms of GDP *per capita* and was ranked fifth in Europe behind Oslo, Munich, Dublin and London (Figure 4). This performance is sustained by a relatively high level of workforce productivity in comparison with both the national average and the large OECD metropolises (Figure 5).

3. The majority of immigrants and their descendants in Ile-de-France no less than in metropolitan France are from Africa: around 30% of immigrants and 40% of their descendants are from one of the three Maghrib countries (Algeria, Morocco and Tunisia). But there is a trend towards increasing immigration from sub-Saharan Africa (18% of immigrants) and "other countries" (17%) (Insee, 2010a).

4. Its GDP should be compared with the national metropolitan GDP of EUR 1 871 billion (Insee, 2011a).

Figure 3. Share of regional GDP in the national economy

Regional GDP as a share of national total (2008)

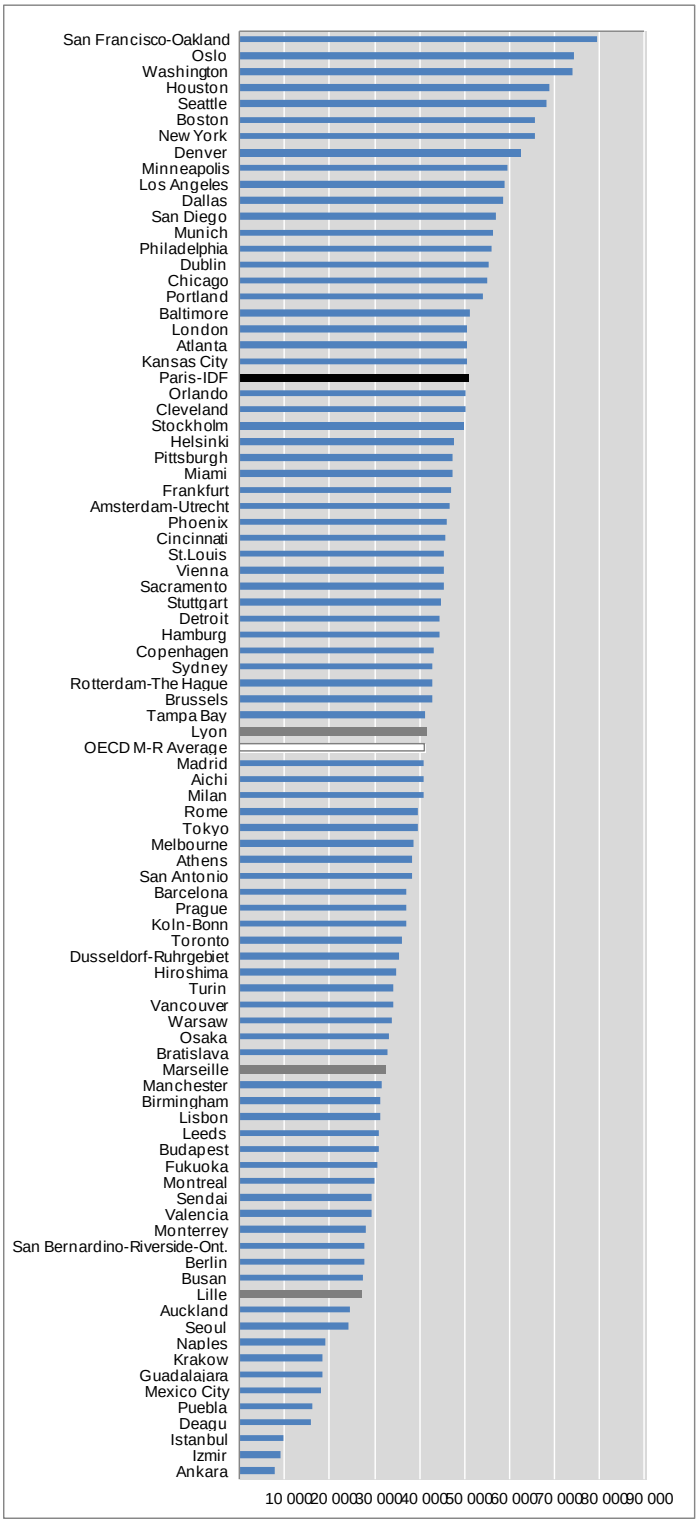


1. OECD M-R average: average for OECD metropolitan regions.
2. Data for Turkey refer to the year 2001; data for New Zealand correspond to 2003; data for Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden and the United Kingdom correspond to 2007.

Source: OECD Metropolitan Database.

Figure 4. GDP *per capita* in OECD metropolitan regions

Purchasing power parity in USD (2008)

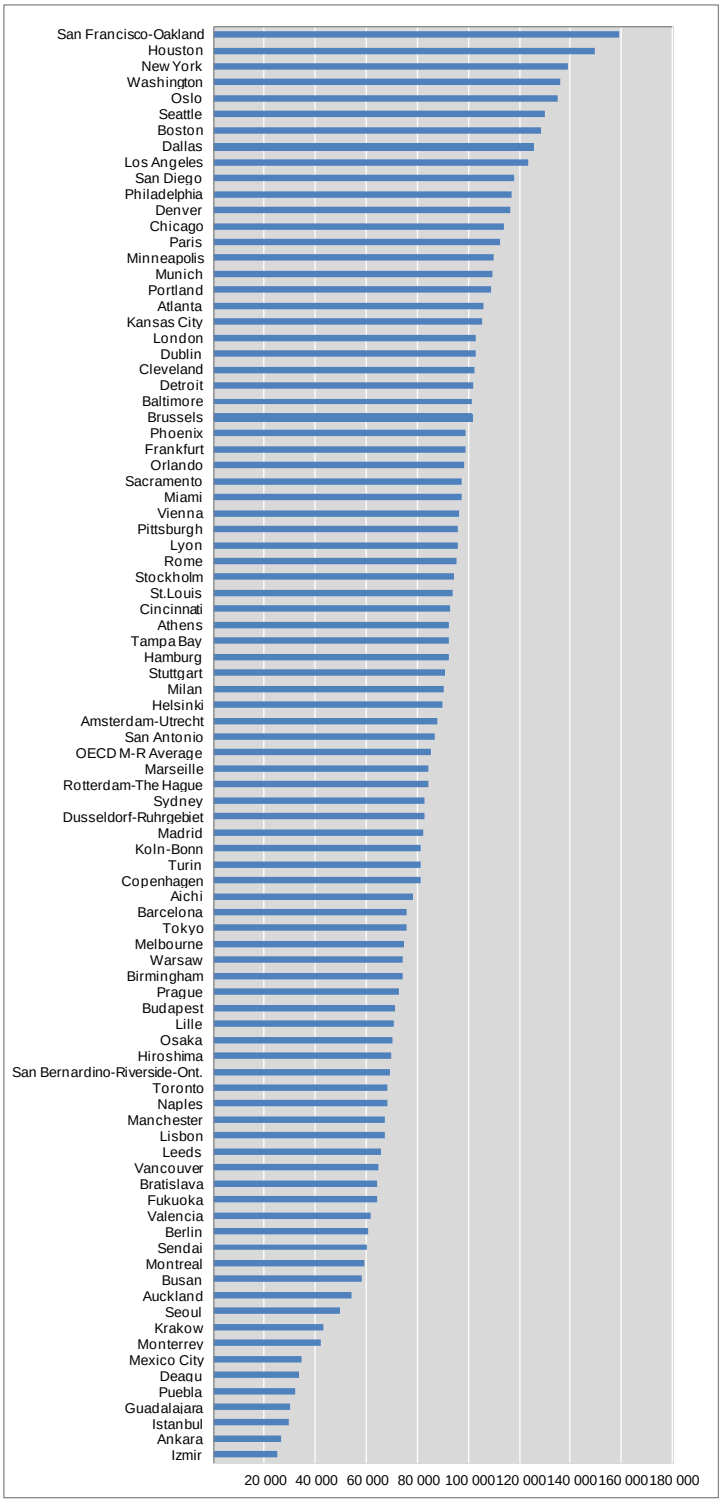


1. OECD M-R average: average for OECD metropolitan regions.
2. Data for Turkey refer to the year 2001; data for New Zealand correspond to 2003; data for Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden and the United Kingdom correspond to 2007.

Source: OECD Metropolitan Database.

Figure 5. Workforce productivity in OECD metropolitan regions

Purchasing power parity in USD (2008)



1. OECD M-R average: average for OECD metropolitan regions.
2. Data for Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden and the United Kingdom correspond to the year 2007; data for Belgium and Ireland refer to 2006; data for Mexico City and Turkey refer to the year 2000; data for Switzerland were not available.

Source: OECD Metropolitan Database.

The economic dynamism of the Paris-IDF region is also evident in terms of business creation and the location of foreign firms. The region recorded a 9% increase in the formation of new businesses (excluding the self-employed (*auto-entrepreneurs*)) in 2009, slightly above the 8% average for France as a whole (Insee, 2008). The majority of new businesses were concerned with services to firms. The rate was highest in Hauts-de-Seine (50% of new businesses with Paris) (Insee, 2008). This renewed vitality (the trends were less encouraging at the beginning of the decade) extended to other *départements* in the inner area of Seine-Saint-Denis and Val-de-Marne. Among major job centres are Boulogne-Billancourt, Issy-les-Moulineaux, Saint Denis, Montreuil, Tremblay-en-France and Rungis. Meanwhile the outer belt experienced strong growth over a long period with the development of new towns, the slackening of industrial activities and logistics, and the growth in jobs with high value added (Insee, 2008). Paris-IDF also remains an attractive region for foreign firms. In 2009, it had the fourth highest number of schemes in Europe for the siting of such firms, and came first in Europe (and third in the world) for schemes to establish research centres (Insee-IAU, 2011a).

The key contribution of specialisation in high value added sectors

The growth in productivity in the Paris-IDF region to a level above the national average is partly attributable to the tertiarisation of the economy and the development of activities with high value added. The Ile-de-France economy is based on service activities (consultancy and assistance, financial and real estate activities, and R&D and cultural activities), representing around 87% of the value added (compared to 74% in the rest of the country) (Insee, 2011b). Services to firms alone account for 24.4% of regional value added as against 16.7% at national level. The tertiarisation of the economic fabric of Ile-de-France has been part of the tendency for industry to outsource tasks such as property management, logistics, research, security and cleaning, and has occurred alongside the establishment of productive activities in the Parisian basin (excluding IDF),[5] other regions of France and abroad. Consequently, employment in Ile-de-France is focused increasingly on highly paid and highly skilled activities.

Partially reliant on a young and well qualified workforce, the Paris-IDF region is also noteworthy for its competitiveness in terms of jobs in technological and knowledge-intensive sectors (KIS). It is regarded as one of the 27 OECD technological hubs and is ranked 13th for its contribution to the overall growth of the area (OECD, 2011c). The region comes easily first in Europe, ahead of Milan, London, Madrid and Barcelona, with over 2.1 million jobs in KIS, including 321 000 in high technology sectors (OECD, 2011c). The KIS represent almost one job in every three in Ile-de-France (5,957 million salaried jobs in 2008, according to Insee). However, between 2002 and 2006, their number fell by 2.3% (IDF, 2011). These sectors draw in particular on a workforce that is on average younger and more highly trained than in the rest of the country: 56% of the population was aged under 40, compared to 50% in the rest of France. The proportion of the population with a "*Bac +2*" (high school *Baccalaureat* degree in addition to two years of university or professional training) qualification or higher is 41.7%, well above that elsewhere in the country (28.4%). The Paris-IDF region ranks eighth when OECD metro-regions are classified according to the share of the population with a higher education qualification (OECD, 2011d).

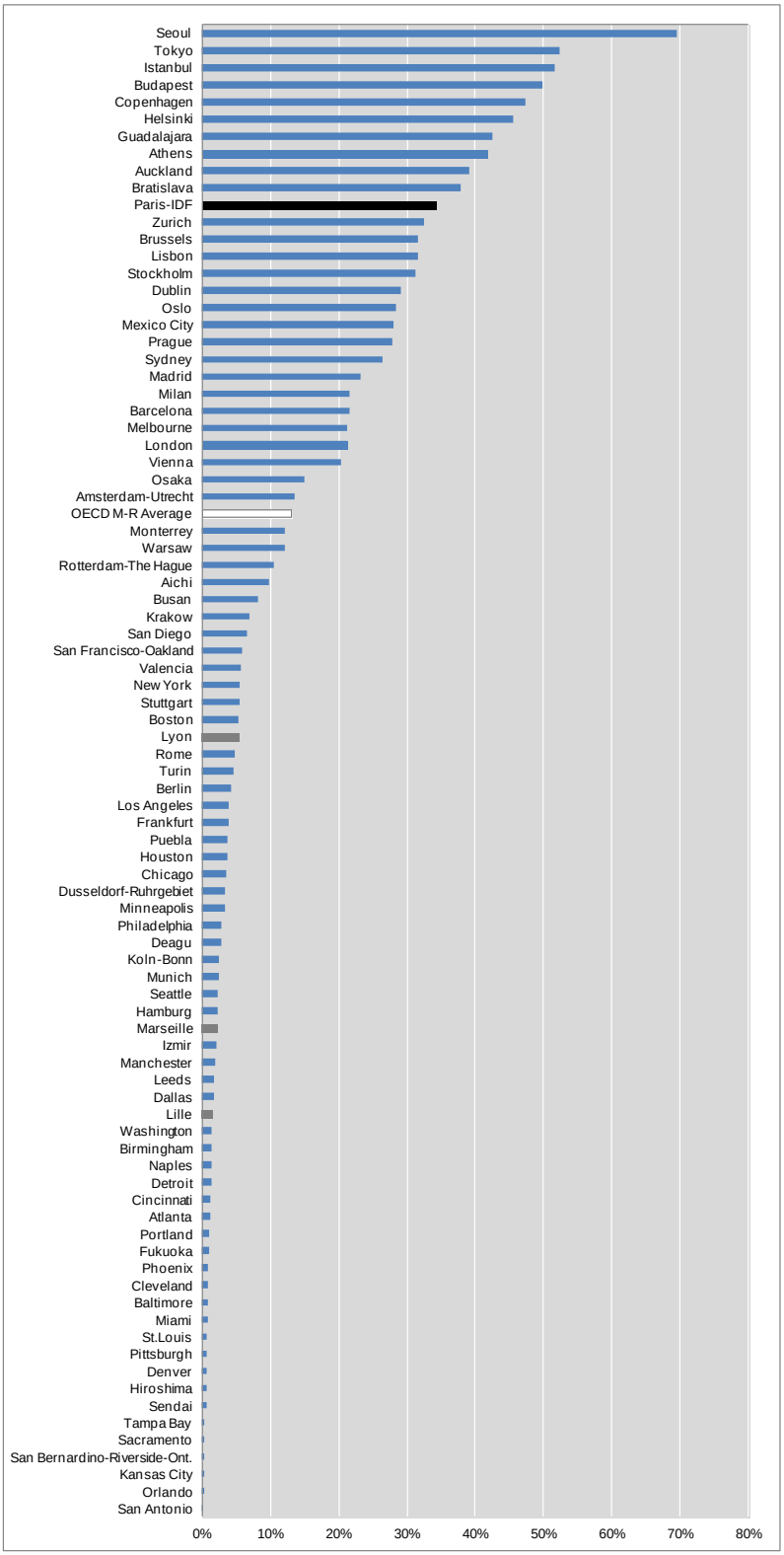
5. The "Parisian basin" is an entity established in 1992 by the *Délégation interministérielle à l'Aménagement du Territoire et à l'Attractivité Régionale* (DATAR, or Inter-ministerial Delegation for Area Planning and Regional Attractiveness), which corresponds to a vast area whose overall unity is ensured by the Paris metropolis and for which Paris assumes organisational responsibilities. Besides the Paris-IDF region, the Parisian basin includes the regions of Haute-Normandie, Picardie, Champagne-Ardenne and Centre and, to the east, the western side of Bourgogne (Yonne and Nièvre) and, to the west, Basse-Normandie and Sarthe (see *www.senat.fr/rap/r02-241/r02-24116.html*).

A strong potential for innovation and R&D

Paris-IDF is still the leading European region for R&D and innovation. With 17 universities and over 300 research establishments, which in 2008 had 89 540 research staff, or 39% of French researchers (IAU-Insee, 2011a), the region is home to 18% of innovative small and medium-sized enterprises (SMEs), or almost 200 000 firms, especially in the computer science, architecture/design, electrical and electronic equipment and machine engineering sectors (IDF, 2011a). The highly knowledge-intensive aspect of the Ile-de-France region is borne out by its good record in the area of patents (Figure 6). While around 34% of French patents are registered in Ile-de-France, compared to 5% in Lyon, 2% in Marseille and just over 1% in Lille, the number of its patents is not rising as fast as in some of its European competitor regions such as Stuttgart or Munich. In the Ile-de-France region, green patents are registered primarily in the fields of electricity and physics, whereas the proportion of those in biotechnology and nanotechnology is very small (IDF, 2011a).

Figure 6. Patent applications in OECD metropolitan regions as a share of the OECD national total

2009



Note: OECD M-R average: average for OECD metropolitan regions.
Source: OECD Regional database.

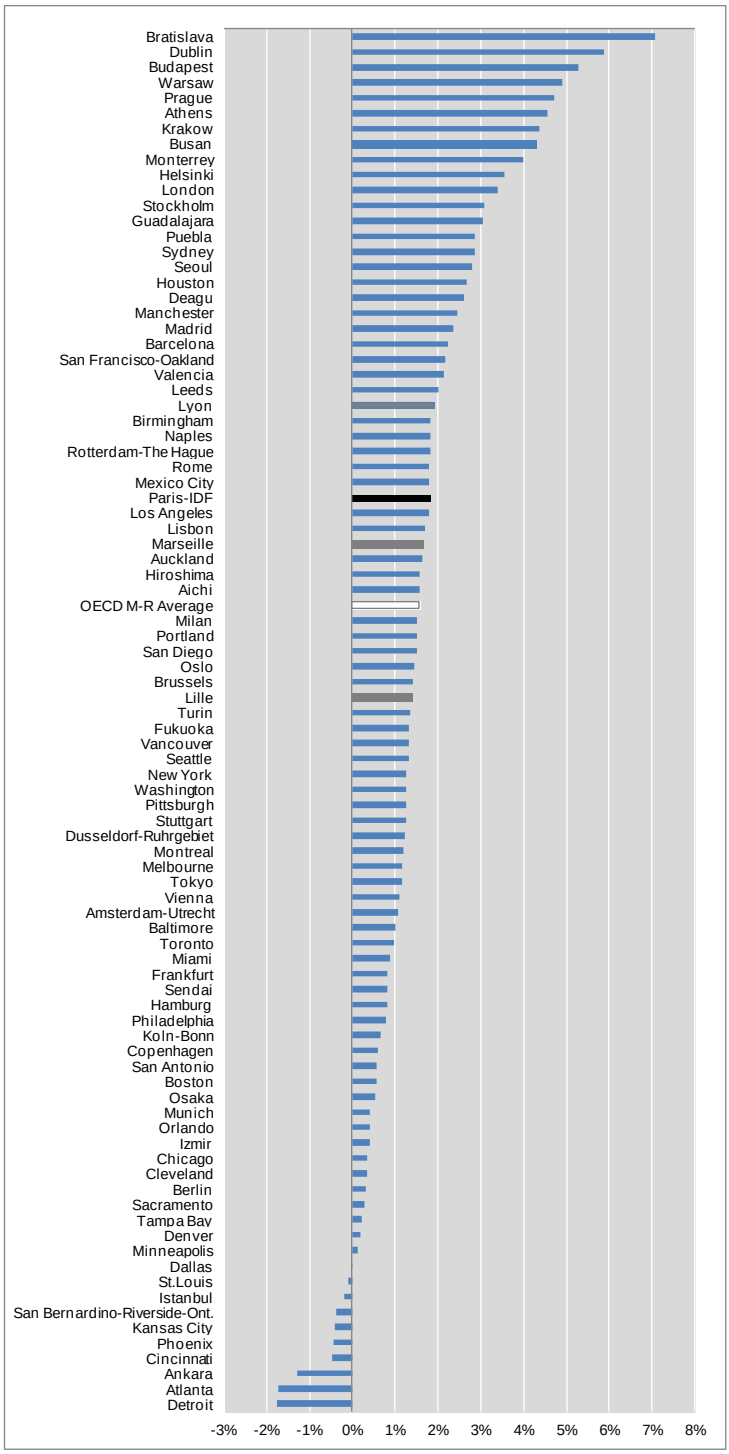
International competition, unemployment and inequality

Sagging vitality?

Although the Paris-IDF region is well placed in international competition, changes in the global attractiveness of the region are the subject of debate. In the 1995-2008 period, Ile-de-France experienced an average annual growth in its GDP *per capita* of 1.79%, higher than the national average (1.59%). However, the region comes no higher than 31st out of 90 OECD metro-regions and 21st out of 39 metro-regions in Europe in terms of growth in GDP *per capita* during the same period (Figure 7). This growth is indeed much weaker than that in European, Korean or American metro-regions (Bratislava, 7.1%; Dublin, 5.9%; London, 3.4%; Stockholm, 3.1%; Seoul, 2.8%; or Houston, 2.7%). And while, from a demographic standpoint, the population of the Paris-IDF region is increasing faster than anywhere else in France, its growth rate is modest compared to international trends, including those within the group of OECD metro-regions. The population of the Parisian metropolis is not growing nearly as fast as in the case of metro-regions in emerging countries, or indeed in comparison with most OECD metro-regions: between 1995 and 2007, its population growth rate was just above the OECD average (Figure 8).

Figure 7. Average annual growth rate in GDP *per capita* in OECD metropolitan regions

(1995-2008)



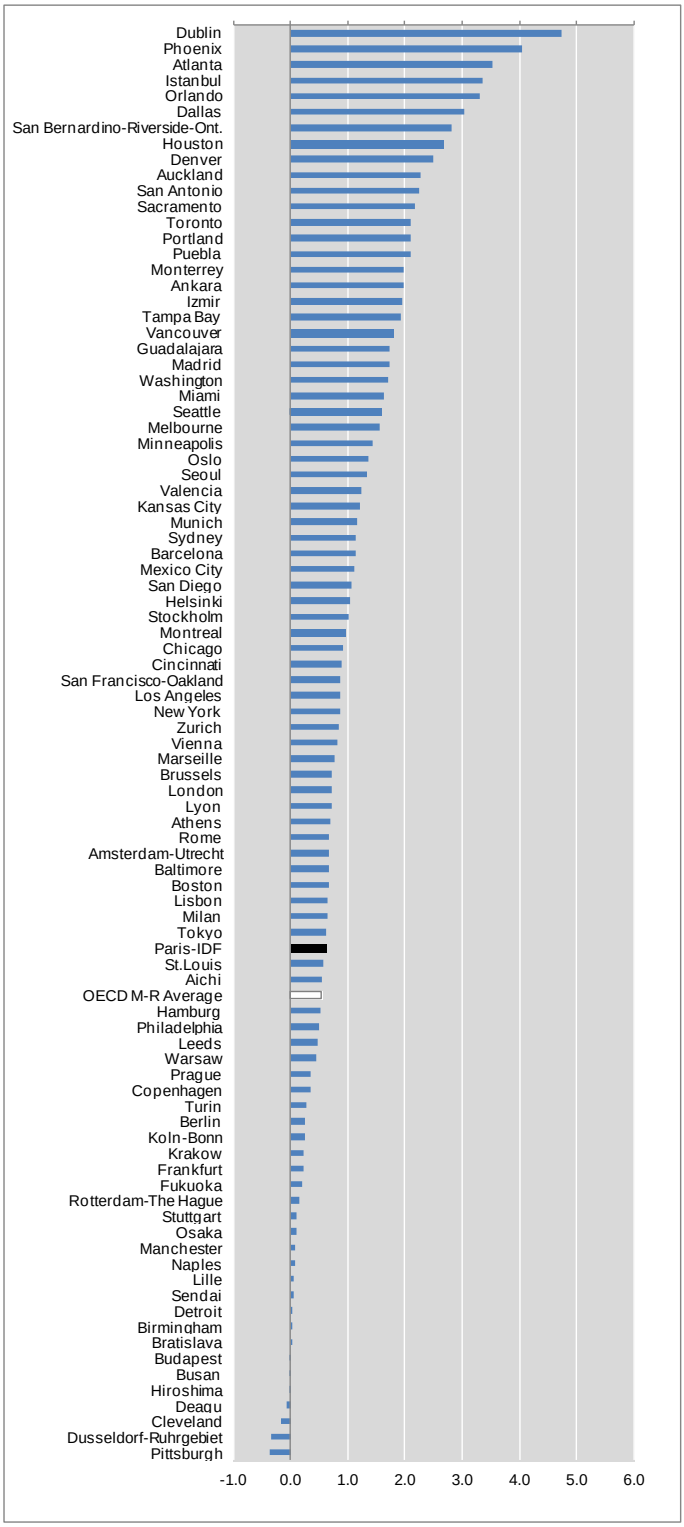
1. OECD M-R average: average for OECD metropolitan regions.

2. Data for Austria, the Czech Republic, Finland, France, Greece, Hungary, Ireland, Italy, Japan, Korea, Portugal, Slovakia, Sweden, and the United Kingdom correspond to the 1995-2007 period; data for Belgium, Germany, the Netherlands and Poland correspond to the 2000-07 period; data for Denmark correspond to 2006-07; data for New Zealand correspond to 2000-03, data for Norway correspond to 1997-2007; data for Turkey correspond to 1995-2001, and data for the United States correspond to 2001-08.

Source: OECD Metropolitan Database.

Figure 8. Annual population growth in OECD metropolitan regions

(1995-2008)



1. OECD M-R average: average for OECD metropolitan regions
2. Data for Australia and Slovakia refer to 1996-2008; data for Belgium refer to 2000-2008; data for Denmark and Germany refer to 2005-2008; data for the Netherlands refer to 2003-2008; data for Poland refer to 2001-2008.

Source: OECD Metropolitan Database.

The region has been affected by the de-industrialisation process that the whole country has experienced since the second half of the 1970s. From 1976 to 2000, the contribution of Ile-de-France industry to regional GDP fell by 50% (DREIF, 2003). While between 2000 and 2007, Paris-IDF lost 100 000 industrial jobs, after losing 260 000 from 1990 to 1999, it still remains France's leading industrial region (with 14% of such jobs) (IDF, 2011b), its leading exporter of goods in 2009 (16% of French exports) and its foremost importer (27% of French imports) (IAU-Insee, 2011a). This de-industrialisation is the outcome of France's loss of competitiveness, especially in the face of competition from emerging countries. The decline in jobs in the industrial sector may also be attributed to the gains achieved in productivity and to the outsourcing of many activities. De-industrialisation has definitely strengthened the process of tertiarisation in the region: 300 000 jobs were created in services during the 2000-07 period (IAU-Insee, 2011a).

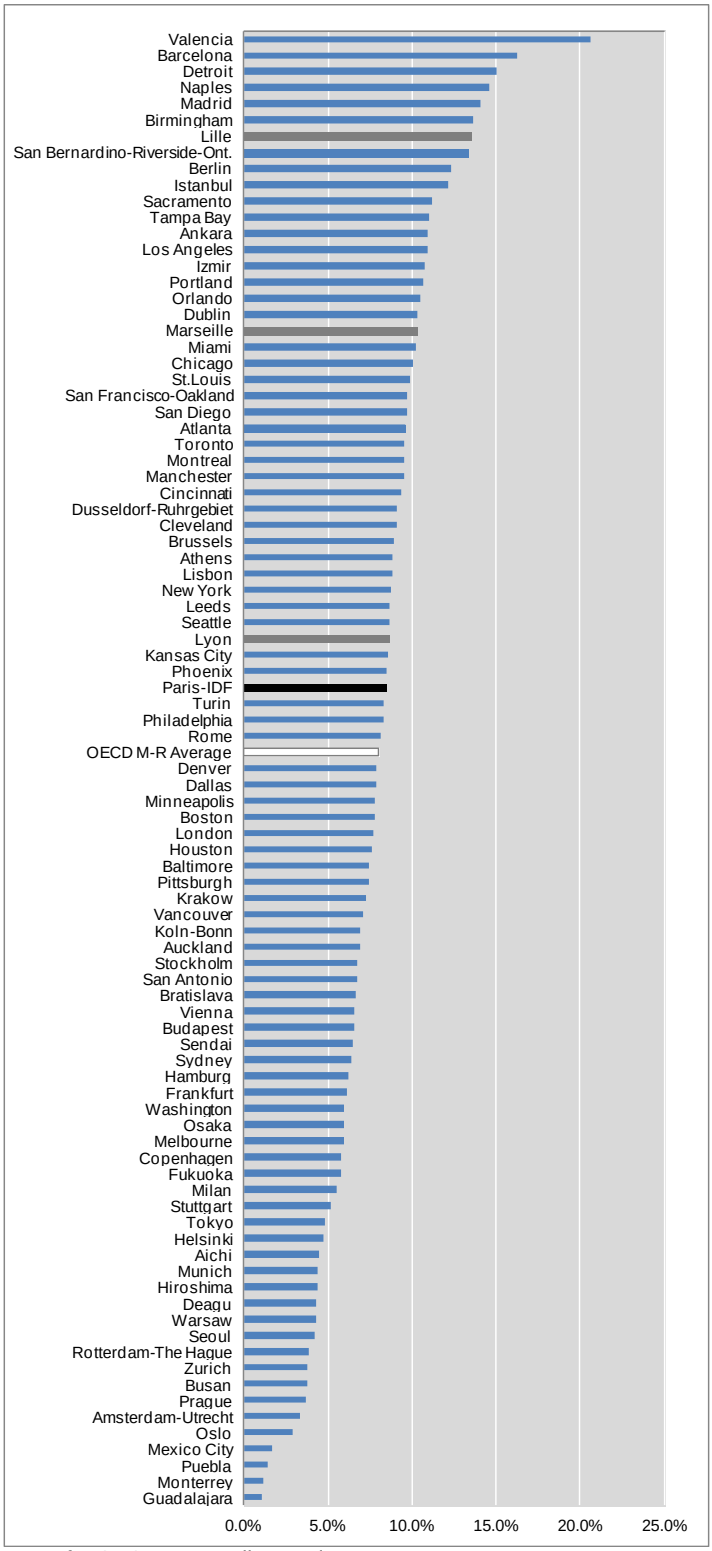
The ability of the region to innovate has also been severely tested by international competition. Even though it meets the Lisbon Strategy criteria, research intensiveness (R&D as a proportion of GDP) fell between 2000 and 2005 (from 3.5% to 3%). Many R&D units (especially in the public sector) were decentralised and the region lost young researchers to other French regions. Furthermore, despite its high business creation rate, the region is weaker than its European counterparts in the creation of innovative firms (Prefecture of the Ile-de-France region, 2007).

A high unemployment rate, especially among young people

Despite sound performances by the Ile-de-France economy, the regional unemployment rate has remained high, especially among young people. Even though the rate in Ile-de-France is lower than the national average (8.2% on average in 2010 compared to 9.3% in metropolitan France (Insee, 2011c)), it is a cause for concern. In 2009, the regional unemployment rate was higher at 8.4% than the average for OECD metro-regions (8.0%) (Figure 9). On the other hand, this rate has not changed very much in recent years, while other OECD metro-regions have experienced a strong increase in unemployment with the crisis. Young people aged under 25 account for 11.2% of job-seekers in Ile-de-France compared to 16.6% in other regions of France.

Figure 9. Unemployment rate in OECD metropolitan regions

2009



1. OECD M-R average: average for OECD metropolitan regions.
2. Data for Belgium correspond to 2006; data for Finland and Norway correspond to 2008; datafor Mexico City and Turkey correspond to 2000; data for Portugal correspond to 2007.

Source: OECD Metropolitan Database.

Job insecurity and strong social and territorial disparities

In the meantime, the region has experienced persistent job insecurity, along with social and territorial inequalities. As a general rule, incomes are higher in Paris and to the west of the region (Figure 10). These inequalities are partly attributable to the presence of very high-income households. While the median income in the *départements* of Paris, Yvelines, Hauts-de-Seine and Essonne is the highest in France, Seine-Saint-Denis has the lowest median income and the highest degree of poverty at the national level (IDF, 2011b). These intra-regional disparities have increased over time: in many communes which, in 1984, had an average income per taxable household that was higher than the regional average this difference increased in 2004, whereas in the east during the same period most of the poorest households became even poorer (IDF, 2008). The level of poverty ranges from 7.2% in Yvelines to 21.6% in Seine-Saint-Denis, in which households often encompass several families who are especially affected by poverty. According to Insee, almost one Ile-de France resident in four in a *zone urbaine sensible* (ZUS, or sensitive urban area)[6] lives in Seine-Saint-Denis. This is also the *département* with the greatest proportion of its population living in a ZUS, namely 20% compared to 6% in Paris (IDF, 2008).

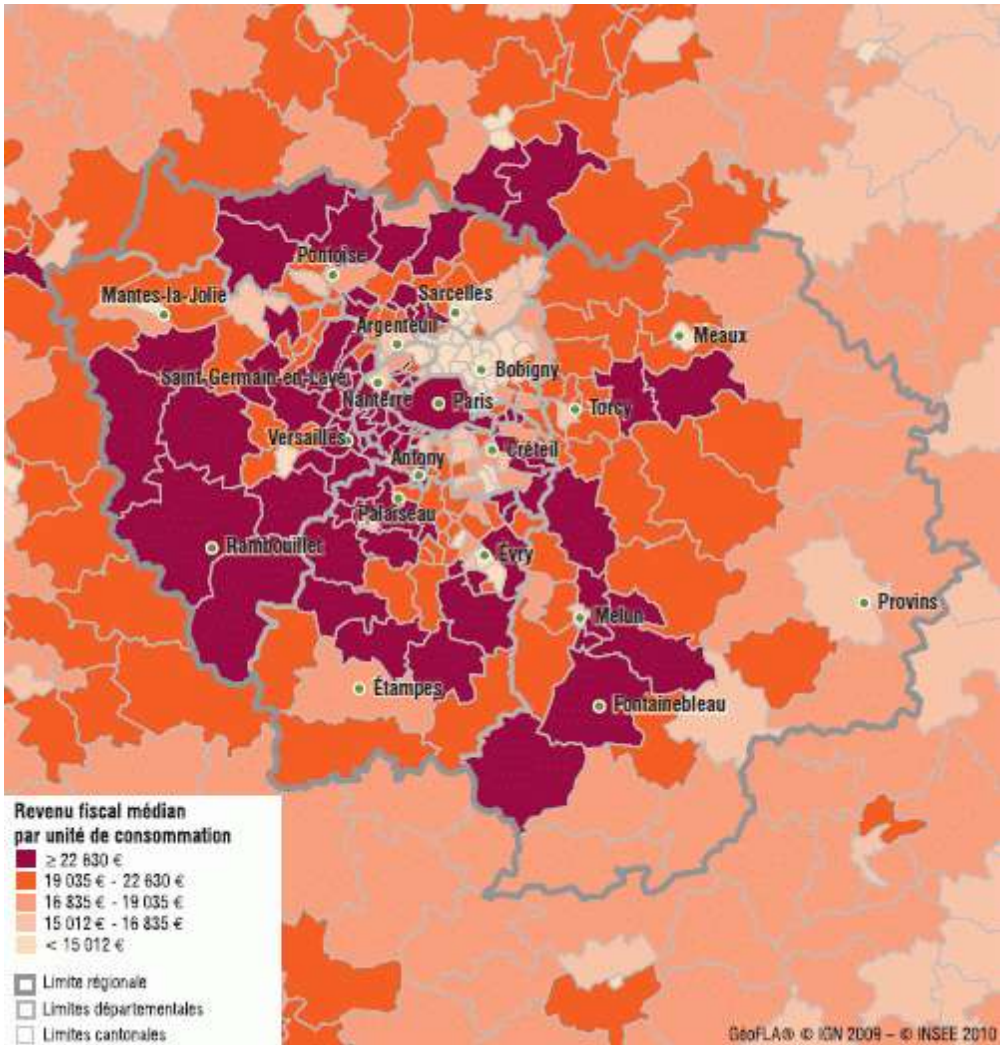
The growth in social and territorial inequalities in terms of income is a phenomenon common to the large metropolises in OECD countries, which exhibit levels of inequality often higher than those apparent between regions in the country to which they belong. However, as in London, levels of intra-regional inequality in the Paris-IDF region are above the average for OECD metropolitan regions (Figure 11).

Intra-metropolitan inequalities are also observable as regards the location of skilled jobs. Jobs requiring few qualifications represent 18% of employment in Ile-de-France, a proportion below that in other regions of France (IAU-Insee, 2011b). They are strongly clustered geographically within the region, especially round the edge in Seine-et-Marne, Val-d'Oise and Seine-Saint-Denis (IAU-Insee, 2011b). In addition, while low-skill workers in the service sector work more particularly in areas of high-density employment and high population density, low-skilled manual workers tend to be more in the outlying areas in large industrial zones in Ile-de-France (IAU-Insee, 2011b).

6 . According to Insee, a sensitive urban area (ZUS) is an intra-urban area identified by the public authorities for the priority targeting of town or city policy, in accordance with local considerations tied to difficulties experienced by residents in the area.

Figure 10. Taxable income of Ile-de-France households

2007

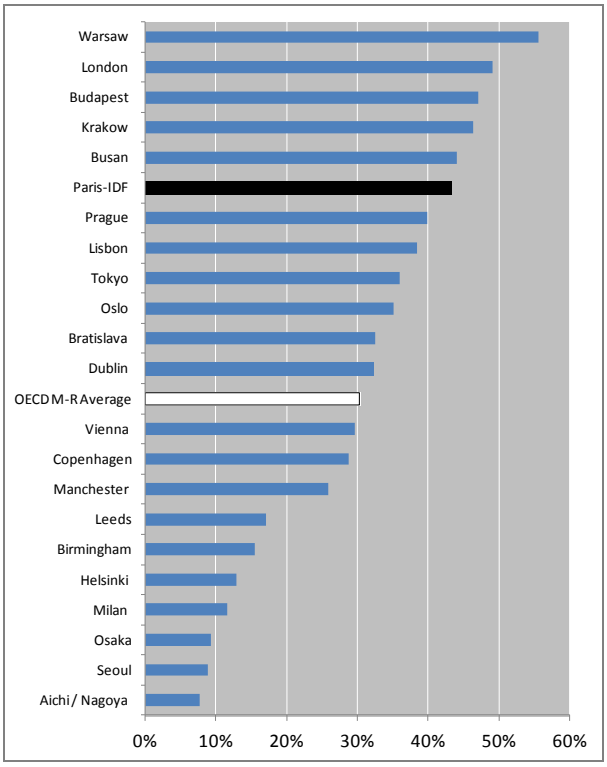


Note: This map is for illustrative purposes only and wholly without prejudice to the status of any territory shown on it or to that territory's administrative supremacy.

Source: Insee (2010).

Figure 11. Intra-regional inequality within OECD metropolitan regions

2008



1. OECD M-R average: average for OECD metropolitan regions.

2. Intra-regional differences in terms of GDP *per capita*. Standard deviation of logarithmic values for metropolitan regions.

Source: OECD Metropolitan Database.

These intra-regional inequalities are also evident in the distribution of financial resources and the location of major employment centres within the region. The distribution of the financial resources of the *départements* and of their GDP *per capita* points to an imbalance, especially between the region's centre (Paris and the inner belt) and outskirts (outer belt) (Table 1). On closer examination, it is possible to identify "economic growth points" which map out a more complex picture but one still tending to point up the west and the south: thus the Paris/centre-west complex is home to over 900 000 jobs out of the 6 million in the whole region; the La Défense/Nanterre district has between 300 000 and 400 000 jobs and the Paris/south-west area over 200 000. In all, therefore, the west and the south account for almost one-quarter of all jobs in the IDF region. In 2007, Paris and Hauts-de-Seine were its two leading *départements* in terms of employment, representing 50% of all its salaried jobs. The northern sub-region with a high unemployment rate also displays considerable vitality as regards new business formation. Centres for research and technology are appearing in the south (Plateau de Saclay) and to the east (Marne-la-Vallée).

Table 1. Variations between *départements* in the Paris-IDF region

Sub-region	Population in millions (2009)	Budget in billions of euros (2011)	Budget *per capita* in euros *per capita*	GDP *per capita* in euros *per capita* (2008)
Paris	2.2	7.7	3 500	85 700
Inner belt				
Hauts-de-Seine	1.5	1.8	1 200	80 400
Seine-St-Denis	1.5	1.8[(1)]	1 212	31 000
Val-de-Marne	1.3	1.8	1 400	30 400
Outer belt				
Seine-et-Marne	1.3	1.2	923	26 200
Yvelines	1.4	1.5	1 071	33 100
Essonne	1.2	0.9	750	31 800
Val-d'Oise	1.1	1.2	1 090	28 800
IDF region	11.5	4.6[(2)]	400	47 800

1. Initial budget 2010

2. This refers to the special budget of the regional entity (NUTS 2) and not to the total budget of the *départements* (NUTS 3)

Source: Eurostat (population and GDP *per capita*); *département* websites (budget)

Housing crisis: an economic and social challenge

For around 20 years, the Ile-de-France region has had to confront a housing crisis of a qualitative, quantitative and financial nature. First, too little is being built, with less than 40 000 units of accommodation completed in 2010, notwithstanding an estimated real need for some 70 000 (Société du Grand Paris, 2011). On top of that, the region is suffering from a shortage of social housing: the number of applications stood at 406 000 in 2010, whereas only 75 000-80 000 a year have been accepted since 2006 (IAU, 2010a). Furthermore, the waiting list of priority applicants is now estimated at 300 000. This poses problems in terms of geographical allocation, as prices in the metropolitan centre have soared (on average EUR 8,000/m^2 in the city of Paris in 2011), which is obliging poorer families and now those in middle social strata to move away from densely populated areas. This trend is encouraging urban sprawl, despite recurrent policies aimed at ending it. Finally the property boom at the start of the century has led to a loss of "household purchasing power".[7] As a result, private investment is falling and the housing deficit is becoming more acute.

Without causing a crisis on the scale of those in Spain or Ireland, these developments are posing a grave problem in Ile-de-France. Housing is a key factor in economic attractiveness. The difficulty experienced by working people in securing accommodation in the central area, and the greater distances between work and housing in the outer belt contribute to a poorer quality of life in the region, furthering net emigration among skilled working people with children. Under circumstances in which Ile-de-France will experience changes in its professional make-up as the baby boom generation now retire, the region is obliged to find new means of attracting and retaining a workforce of high calibre (IAU, 2010a).

7. According to IAU, whereas new tenants spent 15.6% of their income on rent in 1984, the proportion rose to 24.6% in 2006 (see IAU, 2010a)

2. Spatial and environmental challenges

A wide range of natural resources

The rich diversity of the region's natural resources – in terms of water and forestry, as well as geological and agricultural resources – has long constituted one its main economic and natural assets. Its natural and agriculturally rich outlying area accounts moreover for 76% of the total land area of Ile-de-France (IAU, 2011a). With a climate tempered by Atlantic, southern and continental influences, the region is crossed by three major waterways (the Seine, the Oise and the Marne) and covered by woods and forest (23% of the area) and agricultural land (53%). Virtually all (99%) of the agricultural land is in the outer belt, with the majority of it (58%) in Seine-et-Marne, followed by Yvelines (16%), Essonne (15%) and Val-d'Oise (10%) (Ademe, 2010). Its rich and varied geological heritage comprises a wide variety of natural materials (aggregates, cement limestone, Ile-de-France gypsum, industrial silica and fire-clays) destined for industrial use or in building and civil engineering (IAU, 2011b). On the other hand, ground movements due to what is left of this materials extraction are – along with the threat of flooding – one of the main natural risks in the region (IAU, 2011b).

Without forgetting that Paris-IDF is the leading French agricultural region (EUR 3.5 billion, or 11% of national value added in 2008) and the foremost cereal-growing area in Europe, agriculture represents only 1.6% in terms of regional value added (IAU, 2011c). As Ile-de-France agriculture is strongly export-oriented, it focuses intensively on the mainstream crops of cereals (364 055 ha), oil seeds (74 084 ha), industrial sugar beet (38 566 ha) and protein crops (30 481 ha) (IAU, 2011b). In spite of the effectiveness of this intensive industrial agriculture generally involving single-crop farming, it has negative external effects on the environment, especially as regards soil degradation and water pollution. In terms of green growth, therefore, the development of local and/or organic farming[8] offers the Paris-IDF region excellent prospects. As far as organic farming is concerned, it first of all involves agricultural production that causes less environmental pollution than conventional agriculture. Secondly, it is conducive to job creation, as it requires an increase of 9-30% in the workforce and results in more permanent salaried staff than traditional agriculture (Lecoueur, C. *et al*., 2009; Réseau TEE, 2009). Even if organic farming currently accounts for only 1.2% of the agricultural land area used in IDF, the number of farms involved increased by 43% in 2009-10 (AB, 2011). This fact is all the more significant when compared to trends in traditional agriculture, in which intensification of the sector and the industrialisation of farms have led to a decrease in jobs (DRIAAF, 2011).

A compact urban form, nevertheless tending toward sprawl

The region is noteworthy for its extremely dense Parisian core, which becomes gradually less dense in the inner and outer belts, as well as a relatively compact urban form, especially at the heart of the conurbation. In terms of human density,[9] the region has 42 950 inhabitants/km² in Paris, compared to 11 623 inhabitants/km² in the inner belt and 3 465 inhabitants/km² in the outer belt (IAU, 2011b). In 2008, Paris-IDF was the 18th densest metro-region among OECD countries, coming after Tokyo, Mexico City, Seoul, London and Athens in terms of inhabitants per km², but well ahead of other French regions (Figure

8. The European Union defines organic farming "as an approach to agriculture where the aim is to create integrated, humane, environmentally sustainable agricultural production systems. Maximum reliance is placed on self-regulating agro-ecosystems, locally or farm-derived renewable resources and the management of ecological and biological processes and interactions. Dependence on external inputs, whether chemical or organic, is reduced as far as possible" (See *http://ec.europa.eu/agriculture/envir/report/en/organ_en/report_en.htm*).

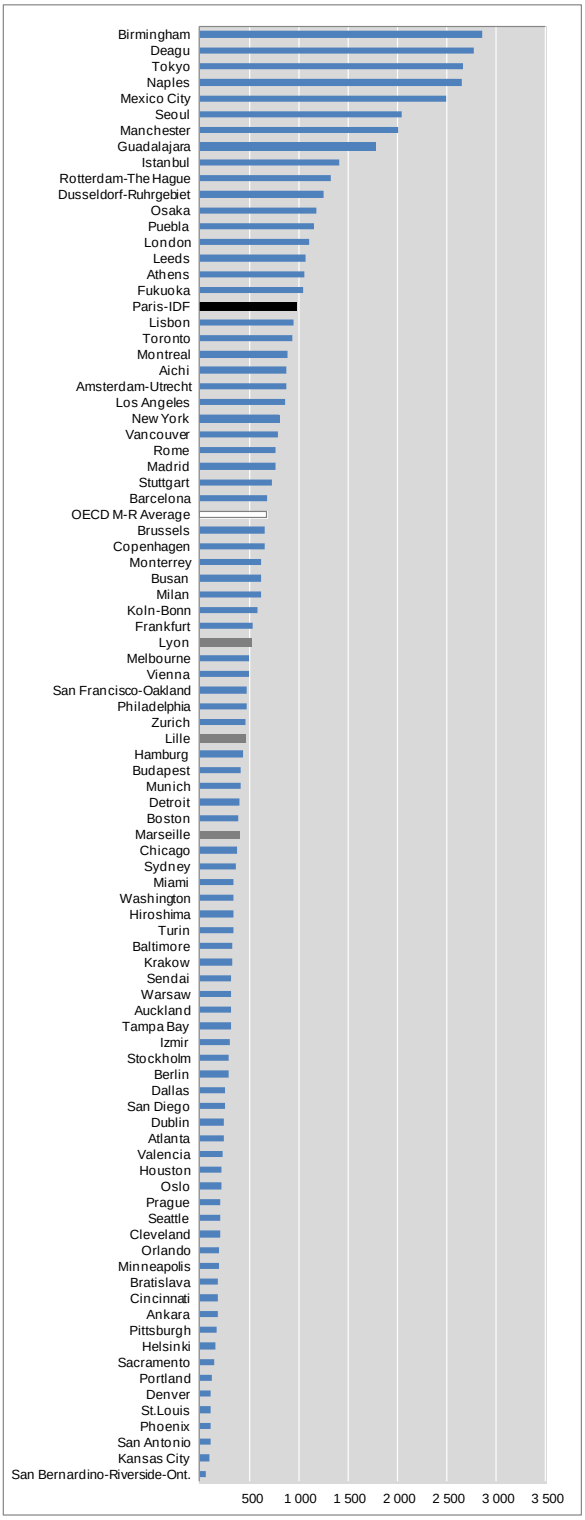
9. Calculated as the sum of the population and jobs in 2008, divided by the urban land area in km² in the same year.

12). [10] OECD research on compact cities compares spatial trends in the Ile-de-France region with those of several world metro-regions, especially as regards intensity of use of the urban land surface. Particularly striking in the Paris-IDF region is a very dense urban core (up to 48 208 inhabitants/km²) covering a comparatively limited urban land area, to which the region owes its compact urban form (Figure 13). The same study measures the geographical distribution of the density. For Paris-IDF, it notes that at least 90% of Ile-de-France territory in a 5-km radius from the centre of Paris has a density of over 5 000 inhabitants/km² (Figure 14), which is comparatively high, and well ahead of Vancouver (60%), Portland (20%) and Toyama (14%). When the radius is extended to 10 km from the centre, at least 80% of Ile-de-France territory is densely populated (over 5 000 inhabitants/km²); this level is 21% in Vancouver, 15% in Toyama and 1% in Portland. Yet, notwithstanding, only 13% of the land area in the Ile-de-France region is urbanised, which reflects the comparative compactness of its urban form (OECD, forthcoming, a).

10. OECD method for calculating density (population on the surface in km^2)

Figure 12. Population density in OECD metropolitan regions

Inhabitants per km² (2008)

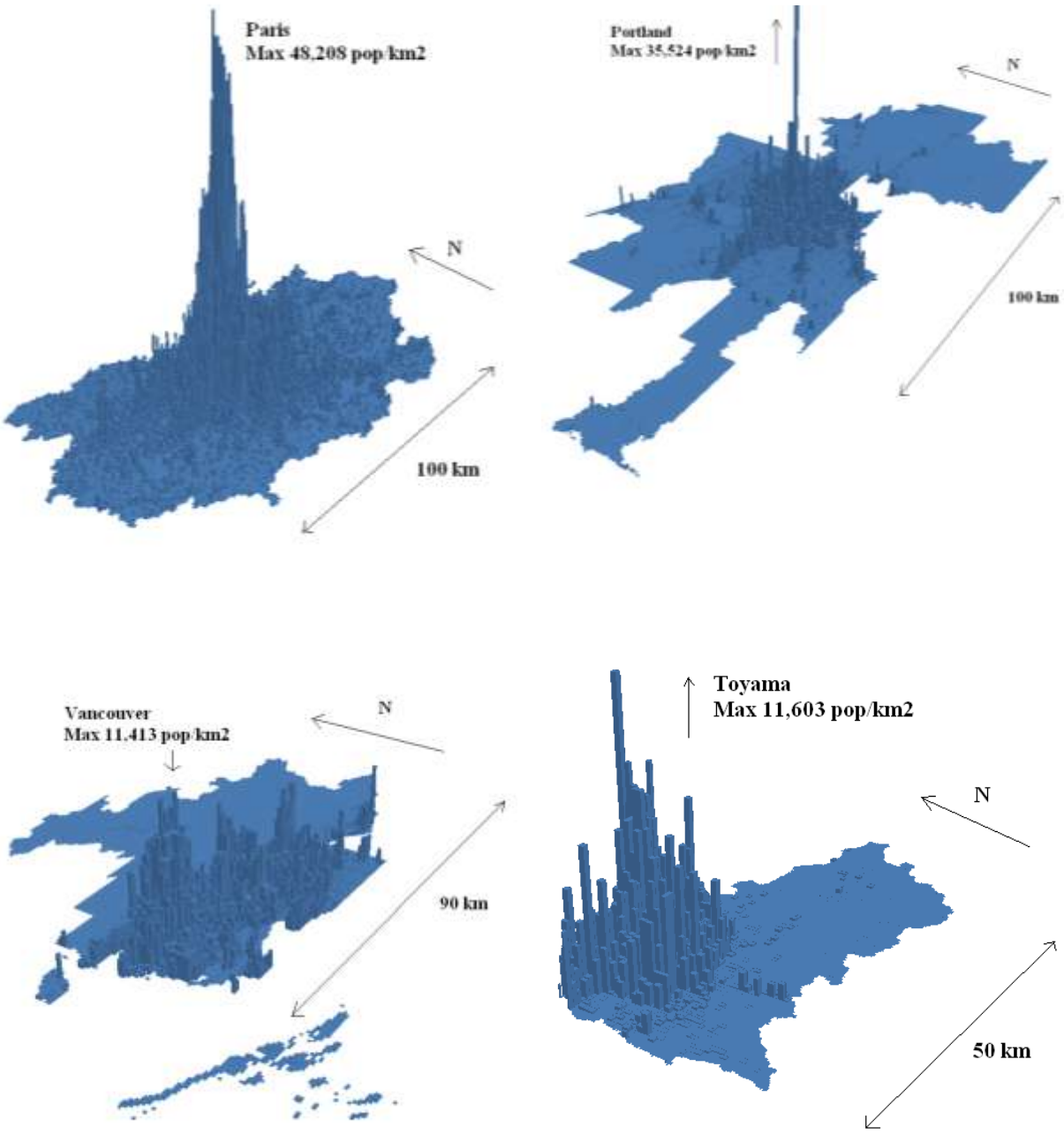


1. OECD M-R average: average for OECD metropolitan regions.
2. Data for Turkey correspond to 2006; data for Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Portugal, Slovakia, Sweden, Switzerland and the United Kingdom correspond to 2007.

Source: OECD Metropolitan Database.

Figure 13. Comparison of the population density of four OECD metropolitan regions

Average density (inhabitants/ha)

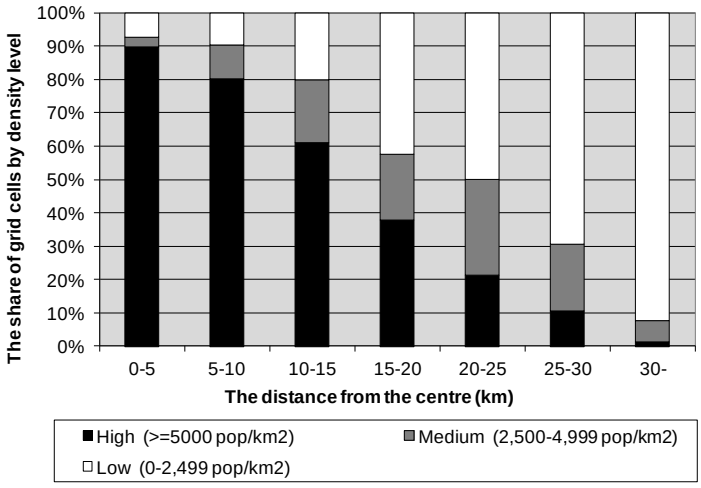


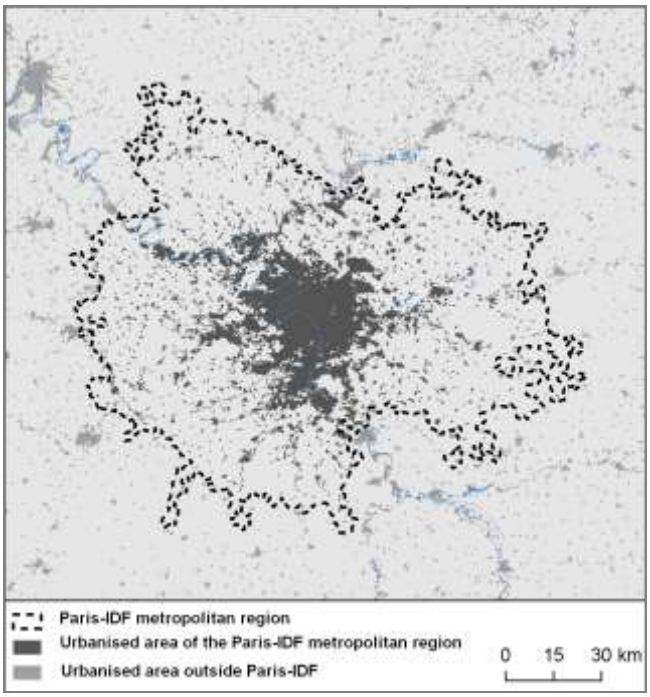
Note: These maps illustrate the average human density over a 24-hour period ((residents + working people)/hectare) in the metropolitan area in order to observe the intensity of use of the urbanised land surface. OECD calculations using Landscan data (2009).

Source: OECD, (forthcoming, a).

Figure 14. Geographical distribution of density in the Paris-IDF region

All areas (*i.e.* non-built-up areas included)





1. This study focuses on the functional perimeter of the Paris-IDF region based on the OECD definition (see OECD, 2011e and OECD, 2011f). The urbanised areas in the region are arranged in accordance with their distance (5km, 10km, etc.) at the centre of the conurbation, which is regarded as the most densely populated territory in the metropolitan area, and classified by density (low, average, high).

Source: OECD (forthcoming, a). OECD calculations using Landscan data (2009).

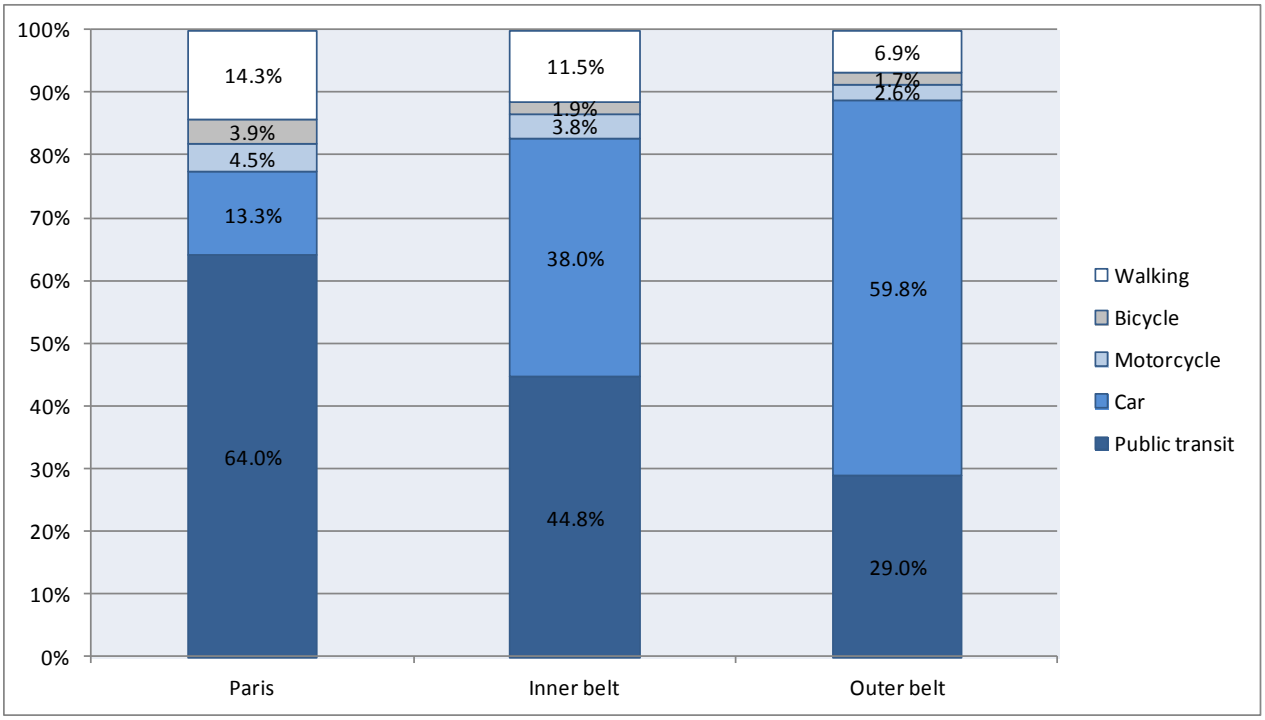
There are striking differences between the city of Paris and the inner and outer belts as regards type of housing, in that Paris had more blocks of flats. In 2008, around 96% of accommodation in Paris consisted of flats, as opposed to 78% in the inner belt and 49% in the outer belt (Insee, 2011d). Even if most housing in the region is of this kind (more than 7 homes out of every 10 in IDF are flats), one-family houses occupy

a proportionally bigger area (47% of urbanised land in Ile-de-France) and tend to result in urban sprawl (IAU, 2011a). The size of dwellings also varies. While around 78% of main housing units in Paris have between one and three rooms, the great majority in the inner and outer belts have at least three (67% and 83% respectively) (Insee, 2011c).

Ways of getting around in the region also vary. Fewer Paris households rely on a car: 41% of Parisian households own at least one car, as opposed to 68% in the inner belt and 84% in the outer belt. Furthermore, people living outside Paris (the city) are more likely to own at least two cars: while only 5% of Parisian households have at least two, this proportion rises to 17% in the inner belt and 35% in the outer belt (Insee, 2011c). This level of car ownership has had noticeable consequences: between 1976 and 2001, the total distance covered by car drivers rose by almost 90%, of which 50% was attributable to the outer belt (Insee, 2011c). While in Paris the majority of trips between home and work are by public transport (64.0%) or on foot (14.3%) – as against 13.3% by car – car use becomes more frequent as one moves away from Paris (Figure 15). Cars account for 38.0% of travel by residents in the inner belt and 59.8% by those in the outer belt (Insee, 2011d).

Figure 15. Modal share within the Paris-IDF region

Mode of home-to-work travel by form of transport, and place of residence of workers (2008)



Source: Insee - SOeS, ENTD 2008.

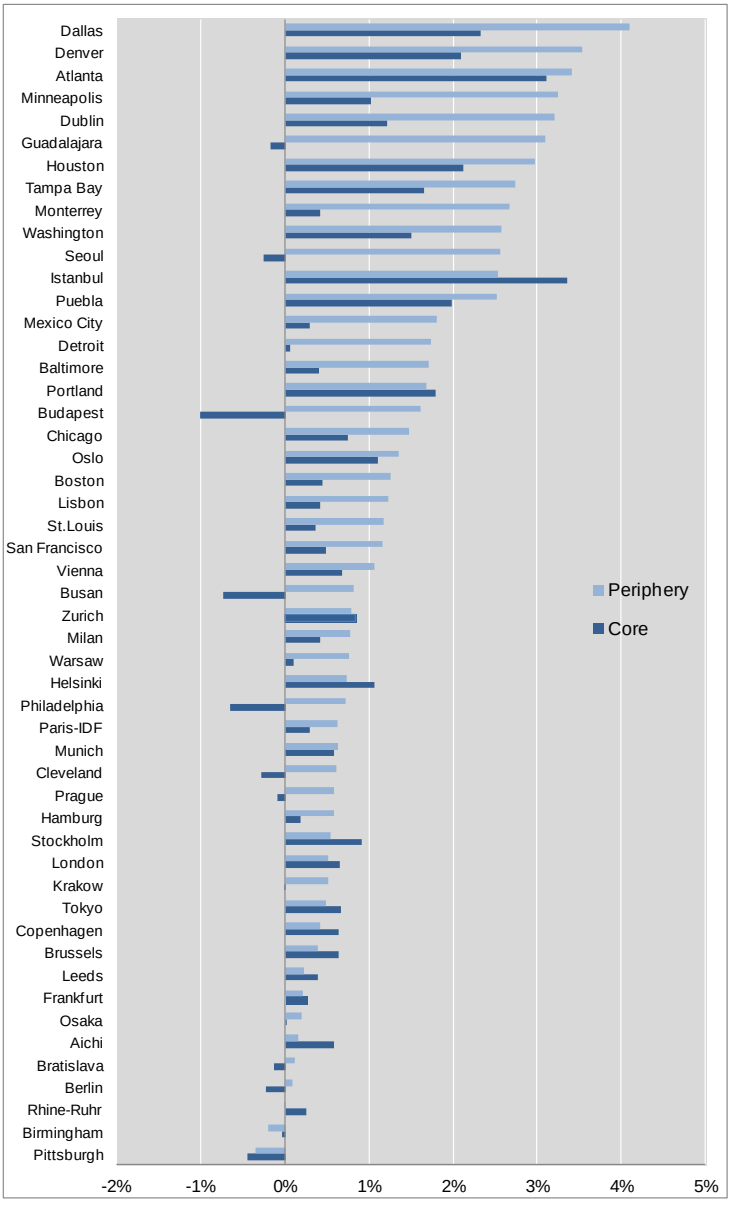
Over the last four decades, with the strongest upsurge in post-war suburban expansion between 1970 and 1985, there has been a growing trend towards urban sprawl in the region. Among the main reasons for this are an increased demand for family housing (and thus demand outside Paris), a market frozen at price levels beyond the reach of poor or average-income families, and a reaction against accommodation in suburban blocks of flats and the high density of the central area, as well as national incentives to encourage home ownership (IAU, 2010b; IAU, 2011d). Between 1995 and 2007, the outer area of the region (comprising both inner and outer belts) grew faster than its core, even if the rate of growth was much lower than in other OECD metropolises (Figure 16). The high level of one-house mono-functional

accommodation in the private housing estates to the east of Val-de-Marne and in Seine-et-Marne is a sign of urban sprawl (IDF, 2008). While the tendency to live in single-house units and own cars has been continued in the outer parts of the region, energy consumption due to the high number of car journeys and of larger and often more energy-intensive dwellings is set for a significant and sustained increase.

Development of a green environment is one of the main challenges in the Paris-IDF region. Going green will entail, on the one hand as regards building, improvements in the energy efficiency of both existing and new buildings and, on the other and at regional level, improved management of consumption in the area with greater control over the shape, functioning and siting of accommodation. The challenges are especially acute in the current context of plans to build between 60 000 and 70 000 homes a year to overcome the regional housing shortage. However, special effort must be invested in the thermal renovation of existing accommodation, given that in 2050, around 70% of the housing stock will consist of dwellings that existed in 2005 (IDDRI, 2010a). Turning the sector green, with which all its professional staff are concerned, may result in the creation of a great many jobs by 2020 (see CIRED, 2010).

Figure 16. Suburbanisation rates in OECD metropolitan regions

Annual average population growth rate in the core and periphery of OECD metropolitan regions (1995-2007)



1. OECD M-R average: average for OECD metropolitan regions.
2. Data for Belgium, Denmark, Mexico City, Sweden and the United States correspond to the 1995-2005 period; the data for Poland correspond to the 2000-07 period.
3. In the case of the North American metropolitan regions, the central counties have been included in the statistics for metropolitan centres. For the European regions, the metropolitan centre corresponds to the TL3 central level.

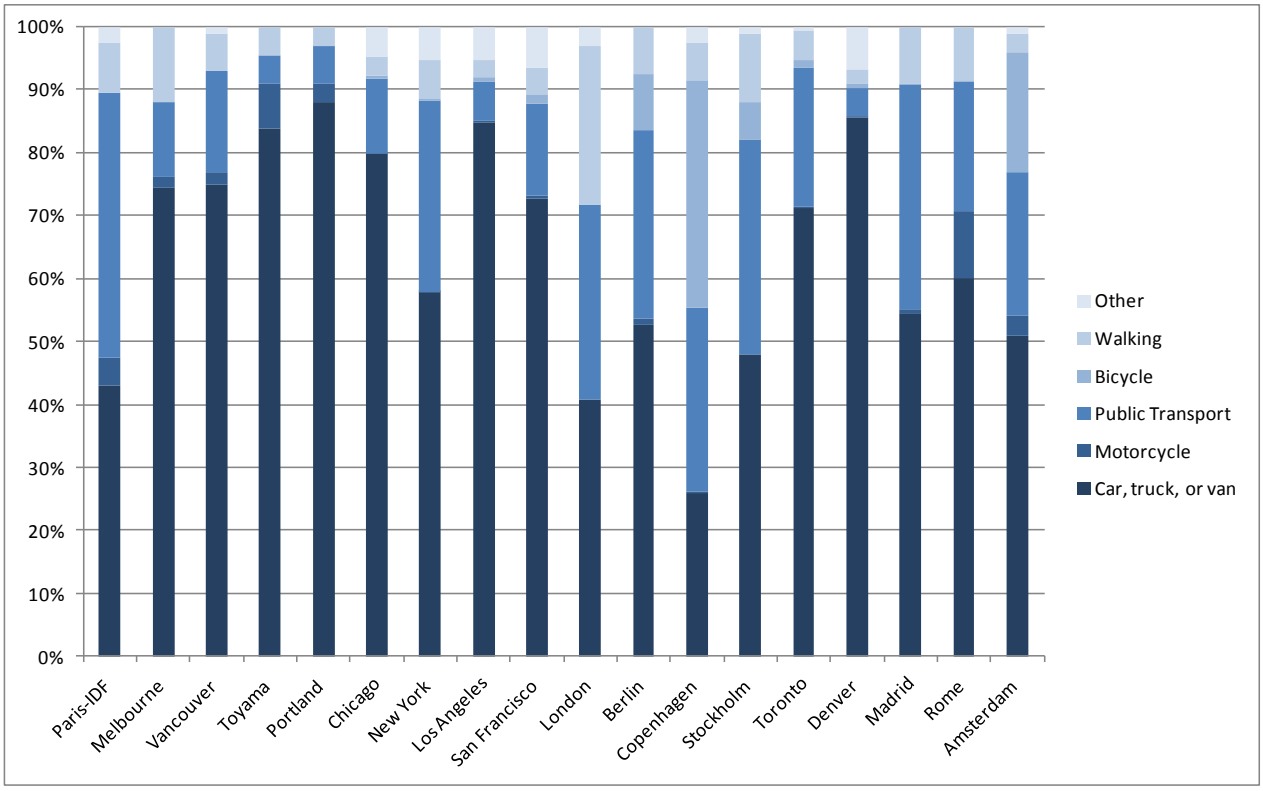
Source: OECD Metropolitan Database.

An efficient transport network in the central area but ill-suited to current regional needs

The IDF public transport network is a great regional asset that has led to an ideal modal shift, especially in Paris and the inner belt. Thanks to an excellent radial-concentric network of metro, bus,

trams, and other rail routes in and around Paris, the Ile-de-France modal shift is noteworthy for a high level of home-to-work travel by public transport. Indeed, people in the region on average use public transport as much as cars for this kind of journey (42% and 43%, respectively). This is something peculiar to Ile-de-France, in that 72% of working people in other large French conurbations go to work by car (Insee, 2011d). Compared to a selection of other OECD metro-regions, the performance of Paris-IDF in terms of modal shift is very good. For example, around 85% of journeys in Los Angeles are by car as opposed to 6% by public transport, with corresponding figures for New York of 58% and 30%, Madrid, 54% and 36%, Stockholm, 48% and 30%, or London, 41% and 31% (Figure 17) (American Community Survey in the case of American metro-regions; Eurostat for European metro-regions).

Figure 17. Modal share in a selection of OECD metropolitan regions



1. In the case of London, the "others" category includes two-wheeled vehicles and bicycles.

Analytical units, source and year: Paris-IDF (Insee, Enquête Nationale Transport, 2008); Melbourne (Melbourne Statistical Division, Victoria State Government, 2007); Vancouver (Census Metropolitan Area, Census Statistics Canada, 2006); Toyama (Toyama-Takaoka Wider Urban Zone, 3rd Person Trip Survey, 2001); Portland (Metropolitan Statistical Area, American Community Survey, 2009); Chicago (OECD Metropolitan Region, American Community Survey, 2005-09); New York (OECD Metropolitan Region, American Community Survey, 2005-09); Los Angeles (OECD Metropolitan Region, American Community Survey, 2005-09); San Francisco (OECD Metropolitan Region, American Community Survey, 2005-09); London (London Boroughs, Department for Transport, 2008-09); Berlin (Eurostat metropolitan definition (larger urban zone), Eurostat, 2003-06); Copenhagen (Eurostat metropolitan definition (larger urban zone), Eurostat, 2003-06); Stockholm (Eurostat metropolitan definition (larger urban zone), Eurostat, 2003-06); Toronto (Census Metropolitan Area, Statistics Canada, 2006); Denver (OECD Metropolitan Region, American Community Survey, 2005-09); Madrid (Eurostat metropolitan definition (larger urban zone), Eurostat, 2003-06); Rome (Eurostat metropolitan definition (larger urban zone), Eurostat, 2003-06); Amsterdam (Eurostat metropolitan definition (larger urban zone), Eurostat, 2003-06).

In spite of the strong points of the Ile-de-France network, however, it is becoming increasingly ill-suited to the current needs of travellers. For one thing, it is not coping easily with growing demand: between 2001 and 2009, demand for the metro rose by 17% and for the *Transilien* (the Ile-de-France public rail service as renovated in 1999) by 24%, without any real changes to the network (Cour des

Comptes, 2010). In addition, it has exhibited major shortcomings in the region's middle and outer areas, in which most journeys now occur. Moreover, according to the most recent figures (2001), travel between different suburbs accounted for 70% of all journeys in IDF (IDF, 2008). Consequently, as already noted, the suburban modal shift tends to prioritise the car, which further clogs up the central area. Bearing in mind the environmental impact of the transport sector (high energy consumption and a high level of greenhouse gas emissions), the greening of this particular sector constitutes another important means of achieving green growth in IDF, as will be discussed in Section 4. The process may result in a net increase in new jobs (see CIRED, 2010), and improve the accessibility – and thus the attractiveness for prospective firms – of areas with currently few if any transport connections, as well as boosting an increase in production and demand for green products and services in the region.

Energy use and CO_2 emissions

While Paris-IDF is the region of France that consumes the most energy in absolute terms (24.6 million TOE in 2005), it consumes less per unit of GDP (54 TOE/EUR billion) than any other region and has a consumption level *per capita* below the national average (2.14 TOE in IDF compared to the French average of 2.54 TOE) (Ademe-Arene, 2010). Even so, energy consumption in Ile-de-France grew by around 1% a year between 1990 and 2005, a level higher than the annual national average (Ademe-Arene, 2010).

However, the region displays a comparatively modest level of energy performance. The fuels used in the final energy consumption of the region are primarily oil products (51%), followed by natural gas (22%) and electricity (20%); district heating (5%) and "other" products (2%) account for only a very small share of the total (Ademe-Arene, 2010). According to a comparative study of 30 urban metropolises, Paris-IDF comes 16th in terms of energy performance,[11] particularly because it uses little renewable energy (The Economist Intelligence Unit, 2009). As regional energy production caters for only 11% of the region's energy needs, Paris-IDF depends on foreign sources for the greater part of its fossil fuels supply – particularly that of oil and gas – and on other regions of France for nearly all its electricity, of which 76.2% of national output comes from nuclear energy (Ademe-Arene, 2010; IAU, 2011b; IEA, 2011).

As regards sectoral energy consumption, the building sector comes first, accounting for 48% of the total (with the residential sub-sector registering 29% and the tertiary sub-sector 19%), while consumption in the transport sector has also grown substantially (44% of the total) (IAU, 2011b). Certainly, the high level recorded in the residential environment is attributable to the age of most of the buildings (68% built before 1975, the year of the first building thermal regulations), which on average devour more energy than more recent buildings (Ademe-Arene, 2010). Energy consumption in the transport sector shot up by 25% between 1990 and 2005, in tandem with the marked rise in road traffic and the number of journeys completed (Ademe-Arene, 2010). Next come industry (8% compared to 24% at national level) and agriculture (0.4%) (IAU, 2011b).

As a rule, reliance on renewable energy is barely underway in IDF and represents only a minimal share of its total final energy. Waste-to-energy (involving incineration (85%) and organic recycling (15%)) dominate in these sectors with 80% of the total, well ahead of geothermal energy (18%), hydraulic energy (1%) and biomass, solar and wind energy (0% of the total) (Table 2). Most household waste in IDF is incinerated (58%), while 14% is earmarked for waste depositories, 14% is destined for materials recovery, 8% is composted and 1% converted into methane (IAU, 2011b). According to Arene, energy recovery from waste is used for 25% of heat production in Ile-de-France and 7% of its electricity production (Arene,

11. Carried out by The Economist Intelligence Unit, the study measures energy performance in terms of energy consumption (25% of the score), energy intensity (25% of the score), consumption of renewable energy (25% of the score) and public policies for sustainable energy (clean and effective energy policies).

2005a). The production of other forms of renewable energy is still generally speaking at a very early stage in the region, with the exception of geothermal energy which has long constituted one of the region's natural assets and is continuing to progress. Yet renewable energy represents a fast-growing sector of activity: for example, the number of solar heating systems rose by 22% between 2003 and 2005 (Ademe-Arene, 2010) and political commitment both at the national and regional levels has grown steadily stronger in recent years. Some renewable forms of energy – such as solar, wind and waste-to-energy – constitute mainstays of green growth in IDF.

Table 2. Production of energy from waste-recovery and renewable energy in IDF

2005

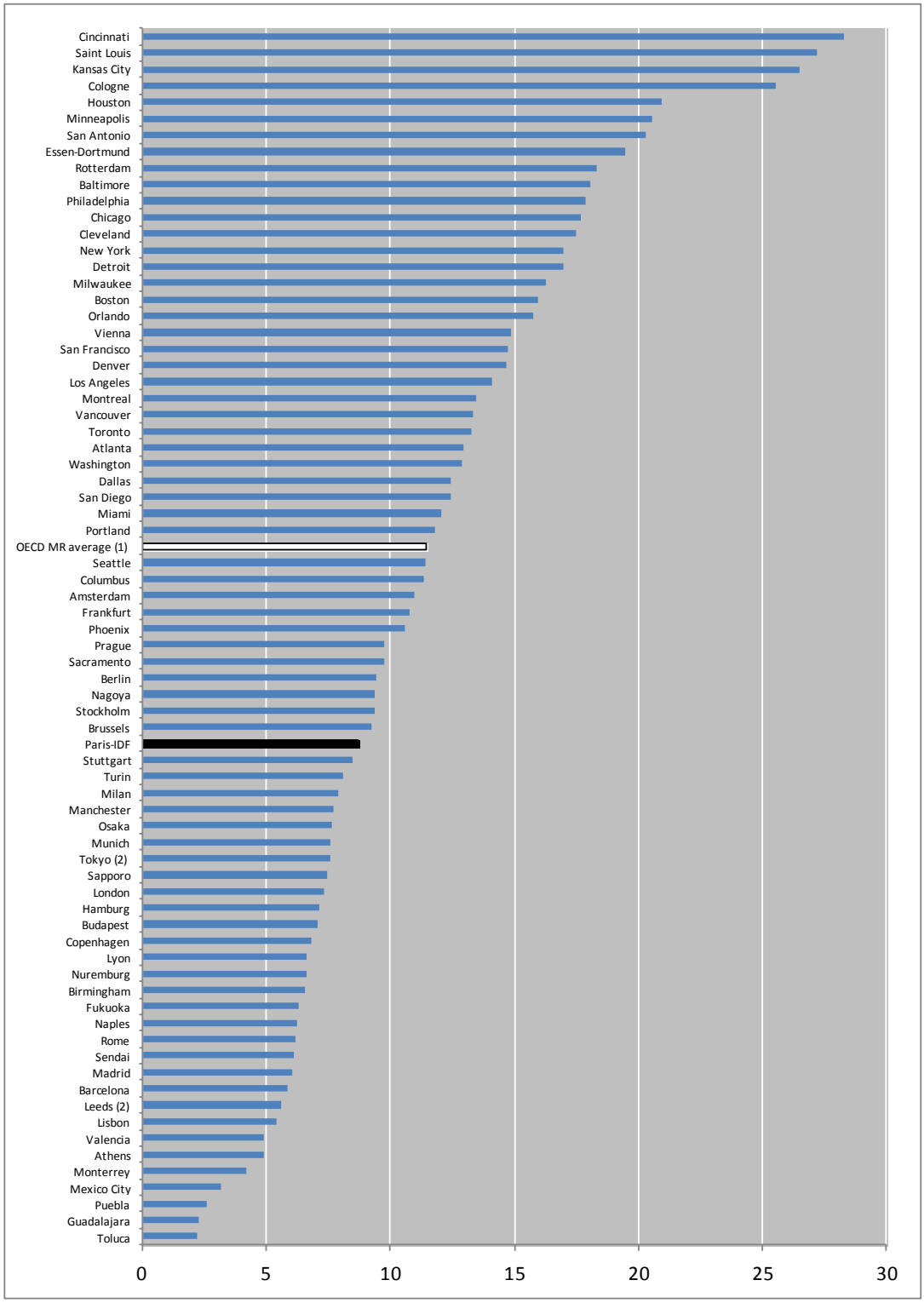
	Electricity (GWh)		Heat (GWh)		Total (GWh)	
Waste	1018	93%	5125	78%	6143	80%
Geothermal	0	0%	1373	21%	1373	18%
Hydraulic	80	7%	0	0%	80	1%
Biomass	0	0%	36	1%	36	0%
Solar	0.1	0%	4	0%	4.1	0%
Wind	0.02	0%	0	0%	0.02	0%
Total	1098	100%	6538	100%	7636	100%

Source: Ademe-Arene, 2010.

As in the case of energy consumption, the Paris-IDF region displays a level of CO_2 emissions which is lower than that in many other metro-regions in the world. With a level of 8.7 tonnes of CO_2 *per capita*, the region performs better than the average for OECD metropolitan regions (with 11.5 tonnes of CO_2 *per capita*) (Figure 18). The level of CO_2 *per capita* varies, ranging from over 28 tonnes in Cincinnati (the United States) to less than 3 tonnes in Toluca (Mexico). Whereas the level in Paris-IDF is higher than in Lyon, Hamburg, London or Tokyo, it is lower than in Brussels, Stockholm, Berlin or Amsterdam. These estimates include CO_2 emissions from a variety of sources, among them land transport, fuel production, industrial combustion and agriculture; however, air transport and international navigation are not included.

Figure 18. CO_2 emissions *per capita* in OECD metropolitan regions

Tonnes of CO_2 *per capita* (2005)

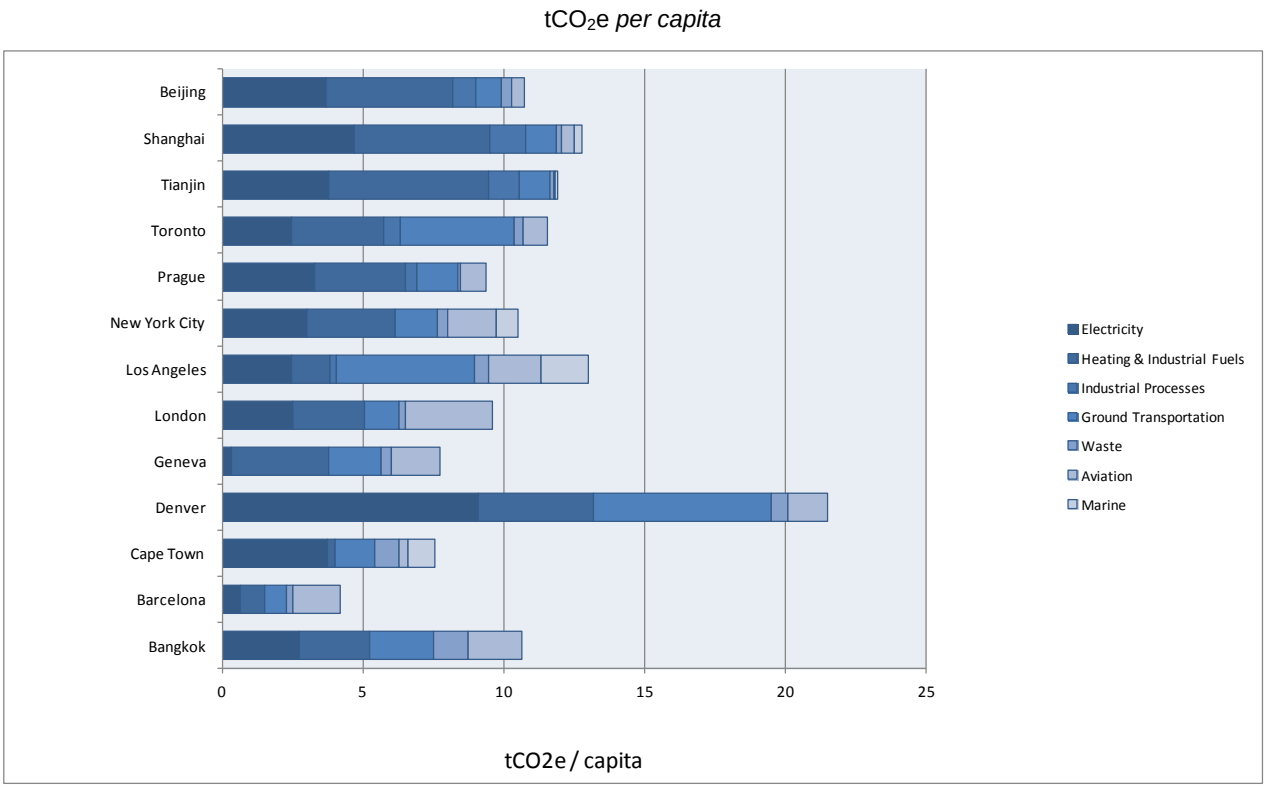


1. OECD MR average: average for OECD metropolitan regions.
2. Reference is to the Tokyo/Yokohama/Kawasaki/Saitama/Chiba functional unit.
3. Reference is to the Leeds/Bradford/Wakefield functional unit.

Source: OECD calculation using the Emissions Database for Global Atmospheric Research (EDGAR), version 4.1. See OECD (2011e) and OECD (2011f).

Other studies (Kennedy, 2011) bear out the relatively good performance of the Paris-IDF region compared to a selection of global cities, but use a methodology and analytical units different from those of the OECD (Figure 19). Closer examination of the sources of greenhouse gas emissions helps to explain this comparatively good performance. First of all, compared to other metro-regions with a similar climate, Paris-IDF records relatively low emissions from heating and the consumption of industrial fuels, because of the low level of fossil fuel combustion in the industrial sector (13%) and the comparatively extensive use of heating networks. Indeed, the 127 Ile-de-France networks spread over 1 421 km represent one-third of French networks and produce 50% of the heat in the metropolis (13.6 TWh of heat supplied, 9 376 MW of installed power). These networks serve 1.16 million homes equivalent[12] (DRIEA-DRIEE, forthcoming). This strong performance can be largely explained by the fact that, as in London or Barcelona, the main energy source in the Ile-de-France region is natural gas, whilst those cities with a higher level of emissions (such as Chinese cities) depend on a greater use of fuel oil and/or coal (Figure 20). .

Figure 19. Sources of CO_2 emissions in large metropolises

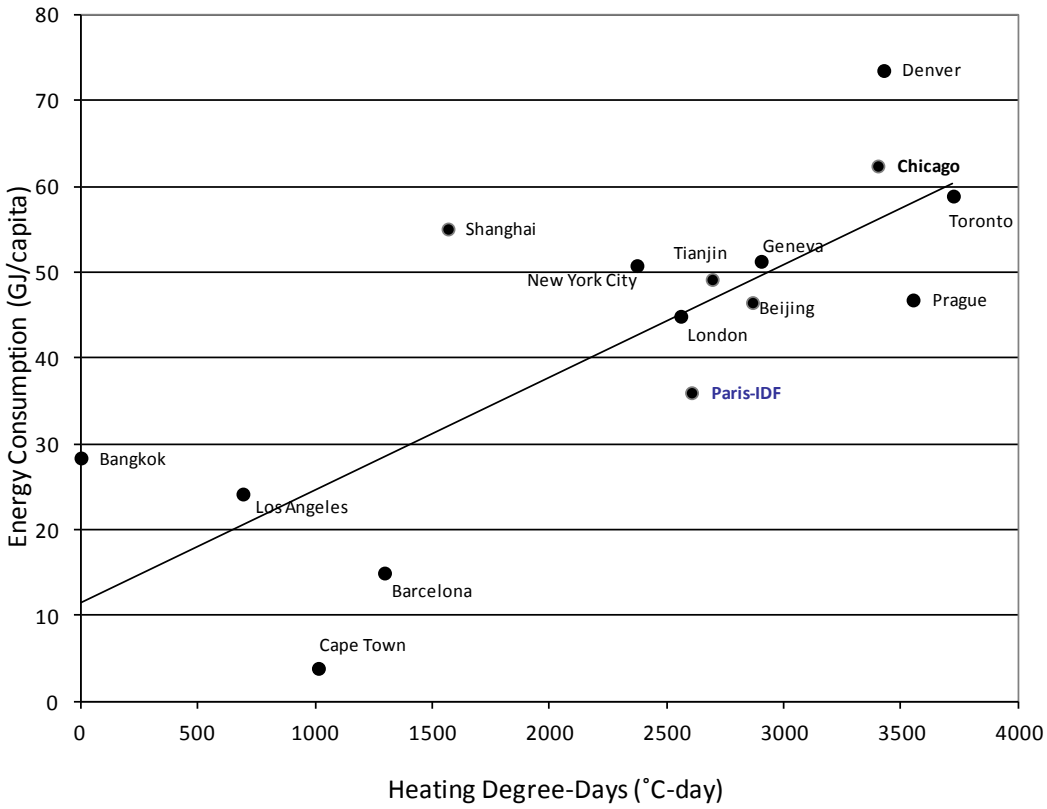


Note: Analytical units and reference years used for these calculations: Barcelona (city, 2006); Geneva (canton, 2005); London (Greater London, 2003); Paris-IDF (IDF region, 2005); Prague (Greater Prague, 2005); Chicago (Chicago Metropolitan Area, 2005), Denver (city and county, 2005); Los Angeles (county including 88 towns or cities, 2000); New York (city, 2005); Toronto (Greater Toronto, 2005); Bangkok (city, 2005); Beijing (province, 2006); Shanghai (province, 2006); Tianjin (province, 2006), Cape Town (city, 2006).

Source: Kennedy (2011).

12. In the Regional Plan for the Climate, Air and Energy, the regional target is to double renewable heat production in 2020, and to triple the number of homes in networks the majority of which use renewable and recovered forms of energy.

Figure 20. Energy consumption from heating and industrial fuels in large metropolises



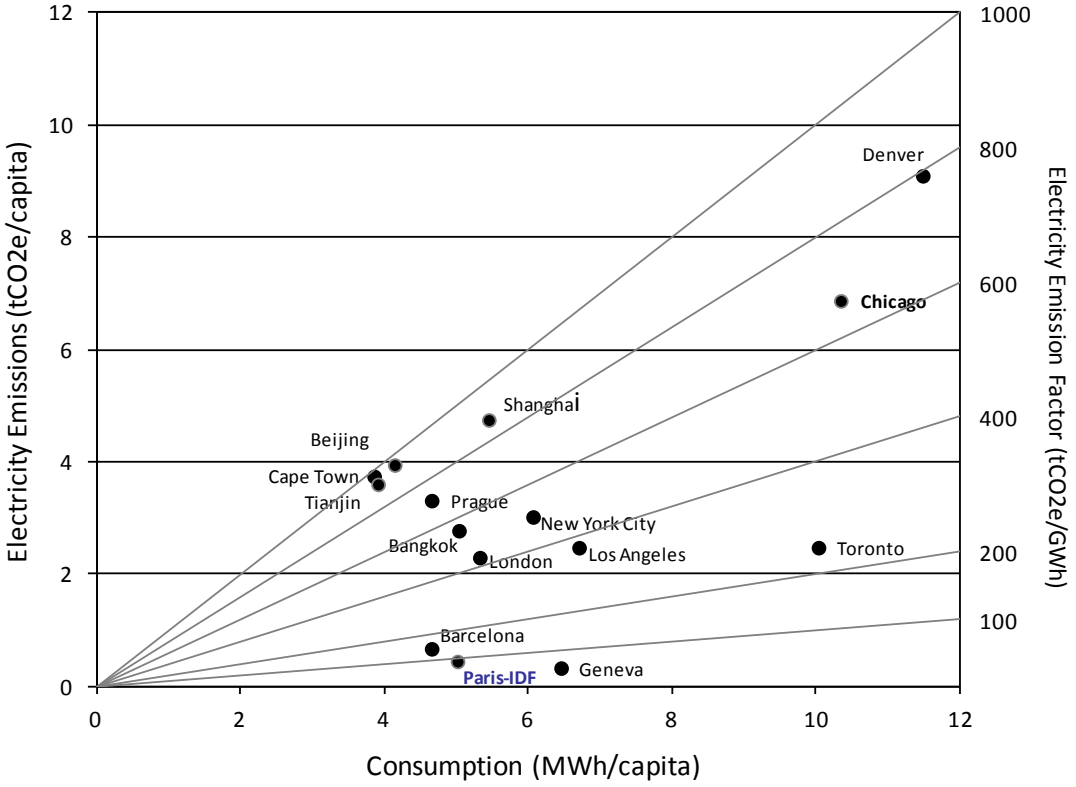
1. Abscissa values are based on temperature deviations below home temperatures (18° C), *i.e.* the base temperature. The values are calculated using number of days in a given year recording temperatures below 18° C, multiplied by the difference between the average temperature and 18° C. For example, two days with an average temperature of 8° C, result in 2 days*(18°-8°) = 20°C days. As a result, the coldest places give a higher value for days of heating. Warm days determined at the main airport are taken from *http://www.degreedays.net/.*

2. Analytical units and reference years used for these calculations: Barcelona (city, 2006); Geneva (canton, 2005); London (Greater London, 2003); Paris-IDF (IDF region, 2005); Prague (Greater Prague, 2005); Chicago (Chicago Metropolitan Area, 2005), Denver (city and county, 2005); Los Angeles (county including 88 towns or cities, 2000); New York (city, 2005); Toronto (Greater Toronto, 2005); Bangkok (city, 2005); Beijing (province, 2006); Shanghai (province, 2006); Tianjin (province, 2006), Cape Town (city, 2006).

Source: Kennedy (2011).

Secondly, the Ile-de-France region records low greenhouse gas emissions from electricity consumption because of the low carbon intensity of the French national grid (87 tCO_2e/Gwh) (Figure 21) (IEA, 2010a). The level of electricity consumption in Ile-de-France (5.02 MWh *per capita*) is similar to that in other European city regions, lying between that of Barcelona (4.66 MWh *per capita*) and London (5.33 MWh *per capita*). Linked to the low carbon intensity of the grid, the greenhouse gas emissions resulting from 0.44 tCO_2 e *per capita*, are lower than in other comparable city regions, except Geneva.

Figure 21. CO_2 emissions from electricity in large metropolises



1. Analytical units and reference years used for these calculations: Barcelona (city, 2006); Geneva (canton, 2005); London (Greater London, 2003); Paris-IDF (IDF region, 2005); Prague (Greater Prague, 2005); Chicago (Chicago Metropolitan Area, 2005), Denver (city and county, 2005); Los Angeles (county including 88 towns or cities, 2000); New York (city, 2005); Toronto (Greater Toronto, 2005); Bangkok (city, 2005); Beijing (province, 2006); Shanghai (province, 2006); Tianjin (province, 2006), Cape Town (city, 2006).

Source: Kennedy (2011).

In the Paris-IDF region, transport and building are both highly significant in terms of greenhouse gas emissions. According to a "cadastral approach", Paris-IDF is responsible for 8.9% of all greenhouse gas emissions nationally, which are due mainly to its population density (in the residential and tertiary sectors) (41%) and to the intensity of its travel activity (24%) (Table 3) (IAU, 2011b). However, one should note that while greenhouse gases emitted in the Paris-IDF region are almost 9% of the national total, this figure should be seen in perspective, given the 29% share of the region in GDP (IAU, 2011a). Another approach, the Carbon Balance method (*Bilan Carbone*) (Box 1) that assesses greenhouse gases emitted within Ile-de-France, as well as all emissions for which the region is responsible (attributable to visitors and incoming materials) and which are linked to each stage in the life of a product, emphasises the significance of both the building and transport sectors in terms of greenhouse gas emissions produced (which overall represent 79% of the total), but attaches still greater importance to the impact of transport – and especially air transport – as responsible for 26% of emissions (Figure 22). The Carbon Balance method concludes that the production of greenhouse gases is due primarily to passenger transport (29%), and then to freight transport (19%), the residential sector (excluding district heating) (19%) and the tertiary sector (12%).

Table 3. Greenhouse gas emissions by sector in Paris-IDF: cadastral approach

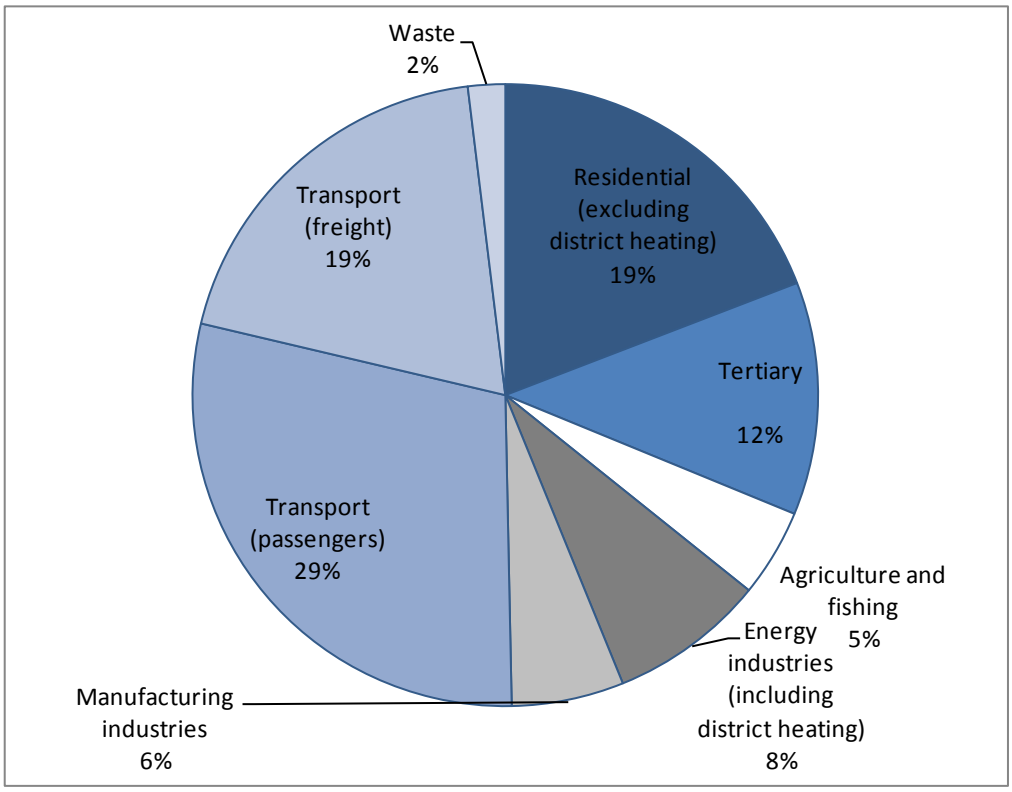
2005

	Emissions (kt equiv. CO_2)	%
Residential and tertiary sectors	21 000	41%
Road traffic	12 500	24%
Waste treatment	5 300	10%
Manufacturing industry	3 900	8%
Energy extraction, processing, distribution	3 600	7%
Agriculture	3 600	7%
Airport hub	1 500	3%

Source: Airparif (2010) in IAU (2011b).

Figure 22. Greenhouse gas emissions by sector in Paris-IDF: Carbon Balance method

2005



Source: IAU (2011b).

Box 1. Two methodologies for recording greenhouse gas emissions in Ile-de-France: the cadastral approach and the Carbon Balance method

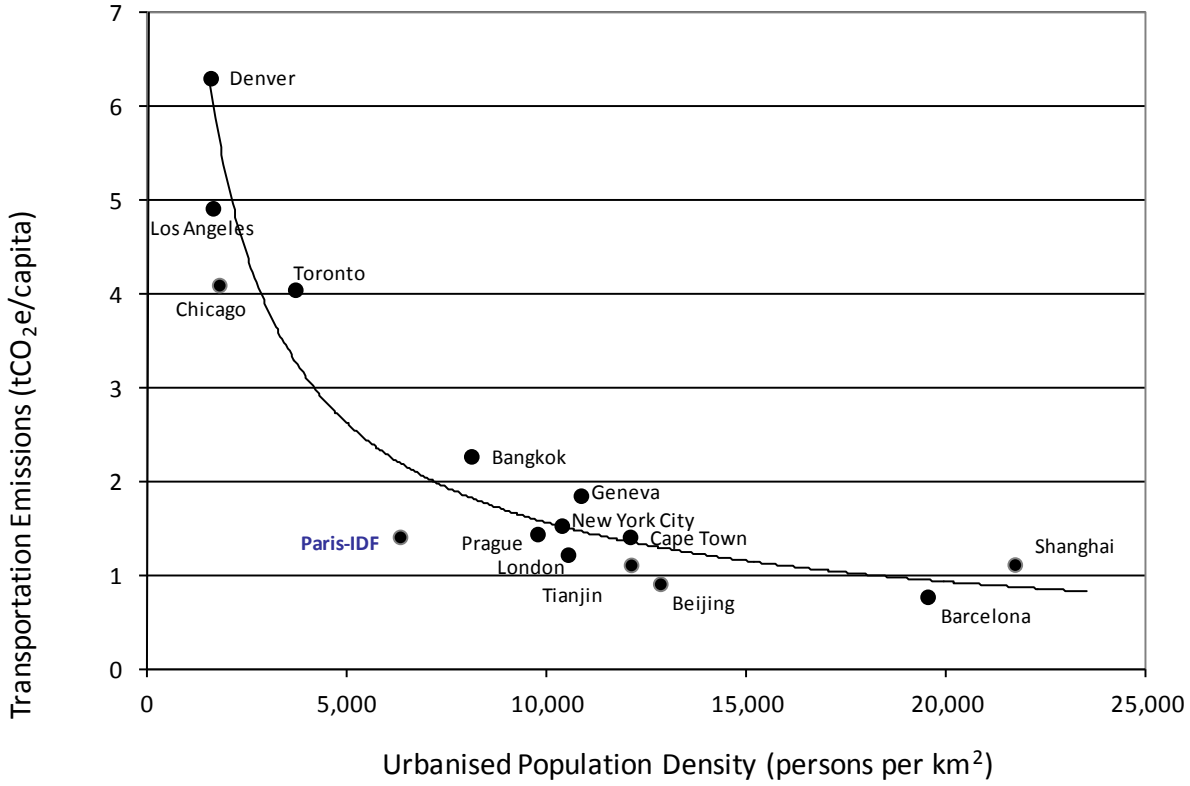
The cadastral approach of the Airparif land inventories. The cadastral approach adopted for Airparif's land inventories in 2000 and 2005 is based on a methodology which uses a precise format and authenticated emissions factors to describe greenhouse gas emissions in the area concerned. The methodology is one which avoids any double counting and enables results to be aggregated at different levels. It also provides for regular updating of the inventory and for it to be monitored over time. However, this inventory is confined to direct greenhouse gas emissions, and so does not cover processes activated at an earlier stage to meet the needs of the area, or any effects arising later. For example, it does not include electricity-related emissions since no emission occurs in the locations of consumption, or prior transport emissions (carriage of goods needed for consumption in Ile-de-France) or indeed subsequent ones (week-end travel by its residents).

*The Carbon Balance (*Bilan Carbone*) approach in the area*. This method has been coordinated by the Institut d'Aménagement et d'Urbanisme d'Ile-de-France (IAU) in accordance with the Ademe methodology, which was used between 2005 and 2007. It has greater scope than the cadastral approach, as it is based on a methodology involving a full diagnosis of emissions, which counts greenhouse gases emitted in the Ile-de-France region but also all those for which the latter is responsible, or in other words indirect emissions "incorporated" in products or services which are needed for activity and come from elsewhere, as in the case of imported consumer goods. Its scope is thus global and not strictly regional. While the Carbon Balance approach is more comprehensive than the cadastral approach, it is susceptible to double counting and does not currently provide for monitoring of emissions over time as its *modus operandi* has not been consolidated (Ile-de-France, 2010). Furthermore, its "open" definition of area boundaries means that no comparison of carbon balance in different areas is possible (IDF, 2010).

Source: IDF (2010), *Plan régional pour le climat. Livre vert: État des lieux des enjeux climatiques*, Conseil régional d'Ile-de-France, Paris.

That said, greenhouse gas emissions from land transport in the region are low compared to other OECD metropolitan regions, particularly when one considers the Paris-IDF region's relatively high urban population density (around 6 300 inhabitants/km²) (Figure 23). The Paris-IDF region is ranked quite favourably in comparison to other metro-regions, as regards the level of transport-related emissions, coming well below other metro-regions. This is partly attributable to the efficiency of the region's rail network and metro system, and its tendency to use smaller cars that cause less pollution than those used by residents of the North American cities surveyed.

Figure 23. CO_2 emissions from ground transportation in large metropolises



1. The density of the urbanised land surface is calculated without including green areas.

2. Analytical units and reference years used for these calculations: Barcelona (city, 2006); Geneva (canton, 2005); London (Greater London, 2003); Paris-IDF (IDF region, 2005); Prague (Greater Prague, 2005); Chicago (Chicago Metropolitan Area, 2005), Denver (city and county, 2005); Los Angeles (county including 88 towns or cities, 2000); New York (city, 2005); Toronto (Greater Toronto, 2005); Bangkok (city, 2005); Beijing (province, 2006); Shanghai (province, 2006); Tianjin (province, 2006), Cape Town (city, 2006).

Source: Kennedy (2011)

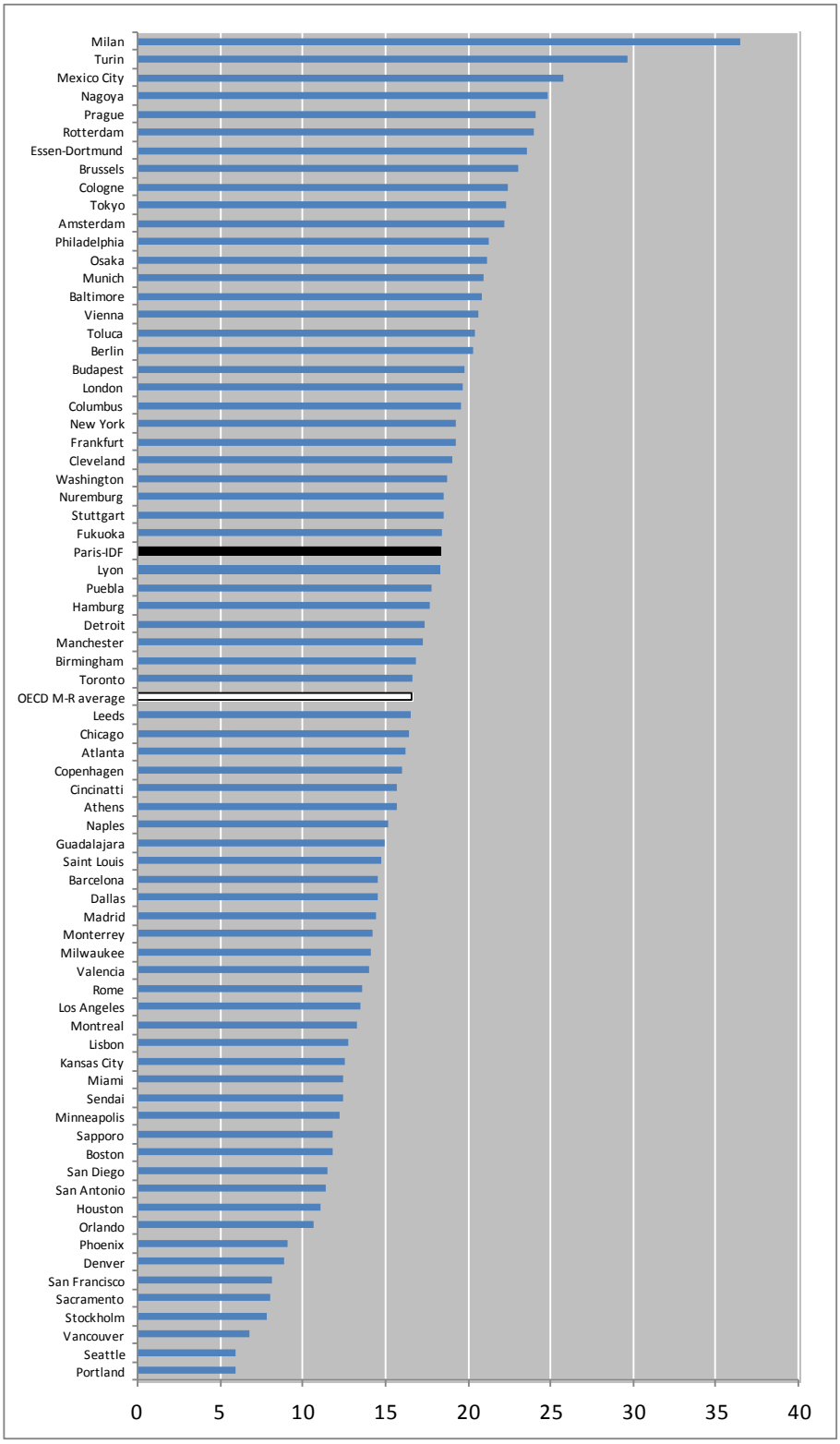
Air quality and water consumption: persistent concerns

Air quality remains a constant concern of Ile-de-France residents. The density of human activities and intensity of transport (especially road traffic) generate along traffic routes nitrogen dioxide (NO_2) levels that are twice as high as the regulatory prescribed levels. The PM 2.5 level also remains above the regulatory threshold of the World Health Organization, and is just above the average of the large OECD metro-regions[13] (Figure 24). Annual ozone averages have almost doubled in the Paris-IDF region (including both urban and rural areas), whereas benzene levels appear to have changed little recently. Most atmospheric pollution is due to road traffic.

13. The PM 2.5 concentration is of natural and human origin, while the share attributable to human activity may vary strongly from one city to the next.

Figure 24. Exposure to PM 2.5 particles in OECD metropolitan regions

PM 2.5/m^3, weighted by population (average 2001-06)

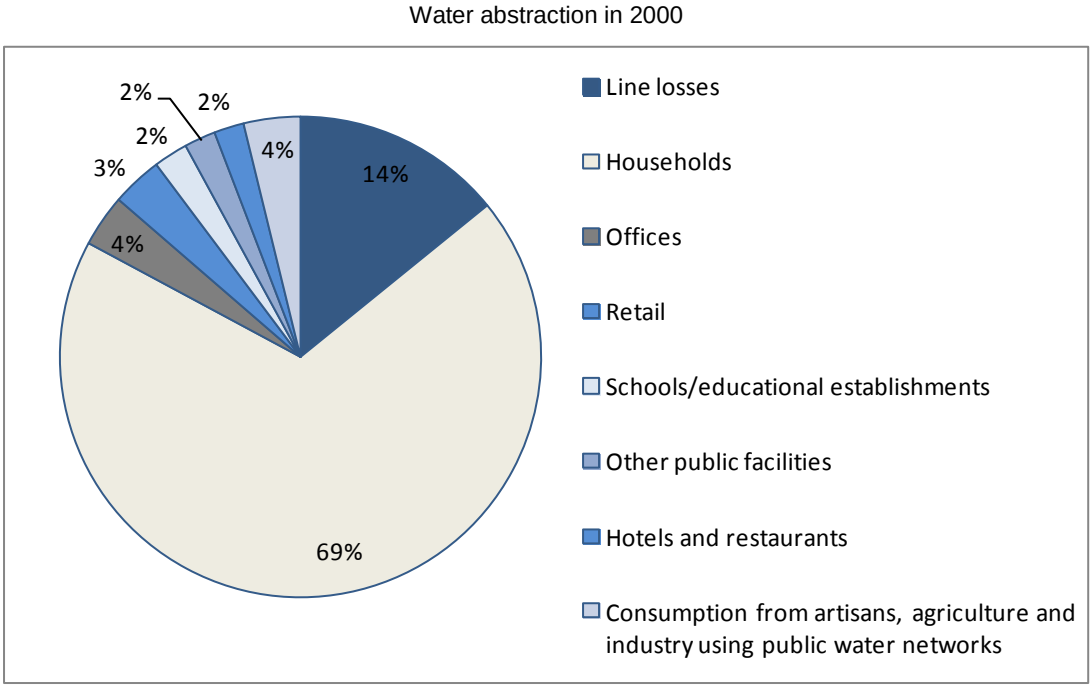


1. OECD MR average: average for OECD metropolitan regions.

Source: OECD calculations based on research by Van Donkelaar, *et al.* (2010). See also OECD (2011e) and OECD (2011f).

As to the issue of water in Ile-de-France, this turns primarily on household use (which accounts for 69% of regional consumption), since the consumption of water by industry and agriculture is comparatively limited (4% as opposed to around 23% in France (Agence Eau Seine Normandie, 2011)) (Figure 25). Nevertheless, industrial and agricultural pollution problems exist and stem from a variety of factors (organic pollution, hydrocarbons, PCBs, agricultural and industrial domestic use of water, etc.), resulting in the need for extensive surface treatment (surface water, underground water and waste water) (IAU, 2002). Given the abundance of water on most of the surface area of Ile-de-France, tensions caused by low-level water abstraction in the aquatic and wetland environments of some basin heads arise mainly in times of exceptional drought (IAU, 2011b).

Figure 25. Consumption of water distributed in Ile-de-France



Source: Agence de l'Eau Seine Normandie (2004).

3. A green growth strategy in Ile-de-France

Discussion concerning the concept of green growth has been the focus of considerable interest at a time of international ecological, climatic and economic crisis, which has demonstrated the need to steer growth in a new direction. Fully aware of this, many countries, including numerous OECD countries, have introduced measures to promote green recovery. Many recovery plans have thus included a substantial section on the green economy: around 15% of efforts to achieve global economic revival are thought to have centred on its green aspects, with significantly higher percentages for China (40%), South Korea (32%) and France (18%) (OECD, 2011g). In France, the central government has taken the matter up most notably through the Grenelle Environment Forum which has provided a framework and injected fresh impetus at the local level. The territorial aspect – particularly in urban areas – of a green growth strategy indeed appears to be a constructive means of achieving the aims of economic growth and employment. OECD research has shown that cities and particularly those within advanced economies whose population growth is slowing down have to discover new sources of growth. Furthermore, green growth is a matter of constructive interaction between the different aims – efficiency, equity, environment – and the ways in which they complement each other, which are only observable at the local level. Finally, a green growth

strategy in the urban context may be better adapted to incorporate the social dimension in a way that is less clear-cut at an aggregated level (OECD, 2011b).

An opportunity to revitalise the IDF region?

The survey of socio-economic trends in the Paris-IDF region highlights the importance of identifying fresh sources of economic growth in a highly competitive international arena, while confronting internal pressures that are no less social (unemployment, poverty, inequality) than environmental (high energy dependence, environmental damage, etc.). The green economy would thus seem to be an especially appropriate means of revitalising the regional fabric. First of all, Paris-IDF possesses comparative advantages in green technology which may lay the foundations for renewed industrialisation of the region. The continued growth in influence of services, the rise in productivity above the national average and the tendency towards sectors of high value added have turned this region into a globalised part of the country, which is the only one of its kind in France, and thus a real national powerhouse. This competitiveness is based in part on the performances of firms providing urban services, as well as those in the transport, building, materials and ICT sectors, all crucial fields for sustainable development. Transport is a foremost industry in France and a substantial part of the French automobile sector is located in the Seine valley. Large building firms have their head offices in the Paris region.[14] Ile-de-France is also the focal point for half of the French eco-technological sector and has substantial research capability in the areas of water, waste and renewable energy (40% of French green patents are registered in IDF). For these patents, the region is better placed (eighth in the OECD classification) than in other fields in which it compares more closely such as information technology (13th position) or biotechnology (14th). This sound performance in terms of specialisation in green sectors is bolstered by the breadth of the more general knowledge base, given that eco-innovation stems mainly from fields unrelated to the environment.[15] The region can thus capitalise on these assets. Furthermore, given that green technologies can readily penetrate much of the economy, they are really well placed to boost it, even if job creation in eco-technology will be paralleled by a loss of jobs in sectors identified with pollution and non-renewable forms of energy.

Growing eco-activity

Economic activities linked to the environment have assumed increasing significance in the Ile-de-France economy, far exceeding their traditional role in supporting the activity of a large metropolis. As will be discussed further below, the region is present, albeit to a varying extent, in the strategic industrial sectors of green growth: *(i)* in the field of renewable forms of energy (biomass, biofuels, photovoltaics) and CO_2 storage; *(ii)* in sectors capable of decreasing their use of energy and managing it better (low energy buildings, low-carbon vehicles, logistics, intelligent energy networks, batteries) and *(iii)* in related fields (waste recycling, green chemistry, water and purification, instrumentation, process optimisation). While the region has achieved little prominence as regards novel concepts or topics (eco-design, recyclability, efforts to curb pollution, fuel cells, clean transport, environmental engineering), it is dominant in water management, air pollution control and geothermal science. Eco-industrial establishments are also diversified, and encompass the headquarters of major environmental companies, research and development activities in environmental fields, international subsidiary companies for the distribution and marketing of eco-products, and research consultancies.

Complex and diversified, the eco-activities sector is expanding steadily in the Paris-IDF region, in terms of turnover and number of jobs. Highly varied, it covers many environmental fields and well-

14. However, as we shall see below, these sectors are often poorly positioned: several firms that have long been market leaders (especially among the larger groups) are having difficulty in establishing themselves in new green markets.

15. See OECD (2011a) and OECD (2011b).

established markets (such as water or waste management) alongside emerging markets, and brings together players varying in size (from large multinationals to SMEs). With growth standing at 15-20% between 2000 and 2008, depending on the sector, the region was home to 112 000 jobs linked to eco-activities in 2008, including 43 000 concerned with consultancy, environmental engineering and energy efficiency (IDF, 2011c). However, listing them all is not easy (Box 2).

Box 2. Eco-activities: a sector hard to quantify

In spite of efforts in recent years to catalogue eco-activities in the region, reliable data on the green market at the regional level are still lacking. One of the difficulties is that there is no definition of eco-industries linked to the *nomenclature des activités françaises* (NAF, or "classification of French activities"), which limits the scope for regular statistical monitoring (Insee, 2007). While the NAF provides for identification of sectors producing environmental services – purification, waste management, water retrieval, production and distribution – it does not allow certain aspects specific to the sector to be taken into account, which limits the quality of the data. For example, the retrieval sector includes a number of small-sized firms which are not all covered by the *enquêtes annuelles d'entreprise* (EAE, or annual business surveys). Furthermore, from cyclical data assessing the vitality of eco-activities, it is clear that while the water and waste sectors are both well covered by official statistics, establishing how production is distributed among private firms in the water sector on the basis of data available in the accounts remains problematic (Insee, 2007).

For its part, the OECD has long been engaged in study of this subject, in research dealing with environmental goods and services, and offers the following definition: "The environmental goods and services industry consists of activities which produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco systems. This includes cleaner technologies, products and services that reduce environmental risk and minimise pollution and resource use" (OECD, 2005).

By establishing a regional database on Ile-de-France eco-activities, it may be easier to identify sectoral opportunities and obstacles, as well as public and private players so as to forge strong partnerships among them. With this in mind, the Observatoire national des Emplois et Métiers de l'Économie verte (National Observatory of Green Economy Jobs and Occupations) was set up following the plan for sectoral and territorial mobilisation presented at the national conference on green economy occupations on 28 January 2010. Among its responsibilities are the development of statistical monitoring, methods of observation at national level and a special survey of regional level research in existing observatories. Ongoing activity is concerned with identifying the scope of green growth and the statistical monitoring of jobs, assessing the sectoral and macro-economic effects of green growth on employment, changes in occupations, recruitment and appropriate changes in training. The work of the Observatory will be collated and made available to the partners and then to the sectoral committees on a dedicated extranet site. It is expected that broader circulation of this work over the Internet will be organised in a second phase (MEDDTL, 2011). The Observatory is run by the Service de l'Observation et des Statistiques (SOeS, or Department of Observation and Statistics) and includes among its members ministerial representatives (Commission for Sustainable Development), as well as representatives of Insee, the directorate for the promotion of research, studies and statistics of the Ministry of Employment (Dares), the Centre d'Études et de Recherches sur les Qualifications (CEREQ, or the Centre for Studies and Research on Qualifications), and the Centre d'analyse stratégique (CAS, or Centre for Strategic Analysis). They are soon to be joined by representatives from the professional sectors concerned.

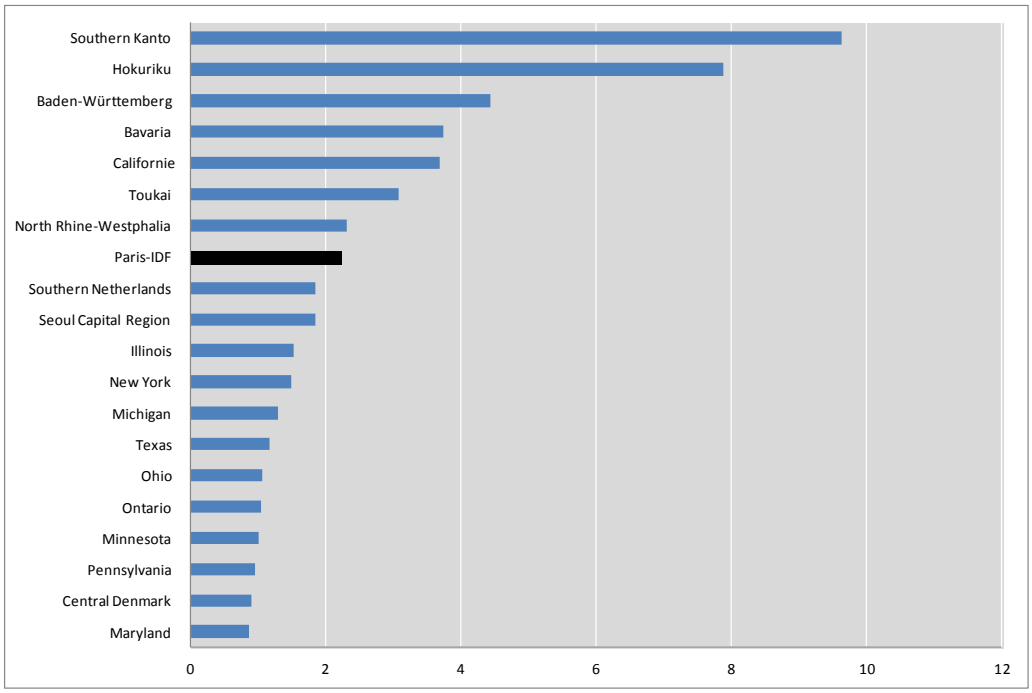
Sources: Chambre de commerce et d'industrie de Paris (2011), website of the *Chambre de commerce et d'industrie de Paris*, *www.ccip.fr*, accessed on 3 November 2011; Insee (2007), « Les entreprises spécialisées dans l'environnement: les éco-activités », *Courrier des statistiques n° 120*, Fiche n° 10, Insee, Paris; OECD (2005), "Opening markets for environmental goods and services", OECD Policy Brief, September 2005, OECD, Paris; IAU (2004), « Les éco-activités en Ile-de-France: une filière innovante, un fort potentiel de développement », *Note rapide n° 363*. IAU, Paris; IDF (2011c), « Lancement du plan filière éco-activités », Direction du développement économique; Réseau TEE (2009), « Emplois de l'environnement: Constats et tendances en Ile-de-France », Direction du développement économique.

The region is performing increasingly well in environmental technology. While it was ranked below 20th among OECD regions (TL2) in the world during the period from 1985-87, it now comes eighth as regards green patents (2005-07) (Figure 26). However, the level of achievement is not the same in all sectors. In Ile-de-France, water and waste treatment are still strong points which offer export opportunities,

but they are faltering. While they accounted for around 42% of all the region's green patents from 1995 to 1997, their share decreased by almost half to 23% between 2005 and 2007 (Table 4). Thus the sector was surpassed by that of transport which in the same period had 892 patents or almost 48% of the total. This very sound performance in the area of transport has been based in particular on progress in car manufacturing, in which the region (together with Normandy) accounts for 70% of the sector's green patents.

Figure 26. The world's top 20 regions for green patents

(2005-07)



Note: These are TL2 regions.

Source: Ajmone Marsan G. and A. Primi (forthcoming), based on OECD REGPAT data.

Table 4. IDF green patents by sector

	1995-97		2005-07		Change: 1995/97-2005/07
	Green patents in IDF	Share of all patents in IDF	Green patents in IDF	Share of all patents in IDF	
Air/water waste management	165	42%	425	22.6%	158%
Renewable forms of energy	11	2.8%	138	7.3%	1 155%
Emission reduction technologies	1	0.2%	58	3%	5 700%
Combating climate change	8	2%	98	5.2%	1 125%
Technologies indirectly affecting greenhouse gases (*i.e.* batteries)	55	14%	203	10.8%	269%
Transport: emission reduction	133	34%	892	47.5%	571%
Building: energy efficiency	16	4.1%	62	3.3%	288%
Total	389	100%	1 876	100%	382%

Source: OECD REGPAT

Overview of strategies and public policy frameworks

Since the year 2000, economic and environmental considerations have been at the heart of many strategic documents. While the term "green growth" had yet to be formally adopted in public policies, many national, regional and local strategic and policy documents gradually came to include various aspects concerned with the issue of green growth, especially as regards reducing energy consumption and safeguarding the environment and climate, such as questions relating to energy and building, transport, biodiversity, natural milieux, environmental and health risks, and finally matters of governance. However, the interaction between these energy-related and environmental aims and the economic aims of job and value creation, at the heart of the green growth concept, have been absent or only partially clarified in the initial strategic approaches. Yet they are tending to emerge with the implementation of these strategies.

- Under the Rio Declaration signed by 178 countries including France in 1992, the signatory states adopted an action programme for the 21st century called ***Agenda 21*** and undertook to prepare a national strategy for sustainable development and 21 local "agendas". In France, the Territorial Climate Plan constitutes the climate section of Agenda 21.

- The ***National Strategy for Sustainable Development*** (SNDD), adopted in 2003 for the 2003-08 period, makes sustainable development a component of public action and adopts an action-oriented approach. It was updated in 2006 to bring it into line with the European strategy (SEDD).

- The ***Grenelle Environment Forum,*** initiated in 2007, against a background of ecological and climatic crisis, lays down the national benchmark in the area of environmental policy and action to combat climate change. The national strategy for environmental policy and the arrangements for implementation are set out in the programming law concerning implementation of the Grenelle Environment Forum, known as the "Grenelle 1" law, and the law on national commitment to the environment, known as "Grenelle 2" (Box 3).

- Subsequent to the Grenelle Environment Forum, a new ***National Strategy for Sustainable Development*** was established for 2010-13. Subtitled *Vers une croissance verte et equitable* ("Towards green and equitable growth"), it takes up all the concerns of Grenelle, while adding a social dimension in response to the twofold economic and ecological crisis. It is built around nine challenges, each of which includes a set of quantitative indicators referring back to the aims of Grenelle.

Box 3. The Grenelle Environment Forum

Initiated in 2007, the Grenelle Environment Forum is based on the following three main principles: a shared awareness of ecological urgency and the need to act to protect the environment and ensure sustainable competitiveness; the need for a new form of long-term governance; and reversal of the burden of proof, meaning that public decisions liable to have a significant environmental impact will have to demonstrate firmly that a more environmentally friendly option at reasonable cost is impossible.

The Grenelle Forum gave rise to extensive legislative activity embodied in the *Grenelle 1* and *Grenelle 2* laws. The (first) *Grenelle* 1 law enacted on 3 August 2009, set out a desirable path for growth and established a number of goals for several sectors, as follows: the energy and building sectors (23% of renewable energy in 2020 and a quartering of greenhouse gas emissions by 2050), the transport sector (modal balance, public transport programmes), biodiversity, agriculture, sea and forest (green and blue network, integrated management), the health and environment sector, the waste sector (management of ecoorganisation, purpose of recycling), and the issues of governance, information and training sector (extensive circulation of environmental information among the general public). The *Grenelle 2* law, enacted on 12 July 2010, sets out step by step, sector by sector, the aims endorsed under the first

legislative section of the Grenelle Environment Forum.

The investment needed to achieve all the Grenelle aims and commitments also highlights the impact of transport and urban planning, and in particular the building sector. According to the government's impact assessment of implementing Grenelle, an overall sum of EUR 440 billion will be needed to achieve the Grenelle aims, 22% (EUR 97 billion) would have to be earmarked for transport and 47% (EUR 205 billion) for the building sector (CGDD, 2011a). Measures for sustainable transport include high-speed lines (EUR 53 billion), segregated lane public transport schemes (EUR 36 billion) and freight (EUR 8 billion) (CGDD, 2011a). Investment in the building sector concerns the modernisation of heating in older buildings (around EUR 185 billion gross) and fresh standards for new construction (EUR 15 billion gross) (CGDD, 2011a).

Source: CGDD (2011a), *Etude d'impact de la loi programme pour la mise en œuvre du Grenelle de l'Environnement*, presentation by Olivier Teissier to the OECD on 27 April 2011, La Défense, Paris.

- At the intra-regional level, local authorities and bodies in Ile-de-France undertook ***agenda 21*** initiatives from 2000 onwards. In 2010, as many as 85 (the Regional Council, *conseils généraux*, cities, and conurbation and communal bodies) had initiatives that were already operational or undergoing preparation.[16] The Ile-de-France Regional Council Agenda 21[17] was developed in accordance with three concerns as follows: the Region as a model of good practice; the incorporation of Eco-Region aims in regional policies; and the renewal of governance.

- The *Grenelle 2* law also amended the Environment Code[18] in specifying that the regions, *départements*, public establishments of inter-communal cooperation (EPCIs) and communes with 50 000 inhabitants should have adopted a territorial climate-energy plan (PCET) by 31 December 2012. Without replacing the agenda 21 initiatives or territorial sustainable development projects, the PCETs deal strictly speaking with energy and climatic issues; for local bodies involved in an agenda 21 initiative, they constitute its climate component.

- The 2008 ***Schéma directeur de la région Ile-de-France*** (SDRIF, or Master Plan for the Ile-de-France region), which was drawn up before the Grenelle Environment Forum, offers a comprehensive long-term blueprint for the region, especially as regards development and urban planning with openly stated economic and environmental goals (Box 4). As to the ***Stratégie Régionale de Développement Economique et d'Innovation*** (SRDEI, or Regional Strategy for Economic Development and Innovation) which in 2011 replaced the SRDE dating from 2006, it lays down the main regional policy lines for economic development and innovation (Box 4).

- The ***Greater Paris Scheme,*** on which discussion was first initiated by the government in 2007, articulates the vision of a "capital city region" capable of assuming its role as world economic leader and becoming the powerhouse of national growth, while promoting "sustainable economic development that is socially committed and creates jobs" (Box 5). The law on Greater Paris provides in particular for the creation of "territorial development contracts" (CDTs) (Box 5) that can be implemented and negotiated with the prefect of the Ile-de-France region. These contracts will mean reaching a shared vision of the area plans concerned, and thus require a fine balance between the Greater Paris Scheme and local projects, and between the contributions forthcoming from all parties.

16. See *www.teddif.org/IMG/pdf/panoramaProjetsTerritoriauxDdIdf2010.pdf*.

17. See *www.iledefrance.fr/missions-et-competences/environnement/lagenda-21-regional/programme.*

18. The amendment is article 75 of the Grenelle 2 law, which established article L.229-26 in the Environment Code.

Box 4. The main regional planning and economic development schemes: the SDRIF and SRDEI

Prepared by the Region in consultation with the government, the **SDRIF** is a document for urban planning and development in the area which sets out the regional policy. The 2008 draft SDRIF was the result of an approach that sought compatibility between the various aims by considering how they might affect each other, but with due regard also for the consequences given the influence of Ile-de-France in the national context and for maintaining an overall balance. According to the SDRIF proposal, a sustainable European metropolis has to confront a certain number of challenges, such as the construction of a more united region, anticipate changes in climate and in relation to energy, and promote a dynamic region that maintains its world standing. Among the declared aims in the 2008 draft SDRIF for encouraging sustainable development should be mentioned the building of 60 000 homes a year, stimulating employment, economic activity and international influence, strengthening the public transport network, international accessibility, soft modes and multi-modal logistics, safeguarding and enhancing natural resources and the environment, and strengthening facilities and services. This approach identifies the impact on the environment of the many planned projects within the entire SDRIF scheme, in order to avoid, to lessen and if need be to offset the negative impacts.

Drawn up by the Region, the 2011-14 **SRDEI** sets out the main thrust of the policy for economic development and innovation.[1] Confronted with the worsening of the industrial situation, the vulnerable fabric of the SMEs and small and medium-sized industries, differences in land areas and environmental pressures, the strategy has concentrated on strengthening the SMEs and SMIs, enhancing the potential for innovation and encouraging the closely-knit development of areas. To this end the region has a EUR 906 million budget for the 2011-14 period. The strategy relies on an inflow of funds (from strengthening the Regional Innovation Fund and the Regional Guarantee Fund, OSÉO, etc.) and a restructuring of action mechanisms (with a special SME and SMI forum, a regional research and forward planning agency, and economic assistance, etc.).

Note: The 2011 SRDEI replaced the 2006 SRDE.

Box 5. The Government Scheme for Greater Paris

The future of ***Greater Paris*** came onto the agenda in a statement by the President of the Republic in June 2007. An international consultation process on the "Great Gamble of the Parisian conurbation" was then begun, involving ten teams of international architects who had the task of considering the future of the Paris metropolis. In March 2008, the President of the Republic established a junior minister's office for the development of the region round the capital, which was made responsible for implementing a project centred on the economic competitiveness of Ile-de-France. The Société du Grand Paris (Greater Paris Company) established by the law on Greater Paris of 3 June 2010, is responsible for devising and developing the Greater Paris public transport network. The new network provides opportunities for the redesign and urban upgrading of certain neighbourhoods and industrial sites undergoing change, as well as for opening up land and generally enhancing the environment.

The overall plan for the ***Greater Paris Scheme*** views development of the metropolis as a matter of national concern and is promoting "sustainable economic development, which is socially committed and creates jobs". It very expressly includes the aim of economic growth in its Greater Paris Scheme, and seeks competitiveness and attractiveness by means of a strategy for land-based and economic development centred on a public transport network, while redressing the backlog in house building with 70,000 homes a year and establishing territorial development contracts. The CDTs are the reflection in area development terms of the aims of greater Paris as regards city planning, transport, travel, action to combat social exclusion, economic, sports and cultural development, and the conservation of agricultural and wooded areas as well as landscapes. These are comprehensive development strategies devised by local bodies in consultation with government regional departments. The CDTs set out quantitative and qualitative aims in order to provide in particular for varied urban commitments, greater social mix in the residential environment, and more rational balanced use of land areas with due regard for the aims of sustainable development. In this sense, contracts will be obliged:

- to ensure the consistency of local schemes with government strategies and projects;
- to interrelate closely all aspects that are instrumental in developing the area of Ile-de-France, and in

particular to encourage the emergence of urban scientific and technological centres, in which contacts and interchange between partners and disciplines will stimulate innovation;

- to integrate the aims of sustainable development: a city that is dense, mixed, interlocking, creative, effective, fair and ecological, in accordance with the principles established since Kyoto and Copenhagen;

- to achieve the aim of over 70,000 homes a year stated in the law on Greater Paris.

Established between the government and local authorities, the CDTs represent a novel approach to area development for the rapid implementation of a scheme in compliance where necessary with urban planning documents. When being jointly drawn up, CDTs may identify actions or operations to be regarded as formally declared projects. Attributing them this status involves procedures to ensure their all-round compatibility with existing urban planning documents, which has the advantage of enabling public enquiries to be grouped together so that in the end the time taken to discuss and approve contracts is much shorter. The idea is above all to achieve all-encompassing proposals for sustainable development, coupled with operational and effective working methods, in a way totally compatible with the future growth points of Greater Paris.

Source: Société du Grand Paris (2011) *Schéma d'ensemble*, *www.societedugrandparis.fr/fr/l-acte-motive-et-le-schema-d-ensemble-_24.html*, accessed 3 November 2011.

The government and the region have ambitions for the Paris-IDF region which embody many common concerns but which differ in certain respects. They reach the same conclusion about the challenges facing Ile-de-France, as a foremost world metropolis, in viewing it as the economic powerhouse of France in which issues of social cohesion and environmental quality are highly significant. In its Greater Paris Scheme, the government articulates the vision of a "capital city region" capable of assuming its role as a world economic leader and driving national growth. It very expressly includes the aim of economic growth and seeks competitiveness and attractiveness by means of a strategy for land-based and economic development centred on a public transport network, while redressing the backlog in house building with 70 000 homes a year and establishing strategies for competitiveness that are based on certain transport interchanges implemented via the CDTs (Box 5). The Region, for its part, drew up the draft SDRIF from 2004 to 2008, in which the emphasis is primarily on social cohesion, housing and collective responsibility. Under this scheme, area development is a means of lessening intra-regional social inequalities and encouraging the growth of "the foremost eco-region in Europe". Although the 2008 SDRIF proposal was drawn up in association with the government, the Council of State rejected it in October 2010 on legal grounds, and particularly in view of its incompatibility with the newly enacted law on Greater Paris.[19] As will be discussed in the section on governance, these differences and disagreements that may occur between the national and intra-national authorities in a capital city region, especially when they are represented by different political parties, are encountered in many OECD countries, and testify to the economic and political importance of capital cities.

Among the various national or regional strategic documents, the Grenelle Environment Forum doubtless provides the fullest discussion so far of the green growth concept – a concept still rarely referred to in other strategic national documents, given their use of the terms "sustainable development" or possibly "green economy". Indeed, the Grenelle initiative includes an action proposal for the development of green growth occupations (MEEDM, 2009). This plan constitutes the first project in the contract for Ecological Solidarity Pact, the "social linchpin" of Grenelle, unveiled in 2010. While the term "sustainable

19. This obstacle has partly been overcome because an agreement between the government and the Region on the "Grand Paris Express" transport plan was reached on 26 January 2011, and included both the modernisation of the existing network and the development of a new one. A procedure for revising the SDRIF is now under way with a 2013 deadline.

development"[20] has come to occupy a prominent position in recent years in the strategies, policies and programmes of public authorities, as well as among private players, the concept of green growth is not as widespread. Government flagship programmes emphasise the ecological or economic ambitions for the area (as in the Grenelle Environment Forum or Greater Paris Scheme, respectively), but the two perspectives are often disconnected. In terms of strategic emphasis, Grenelle is far more basically ecological than economic, as the economic impact of its proposed environmental measures was not calculated *ex ante*. Of course, while the players have a keen interest in the environmental question, this is too often addressed in restrictive terms and in relation to aims regarding climate and energy issues, with attention focused primarily on answers involving infrastructure.At regional level, the SRDEI considers prospects for economic development in Ile-de-France in close conjunction with the environmental requirements, whereas green growth is referred to nowhere in the SDRIF proposal.

The only definition suggested for the term green growth appears in the context of the Grenelle Forum: "the growth of new technologies and services that are going to enable us to adopt ways of life and methods of consumption and production that use simpler natural resources and emit only small quantities of carbon or greenhouse gases" (MEDDTL, 2011b).[21] This is a definition focusing on the emergence of a new green economy, without considering that the traditional economy might itself possibly "go green". Neither does it specify whether this increase in new technologies and services will be reflected in real economic growth, in the light of possible losses in the traditional economy.

Although there is no single clear-cut, unified and commonly shared view of what green growth in IDF might mean, institutional players at the different levels (Region, *départements*, inter-communal groupings, towns) and many private interests have committed themselves to initiatives in favour of green growth, latching onto the challenges identified in the Grenelle Environment Forum and the policies implemented as a result. For many professional people, political determination at all levels to achieve environmental goals constitutes a real opportunity. Thus at the national level, 73% of professionals in the building sector consider that changes arising from the Grenelle Forum amount to a "growth opportunity" for the sector (MEDDTL, 2010b). However, in many fields, the market is strongly supported by the public authorities: on the one hand, public contracts do much to keep it buoyant as they account for 45-50% of the clientele in the eco-industries depending on the sector concerned, especially in satisfying collective needs (IAU, 2004); on the other, in sectors such as renewable energies, the market is largely sustained by public funding. The realisation and implementation of goals and systemic action are primarily the responsibility of the local authorities.

Furthermore, the appraisal which follows stresses that at present most green markets in Ile-de-France are still in a formative stage, as they have only been drawn up and implemented since 2008-09. As noted in the SRDEI, the Ile-de-France sector lacks a clear structure. First of all, most of its activities are scattered across the region, with the exception of two collection centres in Seine-Saint-Denis (collection and retrieval activities) and along the Seine (activities that generate greater nuisances or require more space) (IAU, 2004). The result is that, while the region makes no secret of its wish to become the dominant European eco-region, it currently has no real "identity" where eco-activity is concerned. For this to occur, it is necessary to embark on an active policy to train and qualify the workforce and to strengthen the skills

20. In its National Strategy for Sustainable Development (SNDD) (2003-08), the government adopted the definition of sustainable development put forward by the Brundtland Commission's Report in 1987: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (MEEDM, 2010a). The second SNDD (2010-13) is based on the Grenelle Forum commitments and on the growing mobilisation of all those involved.

21. The second National Strategy for Sustainable Development (SNDD) (2010-13) refers to the concept of green growth several times without offering a clear definition, and assumes that it means "growth involving little energy use and few greenhouse gas emissions".

and knowledge of public authorities (upon which much of the strucutural share of green growth dynamics depends) in order to adapt to changes in professional occupations and facilitate investment in the green economy on the part of those concerned, and adjust public procurement. Furthermore, if the various sectors are to develop they have to overcome substantial setbacks in terms of labour – many of them point to a lack of professional staff with the green skills required – and of funding.

Over and above eco-activity, measures concerned with greener buildings, the development of public transport or denser use of space, all for the purpose of promoting sustainable development, whether they stem from the Grenelle Forum or are driven by major investment policies (as in the case of Greater Paris), require a systems approach to urban space and thus call for appropriate changes in existing urban planning mechanisms, in forms of cooreration between those concerned and in the way various administrative levels are mobilised for a new area project. This raises the question of how actions are funded, which also calls for new forms of intra-regional solidarity.

4. Sectoral opportunities for green growth

The sectors with the most opportunities for generating green growth and green job creation in the Paris-IDF region are the building and transport sectors, both of which are essential and in which action is needed to improve the state of the environment and reduce energy consumption and greenhouse gas emissions (Table 5). As to the sectors of renewable energy and waste-to-energy and local and/or organic farming and water, they are under-exploited in the Ile-de-France region, notwithstanding their potential in terms of job creation, contributing to regional attractiveness and to the supply of and demand for green goods and services in the region. Over and above their potential influence on economic growth, these sectors may also contribute to achieving social aims, with perhaps greater social cohesion and positive effects on health.

Table 5. Employment in IDF green sectors: trends and outlook

Sector	Sub-sector	Employment (jobs)	Growth	Prospects for IDF	
				Job creation[1, 2]	Jobs scrapped[3]
Building	Installation of heating and air-conditioning facilities, insulation and roofing	25 000 (Arene, 2007)	Growth of 13.8% between 2005 and 2009 in insulation activity (EIDER, 2011). There will be growth above all in services and distribution of products, rather than in their manufacture.	2010-20 Direct: 10 700-42 200 Indirect: 15 679-61 959 (CIRED, 2010) Creation of 10.9 direct jobs/year per million euros for installed facilities, insulation and building (Arene, 2006)	
Renewable forms of energy	Solar	2 700-5 000 (IAU, 2010c)	Average annual growth of 40% in the world PV (photovoltaics) market (IAU, 2010c)	2010-20: Direct: 331 Indirect: 66-265 (CIRED, 2010) Creation of 11 direct jobs/year per million euros invested for installed facilities, operation and maintenance of solar PV (Arene, 2006)	2010-20: 3 200-12 100 in the energy sector (CIRED, 2010)
	Wind	No regional data; 11 000 in France (SER, 2010)	Jobs growth of 57% in France between 2007 and 2009 (IAU, 2011). 15.5 jobs created for every MW of wind energy produced and installed (EWEA, 2009 quoted in IAU, 2011)	2010-20: Direct: 183-731 Indirect: 262-1046 (CIRED, 2010) Creation of 15.5 jobs per MW of wind energy produced and installed (EWEA, 2009, in IAU, 2011)	
	Geothermal energy	532 (Ademe, 2009)	Modest renewed growth in deep geothermal energy, after a 15-year period of negligible growth (CGDD, 2010)	42 direct jobs/year per million euros invested in deep geothermal energy for installation, operation and maintenance 14.1 direct jobs/year per million euros invested in surface geothermal energy for installation,	

Sector	Sub-sector	Employment (jobs)	Growth	Prospects for IDF	
				Job creation[1, 2]	Jobs scrapped[3]
				operation and maintenance. (Arene, 2006)	
	Dendroenergy	1 183 (EIDER, 2011; Ademe, 2009)	Growth in the dendroenergy sector which remains poorly structured (TEE, 2010)	16.1 direct jobs/year per million euros invested in dendroenergy for installation, operation and maintenance (Arene, 2006).	
	Refuse incineration plant	342 (Arene 2005a, CPP 2004)	…	2010 and 2020: Direct: 23 Indirect: 65 (CIRED, 2010)	
Transport	Rolling stock manufacture, trade, repairs, transport, storage	1 060 646 (Insee)	…	2010 and 2020: Direct: 12 452-19 398 Indirect: 20 862-38 676 (CIRED, 2010)	2010-20: 2 900-7 800 in the transport sector (CIRED, 2010)
Agriculture	Conventional / Intensive	9 000 (IDF, 2010)	Decrease in jobs of 29% between 2000 and 2010	…	
	Organic	430 (Agence Bio, 2011)	Growth of 43% in the number of farms throughout 2009 and 2010. Growth of 38% in the consumption of organic products from 2005 to 2009 (Agence Bio, 2011)	2010-20: Direct: 2 845	
Waste	Recovery and sorting	2 965 (EIDER, 2011)	Growth of 15% between 2000 and 2008 (ORDIF, 2011)	…	
Water	Water abstraction, treatment and distribution	7 636 (EIDER, 2011)	Growth of 14.1% between 2005 and 2009 (EIDER, 2011)	…	
	Recovery and treatment of waste water	2 472 (EIDER, 2011)	Growth of 9.1% between 2005 and 2009 (EIDER, 2011)	…	

1. "Direct" jobs are those created in the sector concerned in Ile-de-France; "indirect" jobs are those created in the supply chain of the sector concerned.

2. One should also take account of ancillary jobs not included in the Table, which are created or scrapped in the rest of the economy because of the additional costs generated or the savings achieved following new regulations and environmental measures. Whereas an extra cost may lead to a lowering of consumption and thus of the activity in the rest of the economy, and by extension the scrapping of skilled ancillary jobs, savings may have the reverse effect (*i.e.* an increase in consumption and activity and the creation of ancillary jobs).

3. "Scrapped" jobs are those in which activity falls in comparison with the underlying scenario.

4. This calculation is based on an annual growth rate of 20% in the number of farms in IDF (172 in 2011) and a ratio of jobs per farm of 1.3 compared to conventional agriculture (cf. Lecoueur, C. *et al.,* 2009).

Sources:

Ademe (2005), La géothermie en Ile-de-France, Ademe, Paris
Ademe (2009), "Marchés, emplois et enjeu énergétique des activités liées aux énergies renouvelables et à l'efficacité énergétique", Ademe, Paris.
Agence Bio (2011), Bio par région, Agence Bio, Montreuil-sous-Bois.
Agreste (2011), *Donnés Ile-de-France*, Agreste IDF n° 109, Ministère de l'Agriculture, de l'alimentation, de la pêche, de la ruralité et de l'aménagement territoriale, Paris.
Arene (2005a) *Production d'énergie par incinération des déchets*, website of Arene, *www.areneidf.fr/fr/Production-denergie-par-incineration-des-dechets-513.html*, accessed on 3 November 2011.
Arene (2007), "Diagnostic et perspectives de développement des activités et des emplois dans les secteurs de l'efficacité énergétique et des énergies renouvelables en Ile-de-France", Arene, Paris.
BEIDF (Biomasse Energie IDF) (2011), *Collectivités et Entreprises*, website of Biomasse Energie Ile-de-France, *www.biomasseenergieidf.org/collectivites-et-entreprises*, accessed on 3 November 2011.
CGDD (Commissariat Général au Développement Durable) (2010), *Les filières industrielles stratégiques de l'économie verte*, Ministère de l'Écologie, de l'Énergie, du Développement durable et de la Mer, Paris.
CIRED (2010), *Impact sur l'emploi de la réduction des émissions de CO_2 en Ile-de-France*, Centre International de Recherche sur l'Environnement et le Développement, CNRS, Nogent-sur-Marne Cedex.
DRIAAF (2009), *Plan de développement 2009 – 2013 de l'agriculture biologique en Ile-de-France*, DRIAAF/IDF, Paris.
EIDER (2011), *Tableaux détaillés*, website of EIDER, *www.stats.environnement.developpement-durable.gouv.fr/Eider/tables.do#*, accessed on 3 November 2011.
IAU (2010c), *Les Industries des ENR en Ile-de-France : Quel potentiel de développement. 1. L'industrie photovoltaïque*, IAU, Paris.
IAU (2011e), *Les Industries des ENR en Ile-de-France : Quel potentiel de développement. 2. L'industrie éolienne*, IAU, Paris.
IDF (2010), *Plan régional pour le climat. Livre Vert : Etat des lieux des enjeux climatiques*, IDF, Paris.
Lecoueur, C. *et al.* (2009), *Plan de mobilisation nationale sur les métiers liés à la croissance verte – Agriculture et Forêts*, Le Grenelle Environnement, République Française, Paris.
ORDIF (2011), *Emploi dans la filière déchets en Ile-de-France en 2008*, ORDIF, Paris.
Réseau TEE (2010), *Emplois de l'environnement - Constats et tendances en Ile-de-France*, Observatoire francilien des emplois de l'environnement, Paris.

Building

The building sector represents one of the most promising sectors for the Ile-de-France region in the area of green growth. From an environmental and energy efficiency standpoint, the sector consumes 48% of energy at the regional level (including residential and tertiary sub-sectors), largely due to the age of the building stock (68% of which was built before 1975, the year of the first building thermal regulations), which on average consumes more energy than more recent buildings (Ademe-Arene, 2010). The impact of the building sector on total greenhouse gas emissions in Ile-de-France fluctuates between 34% (Carbon Balance approach) and 45% (cadastral approach), depending on the method used.

In economic terms, a green growth policy in this sector could have the following effects:

- *Job creation*: greening the sector should involve everyone in it and require an overhaul of skills among most of those concerned. According to Insee, the building sector in the Paris-IDF region is composed of over 82 000 establishments (2008) and accounts for over 261 400 jobs (2007) (Insee). The great majority of professional workers in the building trade consider the changes stemming from Grenelle to be a "growth opportunity" for the sector (MEDDTL, 2010b). A CIRED study estimates that by 2020 the number of directly created jobs in this sector in Ile-de-France will be between 10 700 and 42 300, while the number of indirectly created jobs will be between 26 400 and 104 200, depending on the price of the barrel of oil and the extent to which funding is covered by public loans[22] (CIRED, 2010). However, these figures should be seen in conjunction with the estimate for jobs to be scrapped in the energy sector as a whole (between 3 200 and 12 100, according to the current forecast), as well as the estimate for ancillary jobs either scrapped or created in the rest of the Ile-de-France economy (between 69 400 scrapped and 27 000 created).[23]
- *Regional attractiveness:* to achieve growth objectives, the region will have to attract skilled labour and make better use of its existing workforce. It is faced with a considerable shortage in its stock of available housing which might lead to a slowdown in economic growth if the region is unable to attract enough qualified working people. The draft SDRIF regional master plan of 2008 proposes that 60 000 housing units should be built annually up to 2030 to overcome this problem, while the law on Greater Paris calls for 70 000 a year. The building of new homes on the one hand and the rehabilitation of older housing in line with energy efficiency requirements on the other should enhance the region's attractiveness.
- *Supply of and demand for green goods and services:* supply may be stimulated by an increase in the demand for facilities, given the prospects for expanding the market for the thermal renovation of buildings and the demand for eco-products, such as suitable equipment (*e.g.* condensing boilers).

The prospects for green growth in the building sector stem first and foremost from improvements in energy efficiency, especially in the existing housing stock, in order to lower greenhouse gas emissions

22. Another estimate by the Arene Ile-de-France (2007), which was thus prior to Grenelle, is far more conservative, namely between 3 000 and 9 400 jobs in the Ile-de-France sector over ten years.

23. In the CIRED (2010) study, job creation forecasts are calculated as follows: (a) "direct" jobs are those created in French territory in renewable forms of energy and energy efficiency; (b) "indirect" jobs are those created in the supply chain in these sectors; (c) "scrapped" jobs are those whose activity is waning compared to the underlying scenario in the study; and (d) "ancillary" jobs are those created or scrapped in the rest of the economy following new regulations and environmental measures. Whereas an extra cost may lead to a lowering of consumption and thus of the activity in the rest of the economy, and by extension the scrapping of skilled "ancillary" jobs, savings may have the reverse effect (*i.e.* an increase in consumption and activity and the creation of "ancillary" jobs).

from gas or fuel oil heating. The age of the housing stock accounts in no small measure for the extent to which the sector is responsible for total regional greenhouse gas emissions. Furthermore, it should not be forgotten that new urban development represents only a very small percentage – around 1% – of the entire French housing stock. By 2050, some 70% of the stock will consist of accommodation that existed in 2005 (Iddri, 2010). The most intensive effort should therefore first be focused on existing stock.[24] Indeed, this situation may constitute a worthwhile line of action for the region as regards green growth, in that certain common approaches to energy efficiency such as heating networks, which account for 50% of the heat supplied in the Ile-de-France region, are better suited to dense environments.

The far-reaching changes that this sector is bound to experience are currently underpinned by the new energy performance targets set by the Grenelle Environment Forum in the Building Development Plan (Box 6) and changes in the 2012 Thermal Regulation. The Building Development Plan is especially attentive to environmental aims and sets new regulatory standards, in particular by obliging builders first of all to reduce energy consumption in new buildings, and then to construct energy-plus buildings. Another central government initiative, the Sustainable City Scheme, seeks to make the most of development operations that exemplify good practice, and to stimulate local authorities and all those prominently active in city life to organise new planning and public transport operations, mainly through eco-neighbourhood projects (corresponding to the scale of a development activity), the eco-cities initiative (corresponding to the scale of major urban areas), and a call for proposals to help local authorities speed up the development of segregated-lane public transport.[25] However, these new neighbourhoods have been open to criticism for an excessively isolated approach (lack of contacts with the existing city) and the effects of gentrification that often go hand-in-hand with their inclusion in the city. By contrast, a strong point of the initiative is seemingly its systems approach to urban issues (water and waste management, etc.) within a single urban scheme.

Box 6. The Grenelle Environment Forum Building Development Plan: new regulations for the building sector

Initiated by the government in January 2009 when the Grenelle proposals were being prepared, the Building Development Plan is based on a strategy aimed at "encouraging and then restraining" with no immediate obligation for households to undertake work. The Plan has announced a set of clear aims for the building sector concerned with new regulations, raising public awareness and a set of tax incentives. In the case of new building, the regulations provide for the general introduction of low energy buildings by the end of 2012, and energy-plus buildings by 2020. The targets are more demanding for new constructions compared to existing buildings, since it is planned to achieve 50 kWhEP/m²/year for the former as opposed to 80 kWhEP/m²/year for rehabilitated buildings from now up to 2050.

In addition, *Grenelle 1* fixes a conversion-to-green rate of 400 000 homes to be renovated from 2013, as well as 800 000 units of social housing (which consume substantial amounts of energy) before 2020. It commits the government to ensuring the energy renovation of its buildings, many of them located in the Paris region, before the end of 2012.

The Region and some local authorities are also involved in efforts to rehabilitate housing. The leading providers of social accommodation have in many cases acted as trailblazers through support from the

24. For this purpose, the city of Paris and the IDF Region have drawn up a Building Convention to encourage private demand for energy economy construction. The Convention contains a communications strategy targeting the general public and incentives for professional workers to diversify their activities with new skills.

25. The Sustainable City Scheme also includes a research and methods component that draws on a competitiveness cluster (*pôle de compétitivité*) of international standing known as Advancity in Marne-la-Vallée, as well as on an eminent expert committee entrusted with monitoring all actions undertaken.

Region for its property development proposals. Additional initiatives include regional financial support for private householders and the office sector, as well as overall action by the city of Paris via its Climate Plan, efforts by area authorities to insulate facilities, incentives through the four government eco-neighbourhoods, and the Region's 19 "new urban neighbourhoods supported under the 2008 SDRIF proposal (IAU, 2011a).

The nature of the various challenges confronted varies somewhat throughout the region, given that living conditions in Paris and its suburbs are different. Indeed, the population density is highest by far in Paris and gradually decreases the more one moves out from the centre. Thus compared to both the inner and outer belt, Paris has more multi-family dwellings and more smaller-sized dwellings. This calls for different approaches depending on local particularities. The example of the city of Toronto demonstrates that by focusing in the first instance on more energy-intensive types of housing, one can quickly achieve a decrease in greenhouse gas emissions and a rapid return on investment. The *Mayor's Tower Renewal Programme* in Toronto thus aims to lower greenhouse gas emissions from residential heating through concentrating on just a few highly polluting buildings, since it mainly targets the 1,000 concrete towers built before 1984. It is estimated that external insulation of these buildings could in itself reduce Toronto greenhouse gas emissions by 5%. In addition, there is also an employment component since it is believed that 30 000 person-years of jobs might be created locally through this renovation scheme. And by limited targeting of buildings, the action becomes cheaper than it would be if efforts to renovate were more thinly spread.

The conversion of building into a green sector will also have considerable consequences in social terms. The current housing shortage means that people of modest or average means are gradually excluded from the centre of the conurbation, so that they have to rely on the housing market further out, which fuels trends towards social segregation and spatial imbalance between the residential environment and employment (IDF, 2008). Furthermore, the consequences of poorly insulated homes often affect the most vulnerable and disadvantaged people. Such households suffer in three respects. As they often live in social and/or poorly insulated housing, they earmark a greater share of their budget for energy than better-off households.[26] In addition, because they tend to live far from their workplace given the cost of accommodation closer by, these households also spend a larger share of household income on daily transport.

While an active policy for green conversion may be consistent with social aims in several respects, the relation between them cannot be taken for granted. First of all, it seems sensible to concentrate on social housing, so as not to exclude the poorest populations from green policies. This is desirable not just for reasons of social equity, but also in terms of energy efficiency. The Ile-Saint-Denis river eco-neighbourhood project in the Plaine Commune conurbation is a fairly good example, since it aims at a social and ecological balance (IAU, 2010d). Furthermore, greening the building sector may be a promising approach to promoting green jobs – especially local jobs – and employment for disadvantaged groups (Box 7). Yet eco-neighbourhood policies and policies for rehabilitating private accommodation raise the question of what will happen to the resident population. The highly ambitious nature of building policies may indeed penalise those groups wishing to become home owners. The Regional Council is especially aware of this issue: it is discussing and examining the question of high quality social provision, while working to lessen social and area inequalities and manage all changes appropriately.

26. Indeed, while Ile-de-France households on average spent 3.4% of their income on energy at home in 2006, tenants in the sector offering *habitation à loyer modéré* (HLM, or lower rent public housing) and households that were heated with fuel oil and electricity spent proportionally more (IAU, 2010a).

Box 7. Green jobs in the building sector: strong potential for achieving greater social equity

In terms of green growth, the building sector is of special interest because its conversion to a green sector is likely to concern its entire workforce (ranging from the most highly skilled to the least skilled jobs) and may lead to long-term job creation (not solely during building works). *Green Pays* in Santa Clara and the *Mayor's Tower Renewal Programme* in Toronto illustrate different ways of achieving elements of social equity in the creation of green jobs in this sector.

The *Green Pays* programme facilitates the implementation of renovations to achieve energy efficiency by means of an innovative funding mechanism (PACE), and offers jobs with good working conditions to workers on low incomes. Developed in California, *Green Pays* will be established in Santa Clara in two phases: it will start by seeking to renovate 1 250 houses and, if successful, will be applied to 220 000 eligible houses in the region. Funding will be supported by a land tax and preferential interest rate loans, which should also help to attract start-up capital. Recruitment targets workers in low-income communities, and entrepreneurs are obliged to pay 250% of the minimum wage for the least skilled jobs, and increasingly higher wages to the more experienced. In addition, workers receive health and safety training.

The *Mayor's Tower Renewal Programme* is striving to create 30 000 job-years in the building sector. The programme is recruiting labour in low-income communities in cooreration with the building union, and offers workers training. The programme aims to renovate over 1,000 flats in towers built before 1984, which would cut electricity use by 50%, gas consumption by over 50%, water consumption by 20%, and the production of waste for incineration by 30%. Besides jobs created for renovation, substantial job creation is likely on the part of businesses and activities associated with the towers. Social equity is achieved here both in improvements to homes in low-income neighbourhoods, and through local job creation.

However, the green transition within the sector faces a major hindrance, namely the need for substantial funding whose sources are currently inadequate. For now, work in the green building sector is driven essentially by public financial support. The estimated cost of thermal renovation at national level is very high, standing at between EUR 185 billion according to the CGDD impact assessment (CGDD, 2011) and EUR 656 billion spread over 40 years, according to IDDRI (2010). Grenelle proposes that costs should be shared between the government (through interest-free eco-loans, a "sustainable development" tax credit and the establishment of a "heat fund"), firms and households. Moreover, investments are planned by the public authorities at every level: EUR 200 million from the stimulus package; EUR 500 million from the "grand loan" scheme, a form of subsidy; and EUR 6.5 million (in 2008) at regional level under the 2008 SDRIF proposal (IDF, 2010).

Coordinating public measures (regulations, financial support) and funding will thus be crucial. It is in this area that financial innovation is really needed and will require the design of a new economic model. While a certain number of government incentives encouraging households and local authorities to carry out renovation in the existing stock are now available (such as a sustainable development tax credit, interest-free eco-loans, and energy performance contracts), the demand for them has not yet materialised (ARD cites green loans as an example), any more indeed than has private funding. According to a report to the Senate on policies for sustainable development in 2010, the Grenelle Environment initiative in budget terms "lacks ambition and clarity". The report notes a fall in the funding allocated to the programmes concerned in the 2011 finance bill. However, in order to establish new economic models and financial mechanisms encouraging the spread of green innovations and risk-sharing by land developers, owners and tenants, the government may consider turning to investors and the Innovation-Finance competitive cluster.

In addition, more extensive use of public/private partnerships (PPP) could lead to a faster, more sustained greening of the building sector, as a result of private funding. The innovative Zero Carbon Hub initiative undertaken in the United Kingdom for funding green buildings might serve as a basis for French practice. United Kingdom regulations are stricter than in France with a "zero carbon" target for all new

housing by 2016. For that purpose, the UK government has established an institutional platform, the Zero Carbon Hub, responsible for building houses to the required standards before 2016. The Hub has the status of a non-profit company limited by guarantee and is based on a public/private partnership. It is in charge of coordinating the building of new housing with low or no emissions. The activity of the Hub has been organised under five headings, namely energy efficiency, energy supply, examples and scale up, skills and training, and consumer engagement (Box 8).

Box 8. Funding green building in the United Kingdom

In the residential sector: the RE:NEW programme (City of London (2011a)), aims to renovate 1.2 million homes by 2015 providing for annual CO_2 reductions of over 1 million tonnes. It will be introduced in London neighbourhoods on a case-by-case basis. The programme seeks to be upfront free with a pay-as-you save model. The plan is to extend it to all willing London homes over the period up to 2030. These renovation measures, including energy-saving light bulbs, double glazing and smart metres, will apply to half of the 3 million homes in London by 2025. This programme began in the summer of 2011, with a GBP 9 million investment in 2011-12. Following a trial period, the Greater London Authority (GLA) has transferred it to the boroughs for implementation. They have been given extensive advice and documentation concerning good practice to help them in their task. A range of advisory services to the community is now available with further back-up provided at meetings, over the Internet and during home visits.

In the tertiary and public works sector, which is responsible for almost 28% of emissions in London, two programmes have been introduced. The first, RE:FIT (formerly the "Buildings Energy Efficiency Programme") (City of London (2011b)) is a public-sector energy renovation programme meant to save an annual GBP 1 million. The aim is that it should be up-front free and financed by a public/private fund (City of London (2010)). The second, known as the "Better Buildings Partnership", brings together leading owners of business and public buildings to establish a building sector renovation programme for energy, water and waste. Mechanisms for comparing sustainable development are available to owners of business buildings.

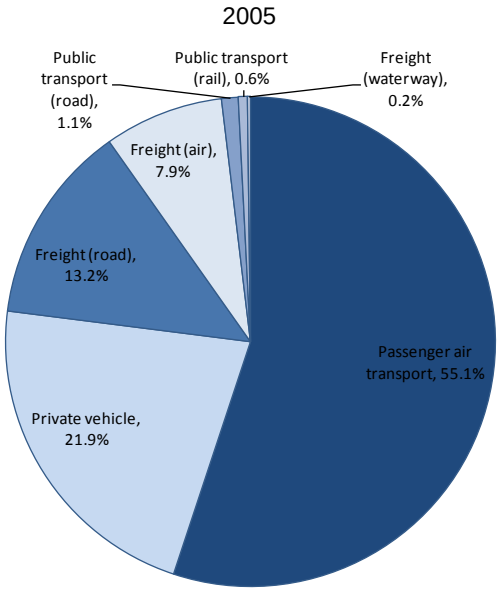
Source: City of London (2010), RE:FIT, London's building retrofit programme, Mayor of London, London Development Agency, London; City of London (2011a), RE:NEW – Homes Energy Efficiency for Tomorrow, website of the London Development Agency, *www.lda.gov.uk/projects/renew/index.aspx*, consulted on 3 November 2011; City of London (2011b), RE:FIT, website of the London Development Agency, *www.lda.gov.uk/projects/refit/*, consulted on 3 November 2011.

Transport

The transport sector offers another opportunity for green growth in the IDF region. The sector is, first and foremost, one of the main causes of greenhouse gas emissions, which are largely attributable to road and air travel. According to the Airparif cadastral method, road traffic generated 24% of regional CO_2 emissions in 2005, coming second behind the building sector (residential and tertiary) (IAU, 2011b). The Paris-IDF region Carbon Balance findings, which also quantify air transport emissions, underscore the effects of transport in emissions generated by residents and their activities, amounting to 29% for passenger transport and 19% for freight transport (all modes combined). The Carbon Balance method also highlights the impact of air transport, which represents 26% of total emissions attributable to Ile-de-France residents and 80% of total emissions caused by visitors (IAU, 2011b). [27] The very modest contribution (less than 2%) of public transport, both road and rail, to greenhouse gas emissions, compared to methods of private road transport (almost 22%), clearly suggests the need for developing public transport and reducing private road transport to achieve an overall reduction in emissions (Figure 27).

27. However, this figure should be seen in perspective as the Carbon Balance findings include the entire air journey starting from Paris in the calculation of emissions, which magnifies the impact of aircraft in total transport emissions.

Figure 27. Greenhouse gas emissions in the transport sector, by mode of transport



Source: IAU (2007).

In economic terms, a green growth policy in the transport sector might lead to the following:

- *Job creation:* According to the CIRED study, the greening of the transport sector may directly create between 12 500 and 19 400 jobs and indirectly create 20 900 by 2020 (CIRED, 2010). In this study, the sector comes first in terms of number of jobs created (with building and renewable energy ranked second and third, respectively). While this figure should be seen in conjunction with the forecast for the number of jobs to be scrapped in the sector, especially in the car industry (between 2 900 and 7 800), the projections show that the net outcome in the sector will nonetheless be positive. Because of the major share of transport services and businesses in the Ile-de-France region, the additional jobs will be mainly in public transport services (extending the existing network) while new infrastructure is built, but in the longer term in making them operational (recruiting drivers, etc.) and in the distribution and maintenance of less polluting cars and of bicycles. Furthermore, the development of new multimodal stations when the public transport network is extended could indirectly lead to the creation of yet further jobs linked to the growth of new activities (establishment of offices, businesses and other services).

- *Regional attractiveness:* Enhancing the transport network may make it easier to reach places with few or no connections – an asset in attracting firms. The growth of new public transport infrastructure could play its part in improving the structure of the network, improve the attractiveness of certain neighbourhoods or areas with few public transport facilities, limit car use and thus pollution, and help lessen regional inequalities in the interests of greater social and regional cohesion. Strategies to stimulate demand for the provision of services (such as the Paris *Vélib'* and *Autolib'* experiments), or to extend the number of electric cars available to local communities or in firms, can also play a role in enhancing regional attractiveness.

- *Supply of and demand for green goods and services:* regional demand could be fuelled by developing the public transport network and vehicles that cause less pollution. Certainly, use of public transport is currently very modest in the suburbs (especially in the outer belt) – in which inter-suburban travel within the region is at present most intensive – because not nearly enough is

provided (Cour des Comptes, 2010). The shortage of public transport is reflected in a higher level of private vehicle use: 84% of households in the outer belt own at least one car, compared to 68% in the inner belt and 41% in Paris (Insee, 2008). Furthermore, the Ile-de-France car industry might be stimulated by the demand for cars that run on renewable energy. Although the impact would be marginal in terms of value creation (the car industry accounts for only 1% of regional value added[28]), the resultant impact in terms of reduced greenhouse gas emissions would be considerable. Such an approach would similarly stimulate service innovations.[29]

Development prospects for this sector have been strengthened by strong public determination at the national level. This has been an issue of great importance for the Grenelle Environment Forum and the Greater Paris Scheme. The *Grenelle 2* law also envisages the establishment of a national plan for transport infrastructure to develop urban and suburban high-speed public transport and plug-in hybrid electric vehicles, experiment with an urban toll system, and encourage rail freight and sea transport. The aim is to lower emissions by 20% in the period up to 2020, by doubling the *lignes à grande vitesse* (LGV, or high-speed line network), increasing the share of rail freight by 25% by 2012, extending the urban and suburban transport network, lowering air transport emissions by 50% with an ideal level of air traffic, developing aircraft that cause less pollution and – finally – renewing older fleets. In Ile-de-France, two main transport plan proposals with possible variations have been drawn up: the Greater Paris Scheme proposed by the government and *Arc Express* proposed by the Regional Council in the 2008 draft SDRIF. The Greater Paris Scheme is for fast underground transport, whereas the proposals of the SDRIF and the Syndicat des Transports d'Ile-de-France (STIF, or the Ile-de-France Transport Syndicate), which were merged following negotiation, include extensive transport in an average speed network (trams, quality service buses) whose integration with motorways or the road system is being tested by the authorities (IAU, 2011a). An agreement between the government and the region was reached in January 2011; it involves both modernisation of the existing network and the development of a new public passenger transport network (Figure 28) to serve areas regarded as strategic (covered by a CDT or a competitive cluster).

28. However, this is consistent with the national average, since the corresponding (car industry) figure for the whole of France is also only 1%.

29. The impact on the car industry is as yet difficult to project (MEEDM, 2010b).

Figure 28. The Greater Paris Scheme

Note: This map is for illustrative purposes only and wholly without prejudice to the status of any territory shown on it or to that territory's administrative supremacy.

Source: Société du Grand Paris (2011).

Greening the sector will involve, as a priority, a modal shift towards alternative modes of transport to private cars, which would require a radical change in outlook and approach. This applies no less to passenger transport than to goods transport, which on the one hand implies that passengers cut back on road travel and instead use public or "soft" modes of transport (such as cycling or walking) and, on the other, a move towards alternatives to road freight (such as rail or river modes) for goods transport. According to the 2011 draft Ile-de-France *Plan de Déplacements urbains* (PDUIF, or IDF Urban Mobility Plan), over 35 million journeys are completed daily within the region by Ile-de-France residents (excluding travel by visitors) and, each year, around 360 million tonnes of goods are transported into or away from the region (PDUIF, 2011).

As regards passenger transport, the situation involves improving the provision of public transport in Ile-de-France, particularly in the suburbs, while increasing the efficiency and effectiveness of the existing network. Indeed, according to a report by the Cour des Comptes (2010), the rail transport network comprising the metro, the *Réseau express regional* (RER, or regional express railway) and the Transilien, is currently facing several difficulties. Among them are its inability to cope with present needs, a deterioration in the quality of the service, rising operational costs, lack of investment to modernise, construction periods that are too long for building new infrastructure, and development costs often higher than forecast (Cour des Comptes, 2010).

Major projects are under way to improve the provision of public transport. Extensive investment is planned to enhance the existing transport network (modernisation of the RER, an extension of several metro lines and development of the tram network in outer Paris). The network should be completed with the Greater Paris metro scheme, the *Grand Paris Express*, which is being run by the government and

developed by the Société du Grand Paris. Adopted in May 2011, the overall plan involves three automated metro lines 175 km long and 57 new stations to help open up the east of the Ile-de-France region, while also providing a transport facility for most of its western side. It is planned that the scheme should come into service in 2020. To consolidate its inter-modal dimension, it has provided for almost 150 multimodal transport interchanges across the whole of Ile-de-France. The Region has also undertaken to commit almost EUR 10 million by 2012 to the renovation of 20 of its stations in the outer belt.[30] In 2007, four interchanges had been completed, 20 were in hand and 35 officially approved.

Enhancing public transport between Paris and its suburbs and between the suburbs themselves should have a positive impact in terms of equity. Indeed, improving public transport out to the suburbs should result in their closer integration. Furthermore, according to an IAU study (2011e), preliminary evidence suggests that there is likely little danger of population displacement due to a potential rise in property prices in these areas whose transport needs would be better catered for.[31]

Contrary to the situation in passenger transport, possible solutions in the case of freight transport by rail and river remain limited. In 2005, these two methods of carriage accounted for just 3.6% and 5.3% respectively of goods transport in IDF (IDF, 2010), whereas more extensive use of these forms of transport – which consume less energy than cars – would lead to a significant reduction in CO_2 emissions. According to the Grenelle Environment Forum Evaluation Report prepared by consultants Ernst & Young (2010), the commitment to increase the share of rail freight by 25% by 2012 is currently compromised given that its share has dropped since 2007, mainly because of the competition from road transport and problems concerning the quality of service in the rail network. Other studies cite a lack of dedicated infrastructure, of warehouses joined to the rail network, of expertise, of funding – the only resources included in the PDUIF, the centres for generating traffic which were its dominant central feature, did not have funding to match and were hardly ever used – and of regional strategy (IDF, 2010). Lacking also is a dedicated body, like the STIF in the case of passenger travel (IDF, 2010). Notwithstanding, several measures have been implemented by public authorities and firms.[32]

That said, forward momentum has been generated by the Grenelle Forum. The Seine-Nord Europe canal project provides for the building of a wide-gauge 106-km long canal, between the Oise (Compiègne) and the Dunkerque-Escaut canal (Cambrai) to open up the Seine basin and bring France onto the wide-gauge river network in the north and east of Europe. According to the Ministry of Ecology, Sustainable Development, Transport and Housing, the project should directly create 4 500 jobs and, in the years up to 2025, 25 000 new jobs for activities in logistics, industry and transport (Voies navigables de France, 2011).[33] In addition, the 2007-13 *Contrat de projet État-Région* (CPER) contains many measures to

30. See *www.iledefrance.fr/missions-et-competences/amenagement-transports/le-plan-de-mobilisation-pour-les-transports/un-reseau-en-developpement-constant.*

31. According to the study, the impact of transport infrastructure on the prices of residential property has not been significant in the case of lines T1, T2, T3 and RER E.

32. The city of Paris has taken up the question of urban logistics, and particularly that of covering the final kilometre, sometimes in partnership with private firms. Concern for freight transport in the *plan de déplacements urbains* (PDU, or "urban travel plan"), the establishment of central car park distribution centres, and support for the use of electrical delivery vehicles to cover the final kilometre (*i.e.* bicycles and delivery tricycles) are all consistent with green growth principles.

33. This EUR 4.2 billion project should be funded by the government (EUR 900 million), the regions and *départements*, along with the ports and the European Commission. Public funding of the Seine-Nord Europe canal comprises initial financing of 50% of the construction costs and funding over the partnership contract period, of the rents repaid to the private partner (who is funding 50% of the construction costs in advance) (Voies Navigables de France, 2011).

stimulate rail and river freight.[34] Finally, the law on Greater Paris also sets out plans to establish a high-performance network intended primarily for rail freight between the big sea ports of Le Havre and Rouen, and the port of Paris.

Aside from transport provision, enhancing the energy efficiency of those modes that cause most pollution (the private car and aircraft) should help to reduce greenhouse gas emissions and improve air quality, and thus the attractiveness of the region. The transport sector (a concept extended to vehicle marketing, distribution and repair) represents 20% of jobs in Ile-de-France (2008). Developing less polluting vehicles might lead to the creation of employment and new markets but this could be offset by an end to jobs in traditional car sectors. The establishment of an *éco-pastille*[35] (a French bonus-cum-surcharge rating that rewards or penalises car buyers according to whether they buy less or more polluting vehicles) and French support for the increasing strictness of EU regulations constitute key factors in national strategy. Local authorities also have financial incentives to encourage the purchase of vehicles emitting fewer greenhouse gases, such as the tax on company or official cars, the amount of which depends on the level of CO_2 emissions in the case of private cars that have undergone an EU-type approval procedure. This is supplemented by a further tax on second-hand cars, which is added to the car licence fee and linked to the CO_2 emission level of the vehicle as purchased. In addition, priority air action zones (ZAPAs), in which movement of the most polluting vehicles will be limited or prohibited outright, are being examined in Ile-de-France. If experiments now being conducted in Paris are conclusive, the Region plans to implement ZAPAs on a more widespread basis in 2013. Finally, the transport sector has also been a means of innovation. For example, some manufacturers are moving towards the provision of mobility services, renting cars of different sizes (*i.e.* Autolib'). This type of initiative helps to increase consumer awareness with a view to furthering green demand.

As regards the air transport sector, certain undertakings have already occurred at the local level to lessen the environmental impact of Ile-de-France airports. Yet real changes in the sector have to involve higher levels of responsibility in commitments that affect it worldwide (such as the introduction of a carbon tax or technological innovations to reduce aircraft fleet emissions) (Box 9).

Box 9. The sensitive issue of air transport in IDF

The issue of airport zones is complex in the context of green growth, since readily accessible air transport does much to boost a region's attractiveness as a factor in economic growth and local tourism, as well as substantial employment, with 4 000 new jobs created annually for the Roissy hub over the last decade, making it the foremost centre for job creation in France (IDF, 2008). Yet aircraft facilities also fuel greenhouse gas emissions: according to the Carbon Balance method, air travel by residents and visitors represents over half of the greenhouse gas emissions from other forms of transport in Ile-de-France (IAU, 2007). However, this proportion should be seen in perspective in so far as the Carbon Balance calculation includes emissions from entire journeys begun in Paris, which magnifies the impact of aircraft in total transport-related emissions. At the same time, the *Observatoire de l'Énergie* found that final energy consumption for aviation fuel (oil delivered) in Ile-de-France in 2002 represented 81.2% of total French consumption.

34. This means the reopening of lines, the creation of a motorway/railway interchange and a combined transport hub, as well as the commissioning of research into urban logistics. In the case of inland waterways, the 2007-13 CPER has earmarked EUR 388 million to develop and modernise the navigable waterways. This involves rebuilding dams on the Seine and Marne, modernising locks, continuing the Oise development programme in readiness for the link to the Seine-Nord Europe canal, converting the navigable section of the Oise into a wide-gauge waterway, and extending and developing port hubs.

35. The bonus/surcharge system in force in France since late 2007 is based on CO_2 emissions per km in new vehicles. The system rewards "eco-responsible" car purchase in order to encourage those buying new vehicles to opt for cars that consume less carbon fuel. Conversely, the financial incentive is a dissuasive surcharge when the chosen vehicle emits more than 160 g of CO_2/km.

For now, the sustainable development approach at the national level is more concerned with noise pollution. For example, the priority for the Roissy-Charles de Gaulle hub is to reduce noise pollution caused by night-time air traffic (Aéroports de Paris, 2010).

Yet within the Ile-de-France region, certain local-level commitments already exist for the purpose of lessening the environmental impact of the region's airports, especially as regards energy consumption arising from the organisational arrangements and activities of airports. The Paris Airport strategy includes the construction of high environmental quality buildings, the commissioning of the geothermal power station at Paris's Orly airport and a biomass plant at Paris-Charles de Gaulle airport, the acquisition of electric motor vehicles, and a reduction in aircraft taxing time. Progress has already been noted: in 2004, ADP Paris emitted 125,000 tonnes of CO_2, whereas in 2010 such emissions totalled less than 100 000 tonnes (Aéroport de Paris, 2010).

New measures have also been introduced in other big cities abroad, including New York (JFK airport), San Francisco (San Francisco International Airport) and Toronto (Toronto Pearson International Airport). These initiatives have generally concentrated on green infrastructure (building) and transport (electrical and ethanol-powered vehicles). In Chicago (O'Hare Airport), environmental concerns led to the publication of a *Sustainable Design Manual* for airports in 2003, the first of its kind in the United States, later renamed *Sustainable Airport Manual* (2009). This handbook seeks to recommend good practice in terms of infrastructural development, but also in development and maintenance.

While, in general terms, a few approaches to reduce the air transport carbon footprint seem promising, the best way forward is far from evident. A carbon tax, though it might be constructive, has not as yet been introduced in France. At the EU level, a European carbon tax proposal was presented in April 2011, which is expected to affect airlines that land and take off in Europe with effect from 1 January 2012. The companies concerned would be allocated CO_2 emissions quotas corresponding initially to their average fuel consumption from 2004 to 2006. At present, these measures are hotly disputed by airlines, and especially American ones.

Similarly at present, technology is not sufficiently advanced to permit the use of less polluting planes (*e.g.* those that run on renewable energy). However, the European Commission, along with major airlines and biofuel producers and Airbus introduced a measure called *Biofuel Flightpath* in June 2011 to speed up the marketing of planes using biofuel in Europe.

Source: Aéroports de Paris (2010), "Réduction des émissions de CO_2 Les actions d'Aéroports de Paris", Dossier de presse, 6 December 2010.

In spite of much progress, the question of funding transport in the IDF region remains a key issue. Schemes such as the *Grand Paris Express* amount to a costly investment.[36] Only EUR 23.8 billion out of an estimated funding requirement of EUR 32.4 billion over the 2010-25 period are as yet available. The money will be used both to modernise the existing network and to develop a new one.[37] The Greater Paris Company investment is EUR 17.5 billion by the end of 2025, supplemented by contributions for the line 14 extension and the *Arc Est* to give a total EUR 19.8 billion. With solely budgetary financing ruled out, funding will be largely raised through a variety of taxes, such as the local tax on offices, the special facility

36. So far, the scheme has still not accumulated all the funding needed for the investment (for which the forecast cost is between EUR 21.4 billion and EUR 23.5 billion, with 80% for infrastructure, 12% for rolling stock, and the remainder for land purchase).

37. The agreement between the government and the Region of 26 January 2011 is concerned with the modernisation of current networks, and in particular the RER, and the construction of an automated bypass metro round Paris which exploits and develops common aspects of the *Arc Express* scheme and the Greater Paris transport network, the westward extension of RER line E, easing congestion on line 13 through an extension of line 14, and other operations included in the regional action plan. The agreement between the government and the region details both the funding for modernisation of the networks, and for the new metro, and specifies government and regional commitments as well as those of the STIF and the *départements*.

tax and the flat rate tax on network businesses (Ifer)[38] with, from 2014, an extra capital grant of EUR 4 million from the "grand loan" and business revenue, and infrastructure occupancy fees. Funding of the remaining EUR 8.6 billion is an especially acute issue, given that conventional solutions, such as a motor vehicle toll in central urban areas like that already implemented in many metropolises, have not yet been introduced. As will be discussed further below, greater involvement by the private sector could well be necessary.

Also apparent is the lack of an integrated approach on the part of operators, who instead tend to work in isolation. SNCF (the French public rail company) has run train/bicycle schemes, as well as combined train/car-sharing, and is striving to undertake ecological reinvention of its products. The rail company, the airlines and car manufacturers (such as Peugeot with Mu, a hiring system available via Smartphones and the Internet) are developing their own organisations. While market prospects are good, there is a growing risk that eco-mobility will become directionless and wholly confusing. Admittedly, the government issued a call for proposals at the beginning of the year regarding inter-modal transport experimentation. It will have to take appropriate steps if it wishes to avoid a proliferation of standards and complex processes to ensure compatibility. As parliamentary deputy Carrez stresses in his report on the funding of Greater Paris, the need is to develop a global and multimodal strategy by prioritising road/public transport interfaces in outer Ile-de-France, in particular through an extensive regional policy of park-and-ride facilities at nerve centres in the public transport network, in order to improve the feeder system.

Besides extending transport networks to enhance provision and the attractiveness of the region, Paris-IDF could secure a place in the non-polluting vehicles industrial market. Two competitive clusters in the area of sustainable development and clean technology (*Advancity* and *Moveo*) exist, with good prospects for developing research and innovation, creating jobs (for engineers and researchers) and significant markets, especially in the field of non-polluting transport. Furthermore, since 2009 the *département* of Yvelines has been carrying out a pilot policy of support for innovation, earmarking over EUR 50 million for research and development in (hybrid and electrical) ecological technology. With over 45,000 jobs linked to the car industry in more than 150 firms, Yvelines is the leading *département* for cars in France. An automobile cluster has been established on the Versailles Satory site (the VeDeCom project), and in 2009 the *département* issued a call for proposals to produce the urban vehicle of the future (Conseil Général des Yvelines, 2009).

Renewable energy

The Ile-de-France region has considerable potential in renewable energy, but it is as yet under-exploited, especially as regards solar and wind energy. Aside from surface geothermal energy for the heating and cooling of buildings which is generally well established, the growth of renewable energy sectors is still very limited. This is due in particular to the very prominent position of the nuclear energy sector in France (the source of around 76.2% of its electricity), which has long hindered the development of renewable forms of energy. On the production side, the region only produces 11% of its energy requirements, most of which are imported. In 2010, the share of IDF primary energy from renewable sources comprised biomass energy (57%), hydraulic energy (24%), geothermic energy (8%), renewable urban waste (5%), wind energy (4%) and solar energy (0.5%) (Insee, 2010). The supremacy of biomass is largely due to the importance of dendroenergy. The Paris-IDF region possesses geological advantages

38. For a funding requirement estimated at EUR 34.4 billion for the 2010-25 period, it is planned that funds should come from the budgetary effort (6.4 billion), the tax on offices and other premises (5.3 billion), fees for the establishment of offices (1.9 billion), a heavy vehicles eco-tax (1.3 billion), parking (0.6 billion), the Grand Paris *taxe spéciale d'équipement* (TSE, or special facility tax) (1.6 billion), the supplementary visiting tax (0.5 billion) and land development. The EUR 5.8 billion balance of the investment should be covered by a 30-year loan (data communicated by the DRIEA Ile-de-France).

conducive to the exploitation of geothermal energy, and especially the underground water in the Parisian basin, which have made geothermal energy a real regional asset. In terms of consumption, less than 5% of the final energy used by Ile-de-France residents comes from renewable forms of energy (DRIEE, 2011a). With regard to job creation in the region, the strongest growth is to be expected in solar and wind energy which in 2008-09 recorded growth rates of 73% and 28%, respectively (Insee, 2010c). The development of energy recovery from biomass, via dendroenergy and waste-to-energy, could also be pursued in the region, particularly by promoting improvements in the structure of the timber industry and establishing stronger links with Ile-de-France industrial capacity.

In economic terms, a green growth policy in this sector could result in the following:

- *Job creation*: While renewable forms of energy still do not account for many jobs – and overall France remains far behind other countries such as Germany in this field – the sector has nevertheless registered strong growth over the last decade and carries job creation prospects. Even though jobs will be scrapped in the energy sector (the CIRID study (2010) estimate is between 3 200 and 12 100, depending on the chosen scenario), net job creation should be positive in that activities tied to renewable forms of energy are more labour-intensive than those concerned with fossil fuels (OECD, 2011b). As in certain cases heavy plants would be produced elsewhere, job creation could doubtless be expected more in installation and maintenance activities.
- *Regional attractiveness*: Reliance on renewable energy has an impact on reducing greenhouse gas emissions and on the urban environment as a result of improved air quality, which thus helps to boost the image of an attractive city while reducing health costs for its human capital.
- *Supply of and demand for green goods and services*: The Paris-IDF region has unexploited capability on the renewable energy market, especially in the latest developments in photovoltaics and on the wind energy market in components manufacture.

Political commitment to renewable forms of energy in the Paris-IDF region has intensified in recent years, but its effects still remain limited with the market broadly reliant on public financial support. The field of renewable energy is only one element among several in the various strategic documents (Grenelle Environment Forum, regional climate/energy schemes, and the Territorial Climate/Energy Plans (PCETs)).[39] Directly awarded financial support for the development of various forms of renewable energy comes from Ademe on the basis of a feed-in tariff. Introduced by the Grenelle Environment initiative and administered by Ademe, the "heat fund" contains EUR 1 billion (2009-11) to develop heat production from renewable energy. The Regional Council offers a feed-in tariff for electricity produced from renewable forms of energy, which is established through the obligation on EDF to purchase them (DRIEE, 2011a). The momentum of the sector is strongly tied to public investment and thus exposed to the uncertainties of political decision-making. Many countries including France have tightened their financial support systems which are considered too costly in times of crisis, even though their role as strong incentives is acknowledged. Furthermore, the crucial decisions to develop solar and wind energy could lead to a substantial 50% rise in electricity prices, according to the association *Sauvons le climat*, which puts the additional cost of the Grenelle initiative at EUR 10 billion.

Solar energy: an under-exploited sector

The potential of the solar energy sector is clearly under-exploited in the Ile-de-France region. Compared to its potential, installed photovoltaic power capacity is still modest in Ile-de-France but growing strongly, with an increase of 170% between 2009 and 2010 (Arene, 2010). The annual solar

39. The PCETs concern local authority areas of over 50 000 inhabitants.

radiation of the region is on average 1 150 kWh/m^2 a year, equivalent to radiation in Germany, and only 20% lower than that in the south of France. Thermal solar radiation alone could cover 20-30% of heating needs and 50-60% of the demand for domestic hot water in suburban houses or blocks of flats in IDF (Arene, 2011a). The aims of Grenelle are concerned with raising the output of solar energy in the collective residential sector, as well as in the tertiary, industrial and agricultural sectors (excluding individual residential provision) by 110 000 TOE/year (corresponding to extra production of 100 000 TOE/year) until 2020 with 2006 as base (Ademe, 2011a). It is expected that these aims will be supported by assistance from the heat fund.

The exploitation of solar energy has developed extensively since the Grenelle law which set preferential feed-in tariffs. But after the investment boom resulting from this preferential pricing system, growth continued at a much slower rate. For its part, the city of Paris considers that purchasing terms for solar-derived electricity fed into the main grid are no longer competitive. In addition to national preferential feed-in tariffs, financial support at the regional level goes to householders and institutional investors for solar panel installation (IAU, 2010c). Over 1,000 private applications for a total of EUR 1.3 million were funded between 2006 and 2009 (IAU, 2010c). Despite these initiatives, the sector is falling behind the Grenelle goals. At the current rate, it will register a 35% shortfall in capacity at national level in 2020, and under present conditions will barely exceed 29 million TOE compared to the expected 35 million. The government could give priority to access to risk capital and an innovation policy to encourage basic and applied research, which might be more effective than the current feed-in tariff mechanisms that target emerging sectors (OECD, 2011h).

While, in terms of employment, detailed regional figures do not exist,[40] national-level evaluations point to a substantial increase in the sector, yet a still clearly backward position compared to other countries. In 2009, France had some 8,500 jobs in the solar energy sector, 15% of them in production and 85% in distribution and maintenance. They have doubled in number annually since 2006, in line with the surge in the photovoltaic energy market, and around 30 000 jobs are now forecast in 2020 (IAU, 2010e). However, compared to Germany, with its 48 000 jobs in the sector in 2009 (including 46% in production and 54% in distribution, operations and maintenance), France is clearly lagging behind, especially in production and operations, in which most jobs are created (IAU, 2010c).

With R&D assets in the solar sector, the Ile-de-France region can stimulate the solar market, but there is strong competition. The region already possesses an extensive network of technological research units and PV research centres, including the Institut de Recherche et Développement sur l'Énergie Photovoltaïque (IRDEP, or Photovoltaic Energy Research and Development Institute), but it faces strong competition from abroad as well as from other regions in France. Almost 40 public and private laboratories in IDF work directly on PV or related topics (IAU, 2010e), covering all fields currently regarded as critical and in particular thin-film research ("second generation" PV). Given that production of current technology is well-established in other countries – and particularly China, in which it is kept cheaper by low wages – France could perhaps become a leader in new generation PV in which there is less competition. In this respect, the leading regional commitment is to the Advancity competitive cluster. Furthermore, action contributed by regional partners is conducive to structuring and developing the sector, as in the case of Innov'eco or Solarvip. The aim of Paris Développement Innov'eco, the development agency in the *département*, is to secure its position as the Cleantech Innovation Hub in IDF, by working in a variety of fields with numerous public and private interests and enhancing in particular the contribution of innovative SMEs (IAU, 2010c).

40. A recent IAU study puts the number of jobs linked just to those R&D centres working on solar energy in big groups at 2 700 (IAU, 2010b).

Yet in spite of its strengths in R&D, the region is not attracting many big projects of an industrial nature. Indeed, while there are almost 110 establishments in the region working on PV, the Ile-de-France PV industry covers no more than 0.35% of the national market. An IAU study attributes this mainly to the weak structuring and profile of players in the sector, a lack of rapidly available sites to accommodate large-scale production and a weak regional market operating well below its potential (IAU, 2011a). The main competition lies in the Rhône-Alpes region with the Tenerrdis competitive cluster and the Institut national de l'énergie solaire (INES, or National Institute of Solar Energy). However, the IRDEP – a collaborative venture located in the Paris-IDF region involving EDF (Électricité de France), the CNRS (the National Scientific Research Centre) and the École nationale supérieure de chimie de Paris (ENSCP) – is still considered the national authority on the subject of thin-film development (IAU, 2010e).

Wind energy has dropped well behind

Installed wind energy capacity in the Ile-de-France region is still very modest – indeed the lowest in any French region – notwithstanding its much greater potential in light of advantageous natural conditions within the region (DRIEE, 2011b).[41] This relatively untapped potential to date could provide energy equivalent to the electricity consumption of around 500 000 homes excluding heating (Arene, 2011c). In terms of jobs, data are scarce and projections vary widely. While the scale of the current regional workforce in the sector has not been assessed, the CIRED forecasts that between 180 and 730 jobs will be directly created and between 260 and 1 000 indirectly created by 2020 (CIRED, 2010). With only national level figures available, the number of jobs in almost 180 firms in France is put at 11 000; it is estimated that 50 000 jobs in France will be created by 2020 (SER, 2010c). However, these estimates should be considered in conjunction with the number of jobs scrapped in the traditional energy sector (for which the regional estimate in the CIRED study is between 3 200 and 12 100).

Public policies are still not forthright and growth of the sector is obstructed by lack of social acceptance. The national policy articulated by Grenelle is that 10% of electricity in France (roughly 20-25 GW) should be produced by wind energy in 2020. The Region supports the sector through financial assistance in compliance with the regional plan for wind energy. This identifies areas known as *zones favorables à l'exploitation de l'énergie éolienne* (ZDEs, or zones conducive to wind energy development), in which operators may benefit from government feed-in tariffs established in 2007. However, sectoral development has been hindered by the many appeals submitted to courts which hold up the award of building permits: in 2010, over half of the schemes in French wind farms were subject to judicial appeals that delayed them for two to three years. At the regional level, three ZDEs were authorised in Seine-et-Marne between 2007 and 2009, whereas half the communal applications submitted were refused (DRIEE, 2011b).

T he region could take advantage of its industrial base to improve its performance in components manufacture. While the manufacturing performance of France is not as strong as in other countries, the region has unquestionable potential. All segments of the value chain are present. Paris-IDF is home to 112 establishments with an activity linked to wind energy and represents a wide variety of bodies working in the sector (IAU, 2011e). Further, the region may gain from the presence of a great many strategic industries concerned with the manufacture of wind farm components, such as the car, aeronautic, mechanical engineering and energy industries (IAU, 2011e). The manufacture of green components might thus constitute a way forward for revitalising industrialisation in the Ile-de-France region, as has been the case in the United States, most notably in Chicago (Box 10).

41. The Paris-IDF region on the whole has an oceanic climate with winds close to the European average. It straddles an area of scale force 2 and one of force 3 with wind speeds varying from 3.5-8.5 m/s and 4.5-10 m/s respectively. The potential is most intense at 60 metres from the ground, on rural-type plateaux or areas, especially around the downstream Seine basin, in the east and north-east of Seine-et-Marne, and in the south of Essonne and Seine-et-Marne (IAU, 2011).

Box 10. Chicago: towards reindustrialisation through the development of wind energy

The metropolitan region of Chicago illustrates how an industrially declining region can manage to reindustrialise by using its traditional industrial base to go green. The Chicago region has succeeded in developing its production capability in the wind energy sector in recent years, by using its waning traditional industrial base and exploiting its existing assets in the field of construction. One sign that the transition has been successful is that Chicago has become home to the main head offices of 13 international wind energy companies, more than in any other American city. Furthermore, in 2011 the region had over 150 firms specialising in wind components and brought together a total of 10 000 construction and manufacturing firms (most of them small with less than 500 employees). All this should help to satisfy the strong demand for wind energy in the United States, which stood at almost four times the country's construction capacity in 2009 (ELPS, 2011; CMC/JARC, 2009). At present, much of the wind energy value chain is already based in Chicago, particularly with firms specialising in the building of turbines, towers, gearwheels and couplings, as well as engineering, legal and financial consultancy services and diagnostic software designers (ELPS, 2011).

While in itself, the Chicago region lacks a climate with a strong wind farming potential, the growth there of this industry is closely linked to the region's strategic position in the Midwest which has experienced vigorous expansion in the wind industry for some years. The combination of a federal policy of support to the sector through a system of tax credits and a policy on the part of the states seeking to raise the share of renewable sources in their energy portfolios by helping firms and investors, results in benefits and a fairly stable policy environment for fuelling private investment in the sector. Without any major wind-related production at the outset, the Chicago region has managed to attract wind component producers and suppliers, by converting its industrial construction and manufacturing sector, and prioritising its assets in logistics along with research and services. In this way, the region is gaining from the development of a fast-growing green industrial sector with good employment prospects.

Source: ELPS (Environment Law & Policy Center) (2011), *The Clean Energy Supply Chain in Illinois: Wind Solar and Geothermal*, Environment Law & Policy Center, Chicago; CMC/JARC (Chicago Manufacturing Center/Jane Addams Research Corporation) (2009), *Renewable Energy Supplier Manufacturing in the Chicago Region,* Chicago Manufacturing Center, Jane Addams Resource Corporation and IEPA, Illinois. In OECD (forthcoming, b).

Geothermal energy: an Ile-de-France asset to be further exploited

Geothermal energy already constitutes a real asset in terms of renewable energy for the Ile-de-France region. Thanks to the profusion of underground water in the region's subsoil, Paris-IDF is home to 34 geothermal energy operations accounting for 57% of France's geothermal plants and supplying 157 000 homes with heating, out of which the equivalent of 13,000 homes were connected between 1998 and 2008 (IAU, 2011b; CRIDF, 2008). While surface geothermal energy is well established in IDF, the considerable potential of deep geothermal energy remains to be exploited. Public policies are moving in this direction, since the Grenelle goals envisage 370 000 TOE a year of extra production from this source up to 2020, compared to 2006, and several schemes within the 2008-13 regional plan to boost geothermal energy in IDF seek to make use of deep geothermal science (Ademe, 2011; CRIDF, 2008).

Yet these commitments will call for extensive investment. The Ademe heat fund helps to support these considerable investments (with an investment of around EUR 12.2 million in deep geothermal energy in 2010) and to cover the mainly geological risks associated with deep geothermal energy, which in the past have held up development of the market by private investors alone. The real cost price of geothermal energy is competitive and attractive, especially in areas of dense housing (ADEME, 2005). As regards jobs, a key sector is the production of heat pumps, in which France is currently well behind its foreign competitors (CGDD, 2010). On the other hand, the country is determined eventually to lead the way in deep geothermal engineering, and the Dogger water table in the Parisian basin, along with the well-developed heat networks, offer good conditions for harnessing regional potential. The expansion of deep geothermal energy is an important option and worth pursuing, especially with a view to reducing CO_2 emissions in the region.

Dendroenergy: a major biomass resource, but a sector still poorly structured

While energy from biomass represents the greatest share of the renewable energy mix in IDF, it remains an unexploited potential source (Réseau TEE, 2010). Of the various biomass energy resources, energy derived from wood-based biomass (or "dendroenergy") is the biggest: 90% of biomass energy in France is dendroenergy. Moreover, an improved carbon balance can be achieved by replacing fuel oil and coal by dendroenergy (Arene, 2011b). Wood is a prolific natural resource in the Ile-de-France region, in which around 23% of the surface area is forested. If forestry was expanded in the region, 1 million m^3 of extra timber could be collected annually compared to the current amount, without eroding the resource or decreasing the wooded surface (IAU, 2011; Réseau TEE, 2010).

Dendroenergy may also be harnessed by collective district heating – located mainly in the region's outer belt – and industrial heating, in both cases generated by fuels derived from wood (chippings, reconstructed logs, pellets, granular timber, etc.) and other forms of biomass (food processing and manufacturing waste, etc.). Furthermore, the development of individual wood heating is supported by national policies (such as tax credits) no less than regional ones. This sector may constitute a vehicle for growth in terms of employment. It is estimated that around 14.7 jobs, the majority of them local, are created for every million euros invested in dendroenergy and that, compared to fuel oil and gas, two to four jobs more are needed for the same amount of energy consumed (Arene, 2006; Arene, 2011b).

While the demand for biomass products is growing, the supply is still poorly structured with many of regional actors working in isolation, which risks hindering growth in the sector. According to a Réseau TEE study, the sector would gain from (i) establishing a suppliers network (the recent participation of IDF representatives in Francilbois, an inter-professional network in the wood sector, is something of the kind), and (ii) establishing hubs close to processing firms to connect the different modes of transport (Réseau TEE, 2010). Some large waste management groups are starting to respond to this need and reorganising their logistic network to secure a footing in the biomass market.

Waste-to-energy: the potential for industrial recycling

At present, the Ile-de-France region has a sound infrastructure for household waste incineration and on-site recovery ("waste-to-energy"). The greater part of waste there is incinerated in refuse incineration plants – the region has 19 – so incineration is the prime means of producing energy from waste.[42] According to Arene, waste is used as an energy source for 25% of IDF heat production and 7% of its electricity output (Arene, 2005a). In its *Plan régional d'Élimination des Déchets ménagers et assimilés* (PREDMA, or the regional scheme to eliminate household and similar waste), the Regional Council plans to increase waste use for energy purposes by maintaining and developing heat networks and raising energy output. While part of the energy produced under the scheme is generally used by the plant to meet its own needs, a further share may be sold: the heat produced may be used to fuel a heat network, while electricity may be sold and fed into the public distribution network.

It might be interesting to take industrial ecology initiatives further in such a way that waste from some firms constitutes resources for others. For example, the city of Kalundborg in Denmark illustrates how economic benefit can be derived from linking waste to energy in an eco-industrial park. The park's various industries use excess heat and waste to achieve estimated annual savings of USD 12-15 million. Other cities have followed suit, such as Guigang in China with its industrial eco-park. In Korea, the city of Paju has developed a partnership with local industry to supply energy from a waste incineration plant. Since 2010, the city has invested KRW 10 billion in a system for recovering heat from waste through its

42. Waste use for energy purposes can take three forms: incineration with energy recovered as steam or electricity; recovery of the biogas produced in waste disposal; or the conversion into methane of organic waste and sewage sludge (fermentation that produces biogas).

incineration plant which heats the *LG Display* manufacturing plant with 100,000 tonnes of recycled waste each year.

Agriculture and water

The relation between agriculture and green growth is complex, partly because of the ambiguous impact of the sector on the environment, and partly because of the varied nature of the problems confronting different land areas and the ability of the latter to overcome them. Indeed, recent OECD research on the subject points out that activities in the food and agricultural sectors can generate both environmental harm and conserve eco-systemic services, and moreover that resource endowments and environmental absorptive capacities vary widely across countries and regions (OECD, 2011i). While a sustainable agricultural policy should cover a very large range of issues and action,[43] several aspects relevant to green growth strategy may be exploited in the IDF region, and especially organic farming, local agriculture and short distribution circuits. The leading agricultural region in France, which is in turn the leading agricultural producer in the European Union, Paris-IDF already possesses assets in organic farming, not to mention a strong growth potential. Even if the sector does not contribute substantially to the regional economy, the growth of organic farming may have positive environmental effects in so far as it generally causes less pollution than traditional agriculture. A way of reducing the transport of agricultural produce may also be direct sales. In the Ile-de-France region, around 50% of farms offer to sell on their premises, 25% sell their produce at markets, and 5% at group sales points or in baskets (Agreste, 2011).

In economic terms, a green growth policy in this sector might have the following outcomes:

- *Job creation*: Organic farming is conducive to job creation as it requires 9-30% more labour and creates more permanent salaried jobs than traditional agriculture (Lecoueur, C. *et al.*, 2009; Réseau TEE, 2009). This is especially significant in the light of trends in traditional agriculture, in which intensification of the sector and the industrialisation of farms have led to a fall in jobs.[44] Organic farming for its part has resulted in some 3 000 more farms annually in recent years. In most cases, they are the result of a transition from conventional to organic farming, and an estimated 200 jobs have been maintained (Lecoueur *et al.*, 2009). Jobs may also be indirectly created in the organic sector, particularly in food processing and specialised organic product distribution, training, eco-counselling, research and local distribution.
- *Regional attractiveness*: Organic farming and local farming today exert a strong appeal among consumers who are increasingly calling for both. The "organic" label contributes to the attractiveness of a sustainable metropolis.
- *Supply of and demand for green goods and services*: The Ile-de-France market is already highly conducive to the development of organic farming, and growth of the sector may fuel this demand still further. Indeed, even though Paris-IDF is not the French region with the greatest number of organic farms (Rhône Alpes has some 2 300 (AGF, 2011)), it is the leading regional consumer of organic produce in France, both in absolute and relative terms (DRIAAF, 2009). According to the

43. The conversion-to-green of agriculture goes beyond the development of organic farming. It also means improving the techniques of all traditional farmers (the use of water and fertiliser, and the nature and value of output).

44. Even though the agricultural sector has witnessed a big rise in output as a result of industrialisation and the intensification of processes, this transition has still not led to job creation. Agriculture accounted for 31% of all employment in France in 1995 and only 4.8% in 2000. Yet while jobs were disappearing, increased efficiency led to constant growth in the sector. Since 1990, jobs in traditional agriculture have fallen by 46% (DRIAAF, 2011).

Ile-de-France Observatory of Environment-related Jobs, the demand for local produce is also rising, while the present supply is insufficient to meet it (Réseau TEE, 2009).

For ten years, therefore, there has clearly been much momentum in the organic farming sector in France, and especially in Ile-de-France. While organic farming only represents a small share of currently farmed agricultural land in the region (1.2% of farmed land and 3% of all farms) and a modest share of the total agricultural market, it has been growing strongly for some years. And it is growing in the face of urbanisation that is not currently conducive to agricultural expansion: heavy pressure on land for the last half-century has led to a decrease in the total area used for agriculture in the region.[45] Nevertheless, from 2009 to 2010, the number of organic farms rose by 43% (AB, 2011).

Yet in France and the Ile-de-France region, the organic farming sector is lagging behind compared to other European regions, especially in Germany and Britain. Germany used 5.9% of its agricultural land for organic farming in 2010, compared to 3% in France at the end of 2009 (AGF, 2011a). Germany's success is linked in part to support since 1996 for organic farming at the regional level (in the *Länder*). In most *Länder*, financial support for producers is higher than that offered to traditional farm producers; money is backed up with communications initiatives devised by the federal government and implemented in the *Länder* (Box 11). This regional approach leads to faster and more targeted action than under the Common Agricultural Policy, and is better suited to the structure of agricultural production which varies from one region to the next. The reliance on financial incentives also means that the cost of the transition to organic farming can be offset. Generally speaking, cooperation between regions nationally but also at the European level – in the exchange of agricultural expertise, marketing, etc. – might also support action to promote organic farming.

Box 11. Organic farming in Germany: a successful regional approach

Organic farming in Germany is continuing to grow, backed by the momentum of the organic produce market and a policy focused above all on the regions, or *Länder*. The land area used for organic farming has more than doubled in the space of 15 years, from 2.1% of all agricultural land in 1996 to 5.9% in 2010. Whereas agricultural policy is primarily conditioned by the European framework, the policy concerned particularly with organic farming in Germany takes shape at the regional level of the *Länder*, with each region able to determine freely its own policy.

Bavaria, Saxony and North Rhine-Westphalia are the most committed to organic farming. Bavaria, with almost 20,000 ha of land used for organic farming and over 6,000 farms, accounts for the greatest share of the sector in Germany. The main policy is support for the transition from conventional agriculture to organic farming, which is awarded by hectare (ha). In Saxony, farmers who convert in this way get EUR 324 per ha of arable land or pasture, and EUR 900 per ha of horticultural land during the first two years, and EUR 204 per ha and EUR 360 per ha respectively from the third year. The high level of support in the early years has to offset losses incurred in the transitional period, while continued support enables farmers to stay competitive in the face of intensive agriculture.

Besides these regional programmes, there is federal action to support the radical change in food processing and the marketing of organic produce. In its application to the regions and in encouraging inter-regional cooperation, the LEADER programme offers opportunities for the development of organic farming. It is based on the following three main principles: the competitiveness of agriculture and forestry; environmental protection and landscape conservation through sustainable land governance; and economic diversification – improving the quality of life. For the 2007-13 period, this programme is being implemented in several regions of Germany, including Schleswig-Holstein, Mecklenburg-West Pomerania and Thuringia.

Source: Nieberg H., *et al.* (2011), Förderung des ökologischen Landbaus in Deutschland – Stand, Entwicklung und internationale Perspektive, Johann Heinrich von Thünen Institut (vTI), Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz, Berlin; *www.oekolandbau.de.*

45. In the last 50 years, 100 000 ha of fertile land have been converted into urban areas in the Parisian region; in recent years 1 300 hectares have been converted annually (Chambagri, 2011).

In Paris-IDF, the organic farming sector has been driven first and foremost by strong demand for organic produce, along with a supportive although recent public policy for development of the market. Since 2009, the European Union has initiated an organic farming policy focused on the market for organic products and their consumption (EU, 2011b). At the national level, an Organic Farming Plan has been drawn up under Grenelle which seeks to triple the certified organic farming land area (from 2% to 6% of all agricultural land) over the next five years. Finally, at the regional level, the Regional Council has devoted special attention to organic farming in its 2009-13 development plan for the sector known as *Plan bio État-Région* approved in 2007. The plan sets out to triple in three years the land used for organic farming in Ile-de-France to a level of 2.4% of all land used for agriculture, corresponding to an increase of over 8 000 ha (DRIAAF, 2009). The action will on the one hand encourage the establishment of organic farms by prioritising farmers in the sector whenever a land opportunity arises and, on the other, make it easier for established farmers to convert – especially in the case of large-scale operators – and to diversify their activities. The Region also seeks to support the introduction of organic products into catering, especially in the public administrative sector and in *lycées* (high schools). Other aims have been drawn up as regards structuring of the sector, the training of producers and a communications campaign.

The development of local agriculture might also be a way of strengthening short channels, biodiversity and product quality. While Paris-IDF is above all a region of mainstream crop growing, which accounts for 94% of agricultural land, local urban agriculture is traditionally more varied, including market gardening, horticulture and tree cultivation. Despite the strong pressure from urbanisation, stallholder markets, the *associations pour le maintien d'une agriculture paysanne* (AMAPs, or associations for the maintenance of smallholder farming)[46] and farms that offer direct sales to consumers have become far more numerous in the region in recent years. Paris-IDF had 122 AMAPs in 2009, with 80 smallholding partners and a further 60 AMAPs being planned; in spite of this growth, supply constantly lagged behind demand. Often, these smallholders were organic farmers, one in every two of whom was ready to sell directly to consumers (IAU, 2011c; AB, 2010b). In addition, in 2010 the region had 707 processors and 412 distributors in the organic farming sector, and distribution of local produce in specialised shops in France has grown by 36% since 2006 (AB, 2011; Lecoueur, 2009). This network which includes suburban agriculture, organic farming, short channels and specialised distribution is a dynamic whole that creates jobs and has several beneficial spin-offs for the region, including the shortening of transport routes, green and organic areas on urban land (which also lessens vulnerability to natural hazards), and the provision of high quality local agricultural produce. This type of service may also be invaluable in strengthening the attractiveness of the region for consumers who are increasingly calling for such produce.

The greatest potential for green growth in the water sector lies in alternative water management (rainwater management, green roofs, rainwater harvesting, filtering gardens) and the development of clean technologies (nanotechnology, seawater desalination). As regards the alternative water management sector, which also has job creation potential, Ile-de-France is lagging behind other regions in Europe, especially in terms of preventive services, in which large French multinationals are only active on an *ad hoc* basis (Arene, 2005b). As to innovation and clean technology, research programmes undertaken by the large multinationals are concentrating on the development of alternatives to offset the under-availability of fresh water (such as full recycling of waste water, in addition to seawater desalination), optimal water cycle management to strengthen health security, and technological innovation concerned with infrastructure. In Ile-de-France, it is above all in the area of R&D that job creation may be achievable, thanks especially to the presence of many research laboratories attached to large multinationals. Yet at present the share of the

46. The AMAPs were set up to encourage smallholder and organic farming whose survival is threatened by the industrial food processing sector. Their principle is to establish a direct link between farmers and consumers who undertake to buy the output of the former at a fair price payable in advance.

R&D budget in total turnover within these firms is comparatively small.[47] Job creation associated with the provision of environmental services (water and waste) might also be substantial in this sector.

5. Eco-innovation and human capital

With its relatively weak growth, the Ile-de-France region, which lost 260 000 industrial jobs between 1990 and 1997 and then 100 000 between 2000 and 2007 (DREIF, 2003), is looking to reverse the trend and revitalise its economy. The region may take advantage of the great diversity of its activities and the favourable outlook that prevails in many fields. In this context, green growth could be a trump card for the future, as the region has definite innovation capacities and a promising record in eco-technology. Meeting the challenge of green growth, however, will require establishing the necessary conditions in terms of factors of production. As noted earlier, large-scale infrastructure programmes are planned, and these should facilitate labour mobility within the region. Yet a coherent and proactive policy for eco-innovation is needed to support the trend, and shortcomings in the governance of specialised clusters, in the participation of SMEs and in the deployment of financing will have to be dealt with effectively. Close attention will also have to be paid to international policy, which must become built into the overall strategy.

Promoting eco-innovation

Can Ile-de-France become Europe's first eco-region?

The Paris-IDF regional economy has a number of assets: a solid services sector, sectoral diversity, a concentration of superior urban jobs, R&D capacities and a multiplicity of laboratories, green patents and a still-thriving industrial base. The region's strong performance in terms of green patents could indicate that it has passed from a phase of stakeholder cooperation to a phase of outcomes.

When it comes to innovation, however, the Paris-IDF region has gradually been losing ground within Europe. According to the European Innovation Scoreboard (2007), it now ranks only ninth in terms of new products and processes. First, Ile-de-France is a region of high potential but weak performance. It has a very good research capacity but this does not result in the creation of significant innovative enterprises. Second, since the war French regional policy has been strongly geared to redistribution, which has tended to weaken the capital region in certain areas such as research or SME development (OECD, 2006). Third, the Paris region's competitiveness relies on long-acquired positions rather than on dynamic positioning, as noted in the SRDEI (IDF, 2011b).

The Grenelle exercise marked a major shift in government interventions, and several sector plans have been implemented. The measures taken seem however to be focused more on "supply push" and on technological progress than on "demand pull". Although there is no national strategy as such for green innovation, Grenelle has now been grafted onto the infrastructure of innovation policy with sector plans, in particular a programme funded with EUR 1 billion over four years for "energies and engines of the future" and other programmes on policies for the renewable energy sector, construction, sustainable cities, transportation and waste management.

At the regional level, the objective pursued in the 2008 SDRIF proposal and the SRDEI is to make Ile-de-France the foremost eco-region in Europe. The SRDEI, adopted by the Regional Council in 2011,

47 In 2006, the share of the R&D budget in total turnover was 0.49% for Suez Environnement (EUR 56 million out of EUR 11.4 billion), 0.4% for Veolia Environnement (EUR 115 million out of EUR 28.62 billion) and 0.68% for Saur (EUR 10 million out of EUR 1.4 billion). OECD calculations using data set out in the activity reports for 2006.

has a major role to play in loosening the constraints that now weigh upon the Ile-de-France innovation system, namely: (i) the dispersal of eco-industries and their lack of profile; (ii) the limited and sometimes embryonic nature of the emerging sectors (solar, biogas, subsoil/groundwater); (iii) the difficulties in finding suitable production sites and the persistence of negative images (waste treatment, for example); (iv) the shortage of skilled labour to support the dissemination of eco-innovative technologies, particularly in construction; and (v) the inadequate competitive positioning of most SMEs on the world market for clean technologies. The region has some generic tools for supporting innovative SME projects – *prêts d'honneur* (loans on trust)[48] and capital injections[49] – but as noted earlier the resources are still very modest given the stakes involved.[50]

Despite the differences of approach, the government's strategy and that of the region have tended to complement or at least accommodate each other gradually. Thus, the competition/cooperation approach (State/Region) has been deepened in the Grenelle context. The central government has pursued the approach by marking off the boundaries of green growth and defining 18 sub-areas, while the regional plans have led to identification of project sponsors for boosting the sectors, the establishment of financing, the provision of training and the greening of certain segments of activities. The fact remains that regional budget capacities are limited. Between 2004 and 2008 capital projects in *domaines d'intérêt majeur* (DIM – areas of major interest) were financed by the Regional Council in the amount of EUR 46.6 million. Regional interventions often represent a top-up to government support, particularly as competitive clusters are generally the recipients of such financing. The region then sits with the government on the investors' committee.

The regional innovation system has many assets

The Paris-IDF region has in recent decades established itself as a regional innovation system geared to green technologies and involving many stakeholders (Figure 29). This system relies in particular on the scientific and technological skills present in a number of large groups in the areas of the environment (Veolia, Suez) or integrated companies (Air Liquide, Peugeot, Renault, Vinci, Eiffage, St. Gobain). The Ile-de-France environment sector is home to many SMEs as well. Much specialised public and private research has been published on clean technologies, the environment and renewable energies.[51]

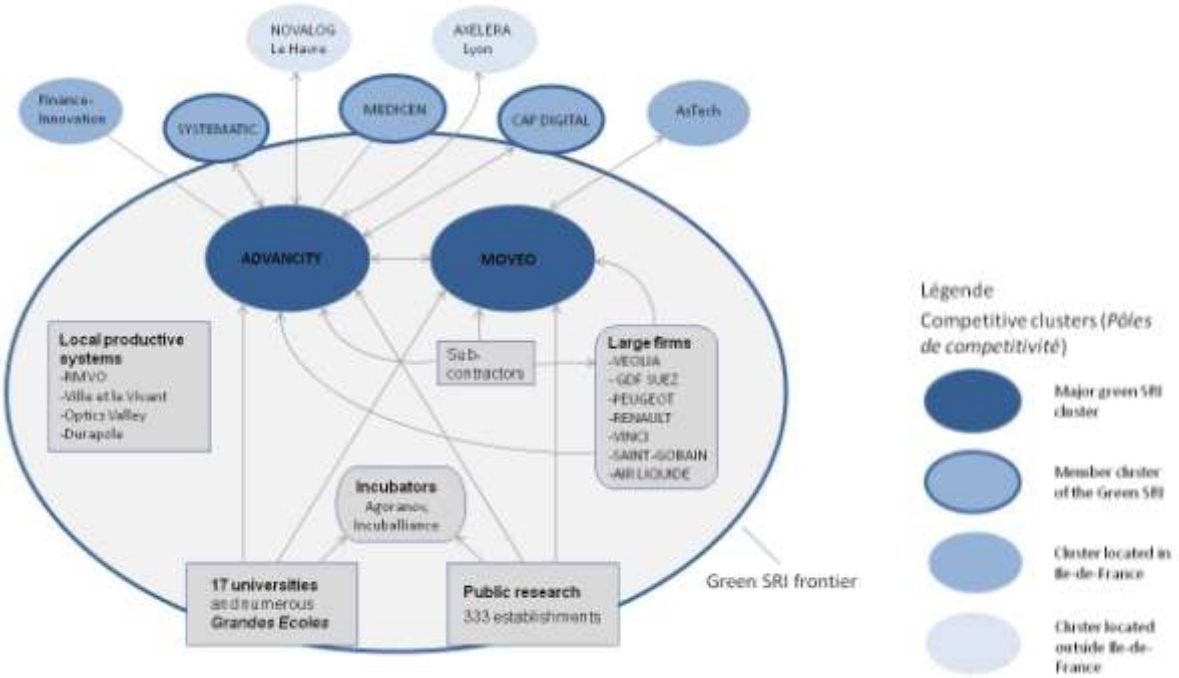
48. The *prêt d'honneur* fund created and managed by the Association Scientipôle Initiative.

49. For example, the region has sponsored the establishment of a network of "business angels" for sustainable development (Développement Durable Ile-de-France (DDIdf)).

50. The SRDEI has an overall budget of EUR 906 million for four years, or EUR 225 million per year. The budget has not been significantly increased in recent years.

51. The institutional landscape of higher education and research has changed profoundly in recent years under the impact of government reforms in favour of a more innovation-oriented approach. Since 2006, several facilities have been created and added to the old ones. In order to reorient R&D investment to projects rather than to institutional budgets, the National Research Agency (ANR) was created. Research organisations have been restructured and the need to de-compartmentalise public R&D has led to the creation of Research and Higher Education Clusters (PRES), *i.e.* coordination structures among the region's universities and *grandes écoles*. The reform of the missions and resources of the universities and research agencies has led to a new governance approach and has profoundly changed the sector. The universities have also acquired new degrees of autonomy. These restructurings have been particularly complex in Ile-de-France, where the number of research agencies (several hundred higher education institutions, many of which do research) and universities (17) is significant.

Figure 29. The IDF regional green innovation system (RIS)



While it is difficult to identify highly localised green clusters in the Paris-IDF region, the regional innovation system has been strongly influenced by the deployment of seven competitive clusters (Box 12). Implemented by the *Délégation interministérielle à l'Aménagement du Territoire et à l'Attractivité Régionale* (DATAR, or the Inter-ministerial Delegation for Territorial Planning and Regional Attractiveness)[52] in 2005 and supported by the regions, the competitive clusters seek to interlock constructively, in accordance with a functional area principle, different-sized firms, research laboratories and training institutions to develop cooreration and encourage research and innovation. These clusters are well adapted to the cross-cutting nature of eco-innovations and may also lead to organisational innovations, but their engineering still leaves much to be desired. Designed to strengthen the bonds between business and research, two of them in particular specialise in green growth areas: Advancity and Moveo.

- Advancity (formerly *Ville et Mobilité Durable*, "City and Sustainable Mobility") constitutes the major cluster for green growth and clean technologies, dealing with the sustainable growth of cities, starting with their characteristics as they relate to habitat, mobility and territorial organisation. Around 20 higher education and research institutions representing over 130 laboratories and around 3 000 researchers are members of the cluster. It also brings together nearly 100 organisations, including 11 large companies, nearly 50 SMEs and more than 20 local governments. The cluster's membership has been growing steadily and has yet to reach full capacity. It has assets in a number of key technological components and building blocks: it has attracted nearly a dozen leading French and international firms in the construction industry, transportation and water management. On the other hand, it is less well-placed in engineering (ranking 23rd in Europe) and systems coordination (ICT substitute for transportation). According to its performance contract 2009-2011, the cluster's objective is to win recognition within five

52. DATAR is an inter-ministerial body which coordinates government area planning policies and guides economic changes, with special emphasis placed on a highly proactive approach to competitiveness.

years as one of the international benchmark clusters, along with, for example, Berkeley, MIT, EPFL and EPFZ, Delft and Potsdam.[53]

- With Moveo, an automotive cluster devoted to energy efficiency through the development of electric or hybrid vehicles, the region is boosting its firepower in the area of sustainable mobility. The cluster's efforts are focused on research into mechatronics and the recycling of materials for automobiles. The cluster has more than 300 members, including 76 large firms. In its three host regions (Haute and Basse Normandie and Ile-de-France), it conducts 70% of the country's automotive R&D and represents 18% of patents filed in France, according to the National Institute of Intellectual Property (INPI). To date, 216 projects have been registered, representing some EUR 700 million in R&D outlays. It is difficult at this stage to assess the contribution of the Moveo cluster to a "sustainable automobile" industry, which is still very competitive. In terms of environmental performance, the results for the main producers are mixed.[54] Moreover, some investments have been delayed, including construction of the Renault factory designed to produce batteries to power that company's electric vehicles.

Box 12. The competitive clusters in France

The competitive clusters (*pôles de competitivité*), introduced by DATAR, are intended to boost research and innovation on key topics in order to enhance national competitiveness. They are designed to generate collaborative projects between universities and industries. The clusters sponsor projects that will then become eligible for finance. However, there is a question as to their staying power. The *pôles de competitivité* approach consists of supporting what are often poorly-organised clusters bringing together research centres, knowledge institutions and entities with industrial capability, synchronising economic development with that of research, and creating the necessary partnerships with businesses in the regions. The *pôles* embrace the full spectrum of economic agents – businesses, research and testing centres, basic and further training organisations – which, through their activities, help to ensure that there is a satisfactory range of products and services available on the market, and that joint projects are pursued. The goal is to achieve within a variable geographical area a critical economic, scientific and technical mass, in order to maintain and enhance the dynamism and attraction of the areas in question. Partners associated with designated clusters will have the benefit of three types of non-exclusive incentive measures: public subsidies, tax exemptions and lower social contributions; financing schemes; and specific guarantees. For example, businesses located within one of the cluster's R&D zones enjoy exemptions from social contributions and lower payroll taxes (50% for SMEs, 25% for others) when they take part in cluster projects (OECD, 2006).

Source: OECD (2006), *OECD Territorial Reviews: France*, OECD, Paris.

In the Paris-IDF region, while only Advancity and Moveo can be considered as major forces in green growth, other sizeable competitive clusters are having a significant impact on eco-innovation. In fact, OECD work confirms that, in the field of green technologies, innovation at both the national and regional

53. Mention may be made here of the university centres: Berkeley, MIT, the polytechnic schools of Lausanne and Zürich, or the University of Delft. For some strong thematic skills, for example in eco-construction or wood, one would have to include Namur and Vorarlberg. A number of other cities deserve mention for remarkable achievements and good practices, including Stockholm (with the most advanced systemic approach), San Francisco (for the responsiveness of its financing), London (Bedzed neighbourhoods), and Songdo (a digital city in Korea).

54. For example, French carmakers who won recognition for an average CO_2 emission of 130 g (the target set by European directives for 2015) for vehicles sold on the French market now see their competitors catching up.

levels often comes from sectors far removed from environmental industries.[55] Moreover, in the tenth nationwide call for proposals for *pôles de competitivité* in July 2010, 30 of the 52 clusters selected were involved in sustainable development projects. The growing power of sustainable development can also be seen in budgets, measured in terms of calls for proposals, as this theme now accounts for nearly 30% of government financing to the clusters, compared with 10 to 15% in the first years (CGDD, 2011). The IDF region's clusters dedicated to aerospace research (AsTech), security, defence and telecoms as well as automobiles and transportation (Systematic) and ICTs (Cap Digital) or sustainable applications in the medical field (Medicen) can also have an impact on eco-innovation. At AsTech, for example, a heavyweight in the aerospace field, most projects are related to sustainable development: cutting energy consumption, improving aerodynamics and reducing noise.

The IDF innovation system also relies on its heavy specialisation in public and private research. The Paris-IDF region has more than 333 public research establishments, 17 universities and several *grandes écoles*. Research ranges from mathematics and physics to medical research, and to a lesser degree fundamental biology and astrophysics. This confirms the region's potential for green growth, as the activities in this field are crosscutting and, as noted above, are being pursued at the intersection of several disciplines that have no direct link with environmental activities.

Main challenges

The dense network of the Ile-de-France regional innovation system nevertheless faces several obstacles:

(i) *Small-scale operation and inadequate professionalisation*. Although the region could capitalise on its advantages in mathematics, heuristics, software and ICTs and on its researchers' predisposition to synthetic rather than analytic approaches, the region's potential risks being squandered by an insufficiently systemic approach and a vision that is too dependent on technology push. Half of the cluster projects have no business plan or market demand analysis to improve targeting of R&D projects at an earlier stage. There is also a need to involve the private sector more closely in the upstream decision-making process in order to take advantage of its skills, its market expertise, etc.

(ii) *Insufficient involvement of SMEs*. While the number of small and medium-sized enterprises that are members of the competitive clusters in Ile-de-France has grown in recent years, their performance in terms of innovation has not yet reached the levels expected. According to INSEE, in comparison to their counterparts in other French regions, the SMEs of Ile-de-France innovate less, coorerate less among themselves, and benefit less from government assistance (INSEE, 2010b). These gaps are especially notable in enterprises employing between 50 and 250 persons, which are underrepresented in the most innovative sectors such as scientific research and development. Yet it is precisely these sectors that are of particular importance for green growth. The capital region is far from achieving its innovation potential, which also applies to the area of green innovation, given the diversity of enterprises and sectors concerned. One explanation of this under-participation could be the lack of effort on the part of public administrations to grant assistance to innovative small enterprises, even if public funding is not always vital for SMEs to

55. An analysis of the scientific fields that influence innovation in green technologies, as measured by patenting, shows that chemistry and material sciences are at least as important as research on energy and the environment. Green patents are distributed as follows: material science (17.4%), chemistry (14.2%), engineering (10.6%), chemical engineering (9.5%), physics (10.5%), environmental science (7.5%), biochemistry, genetics and molecular biology (6.6%), earth and planetary sciences (5.7%), energy (4.9%), immunology and microbiology (4.8%) and agricultural and biological sciences (3.7%) (OECD (2010b), OECD, (2011a)).

develop innovation.[56] Only a quarter of such enterprises report having received public funding, compared with a third in the rest of France (INSEE, 2010b).[57]

(iii) *Weaknesses in the transfer of technology and a shortage of risk capital in the clusters*. The competitive clusters, Advancity in particular, do not make enough use of incubators. There are only three public incubators in Ile-de-France, and two of them work with firms involved in green areas: Agoranov in Paris, which has only 10 green enterprises, and Incuballiance. Operating budgets are very modest as is the personnel assigned to each cluster (three or four persons on average in IDF compared with 70 persons for Envirolink in the United Kingdom or 26 for Lahti in Finland). Clusters such as *Advancity* are not organised around scientific parks and, even if they have performance contracts, these are not really quantified and they make little use of economic indicators. The two SATTs (*Société d'accélération des transferts de technologies*) in preparation, Lutech and Ile-de-France Innov, do not seem to pay much attention to clean technologies. The venture capital market seems fragmented and ill-dimensioned to the activities of the Paris region, in particular eco-technologies. Investors have no stake in the clusters. Overall, the ratio of venture capital to GDP is 0.05% in Ile-de-France, while it is 0.3-0.5% in the London, Oxford and Cambridge regions and as high as 1-1.5% in the San Francisco Bay area. As a survey by the Regional Council (see the SRDEI (2011)) showed, enterprises would like to see a specific fund to support scientific innovation, along with the establishment of "business angel" platforms in the region.

(iv) *A shortage of international projects*. Although Memorandums of Understanding (MOUs) have been negotiated with other clusters abroad, instances of large-scale cooperation are few, in contrast to clusters in other French regions that seem to participate more actively in European networks: for example, Axelera, a green chemistry cluster in Lyon, has joined Ecoclup, the European platform of eco-innovation clusters.[58] The Lyon base is supported by an association to promote local eco-enterprises. The Lahti cluster in Finland also illustrates a successful approach to foreign partnerships (Box 13). The "Paris Region Enterprise" platform, a newly launched initiative developed in the 2011 SRDEI, will work with IDF-region SMEs in initiatives of this kind. It will bring together several existing resources in the areas of design and creativity (*Lieu du Design*), economic innovation (*Centre Francilien de l'Innovation*) and foreign expertise (*Agence Régionale de Développement*) and ICTs (ARN) to offer more comprehensive support to IDF-region SMEs.

56. Google, for example, received no public funding.

57. The discrepancies are more marked for the 50-250 employee group and more important when it comes to financing supported by the regional or local authorities (Insee, 2010b). It should also be noted that SMEs have more difficulty accessing European programmes than do those in neighbouring countries.

58. Some companies that have much of their activity in Ile-de-France, and particularly the largest ones (Veolia, GDF-Suez, Renault), are active in eco-technology clusters outside the region, such as Novalog, S2E2 or I-Trans or in the eco-clusters chartered in 2010 (Avenia, Dream, Eau, Hydreos Team and Energivie). Eau is a world-scale cluster in Languedoc-Roussillon/PACA/Midi-Pyrénées focused on water resources: prospecting, extraction, rational use management and purification. Hydreos in Lorraine Alsace concerns itself with continental waters in coordination with Eau. Dream Eaux et Milieux is also coordinated with the global cluster. Eau is operational in the Centre. The other *pôles* concern subsoil management (capture and storage of CO_2, storage of energy and deep geothermics) with Avenia in Aquitaine; waste reclamation and polluted site and soil cleanup with TEAM in Nord-Pas-de-Calais and sustainable construction and energy efficiency with Energivie in Alsace (DATAR, 2010).

Box 13. The Lahti Cleantech Cluster in Finland: an example of good practices

The Lahti Cleantech Cluster in Finland is a real development success story, both at home and abroad. The cluster now embraces 250 firms, representing 60% of Finnish companies working in the eco-technology sector and accounting for 80% of eco-technology research in the country. The Lahti Science and Business Park (LSBP) coordinates the activities of the cluster. The key objective of this grouping of firms is to create 40 new high-tech firms a year, a goal that has already been achieved. Another goal is to increase venture capital for clean technologies by 15% of total investment. Lahti has already created 500 green jobs and expects to create 900 more.

Its performance in terms of "deal flow" has been excellent. Development abroad is a priority, and in 2010 Lahti expanded into Russia, with a programme to create three mini-clusters involving 38 companies. In China, more than 100 companies are engaged in the Finnish Environmental Cluster for China (FEC). Business contracts have been concluded over the last two years amounting to EUR 120 million. Activities have also been launched with India in the context of a strategic collaboration agreement with the YES Bank.

The LSBP hosts numerous events for investors every year, such as clean technology workshops and "Cleantech Venture Day". Firms such as Eagle Windpower, Ecocat, Numcore and Green Steam Network got their start at Lahti.

Source: OSKE Center of Expertise (2010), Finnish Cleantech Cluster, Kuopio.

(v) *A modest performance in terms of eco-product and eco-technology exports*. Despite a declared ambition for the capital region to become one of the leading eco-regions of Europe,[59] France at the present time is performing only modestly in terms of exports of eco-products and eco-technologies. In 2008, these activities accounted for sales estimated at EUR 62.5 billion, of which EUR 6.9 billion (or around 11% of the total) represented exports. Nearly half of this industry (47% according to ARD) is located in Ile-de-France. The large industrial groups are well represented abroad, but the SMEs in the business have little presence on foreign markets. Activities sponsored under the various strategies have not paid any particular attention to companies' export capacity. They are more concerned with expanding the region's scope for eco-technologies than they are with the international competitiveness of the industrial fabric. As mentioned above, performance when it comes to exports of green products and processes has been uneven among sectors, with the water and waste treatment sector losing steam while the transport sector has been thriving. Moreover, the groups that are spearheading international activities for these sectors reveal some weaknesses: the ecological reputation of French automobile firms is flimsy, and engineering firms in the building sector are smaller than their principal European competitors. The transformation of results from publicly funded research leaves much to be desired. While the region is relatively well-placed in terms of research for the second generation of photovoltaic cells, the move to innovation is not assured: despite its patenting efforts, the French solar industry still lags behind its American and German competitors.

(vi) *Complicated governance is hobbling the development of public-private partnerships.* To the extent that industries depend largely on regional or municipal contracts, the involvement of several levels of government makes it more difficult to establish contracts with builders and operators. Project managers are looking for results within administrative limits, and relations between local authorities can be tense.

(vii) *Conventional financing approaches and still-limited participation by investors and venture capital in the competitive clusters*. Many value-creating ecological investments do not generate sufficient

59. This intention is clear on the part of both the Regional Council (with creation of an eco-region as one of the key objectives in the most recent revision of the SDRIF, and the identification of eco-technologies as one of the 10 priority branches in the SRDEI) and the central government (see Ministère de l'Industrie: *www.industrie.gouv/tc2015*).

return to be financed without a public contribution. Given its importance and diversity, the region is a prime beneficiary of the massive investments that were considered as priorities and defined on the occasion of the Grenelle Environment Forum. With Grenelle and the targeting on "investments for the future" (Box 14) in sustainable development and green technologies, there is a framework for developing a policy of active support for the region. "Investments for the future" are a good example of the many actions taken to support the country's technological progress and its performance in terms of innovation. Financed by the "grand loan" (EUR 35 billion), they bring together highly diverse initiatives and provide close support for a quarter of the entire green growth effort. They are financing and reinforcing basic infrastructure through the designation of "centres of excellence" (Labex[60]), the selection of 5 to 10 "excellence initiatives" (Idex[61]) and modernisation of university facilities ("Operation Campus"). However, of the eight "Institutes of Excellence" in the area of low-carbon energy (IEED), two have already been selected, but they are not in Ile-de-France.[62]

Box 14. Investments for the future for green growth

Launched by the government in 2009 at the time of the financial crisis, "investments for the future" were designed to speed the pace of innovation in France in the priority areas of education and training, research, industry and SMEs, the digital economy and sustainable development. These priorities are financed through the national "grand loan" of EUR 35 billion.

Nearly EUR 8 billion has been spent on infrastructure, eco-innovation and labelling. The biggest item in this envelope is transportation (EUR 3 billion). The objective is to develop future generations of vehicles that are more economical and more efficient in environmental terms. EUR 1.5 billion will be earmarked for investments in cities identified as pioneers of a new urban model. The "vehicle of the future" programme will encourage the development of practical technologies that will produce significant gains in energy consumption, reduced greenhouse gas emissions, and improved security and safety. The same thrust will apply to the aircraft of the future. In addition, a new space launcher and satellites capable of responding to the economic and social demands of sustainable development will be introduced. These funds are intended to encourage the evolution of urban uses and practices through four channels of financing: "network, connection, energy", sustainable mobility, exemplary construction and public spaces, and environment. To date, an initial list of 13 *eco-cities* has been drawn up, including one city in Ile-de-France (Plaine Saint-Denis). These *eco-cities* will be the targets of major projects for architectural, social and energy innovation. As well, eight framework contracts relating to *eco-quartiers* have been signed in Ile-de-France between the central government, the local authorities and developers in the context of the State/Region Planning Contract. There are plans to spend EUR 1.35 billion to create demonstration projects and technological platforms in renewable and carbon-free energy and green chemistry. This will foster the development of technology in such areas as active energy management, for example "intelligent buildings".

Action in favour of the "circular economy" is intended to speed integration and deployment of green technologies in the areas of waste collection, sorting, recycling and reclamation, as well as the set of techniques that allow for production modes that consume less in the way of raw materials. A budget of EUR 250 million is earmarked for this purpose.

Lastly, the introduction of public financial instruments (green loans in the amount of EUR 0.5 billion), supplementing the financing provided by the market, will speed the transition of industry towards eco-design and eco-production. The idea is to support competitive investment projects that take into account environmental protection issues. These green loans will also encourage the marketing of environmentally friendly products and thereby help reduce energy consumption.

Source: *www.investissement-avenir.gouvernement.fr.*

60. A call for proposals for Labex projects relating to "laboratories of excellence" is intended to endow the best-performing laboratories with significant means for meeting global competition.

61. The calls for proposals for Idex projects are intended to create 5 to 10 multidisciplinary clusters that exhibit excellence in higher education and world-class research.

62. They are the Institut national pour le développement des écotechnologies et des énergies décarbonées (INDEDD) in Lyon (Rhône); and Picardie innovations végétales, enseignements et recherches technologiques (PIVERT), in Venette (Oise).

Towards a green innovation strategy

To update the Ile-de-France strategy and boost its green innovation potential, the following actions should be emphasised:

(i) *Develop a coherent and consistent strategy for green growth*, one with a strong regional dimension. While the objectives of the government initiative are clearly defined by the Grenelle exercise, implementation at the regional level is less clear. There are many plans and they tend to overlap at each level of government. It would be useful to articulate the different measures within a green competitiveness programme that stresses the globalisation of activities and the potential for innovation. This would mean reviewing export subsidies for firms in the industry, promoting technological monitoring, and encouraging clusters to venture into foreign markets. Moreover, innovation is known to have a strong proximity dimension, and the region must therefore be in a position to appropriate the available instruments (win tenders for programmes such as institutes of excellence, for example) and national policy must be complemented by regional measures. On this point, there is a shortage of initiatives and specific support. The industry-specific plans (the eco-technologies plan 2012, for example) generally offer little support for innovation. Moreover, regional subsidies to small firms are not very significant from a financial viewpoint and tend to be scattered too thinly. The fact that the government and the Region have been able to establish a Strategic Innovation Committee for pooling their positions is, on the other hand, a good sign.

(ii) *Strengthen the governance structures of the regional innovation system* and make them more professional. French policy in this area has tended to stress the research potential of the competitive clusters – especially those in Ile-de-France – through calls for proposals from the ANR (National Research Agency) and interventions of the FUI (Single Interagency Fund[63]), while the day-to-day running of the clusters has received less attention. The Ile-de-France region could be selected as a site for experimenting with a national policy to implement network engineering and cluster management geared more specifically to clean technologies and sustainable activities, as Denmark has done with its "brokers" programmes.[64]

(iii) *Develop interfaces and facilitate R&D activities*. In the Ile-de-France region, it seems difficult to mobilise the public research/business/government triptych for innovative activities. Thus, despite its strong points in the area of research, the region has trouble submitting competitive proposals to obtain subsidies for centres of excellence. Moreover the overwhelming governmental presence (the top-down approach) and inadequate representation of the private sector in the operating agencies and regional structures responsible for the innovation strategy and sustainable development measures does little to induce businesses to take initiatives (the bottom-up process) or to engage in cooperation. The national and sub-national administration is not sufficiently imbued with the principle that "business knows best" when it comes to innovation and green growth, even if a balance has to be found between the principle of private initiative and the need for a consistent economic policy on the part of the public authorities. Lastly, fragmentation in the public research sector and the ivory-tower stance of the *grandes écoles* impede public/private cooperation. It would be better if the local authorities could work with enterprises well

63. The FUI finances cooperative research and development projects.

64. In 1989 the Danish government decided to boost SMEs through a program that would encourage them to cooperate so as to enhance their competitiveness and their ability to penetrate new markets by networking, mounting joint projects, and using the services of a mediator. The program also had a financing component designed, on the one hand, to cover the cost of preliminary feasibility studies and, on the other, to defray up to 50% of network management costs. As well, to help achieve critical mass, the government loosened antitrust regulations. Joint projects under this program could be geared to the development of a new range of products, market access, or development of new production processes that an individual enterprise could not undertake. The programme, which ran for four years, was not specifically targeted at eco-technologies but it could serve as a model for an initiative in this sector.

upstream in order to determine the best solution for the city. This would strengthen the know-how of the project sponsors (examples: Amsterdam, Hamburg, Stockholm). In France, this is not compatible with the Procurement Code. Some research and higher education centres in Ile-de-France (for example Universud) have schools and universities as associates. The government should encourage such collaboration through financial incentives. There is also a need to give the business sector greater representation on decision-making bodies for implementing programmes of the Ministry of Ecology. Lessons should be drawn from other national experiments that are more targeted on upstream assistance and direct service to businesses than on infrastructure (Box 15).

Box 15. The Proof of Concept Centers in the United States (i6 Green Challenge Programme).

The Commerce Department's Economic Development Administration (EDA) and its Office of Innovation and Entrepreneurship announced in March 2011 the opening of the USD 12 million "i6 Green Challenge" initiative, in partnership with the US Department of Agriculture, the US Environmental Protection Agency, the National Science Foundation, the National Institute of Standards and Technology and the US Patent and Trademark Office

The funding will be awarded on a competitive basis to six teams around the country offering the most innovative ideas to drive technology commercialisation and entrepreneurship in support of a green innovation economy. The Department of Energy will top up the initial budget by USD 2 million. The programme will lead to establishment of Proof of Concept Centers (CPC) in the areas of renewable energy, energy efficiency, and green building technology.

The Centers will help companies test their innovations, a critical step in commercialising next-generation clean energy technologies. They will support all aspects of the entrepreneurship process, from assisting with technology feasibility and business plan development, to providing access to early-stage capital and mentors to offer critical guidance to innovators.

The i6 Green Challenge is an important component of President Obama's Startup America initiative to promote innovation and maintain or increase America's lead in this area. It will help catalyse American ingenuity by leveraging the benefits that the CPC offer to promote green growth, advance cluster development and strengthen the economic ecosystems of America's regions.

(iv) *Focus the effort on SMEs*, to promote their innovation potential. The eco-technology clusters still have relatively few members in comparison with the conventional clusters. SMEs predominate - they account for more than 60% and often as much as 80-90% of cluster membership – but their innovation capacity is limited. These trends also underline the growing need to develop synergies between clusters and to promote multidisciplinary activities: indeed, green growth is symbolic of these crosscutting approaches. Inter-cluster agreements have been signed to speed these changes. Such agreements exist, for example, between Advancity and other complementary clusters in the region: Systematic and Cap Digital, Finance Innovation and Moveo. Cooreration extends to other clusters such as Novalog in Le Havre, and Axelera in Lyon in other regions, as well as certain eco-clusters around the periphery of the country.[65]

65. The fabric thus woven is yet more complex, as many firms in clusters are also stakeholders in local productive systems (SPLs) with eco-technological dimensions, such as Durapole in Paris (an SPL in environmental technology with a group engineering office) or *Vivant et la Ville* (BTP). Moreover, Advancity has established agreements with SPLs or clusters of significant scale such as *Réseau Mesure du Val d'Oise* (RMVO) or Optics Valley, an SPL involved in sensors, energy efficiency and intelligent networks. Such downstream cooperation can be reinforced by the development of upstream platforms, for example with Systematic (architecture system) or Cap Digital (haptic content and interfaces); the region is also implementing a regionally-run unified services platform, "Paris Region Enterprise", to provide coaching to local SMEs. As to the city of Paris, it has prompted the establishment of an association, Laboratoire Paris Région Innovation (LPRI), open to other metropolitan area authorities and public partners. Its aim is to encourage experimentation and help IDF startups, firms and research laboratories to access public spaces for real-life testing of their innovations.

A few large firms are beginning to establish innovative partnerships. An example is Veolia with its "Innovation Accelerators". They represent both a distribution channel and a market for SMEs. Others are investing in small enterprises (for example, Suez through its "blue orange fund"). Some clusters such as Systematic have sponsored projects to promote SME members' access under the aegis of the Ministry of Finance. With its *Ambition PME* programme, Systematic has succeeded in associating 200 SMEs in 112 projects, in 30 of which they are the leaders. At Moveo, SMEs receive specific assistance to help them communicate about their technologies, to make equipment available and to encourage large firms to make purchases from small ones (Moveo's *Make or Buy* newsletter). The State could speed this process by designing a framework conducive to such collaboration and initiating an SME eco-technologies pact. The region, for its part, could institute a sovereign fund to stabilise the most innovative SMEs, as has been done in the Loire Valley.[66] Attention should also be paid to the relationship between sector SMEs and the universities. Research vouchers for spending on public research could be granted to small enterprises working in the area of green technologies. An experiment to this effect could be tried in Ile-de-France.

Adapting capabilities to meet the needs of the green economy

Although the Ile-de-France region has a young workforce that is generally well-trained and highly qualified, there are still some glaring shortages in the area of green skills, and training does not always meet the needs of the labour market, a fact that holds back gross job creation. This problem has been recognised in the work of the 11 industry committees that the government tasked during the Grenelle process with assessing training needs in the area of green growth.[67] It is due in part to a mismatch between green employment supply and demand. While many young graduates have a grounding in regional planning and nature conservation,[68] job offers tend to be concentrated in the prevention of pollution, nuisances and risks (Réseau TEE, 2009). A number of green sectors are facing recruitment difficulties. This is the case, for example, with firms responsible for waste collection and treatment, especially in the areas of prevention, hygiene and safety, and in the water sector.

The problems as well as the needs are not homogeneous across the different green sectors: the most urgent needs are to be found in the building and renewable energy industries (MEDDTL, 2010c). In particular, training in renewable energy in France seems to be lagging behind other countries such as Germany. With respect to the building sector, a study for the *Cellule Économique Régionale de la Construction* (CERC) of Ile-de-France (2009) argues that the region needs to attract 7,000 "skilled or highly skilled" young people per year (Réseau TEE, 2009). The waste management business, which is currently undergoing modernisation and mechanisation of collection and sorting, is likely to see a gradual decline in unskilled jobs and a growing need for engineers and technicians, according to the *Observatoire francilien des métiers de l'environnement* (Réseau TEE, 2009). In many cases, what is needed is to develop new activities on the basis of conventional skills. For example, the *département* of Seine-et-Marne is now seeking to create value from the flows of water, wastes and materials it receives from the metropolis.

It is not just a question of training young people: a great effort is also needed to train the teachers as well as elected officials and public servants. In some fields, for example that of building-energy, competent

66. This is a modest fund (EUR 5 million) that always works with other partners. The objective of the Pays de Loire region is to help businesses grow, whether they are at the launch or startup phase or developing toward critical size. The idea is to allow SMEs to go faster in boosting their equity as leverage for bank credit. The region plans its intervention over the medium term, which is the appropriate time frame for sustainable employment creation projects.

67. Observers agree that there are great needs in terms of initial and continuous training in each of the branches studied, and a "virtually unprecedented need to mobilise the training branch" (MEDDTL, 2010b).

68. Nationwide, enrolment in environmental training rose by 17.6% of the total, or 2% per year (Réseau TEE, 2009).

trainers are in short supply. Nationwide, the number of secondary school teachers in this area is inadequate in light of the growing number of students (MEDDTL, 2010c). There is also a problem of competence on the part of elected officials and public agencies. Paris Métropole, a public-private association, trains elected officials to understand metropolitan issues and to look beyond the communal framework. The Region could also play an assisting role in project commissioning, in support of local officials.

The State and the Region have taken a number of measures, strategic as well as tactical, to fill these needs:

(i) At the national level, a green growth trades plan is enlisting contributions from the five Grenelle environmental colleges and a national green employment observatory has been created in the region with the help of professional associations. Some training courses have also been adapted. Since 2008, basic training in organic farming has become compulsory for all students in agriculture schools (Réseau TEE, 2009). Since 2005 professional degree courses have opened the way by allowing a degree of diversity, particularly in the water, sanitation and waste branch.[69]

(ii) At the regional level, there are two strategic documents outlining training policy, the Regional Scheme for Initial and Lifelong Training and the Regional Scheme for Economic Development (now the SRDEI). The latter now includes "ecological conversion" of the economy as a priority subject. As well, an undertaking jointly prepared with the State, Ademe, Arene and other partners since 2000 has led to a network known as "Territoires Environnement Emplois" (TEE) Ile-de-France, a centre of resources and regional expertise for environmental players. The region has established an agreement known as the Regional Contract of Professional Commitment (*Contrat régional d'engagement professionnel* (CREP)) with its labour and management partners to work together to adapt trades and training to the challenges of sustainable development. A regional observatory of environmental trades and employment has been launched in Ile-de-France, with the help of the TEE Ile-de-France network and the regional employment-training observatory. These initiatives are very promising, and demonstrate a real awareness of the scope of the problem. They should produce a more solid grounding of knowledge on which a green growth strategy can be built.[70]

Although the national and regional authorities seem to be aware of the scope of needs, they lack the means to take action. Training policy is a responsibility of the region, which in its 2011 budget earmarked EUR 617 million (or 13.3% of the total budget) for vocational training and apprenticeship. The SRDEI, which is mainly targeted at the environmental trades, has a budget of EUR 906 million over four years, or around EUR 225 million per year. But the cutback in regional resources as well as a shortage of capacities have been identified in the SRDEI as heavy constraints holding back regional efforts in the area of economic development, training and innovation.

Matching supply and demand more closely will be essential for facilitating recruitment, and will require greater involvement by the private sector. For the time being, a number of actions can be taken to improve the supply-demand match on the labour market: (a) adaptation of existing diplomas, (b) creation of new diplomas (professional degrees), (c) development of apprenticeship (the ranks of environmental apprentices grew by 5.3% from 1997 to 2005), and (d) vocational training. A broader range of private

69. In 2005 there were 128 professional degrees awarded in environmental studies, some dealing with new disciplines such as renewable energy and sustainable building (MEDDTL, 2010c). There is an observable trend in these degrees: from 1997 to 2005, 21 new professional degrees were created while 25 were abolished (MEDDTL, 2010c).

70. See *www.developpement-durable.gouv.fr/IMG/pdf/observatoire_presentation-2.pdf.*

sector players – from large companies to SMEs – should be involved in the initiative in order to identify needs and opportunities more closely. The solutions considered will vary by sector. While some branches, such as renewable energy, are considering training coupled with long-term internships in firms, others, such as transportation, will associate sectors at the frontier of several trades (MEDDTL, 2010c). The attention that the region has given in the SRDEI to the specific training needs of SMEs, recognising that they often lack the capacity to offer training to their employees, is also welcome. The work of the environmental employment Observatory will be useful in this initiative, and should be maintained.

The competitive clusters could constitute real support for green training. Experience abroad suggests some routes forward for Ile-de-France. The leading eco-technology clusters in the world offer specific programmes for meeting the demands of companies. Envirolink Northwest (UK), for example, relies on a consortium of universities with which it is developing tools for businesses and training providers to interact. The Solar Valley Cluster in Germany has a training needs coordination committee that includes industrialists, training centres and the regional (*Land*) authorities. It has developed university courses focused on solar energy (Box 16). The Massachusetts Clean Energy Center has developed the Workforce Development Programme to promote collaboration and consistency in training programmes, to assist in the development of programmes for training students and to ensure the availability of skilled workers at each link in the value chain. In Ile-de-France, the links between training centres and firms are still fairly tenuous. The LRU law on university autonomy has created the conditions for strengthening those links, however. In Ile-de-France, the role of education institutions in the different clusters could be examined by focusing on green growth and eco-technologies with a view to producing specific recommendations regarding training gaps. The progress that the region's universities are making in the globalisation of these disciplines (attracting foreign professors and students) could also be reviewed, recognising that this is an important point for encouraging a culture of better cooreration with businesses.

Box 16. Solar Valley Mitteldeutschland

In Germany, Solar Valley Mitteldeutschland is a cluster of industries, research institutions, universities and schools working on solar photovoltaic (PV) issues. Saxony, Saxony Anhalt and Thuringia – three regions (*Länder*) in the centre of Germany – have recently pooled resources to create one of the leading PV regions. Within a limited space, there is now a concentration of research and education organisations and production centres involved in PV, across the entire value chain. The Federal Ministry of Education and Research is sponsoring Solar Valley Mitteldeutschland, which it has identified as a "cluster of excellence".

Solar Valley Mitteldeutschland embraces 35 global companies, nine renowned research organisations, five universities, five colleges, three educational institutions, and three federal German states. Its aims are to reduce solar electricity generation costs through innovation in technology and products, to offer high-level training, and to attract national and international financing. An administrative body, the "Cluster Board", coordinates PV activities in the region and decides on the allocation of resources and on strategy. The advancement of research and the development of vocational training are key objectives of the cluster, which seeks to develop a comprehensive transnational education system linking education and vocational training in order to meet the need for qualified employees. Among the measures already taken, B.Sc. and M.Sc. courses have been introduced, eight academic chairs have been created and financed by private foundations, and a Centre of Excellence for vocational training and further education has been established. The cluster is also home to the Solar Valley Graduate School for Photovoltaics, based on cooperation with several neighbouring universities, research institutions and technical colleges. In September 2011, Solar Valley inaugurated a summer school for PV, open to students at the undergraduate, master's and doctorate levels.

Source: *www.solarvalley.org*

6. Reforming urban planning for a systemic approach

A green growth strategy cannot be confined to a purely sectoral approach: it must understand the metropolis as a system, taking into account the spatial dimension, interaction and synergies among different objectives and policy sectors in order to maximise socio-economic and environmental impacts. To the extent that each green sector entails key spatial issues, urban planning tools need to be rethought in order to conceive and construct the metropolis of tomorrow as a whole. The transformation of the building sector will take place not only at the scale of the building itself but also at the scale of the neighbourhood, the city and the metropolitain region, in order to intensify and diversify the urban fabric. Transportation plays a role in structuring the urban space; the organisation of transport networks, whether for passengers or freight (or both), must be viewed in terms of the improved functioning of the metropolitan area and devised so as to keep costs to a minimum. Exploiting the potential of different types of renewable energy in the urban setting will depend on the natural resources available in the environment, the accessibility and availability of appropriate equipment, and the connection possibilities among existing urban networks. Local and/or organic agriculture needs to be located close to consumers and this means, in Ile-de-France in particular, that there must be policies to ensure the development of such operations in a space under constant pressure from urban sprawl. All green sectors, then, need systemic management of space, which takes into account aspects both of complementarity and of opposition.

The current system of urban planning in France, structured since the 2000 "Solidarity and Urban Renewal" (SRU) law in accordance with a three-tier system (Box 17), seems to frustrate such a systemic approach. It is true that the Grenelle laws brought about a profound change in the objectives and instruments of urban planning, by giving them a heavy environmental dimension. They reinforced the goals of densification already introduced by the SRU law, which profoundly modified urban development and housing legislation in France.[71] Nevertheless, as things stand, implementation of the new, often highly sector-specific Grenelle provisions in the planning area does not seem likely to result in a global and cross-cutting approach. For one thing, Grenelle introduced a great many novelties (strategies, plans, programmes, standards) which have proved very difficult to implement with existing provisions, especially given the different territorial scales involved in the approach. On the other hand, the government is devising and implementing strategies that are potentially conflictual: the Grenelle approach, which produces rules and regulations, and the urban development approach based on projects by *ordonnance*, which encourages greater flexibility in urban rules and plans.

Box 17. The three-tier urban planning structure in the Paris-IDF region

Following the SRU law of 2000, the structure of urban planning in Ile-de-France consists essentially of a three-tier system. The interrelationship between these three levels is thus a central issue in managing urban development.

At the *regional* level, the *Schéma directeur d'aménagement et d'urbanisme* (the Master Plan for Urban Development, *i.e.* the SDRIF in the case of the Paris-IDF region), which has become a distinctive feature of Ile-de-France since the 2000 SRU law, sets out broad guidelines for development on the regional scale.[1] The SDRIF is, on the one hand, an area planning document providing a framework for thought and discussion and a strategic vision ensuring consistency within the region between all aspects of its development and those actively involved in it; on the other, it is a prescriptive urban planning document within the hierarchy of standards in urban planning, and thus places obligations on certain local urban planning documents that have to be compatible with its provisions. It shapes and frames regional-level documents like the PDUIF, as well as local urban planning documents such as the Territorial

71. The SRU law has three components: *urban planning* (with the updating of planning documents to reflect new municipal issues such as urban sprawl), *housing* (with a declared intention to promote social diversity, obliging communes with more than 3 500 inhabitants that are part of a conurbation of more than 50 000 inhabitants to accommodate a minimum of 20% of social housing units) and *mobility* (with provisions to promote public transport and, for the Ile-de-France region, reform of the STIF).

Coherence Schemes (SCOTs) or the *Plans locaux d'urbanisme* (PLUs, or Local Urban Development Plans) where there is no SCOT.[2]

In the Ile-de-France region, the last master plan to be approved dates from 1994 and continues to apply to proposed urban development schemes, as the 2008 SDRIF proposal was not approved by the government following its rejection by the Council of State. However, pending revision of the proposal, provisional measures were introduced in 2011 so as not to hold up schemes frozen because of the 1994 SDRIF. The SDRIF revision procedure is under way with a 2013 completion date.

At the *inter-communal* level, the urban planning SCOT is a mechanism for organising and ensuring the consistency of the urban scheme prepared jointly by several communes.[3] Introduced by the SRU law of 13 December 2000, the SCOT is used to devise, implement and monitor inter-communal planning with a view to sustainable development. It is an urban planning document which establishes for several communes or groups of communes (where possible a "living basin"), the basic guidelines for organising the area and the development of urban districts, in order to maintain a balance between urban, industrial, tourist, agricultural and natural areas. It fixes the aims of various public policies at this level as regards housing, economic development and travel. There is no obligation on communes (or groups of communes) to develop a SCOT. However, there is every incentive for them to do so, as this is a precondition in law for new and natural areas to be opened for urban development. SCOTs are drawn up by an *Établissement Public de Coopération Intercommunale* (EPCI, or public body for inter-communal cooperation), or by a mixed syndicate.

The aims of a SCOT are to identify development guidelines without specifying locations too firmly; to ensure that decisions regarding housing and activities are compatible, with due regard paid to the scope for mobility or the catchment areas of facilities; and to restructure the built-up fabric, while limiting the use of fresh space. Where no SCOT exists, urbanisation is governed by the principle of restrained development. The SCOT also contains the proposal for planning and sustainable development, a document in which the EPCI states its decisions regarding development and preservation in compliance with sustainable development principles, as well as a general guidelines document for implementing the proposal.

1. At the *communal* (or *inter-communal*) level, the PLU[4] is the main urban development planning document for either level. It includes details on individual plots of land and establishes land rights, especially as regards suitability for building. The *Grenelle 2* law of 12 July 2010, amended several aspects of the PLU: due regard for the green and blue network, development and programming strategies, the *programme local de l'habitat* (PLH, or local housing programme), and the *plan de déplacements urbains* (PDU, or urban mobility plan) included in the inter-communal PLU The Ile-de-France is the only region in which the 2000 SRU law has maintained planning at regional level. According to article L141-1 of the urban planning code, the Ile-de-France region is preparing with the government a master plan for the whole region. The regulations also state that the *conseils généraux*, the regional social and economic council, and the chambers of commerce, the professions and agriculture should be consulted when preparing revision of the 2008 SDRIF proposal. Furthermore, it is the government which in law, by a Council of State decree, initiates review of the preceding SDRIF, and approves the revision.
2. Furthermore, the SDRIF has to comply with different provisions, and in particular the general principles of articles L. 110 and L. 121-1 of the urban planning code (principles of balance, social and functional mix, and environmental protection and enhancement), public utility restrictions affecting land use, and the provisions necessary to implement government schemes of general interest and operations of national interest.
3. Since the 2000 SRU law, the SCOT has replaced the master plan, except in the Paris-IDF region, in which there is still an SDRIF prepared at regional level in collaboration with the government and SCOTs for the inter-communal activity.
4. Since the SRU law, the *Plan d'occupation des Sols* (POS, or land occupation scheme) has been converted into a PLU. The PLU is governed by the provisions of the urban planning code, and essentially its articles L. 123-1 *et seq.* and R. 123-1 *et seq*.

With the Grenelle Environment Forum, regional densification was already a clear objective in planning documents. The SRU law of 2000 changed the planning rules to allow intensification of uses. Some rules that limited densification were eliminated. New provisions were are also introduced in order to encourage developers to exceed the authorised density ratio in exchange for social or environmental benefits, such as ensuring energy savings or building low-cost housing:

- *Exceeding the authorised density to encourage energy savings*. Created in the mid-1970s, provisions allowing authorised density to be exceeded in exchange for efforts to achieve energy savings were reintroduced with the "programme law fixing energy policy guidelines", the "POPE" law of 13 July 2005. That law allowed the authorised density to be increased by 20% for buildings that met conditions of energy efficiency or that contained equipment for renewable energy production.

- *Exceeding the authorised density to encourage the construction of social housing*. A set of measures[72] make it possible to exceed the land occupancy coefficient (COS), the principal measure of density, in order to encourage the construction of social housing and enhance social cohesion in urban areas where the housing imbalance is severe.[73] Nevertheless, the record of application of these provisions, the SRU in particular, has been mixed. The SRU has had a certain positive impact, but it seems that many communes prefer to pay the penalty (which is thus too low) rather than build social housing.

With the introduction of Grenelle, densification targets were reinforced, construction standards linked to energy efficiency were introduced, and the metropolitan scale was given precedence. The *Grenelle 1* and *Grenelle 2* laws represent an important shift in urban development law, from a law confined to the organisation of space toward a law that serves broad social objectives. This tendency had already begun with the SRU law, where the word "sustainable development" appeared for the first time and the idea of taking a long-term vision of urban development was put forward. What Grenelle has done is to impose new construction standards linked to energy and environmental efficiency, in particular greenhouse gas emissions, water consumption and waste production.[74]

One of the Grenelle objectives is to promote a global approach to urban development by harmonising guidance and planning documentation at the metropolitan level. The SCOT, which had previously been a general guidance document setting objectives for housing, transport and economic development, is now, with *Grenelle 2*, the strategic document of reference at the inter-communal level, which is obliged to fix quantitative targets to limit the consumption of natural spaces, for example, or to set possible minimum density levels, or more stringent energy or environmental efficiency standards. On the other hand the PLU, the main document for regulating land occupancy upon delivery of development permits, is supposed to pursue new objectives, to be compatible with or to take into account new documents, in particular the regional schemes for ecological coherence and the territorial climate-energy plans, and to respect new rules. The PLUs covered by a SCOT will have to be entirely consistent with it, and the SCOT may also impose binding objectives on the PLU. It should be noted that the SCOT will have to be evaluated every six years, as opposed to ten years before the *Grenelle 2* law. Thus, the *Grenelle 2* law marks the beginning of a process of regrouping regulatory documents and clarifying the hierarchy of rules.[75]

---

72. The housing diversity law of 21 January 2005, the "National Housing Commitment" (ENL) of 13 July 2006, and the SRU law of 2000.

73. There are some communes, on the west side of Paris in particular, with less than 5% social housing, while the ratio in some other communes, mainly in Seine-Saint-Denis and Val-de-Marne, is more than half.

74. The 257 articles of the *Grenelle 2* law on the "national amendment to the environment" amended 19 codes, including several chapters of the environment code and the first section of the urban development code, as well as 20 or so uncodified texts.

75. The essential role assigned to the SCOT has inspired several legislative measures to encourage general use of these schemes: as of 1 January 2007, the creation of new urban development zones in territories not covered by a SCOT will be prohibited.

Grenelle has also made changes in the three main tools of urban planning, the SDRIF, the SCOT and the PLU, giving them new instruments to reinforce the densification goals at the centre of the urban development approach. While the SCOT has instituted possible densification rules, the PLU now has new instruments for densifying land areas. In both cases, the SCOT and the PLU, the notion of minimum density is apparent. Grenelle allows the rules concerning building outlines and densities fixed in urban plans to be exceeded by up to 30% for structures that meet high energy efficiency criteria or that are supplied by energy from renewable or recovered sources.[76] Incentives of this kind that allow over-density in exchange for observance of ecological models seem to have been of limited effectiveness. The principle of over-density is still not very attractive to most elected officials, developers, or future purchasers.

The green growth objective proclaimed in the Grenelle context constitutes a real opportunity, then, to restore sorely lacking solidity and relevance to urban planning, whether in terms of the SCOTs, which are gradually emerging (with 373 approved SCOTs under way or in hand on 1 January 2011), or of the PLUs which are still often highly volatile and for which Parliament has rejected the compulsory inter-communal principle. Yet implementation is proving difficult because of, on one hand, (i) the introduction of a proliferation of uncoordinated provisions and, on the other hand, (ii) its prescriptive approach, which runs counter to the current trend to make planning more flexible and accommodating.

(i) With the new Grenelle provisions, the government is proposing a host of new categories of plans and programmes, the legal nature of which is not always clearly defined. The old "territorial planning directives" (DTA) are being replaced by "territorial planning and sustainable development directives" (DTADD), the content of which is expanded to include coherence of ecological continuities, improved energy efficiency and reduced greenhouse gas emissions. The "natural risk prevention plans" (PPRN), which had been maintained, are reinforced by new "flood risk management plans" which, in addition to easements affecting territories governed by the PPRN, are supposed to define the full set of prevention, warning and response measures. In terms of new features, Grenelle calls for the creation of "regional schemes for ecological coherence", framework documents for protecting ecological continuities (and particularly the *trame verte et bleue* (green spaces and water surfaces)); "regional wind energy schemes"; "sanitation schemes"; and above all, "territorial climate-energy plans" (PCET)[77] and "territorial sustainable development projects". Preparation of all these plans and programmes will take many years and will involve a great many urban stakeholders.

The *Grenelle 2* law also calls for mobilising a very broad range of financial and fiscal instruments. Many already exist – what the law does is to make it possible to modulate those instruments in light of environmental objectives. Thus, fees and charges for household waste removal can be adjusted in light of environmental criteria. Cities of more than 300 000 inhabitants that have an approved urban mobility plan calling for public transport development on exclusive rights-of-way will be able (on an experimental basis) to impose road tolls to improve local air quality or reduce greenhouse gas emissions, etc. A major innovation allowed the urban transport authorities to impose a levy on property value appreciation generated by the construction of public transport infrastructure with exclusive right-of-way; but this levy has subsequently been abolished.

It must be recognised that application of the *Grenelle 2* law will be complex and costly and will have to be phased over time, and that it will depend to a large extent on the willingness of local authorities to

76. The principle of allowing excess density in order to encourage energy savings, instituted by the SRU law, was reinforced and generalised by the *Grenelle 2* law of 1 July 2010.

77. The PCET are supposed to be adopted before 31 December 2012 by the regions (if they have not yet adopted regional climate and energy schemes), the *départements*, the urban communities, and *communautés d'agglomération* with more than 50 000 inhabitants. Defining objectives and actions planned at each level to combat climate change, the PCET must be taken into account in urban planning documents.

seize these new opportunities. First, several of the measures contained in the *Grenelle 2* law are awaiting decrees that will make them enforceable. Some 180 decrees of the Council of State or simple decrees will be needed for this to apply to the majority of the new provisions. Second, the law imposes evaluation and consultation procedures for preparing new instruments, plans and programmes and for amending existing ones, and this will be a long process. For example, the local urban development plans (PLU) created more than 10 years ago by the SRU law to replace the land occupancy plans (POS), cover only a portion of French communes. Lastly, it must be recalled that, with rare exceptions, the *Grenelle 2* law institutes these new procedures and gives the municipalities these new powers on an optional basis.

The multiplicity of instruments and strategies introduced by Grenelle would require a change in the relationship between the central government and local authorities in order to be fully implemented, and there could well be friction with existing provisions. A crucial question, for example, has to do with the multiplication of perimeters and the independence of the different plans: SCOT, PLU, PDU and PLH, etc. Evidence from neighbouring countries, such as Germany or the Netherlands, indicates useful directions for recasting urban planning at the appropriate level, that of the conurbation, or at the scale of a macro region, for coordinating the various aspects of urban development. In France, a reform of governance in Ile-de-France would seem an essential precondition for taking advantage of the tool introduced by these laws. Yet, as will be discussed below, the needed instruments of governance, which because of the players involved are essentially instruments of coordination and cooperation, are proving difficult to develop in Ile-de-France. A large-scale economic shift towards green growth in the region, then, seems especially hard to achieve: other regions of France, such as Nord-Pas-de-Calais and Bretagne, have overtaken Ile-de-France in the area of sustainable development and greening of the economy, doubtless because they are less complex and because the governance of their cities is more flexible and less subject to possible disagreement.

Moreover, the government is following two approaches that are difficult to reconcile: the Grenelle approach, on one hand, and "urban planning by ordinance" on the other. Grenelle is generating a series of new rules and standards while at the same time the "urban planning by ordinance" approach, envisaged as a "response" to the constraints imposed by Grenelle, is blurring the message put out by the government by promoting a more flexible urban planning that allows rules to be set aside when certain conditions are met. At the same time, since the end of 2010, there has been growing interest in the topic of *urbanisme de projet* – "project-based urban planning" – designed to secure the prompt issuance of ordinances, *i.e.* decrees that do not have to go through Parliament and that are explicitly provided for in *Grenelle 2*.

On the whole, the provisions contained in the framework of *urbanisme de projet* go in the direction of greater flexibility in urban development rules and plans. A regulation now under preparation as regards the PLU is intended to facilitate the evolution of these documents, to simplify their contents, and resurrect the land occupancy plans left escheated in the PLU in line with *Grenelle 2*, in order to counteract urban sprawl, contribute to urban densification and safeguard natural and agricultural areas. The notion of "project sector" would be introduced in the course of implementation, with the general philosophy being (depending on the working group drafting the text) to "create sectors in which all or a portion of urban planning rules can be set aside in exchange for meeting project objectives that have been determined and are shared by all". A judicial committee is responsible for preparing legislation on project sectors which may establish a clear legal basis for action.

The motivation behind the ordinances is clearly different from that of *Grenelle 2*. A key concern is to limit the fast-rising volume of litigation that is now slowing projects and boosting their cost. From this perspective, the idea would be to filter appeals and to increase substantially the fines for "frivolous appeal", and to give a more restrictive definition to the notion of *intérêt à agir* (legitimate interest to act) for associations, a necessary condition for them to go to court. These are sensitive issues and are subject to rigorous oversight both by the Constitutional Council and by bodies of the European Union. A last

provision, on which there already seems to be broad consensus, would dispense with a building permit for any construction of less than 40 m² in surface area, which would then be subject to a simple filing procedure (*délaration de travaux*) where the threshold is now 20 m². Nevertheless, for the local authorities of the Paris region to implement this provision, on the eve of important elections, raises some sensitive questions because of the great potential for legal challenges.

7. Metropolitan governance and green growth

Green growth policies and strategies, whether sectoral policies concerned with energy, building, agriculture, transport, waste, etc., land development policies, or policies to support innovation or boost skills, emanate from different sources, and in particular different administrative levels within the public sector. Regardless of the institutional context, there is no single agency in any country that is capable of covering all aspects of green growth. Yet implementation of a consistent green growth strategy calls for forms of cooperation and collaboration between the various stakeholders. Such coordination is especially complex in the case of metropolitan regions, in which institutional fragmentation within a functional region represents one of the hardest challenges to deal with when implementing public policies (OECD, 2006). This complexity is even greater in the case of global metropolises regarded as strategic for central governments because of their demographic and economic significance, especially when they are political capitals.

Given the number of players, the scope and the fragmentation of fields of intervention, and the diffuse and often opaque nature of decision-making processes, it is difficult to describe the system of governance of the Paris metropolitan region. This is all the more true when one attempts to describe a "system of green growth governance in Ile-de-France", as "green growth" is not currently identified as a focus of governance. There is in fact no formal definition or any explicit strategy for "green growth" in Ile-de-France. This lack of any reference to "green growth" has nothing to do with public disinterest in the environment or growth. Rather, it reflects the fact that the key elements – a common vision and strong leadership – are missing. The fragmentation of players and their sometimes contentious relations make it impossible today to move forward in evaluating potentials, defining a strategy, and financing and implementing it.

This section will examine a set of difficulties in terms of implementing governance for green growth in the Ile-de-France region. The challenges are not confined to the domain of green growth, but it is useful to analyse them from that perspective. This section does not pretend to exhaust the subject of governance for the Paris metropolitan region, but will suggest some lines for further consideration in the light of international experience.

The main gaps

There are a number of governance gaps in Ile-de-France that may impede a coordinated response by the various stakeholders to the issues of green growth. Using the conceptual analysis framework provided by the OECD to identify the concerns in multilevel governance (Charbit, 2011), which is adapted to the issue of green growth (OECD, 2011b), it is possible to enumerate them in the Ile-de-France context (Table 6). Four of them are particularly pertinent to the field of green growth in the Paris-IDF region.

- The *administrative* gap caused by the complexity and fragmentation of metropolitan administration. This complexity relates to the fact that the administrative boundaries do not match the scale appropriate for the green growth policy. It requires active horizontal and vertical coordination among stakeholders to produce a profusion of strategies and objectives. Unequal resources at the different territorial levels (commune, inter-communal level, *département*, region

and central government) restrict the scope of action at each and give rise to frequently contentious relations.

- The *objectives* gap due to the number of public players claiming leadership over the territory, without the emergence of one clear leader. One must not underestimate the impact of political differences within the region, with a central government that prepares public policies, and a region and many local authorities which are positioned elsewhere on the political spectrum but which have to implement those policies, and in most cases finance them. Consequently, it is difficult to achieve a coherent and shared vision of the region when it comes to green growth.

- The *accountability* gap due to the marginal and piecemeal involvement of the private sector, which produces a model that tends to favour interest groups with a monopoly of representation vis-à-vis the authorities: the chambers of commerce and industry, on one hand, and the *syndicats patronaux* (employers' unions) on the other.

- The *funding* gap caused by the lack of coordination of resources, compounded by the proliferation of fiscal tools in the wake of Grenelle and the law on Greater Paris. The various resources envisioned are still scattered. As will be discussed in the following section, the government has abandoned some important initiatives – institution of a carbon tax in France or urban road toll in the Paris-IDF region – because of political disagreements. Moreover, the weak involvement of the private sector limits the potential means for financing major urban projects.

Table 6. The green growth governance gaps in IDF

Gap	What is involved?	Examples in IDF
Administrative gap	Mismatch between functional areas and administrative boundaries *=> Need for instruments for reaching "effective size"*	Institutional overkill in IDF, with countless local players and skewed weighting (relatively weak regional body and State involved at many levels). Mismatch between administrative units (region, *département*, *commune*, *inter-communal* structure) and scales for effective management of urban services (water and sanitation). Inter-communal structures, designed to overcome territorial fragmentation, do not always work well in the Capital region.
Policy gap	Sectoral fragmentation across ministries and agencies. *=> Need for mechanisms to create multi-sectoral/systemic approaches and to exercise political leadership and commitment*	Possible contradiction between sectoral policies. For example, lack of consistency in economic and environmental policies during the 2009-10 stimulus package, in which the priorities involved in maintaining economic activity disregarded several commitments made during the Grenelle forum (such as on the funding of motorways) (OECD, 2011g).
Information gap	Asymmetries of information (quantity, quality, type) between different stakeholders, whether voluntary or not *=> Need for instruments for revealing & sharing information*	Lack of reliable regional data on eco-activities (availability and quality of data on green sectors, regular statistical monitoring), due in part to definitional problems related to official terminology (NAF). Data-gathering problems with private enterprises.

Gap	What is involved?	Examples in IDF
Capacity gap	Insufficient scientific, technical, infrastructural capacity of local actors *=> Need for instruments to build local capacity*	Lack of capacity in green technologies, processes and skills in many sectors (building, renewable energy). Mismatch between vocational training in green areas and employment demand. Marginal private sector involvement in IDF government systems hampers transmission of non-technical skills, *e.g.* project management, cost-benefit evaluation.
Funding gap	Unstable or insufficient revenues undermining effective implementation of responsibilities at sub-national or inter-sectoral level, *=> Need for shared financing mechanisms*	Little coordination of funding instruments between levels of government and between local and central authorities. Many emerging industries (including renewable energy) are dependent on public subsidies. Budget problems at the commune level, following local taxation reforms, in particular elimination in 2010 of the *taxe professionnelle*, a major source of local revenues. Marginal private sector involvement also limits potential funding for large urban projects .
Objectives gap	Different rationalities creating obstacles to the adoption of convergent approaches between local players and central government. *=> Need for instruments to align objectives*	Profusion of players justifiably claiming some sort of "leadership" in Ile-de-France. Proliferation of strategies, plans and programmes without an integrating mechanism. Lack of a consistent shared vision for the region. Major political differences between the central government responsible for designing policies, and the regions, which implement and even finance them in most cases.
Accountability gap	Difficulty in ensuring the transparency of practices across the different constituencies *=> Need for institutional quality measurement*	Many players involved (*e.g.* various mass transit operators in IDF) which impedes transparent management of urban services; incomplete or obscure financial reporting which prevents the manager (in this case the STIF) from controlling transport costs.
Market gap	Mismatch between public policy objectives and private sector capacity to implement them	Green products ill adapted to demand in some sectors (*e.g.* solar PV, green construction).

Source: OECD (2011b), adapted from Charbit (2011).

The institutional millefeuille in Ile-de-France

The Paris-IDF region is characterised by a surfeit of administrations – the famous French institutional *millefeuille* (Figure 30), further complicated by the distinctive nature of the capital city region. This complex and dispute-riven institutional landscape, comprising 1 281 communes, more than 100 inter-communal structures, eight *départements*, one region, and the central government (which also involves itself in the doings of the metropolis) may impede horizontal and vertical coordination among public players. The involvement of three main administrative entities in IDF governance – the central government, the region and the other local levels of government, including the *départements* and the City of Paris, with its considerable economic and political weight – creates a game of one-upmanship that leads to a proliferation of strategies and objectives. Consequently, it is difficult to strike a consensus on a coherent and shared vision of the metropolis. Moreover, the unequal resources of these different

government levels restrict the scope of action at each. This is a problem common to the majority of metropolitan areas in OECD countries, but the scale of the institutional fragmentation in Ile-de-France is nevertheless highly unusual.

Figure 30. The institutional *millefeuille* in Ile-de-France

1. This map is for illustrative purposes only and wholly without prejudice to the status of any territory shown on it or to that territory's administrative supremacy.

Source: IAU (2011).

To define and implement a green growth strategy in Ile-de-France and ensure collective action demands a degree of cooperation and coordination that in itself is a considerable challenge, given the great number of stakeholders in the region. The capacity to cooperate and coordinate in Ile-de-France faces two barriers: on the one hand, the historic French tendency to swing between downplaying the Paris-IDF region and celebrating its special characteristics; and on the other, the successive stages of central government engagement and disengagement with the region which have left the State a key player in its system of governance. This central government interest in the capital city region is encountered in many countries, including federal states, and is the cause of tension vis-à-vis the sub-national authorities, which regard government action as an intrusion running counter to the aims of decentralisation and subsidiarity. In the case of Ile-de-France, this is compounded by fragmented local authorities whose intermittent disagreements among themselves can hold up the pursuit of a common strategy for green growth. It is urgent, then, to clarify the roles, responsibilities and resources at each level, and to bring them into line with the territories and their needs. This will necessarily mean strengthening mechanisms for cooperation and coordination in the interests of such a policy which exhibits conspicuous external effects.

The central government is involved at various levels in the IDF territory. Despite the decentralisation process that has been under way in France since the 1980s, the State retains an important role: at the regional and *département* levels, central government services coexist with sub-national ones, while at the communal level the mayor is both the chief executive for the commune and entrusted by the government with certain specific powers (civil registry, elections organisation, etc.) (OECD, 2006). The central government maintains a local presence not only through the prefects (region and *département*) but also through the geographically decentralised area offices of the various ministries placed under the authority of the prefects, and which form the highly developed network of administrative offices at the regional, interdepartmental and sub-departmental level. The prefects' authority is confined to the devolved services of central government administrations, excluding education, administration of justice, and tax collection.

The "dual role" of the State in the IDF territory, as both central administration and local authority, underlines the importance of the capital region in national politics (Box 18). Yet this dual role has often led to disputes with local players. An example of this problem occurred at La Défense in 2006, when the central government proposed a neighbourhood renewal plan that went against the advice of a portion of the local authorities and of the Regional Council. The Greater Paris Scheme is another example. As indicated elsewhere in the present report, this project of national, even international, importance which was launched at the initiative of the President of the Republic in 2007 ran into direct conflict with the 2008 SDRIF proposal championed by the Regional Council – the two initiatives offered different visions for the region. Although the government and the Region have long collaborated in the regional development field, around 70% of public investment has come from the area authorities, communes and inter-communal bodies, *départements* and regions, whereas the government share has gradually diminished.

Box 18. The dual role of the central government in the Paris-IDF region

The central government intervenes in Ile-de-France in two ways, namely as the decentralised administration whose purpose is to implement national policies at its different levels of responsibility through its directorates, agencies and national enterprises, but also as a local authority.

At the central level, State interventions may, on one hand, take the form of legal or financial action applicable to all French territory, and therefore also to the Paris-IDF region and, on the other, they may be targeted specifically at Ile-de-France. The creation in March 2008 of a Secretariat of State for the Capital Region and the subsequent foundation of the Société du Grand Paris to design and implement the massive new transport infrastructure and other improvements in the IDF region is a prime example. The State also has a number of national enterprises that are directly involved in the Paris-IDF region, in energy (EDF, GDF-Suez) and transportation (SNCF, RATP, Aéroports de Paris) and they are sometimes called upon to coordinate with their regional counterparts.

At the local or territorial level, the central government has a local administration, headed by the prefects who coordinate State actions within their territory, and it participates in a great number of local or territorial institutions. The State also has various agencies in the IDF that report directly to ministries: these include the *Direction régionale interdépartementale de l'équipement et de l'aménagement* (DRIEA), responsible for carrying out central government policies for sustainable development of transportation and housing in the IDF region. It also participates in agencies and institutions at the territorial level, such as the *établissements publics d'aménagement* (EPA) and the management bodies for the *Opérations d'Intérêt National* (OIN).

In both cases, a key dimension of the central government's intervention lies in the property it controls, first through its oversight of the major urban operators (RATP, SNCF etc.), which are also property owners, and then through the public lands that are held directly by ministries or by the *Agence Foncière et Technique de la Région Parisienne* (AFTRP). The State keeps a firm hold on this enormous stock of capital, and has the capacity to mobilise its land holdings indirectly through the OIN, the competitive clusters, and the national urban policy.

The regional structure, for its part, lacks power and means. While the Paris-IDF region is quite congruent in scale with the functional urban region – which could be an asset in terms of regional governance – it nevertheless has a limited field of action. In fact, although the French regions have gained

some administrative powers with respect to education, training, economic development, urban planning and transport thanks to the Defferre laws passed in 1982 and the constitutional reform of 2003, they have limited political and financial clout. As to the Paris-IDF region, with a budget of EUR 4.6 billion in 2011, its political weight is much less than that of other European metropolitan regions such as the Autonomous Community of Madrid, the *Land* of Berlin or the Latium region (Rome), all of which have legislative powers, budgets several times larger, greater responsibilities and much more staff. For example, Berlin's budget in 2008 was EUR 21.2 billion[78] and within a less fragmented institutional framework. To these differences must be added an electoral and political system that further weakens the Paris-IDF region: proportional voting arrangements that favour the *département* as the electoral district and a parliamentary-style executive liable to comprise sometimes unstable coalitions.

Nevertheless, the region has gradually consolidated its responsibilities and developed its means of action, primarily through the strategic functions of territorial planning. The transfer of decision-making powers over transport involving the STIF, the creation of a regional land management agency, the SRDEI and the SDRIF, among others, confirm the region's presence in urban policy. The STIF, designed at the regional scale, is a great asset for the region, and something that the other French regions do not have. Endowed with a budget of EUR 4.97 billion in 2011, it is an institution to reckon with on the technical and political fronts, as demonstrated in the recent conflict between the central and regional authorities concerning the transport aspect of the 2008 SDRIF proposal, championed by the STIF (see discussion above). On this score, conflicts of interest may emerge between the STIF and the operators who are dominated by the central government.

Despite having consolidated its responsibilities, the region pales as an administrative unit in the face of the communes. There are a great many communes, dominated by the City of Paris, and they have trouble speaking with a single voice in the absence of determined regional leadership. The City of Paris dominates the communal landscape by its demographic weight – with more than 2 million inhabitants, it is by far the most populous commune regionally and nationally – to which must be added is extremely strong economic, political and symbolic importance. The city enjoys a unique institutional status, for it is both a commune and a *département*. This dual status strengthens its clout by combining the responsibilities and resources of the two sub-national levels. This is reflected in a 2011 budget of more than EUR 7.8 billion and a staff complement of more than 40 000 (compared to a budget of EUR 4.6 billion and 1 400 employees for the region). Moreover, it has a powerful executive, one that is visible and politically stable thanks to a majority-vote electoral system. Among the 1,280 other communes in Ile-de-France, only 20 have more than 100 000 inhabitants. The *départements* as well are powerful local entities, with numerous responsibilities concerned primarily with social action and sizeable budgets that on a *per capita* basis exceed by far those of the region (EUR 1.8 billion for Hauts-de-Seine in 2011, with 1.5 million inhabitants; EUR 1.8 billion for Seine-Saint-Denis, with 1.5 million inhabitants in 2010).

In contrast to federally organised countries like Germany, Italy or Spain, there is no hierarchical relationship allowed between the sub-national levels of government in France. Thus, of all the sub-national authorities in the IDF region none – including the region – can legally impose its leadership. Consequently, the identification of metropolitan issues and the tools to respond to them must necessarily be achieved through consultation, and this leads to a very competitive political and institutional system. Nevertheless, this need for consultation may result in the development of a more broadly shared vision.

As a result of this fragmentation, the local authorities' means of action are scattered and uncoordinated, between levels and within each level of administration. Among the sub-national authorities, each level has a legitimate claim to prepare its own development strategies, including those for economic development and hence for green growth, with relative independence, but the resources are frequently not

78 See *www.berlin.de/berlin-im-ueberblick/wirtschaft/haushalt_finanzen.en.html*

up to the scope of the challenges. Although some responsibilities are clearly subdivided and assigned to a specific sub-national level (education, for example), the articulation is not so clear for other shared powers. For example, while the region coordinates economic development, the *départements* and the local authorities can also intervene (OECD, 2006). This situation is the consequence of the constitutional principle of the absence of hierarchy (non-subordination, *non-tutelle*) among sub-national authorities, which can lead to superfluous and even contradictory measures. Furthermore, the decentralisation process in France since the 1981 and 1982 Defferre laws, the Chèvenement law of 1999 and the 2010 Balladur reform has increased fragmentation of the Ile-de-France local authorities. This whole state of affairs is a particular problem when it comes to green growth: uncoordinated actions can limit the effectiveness of provisions implemented for greening the economy. For example, the environmental impact of a green urban undertaking, such as development of an *eco-quartier*, will be limited – or even negative – if the operation does not take into account the urban setting with its multiple economic and social connections, in particular the public transport networks to which the *eco-quartier* is linked. An *eco-quartier* may be very well designed in theory and may be of small scale, but if it does not take into account the pre-existing urban context it can generate more traffic and pollution: the "positive" effects of the *eco-quartier* on the environment, in terms of energy efficiency for example, will be nullified by the "negative" effect of increasing pollution from denser traffic circulation within the *eco-quartier* and between that district and other urban areas.

The limitations of existing coordination tools

The principal tool for horizontal coordination, the inter-communal structures, are only partly operational in the capital region. In fact, the fragmentation of local authorities has been exacerbated by the "success" of the Chevènement law of 1999 on inter-communal cooperation (*intercommunalité*), which has seen the multiplication of EPCIs with fiscal powers (project-oriented inter-municipal cooperation). The number of EPCIs with fiscal powers in France is growing steadily, and stood at 2 611 on 1 January 2011, compared to 2 599 a year earlier. Thus, 95.5% of communes and 89.9% of the population belong to one of four types of groupings with fiscal powers (Direction générale des collectivités locales, 2011).

In Ile-de-France, while there are several hundred inter-communal structures (with a larger presence in the outer belt than in the inner belt), most of them are small and rarely embrace a large population (IAU, 2010f). The Paris-IDF region has the most inter-communal structures of fewer than four communes (10% of the region's inter-communal structures have only two communes). Originally designed to meet territorial infrastructure needs, the inter-communal structures in the region have in the meantime taken on responsibilities for territorial planning, but offer only a partial solution to this institutional fragmentation at the local level (IAU, 2010f). Moreover, the sharp economic and social disparities and strong polarisation between territories where investments and high value-added activities are concentrated and those that suffer significant social and economic problems constitute an obstacle for the development of inter-communal cooreration (OECD, 2006). Finally, although 85% of the French population is covered by inter-communal cooreration structures, the responsibilities of those structures are still poorly defined and their creation has tended to generate greater expenditure, and particularly investment expenditure, than savings for the provision of local public services (OECD, 2006; OECD, 2011h).

The main tool for vertical coordination, the State-Region Planning Contracts (CPER), poses a number of issues in terms of financing and implementation in the Ile-de-France region. Vertical coordination is a sizeable challenge in France, for it involves seven different levels of administration: central government, regions, *départements*, communes, in addition to the European bodies, the interdepartmental and the inter-communal structures, totalling more than 50 000 institutional players (without counting the "*pays*"). The issue is further complicated in the context of the IDF *millefeuille*. As the instrument for regional development policy since 1984, the CPER engages the central government and the region in the co-financing of infrastructure projects as well as industrial and economic development and innovation

initiatives defined in the contracts. Recently these contracts have also involved contributions from other sub-national governments and the European structural funds. While they represent a real coordination tool, they could be improved, especially in terms of clarity of objectives, selectivity of actions, the role of public players and the evaluation of policy outcomes. In fact, the CPERs are facing a number of problems relating to commitment at the central level: the absence of an automatic financing guarantee, the risk of scattering appropriations too thinly, a certain lack of transparency in programmes often conceived primarily for their public relations impact, the difficulty of implementing them, and the lack of any real evaluations (OECD, 2006).

The 2007-13 State-Region Planning Contract for Ile-de-France drawn up before the Grenelle Environment Forum already included concerns and actions that reflected the principles of green growth without however constituting major initiatives. Among the eight "big projects" identified, only two have to do with green growth: these are *Grand Projet* 7, "Combating climate change", and *Grand Projet* 8, "Giving environmental issues their due". *Grand Projet* 7 thus presents opportunities for green growth through projects for thermal retrofitting and support for geothermal drilling, as well as the programme to encourage the installation of solar energy collectors and programmes for energy conversion of household wastes and biogas and green electricity production. As to *Grand Projet* 8 dealing with environmental issues, it focuses more on information, awareness raising and consultation than on green growth projects in the strict sense.

The importance attached to transportation in investment planned by the CPER is considerable (EUR 2.93 billion), and intended to modernise public transport (metro, RER and trams), so it does have a green dimension. These operations seem modest, however, compared to the Greater Paris Scheme (EUR 35 billion), even though that programme will be stretched out over a longer period. A major effort is devoted to higher education, research and innovation, but it focuses more on infrastructure without really addressing green innovation. Thus, although the CPER contains environmental projects, the amounts committed to them are low and are geared above all to information and awareness raising activities, except for programmes for reviving and increasing green energy production.

Private sector involvement is marginal and piecemeal

The fragmentation of public players is repeated among private players. In a typically continental context (Italy, Netherlands, Germany, Spain), restructuring of economic operators in Ile-de-France has been shaped in many respects by government intervention and can be characterised as corporatist and territorial (Lefèvre, 2009). In contrast with many English-speaking cities (London and New York, for example), the fabric of economic agents is not yet sufficiently restructured to make Paris a centre of global economic influence (Lefèvre, 2009). There is no established structure of large and very large companies to represent private players in Ile-de-France, such as one finds in London or New York. The economic players, such as chambers of commerce and employers' unions, operate largely on their own, apart from their possible association in a sector framework. In this respect the IDF stands in contrast to London and other big cities, where economic players are grouped in organisations such as the London Pride Partnership, which was created in 1994 and produced in 1995 the first strategic document, the London Development Partnership (CAS, 2010).

In contrast to London, Toronto or Chicago, where the private sector occupies an important place in the decision-making and institutional system, business involvement in Ile-de-France is weaker and most often confined to consultation by the national and local authorities. For example, the private sector had only an advisory role in the Grenelle process, just like that of the Regional Economic, Social and Environmental Council (CESER) in the IDF region. Moreover, this involvement is fragmented, and each public institution deals with the economic players in the territories it controls, through *ad hoc* structures, with or without a legal basis, and as a function of their own powers and responsibilities, within a

framework of formalised procedures for developing policies that explicitly require input from economic players. As a result, private sector involvement is fragmented and based on sectoral and territorial considerations without any real coordination or permanence.

In the pursuit of green growth, then, it is still difficult to enlist businesses in evaluating potentials and opportunities, defining a strategy, and financing and implementing it. Large and small firms alike have an inadequate role in the decision-making process. On one hand, they are not organised to express themselves clearly (and to set forth a common, cross-sectoral position for the region) and on the other hand the political and institutional world is not structured or equipped to listen to them – the allocation of roles and turf is unclear and there are no forums for consultation and exchanging views. Even more problematic than their fragmentation is the lack of dialogue among the structures, which are often in conflict. While these conflicts may be less visible today, and economic agents are more willing to make compromises, tensions are always simmering and no truly united voice has emerged (Gilli and Offner, 2009).

The organisation of economic agents in Ile-de-France results in a system based on organisations that have a monopoly of representation vis-à-vis the public authorities: the chambers of commerce and industry on one hand and the employers' unions on the other.[79] There are five chambers of commerce and industry (CCI) in the territory, covering one or several *départements* in the IDF, as well as the Regional Chamber of Paris-Ile-de-France (CRCI), which is a federation of local CCIs and has a very small budget. The employers' unions are dominated by the *Mouvement des Entreprises de France* (Medef) which traditionally speaks for big business and the *Confédération Générale des Petites et Moyennes Entreprises* (CGPME) which, as its name suggests, represents SMEs. These two groups are organised differently in functional and territorial terms: the Medef has a dual system comprising sector branches (older and more powerful) and territorial branches, while the CGPME is organised by *département*.

Conflicts between the chambers of commerce and the business associations have to do mainly with the chambers' monopoly for representing economic interests. The government has given the CCIs a monopoly on representing businesses with the public authorities. In Ile-de-France this situation sparked a revolt by some employers' organisations (including Medef) in the late 1990s, claiming that the CCIs did not represent them and in fact represented only themselves (Lefèvre, 2009).[80] There are also sharp and long-standing differences among the CCIs of Ile-de-France over the domination of the Chamber of Commerce and Industry of Paris and the underlying question of reforming the regions' CCIs.[81]

Over and above official bodies for private sector representations, private initiatives concerned with the green economy would gain from more regular inclusion in discussion and in the preparation and implementation of public policies. The association known as *Orée Entreprises, Territoires et Environnement*, for example, consists of around 80 firms of all sizes and from different sectors, local authorities and managers, professional and environmental associations, and academic and institutional bodies, for the purpose of engaging in common discussion on ideal environmental practices and implementing practical approaches to integrated environmental management at area level. Major industrial groups have begun to consider urban sustainable development issues, through foundations such as the Fondation Fondaterra (EDF, GDF Suez et Vinci Construction) or the Fondation d'Entreprise Bouygues

79. This structuring of economic operators can be contrasted with another widespread model, the Anglo-Saxon one (United Kingdom, Canada, United States, Scandinavian countries), where the chambers of commerce are merely voluntary business associations that represent only their members.

80. The Medef submitted its own contribution during negotiation of the State-Region Planning Contract 2000-2006, separate from those of the CCIs, and also demanded a seat in the discussion and consultation bodies.

81. One of the proposals from the Perben Commission report on metropolises in January 2008 was to establish a single regional chamber for Ile-de-France.

Immobilier (Observatoire de la Ville), while working groups have been organised as public/private partnerships in the property sector for example (Observatoire de l'immobilier d'entreprises en Ile-de-France (ORIE) and Observatoire Régional du Foncier (ORF), or in the planning sector (Club Ville-Aménagement)).

Towards a global and shared vision of the Paris-IDF metropolitan region

The preparation of a strategy for green growth could serve as a catalyst for a broader debate on the future of the metropolis, leading to consensus on the forms of governance that might emerge. To this end, a number of issues need to be addressed:

(i) *Reviving the debate on the "global city."* While big metropolitan centres such as London and New York have clearly decided to position themselves as global cities (Lefèvre, 2009), that is to say in competition, first of all economic, with other great world cities, Ile-de-France is far from presenting such a decided stance. The dichotomy between the vision focused on economic growth, and in particular its social content (number of jobs created, type of employment, fiscal benefits, etc.) and the environmental vision constitutes a challenge for defining a common strategy for green growth and deciding the instruments for implementation.

(ii) *Who will take the lead?* There are several public players – the central government, the region and the City of Paris, in particular – that lay claim to "leadership" of the Paris-IDF territory, and yet no clear leader or coalition of interests capable of assuming leadership has emerged. Consequently, it is difficult for the various territorial players to reach a coherent and shared vision of the region, especially with respect to green growth, and indeed few players can agree on the ideal positioning for the region.

(iii) *Involving socio-economic players, and business in particular, in the governance of the metropolitain region*. In the first place, the public/private relationship in the capital region needs to be reinvented. An important approach for consideration, to be examined in greater detail in the section on funding, concerns the possibility for firms to arrange for the integrated deployment of various urban services (such as water, waste disposal and the Internet) in calls for tender, in order to achieve inter-sectoral environmental synergies. Another strategy consists in offering participation that amounts to more than a simple advisory function.

(iv) *Selecting the form of governance best suited to meet the multiple and complex challenges that the metropolis must face*. Governance approaches and tools, in particular urban planning, will need to evolve. At the same time, the complexity of the problems facing the metropolis today demands a longer-term planning perspective. This could be achieved, perhaps, by creating informal structures and flexible cooperation platforms.

Paris, a global city

The question of the future of the IDF metropolis is complicated by differing conceptions of its place in globalisation. For most stakeholders, the IDF metropolis is above all to be viewed as in the process of globalisation, but there are some who resist this view and consider the national space – "Paris and the French desert", "Paris, capital of an economic and cultural empire" – as the only relevant benchmark, with no need to measure itself against others. The current backdrop to the governance system of the IDF region – the system of values – is not very conducive to a liberal vision of green growth. The conception of the relationships between politics and economics and that of the role of great cities in globalisation are the two main obstacles to implementing such a vision. On one hand, there are those who stress economic competition and the competitiveness of territories. Accepting economic globalisation and competition among world metropolises, this process is above all viewed as a constraint to which the metropolis must

submit and adapt. On the other hand are those for whom globalisation is synonymous with social inequalities and regional disparities, and who insist therefore that social and territorial cohesion must take precedence over all other objectives. For them, globalisation is something negative and the public authorities must develop policies to cushion its effects, particularly on the social front, and to prevent some territories from falling behind.

Accordingly, two competing planning strategies for the region were put forth in 2008: the Greater Paris Scheme, prepared by the central government, and the 2008 SDRIF proposal, championed by the region. While the strategies may not be incompatible at first glance (the law on Greater Paris calls for the construction of 70 000 homes, while the SDRIF proposes 60 000; both target modernisation of the public transport network with construction of a major metro line linking several suburban cities – although the scope of the two projects and the proposed routes are not consistent), their fundamental rationales are divergent. The central government proposal focuses on the region's competitiveness as a global city, while the 2008 SDRIF proposal places the emphasis on sustainable development and overall attractiveness based on the quality of life, with special attention paid to the issues of housing and social cohesion. The State vision relies on a proactive approach to economic development which recognises that the Paris-IDF region is not achieving its growth potential, mainly because the regional territory is not functioning well. In the 2008 SDRIF proposal, the economic strategy is less ambitious and is given secondary importance.

In this context, the fragmentation of players and their conflict-prone relations make it impossible today to move forward in evaluating potentials, defining a strategy, and financing and implementing it. To do so will require a shared vision of Paris as a world city, with clear objectives concerning training, innovation and infrastructure investment, and coordination among the different stakeholders around a concrete plan endowed with adequate financial means. This vision must go beyond an urban development plan to include economic and, above all, social aspects, all based on the principles of green growth. Only by developing synergies among these elements and among the different administrative layers and by involving the private sector more closely will Paris-IDF be able to lay full claim to the status of a globally influential metropolis. The region will also have to take more effective advantage of its innovation potential by addressing the lack of competitiveness, attractiveness and transparency.

Who will take the lead?

There are at least three players that can aspire to political leadership of the IDF metropolis – the central government, the Regional Council and the City of Paris – but none of them seems for the moment to have the geographic legitimacy, the political clout or the financial capacity to assume this role on its own.

- *The "great gamble" of central government*? With the establishment of a Secretariat of State for the Capital Region in March 2008, the central government is now thoroughly implicated in the future of the metropolis. This institution is supposed to implement a plan based on the economic competitiveness of the IDF region: the Greater Paris Scheme is the result, but a top-down approach alone cannot produce consensus.

- *The region?* Although the Regional Council represents the proper territorial level for managing the IDF region, it is in fact a politically and fiscally weak institution. A consensus seems to be emerging to the effect that the region has failed to seize the opportunity that presented itself at the end of the 1990s to play a more central role in the governance of Ile-de-France, and has not succeeded in rallying important stakeholders or creating lasting partnerships (Lefèvre, 2009).

- *The City of Paris?* As the centre of gravity of the IDF region, the City of Paris is an undeniably attractive zone but its confined territory limits its legitimacy at the regional level. Its political,

economic and symbolic importance far outweighs that of the other IDF communes and of the region. Despite attempts to foster a true metropolitan polycentrism, as envisioned in several proposals,[82] there are no other poles to counterbalance Paris. The City of Paris certainly has the power to take the lead in guiding the future of the metropolis, but Parisian leadership could obscure the specific concerns of other players at the local level. On the other hand, as the city covers only a tiny portion of the regional territory, it lacks standing to speak on behalf of the region. All the same, as will be discussed below, a recent experiment with metropolitan governance, *Paris Métropole*, launched at the initiative of the City of Paris, represents a promising option for governance of green growth across Ile-de-France

Beyond the question of leadership, the metropolis lacks discussion forums for building a common vision. Such forums and instruments have traditionally served several purposes. The first is to understand one another, to identify divergent or opposing interests, to debate and to exchange views. The second is to settle disputes that may emerge over decisions and policies. The third is to define common strategies, select priorities, and prepare policies. The last is to set the rules of the game, such as the distribution of roles between political and economic stakeholders. Although many organisations or procedures could perhaps fill such a role, it must be admitted that in Ile-de-France there is a shortage of formalised and legitimate forums for dialogue, settlement and mediation between political and economic players. Among existing organisations one may cite the ARD, the IAU, the STIF and the *Conseil Économique et Social Régional* (CESR). All these structures and "modalities" seem to have trouble when it comes to assessing disputes and fostering dialogue, probably because they are too closely linked to the institutions that control them and are thus party to the disputes that arise.

Paris Métropole may be an option in this regard, going beyond the move towards greater cooperation between the players, provided that it can develop, and represents a good example of innovation in governance in Ile-de-France. In 2003 the City of Paris proposed a dialogue with its near suburbs, and in 2006 the Metropolitan Conference was established as a forum for discussion and informal consultation among elected officials of the Paris region. This was followed by *Paris Métropole*, a study group (*syndicat d'études*) that today embraces 188 IDF communes as well as the *départements* and the Regional Council of Ile-de-France. *Paris Métropole* has its own budget and is independent of existing institutions. It is administered by a group of municipal officials, including a committee representing local authorities, an executive board (with a representative from the region, a representative of each of the member *départements*, and a representative of the City of Paris) and a president (elected annually by majority vote of the committee).

One may question whether this new form of inter-communal cooperation will lead to real change – it cannot, for example, apply the recommendations from its studies, or impose fiscal equalisation among its members, or institute a single business tax – but it is nonetheless an informal forum for discussion and seems at the moment to be rather successful, in an institutional landscape that is otherwise diffuse and contentious. In addition to participation by public players there is an alliance with a committee of partners, including representatives of *syndicats mixtes*, public agencies and establishments, businesses and associations. A partnership was recently established with the Chamber of Commerce of Paris. By bringing together multiple stakeholders, *Paris Métropole* could be an ideal forum for developing a vision for green growth in Ile-de-France.

Involving socio-economic stakeholders

In addressing the questions of leadership and political structure, the public/private relationship in Ile-de-France will certainly have to be rethought. An important step forward will be to reform the public

82. The SDRIF or the Greater Paris Scheme, for example.

procurement code, first to enable a variety of private sector representatives to be involved in public consultation to devise calls for tender and, secondly, to give firms the chance to reply in an integrated procedure involving deployment of several urban services (water, waste disposal, Internet, etc.) so as to submit broader better quality tenders. Section 8 will consider these approaches with special emphasis on the preconditions needed to ensure that processes remain both transparent and open to all (big groups and SMEs).

In addition, having an effective green growth strategy in place should make it possible to experiment with greater involvement of socio-economic stakeholders in metropolitan governance. Such involvement should go beyond a mere advisory role vis-à-vis the national and local authorities. This consultation, which at the moment is done in an *ad hoc* manner by various territorial institutions, would be more effective if it were organised within a central institution, as is the case in London with the London Business Board, a single structure for coordination with businesses. The example of Greater London shows that there are two key elements to any coherent coordination framework: a comprehensive system that will attract membership as well as an organisation capable of managing the system. One possible route would be to rely on forms of local governance that are emerging in the *pôles de compétitivité*. Another possibility, as proposed by the *Conseil d'Analyse Stratégique* (CAS) would be to go beyond the exclusively public leadership scheme so as to ensure that all stakeholders, regardless of their status, will be committed on the basis of equal rights and duties to the development of Greater Paris, with a deliberative body to set strategic guidelines and an executive unit to implement them (CAS, 2010).

Inventing new forms of governance

While creation of *Paris Métropole* is a first step towards the emergence of a new form of inclusive governance, a number of questions remain. *Paris Métropole* is successfully involving many local players and is working in partnership with private businesses (in particular the Chamber of Commerce); it has also been able to bring in elected officials from various political domains, and the City of Paris has strong leadership. But what is the concrete outlook for this new association? Could it have real legal and administrative powers that would allow it to oversee the different local strategies and facilitate coordination among local authorities? How should it position itself vis-à-vis the region?

Given the region's institutional complexity and the unique nature of the metropolis as a world city, it might be wiser to concentrate on innovative solutions for improving cooperation and coordination among public players, and to adapt the existing tools as a way of addressing all the challenges facing the metropolis. Contractual arrangements (between local authorities and between different levels (State – Region)) as well as cooperation agreements (which produced Paris Métropole) are good instruments for coordinating the initiatives taken by different players. Yet they do not always work very well in the capital region. There is a need to bring the communes together and develop a territorial approach to address institutional fragmentation and to achieve greater effectiveness by choosing the most appropriate territorial scale for implementing projects, particularly in the area of green growth (OECD, 2006).

There remains the problem of planning for Paris-IDF, as for all the world's great cities. A change of approaches and of tools would seem essential. Initially, the review of the SDRIF, now underway, could offer an opportunity to move in this direction. The approach in the strategic document for Greater London, a much more comprehensive regional planning document based on economic, ecological and social objectives that the various local authorities must respect and achieve, could serve as an example. In time, the planning tools will need to be simplified and made more flexible in order to arrive at a more systemic and crosscutting approach. Such a systemic approach will require evolution not only in planning instruments but also in fiscal tools, as well as among stakeholders and their capacity to work together. The ability to form a global and shared vision for the Paris-IDF region will be indispensable for addressing the set of economic, environmental and social challenges at the heart of such a broad and crosscutting issue as

green growth. It is a process that will require not only the involvement but also the coordination of all stakeholders.

Beyond instruments and structures there is the question of the proper scale of governance. The "living basin" or "employment basin" is clearly an appropriate scale of intervention. But forging a consensus at this scale begs the question of solidarity among territories and the need to develop fiscal equalisation mechanisms. Beyond the employment basin, a characteristic of world cities and mega-cities is that their zone of influence extends beyond their functional zone, and new forms of territory until now rarely studied are emerging and posing new governance issues. These territories may be called corridors or extended gateways, urban systems or urban clusters, and they usually involve a grouping of cities of different sizes that are well linked by transportation infrastructure. An example is the delta of the Pearl River, formed by nine cities of China plus Macau and Hong Kong; the Randstad, comprising Amsterdam, Rotterdam, The Hague and Utrecht; and the Rhine-Ruhr, an agglomeration of many cities along the Rhine and Ruhr rivers (OECD, 2010c). These territories often develop under the impetus of a deliberate policy to create a mega-region that is large and strong enough to compete internationally. This applies to the Chicago Tri-State Region or Stockholm Malar Region schemes.

In considerations of the economic, ecological, social and institutional future of the metropolitan region (*Grand Paris, Paris Métropole*) it has been suggested that metropolitan planning needs to be addressed from a broader perspective, that of the Seine Corridor linking the capital region to the sea and the ports of Le Havre and Rouen. Because of its crosscutting nature and the diversity of fields and stakeholders involved, green growth could in fact contribute to territorial coherence at this broader scale. The current complexity of the challenges and the ambitions of big urban territories such as the Paris-IDF region highlight the limitations of an institutional approach structured by administrative subdivisions. Economic markets cannot be carved up into administrative units but must be viewed from an international perspective. Then too, the development of many green areas, such as river and rail transport networks, logistics, renewable energies, organic farming and waste and water management, is best approached on a more comprehensive geographic scale. The Seine Corridor idea deserves to be brought into thinking about the future of the metropolitan region (Box 19).

Here again, to permit action on a larger scale, tools for coordination and cooperation will have to be invented. The governance of large urban spaces will have to take new and more flexible forms appropriate for integrating crosscutting issues (such as green growth) at a more relevant scale from the economic and ecological viewpoint. This may require the creation of informal structures and flexible cooperation platforms, seeking as far as possible to avoid cumbersome new institutional reforms ill-suited to the functioning of markets (OECD, 2011j).

Box 19. The Seine Corridor proposal

In the context of thinking about Greater Paris, a metropolitan planning approach focused on the Seine has been proposed, one that would link the capital region to the sea and the cities of Le Havre and Rouen. The Seine corridor is a vision that would forge a geographic identity and optimise management of passenger and freight traffic and urban and social services (waste, water supply, agriculture etc.). It strengthens the links between the Paris metropolitan area and neighbouring regions and their activities (in particular the port activities at Le Havre), which in turn would link the French capital to other major European cities and markets.

From a concentric to a linear metropolis. The spatial concept of the Seine corridor, linking the capital city to the sea, seeks to integrate problems of transportation, logistics and agriculture in a more rational manner. It involves a concept of "city-territory", which embraces the Ile-de-France region beyond its current administrative and functional limits. This broader scale will, on one hand, boost economic development through easier access to the sea and will improve the organisation of port logistics areas and create an opening to Europe, especially when combined with the Seine Northern Europe canal project, which could bring the Seine Valley into the European container traffic system (Apur, 2009). On the other hand, it opens the way to more environmentally friendly management of urban and social

services. Organic farming and proximity farming are key elements in the notion of a metropolis organised along the Seine, as are waste management, water supply, logistics and, above all, river and rail transport. At this broader scale, river transport for passengers and freight makes more sense.

Moving to action: a large-scale port project. As the next step, the scheme's three main cities launched a series of discussions on the structuring of the Seine Valley, following a relatively informal format (with no fixed administrative structure). An inaugural conference was held on 4 May 2010 to develop a common view of the region's future in terms of transportation, logistics, the environment and economic development. These ideas are being looked at in the context of studies on the emergence of a "Greater Paris", but they also reflect the willingness of the seaports to work with their hinterland. The model here is that of the Belgian and Dutch ports (the Extended Gateway of Antwerp, for example, mentioned earlier), which have succeeded in creating complete logistics branches in their surrounding regions. The objective is to create a network of multimodal clusters, logistics zones and inland ports where local economic players can develop and flourish (OECD, 2011j). In the context of green growth, these very concrete ambitions on the part of the three cities to develop their ports should nevertheless be made part of a broader, crosscutting approach that would allow other themes (in particular the ecology) to be integrated into a project of such scope.

Source: Apur (2009); OECD (2011j).

8. Financing: who pays for green?

Green growth in the Paris-IDF region will require major investments: greater and greener use will have to be made of available public resources (which are shrinking) and new sources of financing will have to be found. The central government and the region, with the "grand loan" and the regional co-investment fund, are both planning significant investments in green areas, and projects are already being implemented. Moreover there has been an explosion of fiscal tools, in the wake of Grenelle and the law on Greater Paris, that involves the greening of existing taxes as well as new instruments. Despite this, the various financing means available for greening the French economy are thinly scattered, and some important initiatives – such as implementing a carbon tax in France or an urban road toll in the Paris-IDF region – have since been abandoned. Given the financing challenges, it no longer seems realistic to limit the potential for private financing in major urban projects. Thought should be given to such alternatives as third-party investors, public-private partnerships, advance consultation and integrated tendering.

The limits of public resources

The three mechanisms of public finance for green growth are the "grand loan", the regional co-investment fund, and taxes.

(i) The "grand loan" programme has an "urban green growth" component under which it earmarks EUR 1 billion for sustainable cities, to be provided in the form of equity investments (60%) and grants (40%), and EUR 500 million for thermal upgrade of dwellings, in the form of grants. The first component, then, involves a State subsidy to the cities to finance innovative urban projects: carbon-free public transport, facilities to accommodate electric vehicles, housing that is energy-efficient and affordable to the poorest. Ten projects are to be selected, mainly among the 13 cities recognised as *eco-cités* by the Ministry of Ecology and Housing (including one in Ile-de-France, Plaine Commune in Seine-St.-Denis), which will share 75% of the funds. The second aspect, involving EUR 500 million for thermal retrofitting of social housing, will be provided by the National Housing Agency (ANAH) in the form of grants for insulation works. The ANAH must now negotiate partnerships with the *conseils généraux* to communicate the plan to the target populations in the *départements*.

Under the "grand loan" programme there are two other aspects that do not fall under "cities" but that have an urban dimension. Thus, EUR 3 billion is earmarked for investments in sustainable energies and the "circular" economy. The biggest slice of the envelope, EUR 1.35 billion, is earmarked for demonstration projects in renewable and low-carbon energies to help take innovations from the laboratory to the industrial

stage. Further upstream in the research process, EUR 1 billion will support the establishment of 5 to 10 low-carbon energy research institutes and universities. Through these institutes public and private laboratories and companies will be able to pool their resources to launch prototypes. Eligible technologies cover the full range of the green economy: solar, geothermal, marine energy, hydrogen, plant chemistry, fuel cells, reduction of greenhouse gas emissions, energy efficiency of buildings and transportation, etc. The funds will be allocated by the National Research Agency (ANR) in the form of capital endowments.

From the urban green growth perspective, two features predominate. First, the green policies of the central government tend to put French cities in competition for funding rather than to promote cooperation and pooling. Second, the government does not choose "champions" on which to focus its efforts, either between sectors or between technologies.

(ii) At the regional level, Ile-de-France launched a co-investment fund in 2011 to finance innovative SMEs, particularly in eco-industries. This fund will have EUR 6 million, financed equally by the region and the European Union. It will give priority to SMEs seeking initial financing and will offer them an equity investment ranging from EUR 50 000 to EUR 1 million per SME so that they can quickly build up their capital. The regional fund's support is not to exceed nine years. Participating SMEs will also receive coaching. The region hopes to bring the fund to an investment capacity of EUR 250 million.

(iii) Local taxes are the third method of financing green growth: this involves the greening of existing taxes and the introduction of new mechanisms. The *Grenelle 2* law calls for mobilising a very broad range of financial and fiscal instruments. Many already exist – what the law does is to make it possible to modulate those instruments in the light of environmental objectives. Examples are the annual storm sewer tax and household refuse collection fees, which could be modulated in the light of environmental criteria, or the establishment of new services related to energy savings, the production of new energies, or pollution abatement. However, environmental tax revenue represented only 2.2% of GDP in France in 2007, which was one of the lowest levels in Europe: only Belgium, Spain and Greece levied less environment tax as a percentage of GDP (OECD, 2011g).

New fiscal instruments have also been introduced to facilitate the financing of public transport and to encourage urban renewal and densification. Following the examples of Singapore, Stockholm and London, which have instituted urban road tolls to help finance public transport, article 64 of the *Grenelle 2* law authorises urban road tolls for the first time in France.[83] Cities of more than 300 000 inhabitants that have an approved urban mobility plan calling for public transport development on exclusive rights-of-way will be able (on an experimental basis) to impose road tolls to improve local air quality or reduce greenhouse gas emissions.[84] Another major innovation allows the urban transport authorities to impose a levy on property value increases generated by the construction of public transport infrastructure with exclusive right-of-way. Lastly, another article of the urban development code has been introduced to penalise "under-density", setting a threshold beneath which delivery of a building permit gives rise to a special charge. This charge is applicable in particular to districts close to existing or planned public transport systems. This point has been taken up in the law on Greater Paris.

At the present time, the record on introduction of these fiscal measures is mixed. As regards urban road tolls, this option was discarded after sharp political debate over the social acceptability of such a measure, with some arguing that a toll would penalise suburban residents who have no adequate public transport alternative – yet another reason for expanding the mass transportation network. Conclusions drawn from the experience of OECD countries with political and economic aspects of a congestion charge

83. More precisely, it provides for "taxing trips made by motor vehicles in order to limit automobile traffic and combat pollution and environmental nuisances".

84. This provision is awaiting its application decree.

might be instructive for France (Box 20). Other options could be envisaged, such as parking fees tied to the level of demand for parking in town (the greater the demand, the higher the fee), with which several American cities (*e.g.* San Francisco and Los Angeles) are experimenting. Toll motorways could also introduce variable demand-related tolls, with Ile-de-France selected as an area for testing the proposal.

Box 20. Political and economic aspects of congestion charges: an appraisal of experience

Transport congestion, especially in the case of road transport, has consequences that may be offset by a green growth strategy. According to a UK Ministry of Transport White Paper entitled *Creating Growth, Cutting Carbon* (Department of Transport, 2011), delays caused by congestion result in an annual GBP 11 billion loss in urban savings, while carbon emissions cost the community up to GBP 4 billion annually and health costs may reach GBP 25 billion.

The economic data studied by the International Transport Forum (ITF, 2010) support the case for use of charges to offset congestion. From the political and economic angle, lessons learnt from tolling in London, Stockholm and Singapore, and pricing based on tolls on some motorways in the United States could be useful in devising green growth policies in other sectors. Reasons for abolishing national congestion charge schemes in the United Kingdom and the Netherlands are also highly instructive.

The main lessons to be learnt may be summarised as follows:

- Congestion charge systems are only justifiable if congestion is really substantial and, even then, considerable effort should be invested in ensuring that the public are sufficiently aware of the problem before implementing the scheme.
- While congestion charges may generate considerable revenue, systems are also expensive to operate, with running costs generally amounting to 10-30% of that revenue.
- A non-committal attitude to revenue may seem necessary to gain the support of taxpayers and political consent, but it limits the room for manoeuvre of the public authorities. The example of London shows that transparency and control of how revenue is used are just as important in securing acceptance of these systems.
- There should be no mistake about what is intended. Less expensive ways of generating revenue and protecting the environment exist. Congestion charges are only enforceable if congestion is a problem for the whole country. If the main aim is to achieve fairer road taxation, for example by levying the same charge on use of foreign heavy goods vehicles as in the case of local ones, or replacing a national tax which poses problems of tax competition with neighbouring countries, other more cost-effective solutions probably exist.
- The price fixed at the outset should not be too low, as otherwise congestion charges would be ineffectual and so fail to gain the necessary support. Furthermore, it would create the impression that the real aim was to raise revenue.
- Securing acceptance of the charges may mean giving up some of the benefits of a notionally ideal system.
- Less ambitious schemes such as cordon pricing or value-based pricing may yield satisfactory results.
- As regards changes in pricing, systems that adhere to a rule (for example keeping traffic at a predetermined speed, as in Singapore, or dynamic pricing on the I-15 San Diego motorway) are apparently viewed more favourably than those dependent on a political decision, meaning the periodic approval of elected representatives for the level of toll charges and increases in them.
- While related benefits, such as a decrease in effects on the environment, may sometimes have an impact on the price as fixed and should always be taken into account in evaluations, they are not the main aim of congestion charge arrangements. Highlighting the reduction in CO_2 emissions as an argument in defence of tolling might carry little weight.

Source: ITF (2010), "Implementing Congestion Charges", Working Document No. 2011-02, ITF, OECD, Paris; and Department for Transport (2011), "Creating Growth, Cutting Carbon: Making Sustainable Local Transport Happen", Local Transport White Paper, London, in OECD (2011a), *Towards Green Growth*, OECD, Paris.

The law on Greater Paris introduces the possibility of taxing the appreciation in the value of undeveloped lots and buildings resulting from public transport development on exclusive rights-of-way. The aim of that tax is to have the property owner share in the costs of public infrastructure that enhances the value of the property. However, implementation will be a complex matter, given the great volume of infrastructure concerned, and there are bound to be practical problems in assessing and collecting the tax. Lastly, the "under-density" charge is an attractive idea, in spite of the difficulties involved in applying it. It could have the perverse effect of assigning a fiscal objective to an urban planning document. In communes where the real estate market is tight, the authorities could be tempted to set the density threshold low in order to wring more revenues from the charge. The government could get round this by introducing a minimum density threshold. At the present time, practical implementation of this provision is difficult. As discussed earlier, the mayors are not very receptive to this objective in the face of demands from developers and future purchasers.

Generally speaking, introduction of these new fiscal measures raises a number of questions. A fiscal measure serves objectives of several kinds, relating not only to revenue but also to distributional equity and economic incentives. No single mechanism can achieve all these objectives at once. Thus, the greening of taxation will not always coincide with revenue concerns. Moreover, ecological objectives and urban planning goals are not always compatible, making the ecological adaptation of taxes difficult. Without being exhaustive, the Grenelle law proposes merit-rating systems based on the energy characteristics of construction, the granting of supplementary densities, etc. Such provisions can be effective for encouraging desired behaviour, but they have to be carefully calibrated in advance. The case of the *bonus-malus écologique* (ecological merit rating) instituted by the government in 2008 to encourage the purchase of less-polluting vehicles[85] is an illustration in point. An ongoing study (D'Haultfoeuille, *et al.*, 2011) found that, while there was a spectacular shift to vehicles benefiting from the bonus, the environmental impact of the policy was negative in that the reform clearly boosted sales and thus emissions linked to the production and circulation of these new vehicles.

Finally, there are two urban land taxes that could be better used by the authorities as incentives for densification and urban renewal: local taxation on building lots and taxation of capital gains by the central government.

a/ Building lots in France are subject to an annual property tax on vacant lots, the TFPNB, which is assessed on the registered rental value of lands and paid annually by the owner. This was in fact the very first tax created in France: it was imposed in the mid-19th century, once the land registry was completed. It should be the ideal tax for encouraging densification, sustainable use of land and effective implementation of urban planning documents, particularly the local plans. Given real estate prices in the Paris-IDF region, one can imagine that this tax should be an important revenue source, and that it can be modulated as an incentive to encourage one land use or another.[86] Yet this is not the case, as building lots in the sense of urban planning documents are classed for taxation purposes as *friche* (essentially, wasteland) and thus pay very low taxes. In total, the TFPNB represents less than 1% of local tax revenues. In other words, it does not represent a strategic element in local financial management; worse, from a green growth perspective, its very low level makes it a counter-incentive in terms of the objectives of urban planning documents, as building lots pay practically no tax, the effective tax rate being usually below 0.5%. This anomaly has been

85. The least-polluting vehicles benefit from a reduction at purchase running to as much as EUR 1 000, while the "dirtiest" ones are subject to a tax of EUR 2 600.

86. However, this is hardly the case, for property taxation was designed primarily as a tax on agricultural land, and was therefore based more or less on productivity value. Building lots, which are a residual category in the French taxation system, are thus largely excluded.

mentioned regularly in various official reports, but the complexity of local taxation reform has conspired against rectifying it. It is an interesting tax that the public authorities might do well to consider.

b/ The taxation of capital gains, in particular those from property and real estate, was introduced in France in the mid-1970s. The tax is imposed on the capital gains realised when a property is sold for a price higher than what was paid to purchase it. In France, this tax is historically complicated and relatively unproductive for two main reasons, the first being its political sensitivity and the second its technical nature (which often leads to multiple exemptions), including the rules for calculating appreciation, and the impact of the duration of ownership.[87] The amendment of this regime in September 2011 made it simpler to enforce, although it did not turn it into a real incentive for urban renewal and hence for achieving green growth objectives. Until then, the property taxation regime took account of the duration of ownership of the asset, land in particular, on the assumption that speculative intentions diminish with length of ownership. Appreciation was therefore no longer taxed after 15 years of ownership. Such a system clearly encouraged owners to hold onto land, contrary to the intention of urban development plans to mobilise building lots, and contrary as well to objectives for redeveloping sites and fostering urban regeneration. This system was amended by deleting the progressive reductions, restoring a fixed rate of 31.3% (19% as income tax and 12.3% as social charges) regardless of length of ownership.[88] This might be considered a measure for simplifying and "normalising" this fiscal tool, but it is not enough to make it a real incentive for urban renewal. There is clearly a problem here of reconciling the objective of distributional equity with that of encouraging urban renewal. One possible way of making the measure more sustainable and effective might be to enforce it solely if the period between purchase and sale was longer than a given length of time, which would enable incentives for urban renewal to be created.

The capacity for public funding of green growth is however a significant concern in the IDF region, given the current context of shrinking local finances in France and the uncertainty over future resources of municipalities, which as in most OECD countries are having to "do more with less". Local authorities account for more than 70% of public civil investment nationwide, and the stakes are thus considerable. In enforcing the budgetary stringency that followed the crisis, the government froze overall operating grants, the most important transfers from central to local government, at their 2010 level until 2013 (OECD, 2011g). This measure wrecked havoc among the communes, which had to struggle as well with the elimination in 2010 of the *taxe professionnelle* (local business tax), one of their major sources of financing (19% of revenues in 2008).[89] The gap between steadily rising expenses, on one hand, and declining fiscal revenues and stagnating, or even falling, transfers from the central government, which is itself facing lower revenues, is likely to leave many *départements* and *intercommunalités* with very little manoeuvring room. In addition, uncertainties remain over the reform of local finances (equalisation, the "urban solidarity grant", the future of the FCTVA), and this could put a damper on local government investment (OECD, 2011g). In these circumstances, greater involvement of the private sector and particularly the banks seems indispensable.

87. These points are particularly important in markets that are becoming increasingly volatile. Above all, the fiscal tool needs to be resistant to cyclical fluctuations.

88. See Service-publique.fr (2011): *http://vosdroits.service-public.fr/F10864.xhtml*

89. The *taxe professionnelle* was eliminated on 1 January 2010 in order not to penalise business investment. Since 2010, companies have been subject to the "territorial economic contribution" (CET) which comprises a portion payable on property and a portion payable on value added. Network businesses are also liable for a flat tax. In 2010, the government started collecting these new taxes and paying compensation to local governments to replace the *taxe professionnelle* proceeds. The proceeds of these taxes will be received by local governments beginning in 2011. With this reform, the entire architecture of local taxation, and in particular the distribution of taxes among local authorities, has been revised, even though the *taxe professionnelle* had already undergone various prior reforms, all of which tended to limit its "local" nature.

How to involve the private sector?

Transforming the constraints imposed by more exacting environmental regulations into commercial opportunities is one of the key challenges for the private sector in the context of green growth. Companies in Ile-de-France, particularly the larger ones, seem to have built the constraints of sustainable development into their business models, their product offerings and their hiring practices with a view to ensuring new in-house competencies.[90] These new constraints are in fact sources of new markets, especially as they allow French businesses to differentiate themselves from their competitors in international markets.

The problem lies, then, not in the appetite of companies for new business models or the availability of clean technologies but rather in the returns to be had from these new markets. As the demonstration effect has its limits, incentives will be necessary. The private sector is calling for financial assistance for overcoming market constraints, as the returns on investment in this sector are still too far off and uncertain. This is particularly true in the building insulation sector. While corporate landlords and public authorities have made a start at the works needed to comply with Grenelle, this is not the case with individual owners or private condominiums. In such an uncertain climate, risk-taking has to be shared, naturally enough among public players in partnership with private operators, but also for the banks whose support appears desirable.

One way to enhance the attractiveness of these new markets created by the environmental constraint might be to call upon so-called "energy service companies" (ESCO), which are specialists in the energy-savings business and offer a broad range of energy solutions. An ESCO will conduct an in-depth analysis of the premises, design and implement solutions and keep the system in place to ensure that the energy savings continue for the life of the contract with its client. The savings in energy costs are then used to repay the ESCO's investment over a period ranging from 5 to 20 years. In Ile-de-France, some companies are already active in this market, including a subsidiary of GDF-Suez, which is involved in projects to supply 100%-renewable energy to *eco-quartiers* (Limeil-Brévennes in Val-de-Marne) and is working with the central government on thermal upgrades to public institutions such as hospitals, universities and prisons. The City of Berlin has taken the initiative to work with an ESCO within a housing rehabilitation programme which since the 1990s has led to the renovation of around one-third of the city's residential buildings (Box 21).

Box 21. How an ESCO is promoting thermal upgrading in Berlin

The city of Berlin has worked with the German public investment bank *Kreditanstalt für Wiederaufbau* (KfW), the main financial institution in Germany which is funding the thermal upgrading, and with the Investionsbank Berlin so as to provide private owners, tenants and housing corporations with access to loans for the upgrading. Since 1991, over EUR 4 billion have been invested in such upgrading, resulting in savings of almost 631 000 tonnes of CO_2 each year (City of Berlin, 2011). These loans are normally repaid by increasing rents to an 11% limit, a model particularly well suited to Berlin in which much of the housing stock consists of rented flats, the proportion of which is greater than in other German cities. The higher rent for renovated dwellings is offset by savings achieved by tenants in their electricity and heating bills. The net result of these various KfW programmes since the beginning of the 1990s is that one-third of Berlin's residential buildings have been renovated, including 273 000 prefabricated flats, in which energy consumption has been cut by 50% (City of Berlin, 2011).

Source: City of Berlin (2011), Protection du Climat à Berlin, Senatsverwaltung für Gesundheit, Umwelt und Verbraucherschutz, Berlin.

Another route is the public-private partnership (PPP), which allows for private cofinancing on the basis of an effective sharing of financing and risks. The Paris experiment with Vélib', launched in 2007,

90. This point was stressed by representatives of large companies during the interviews.

followed by Autolib', is a good example. Infrastructure and operations are entirely financed by the private concessionaire (JCDecaux), which is remunerated through advertising on public billboards (24 000 bicycles, 1 740 stations). Although the system was a great success in the eyes of many citizens, the terms of the contract between the City of Paris and the operator had to be revised along the way because operating costs had been underestimated (due to higher-than-anticipated rates of vandalism). At the outset the risk was supposed to lie with the private sector, but it appears that the authorities did not assess those risks very well. Nevertheless, this experiment seems to have influenced the city in its negotiations concerning Autolib', an arrangement involving electric vehicles which will come into effect at the end of 2011, on a self-service basis with a perimeter comprising the communes surrounding Paris. The *syndicat mixte Autolib'*, which embraces the City of Paris and neighbouring communes, will share in the initial investment (EUR 35 million out of a total budget of EUR 200 million) but the bulk of the budget, including operating costs, will be borne by the concessionaire (Bolloré).[91] In the United Kingdom, the "Green Deal" is an interesting case, as the initial investment costs are covered by private financing rather than by the public sector (Box 22).

Box 22. Private financing of Britain's Green Deal

The Green Deal is a new approach by the British government for financing energy efficiency measures, slated to be in place by the end of 2012. The principle of the Green Deal is a financing mechanism that allows homeowners and businesses to pay for energy efficiency upgrades through their energy bills. The improvement works can be performed at no upfront cost and will be repaid over time, through a charge on the customer's energy bill, as the savings from greater energy efficiency materialise. The amount of savings is estimated by a certified firm before the works begin and invoiced by the energy distribution company after the works are completed. The customer will then pay for the totality of the works over a period determined in light of the cost of the works and the potential savings from reduced energy consumption. The customer is protected by the "golden rule", according to which charges to repay the cost of the works must never exceed the savings achieved from the energy efficiency measures. The entire repayment obligation is tied to the property and to the savings achieved: if the customer sells or moves out, the obligation is passed on to the new owner or occupant.

Other approaches include the possibility of issuing integrated calls for proposals covering, for example, water, heating, electricity (building and electric vehicle), waste and Internet services to improve both the environmental effectiveness of each and all sectors, and enhance constructive environmental interaction between them. That could result in mobilising specifically urban reservoirs of green growth. A first way forward lies with private interests and relates to their individual diversification strategy. However, it runs the risk of bolstering local private monopolies encompassing the various services concerned with green growth. A second approach involves devising procurement contract calls for proposals on a multi-sectoral basis. This would be an incentive for firms specialising in a given sector to coordinate their proposals by signing up for an integrated green growth project. Such processes would of course have to be officially recognised in the procurement contract code, and encourage the inclusion in them of SMEs. It is also clear that there will need to be evolution in planning capacities and approaches, regulation and control of concessionaires by local authorities.

Lastly, given the magnitude of the challenges in all green fields and in particular in the building and transport sectors, the economic model will have to evolve. In Ile-de-France, this would imply, among other things, a shift in the relationships between the public and private spheres. Some cities have already adopted innovative solutions for integrating private financing into urban projects, as exemplified by the City of Toronto in the context of the "Mayor's Tower Renewal" programme. In order to finance thermal upgrading by means of private resources, the city is awaiting a regulatory amendment, so that it can process loans for

91. See *http://lexpansion.lexpress.fr/entreprise/pourquoi-bollore-a-tout-fait-pour-remporter-autolib_245470.html.*

owners wishing to upgrade in the same way as land taxes, and thereby recover them without resorting to conventional financial mechanisms akin to mortgages (Box 23).

Box 23. Financing innovations: The Mayor's Tower Renewal programme in Toronto

In Canada, as in most common-law countries, property taxes are attached to the real estate itself and, in contrast to mortgage loans and other private instruments, they do not need to be registered with a deed pledging the building as collateral. They are collected, in case of default, either through the courts, involving forced sale of the property, or in the normal process of property purchase and sale. For an obligation to be subsumed under property tax enforcement, it must relate to a municipal tax or, in certain circumstances, another charge levied by the city or one of its agencies.

In order to finance an ambitious programme of energy efficiency renovations for existing blocks of flats, through use of private sector resources, the City of Toronto has created a public agency to lend private owners the money needed for the renovations. The funding for that agency is raised on the bond market. Subject to regulatory amendments now in process (following the example of Melbourne, Australia), the obligations to repay the agency's loans will be treated as property taxes, and can therefore be recovered without the use of financial instruments of the mortgage type. From the municipality's viewpoint, then, the project is privately financed (through the bond market), and from the property owners' perspective, the renovation works will be financed without impinging on their ability to use their property as financial collateral, as the obligations are attached solely to the building in case of default or sale.

Source: City of Toronto (2011), Tower Renewal, City of Toronto website, *www.toronto.ca/tower_renewal/about.htm*, accessed on 3 November 2011.

Evaluating the prospects for green growth

The green economy has developed at a time of economic crisis. The question of funding actions in support of green growth thus means undertaking an assessment of the opportunity costs of green investment. This raises the question of whether decisions to steer funding towards such investment might compromise the ability to fund other types of investment. The green economy is often reliant on higher capital investment, whereas income is harder to predict as in the case of the green car or building insulation markets. In both cases, market growth hinges on certainty among buyers that they can recover their costs through decreased energy expenditure, within a reasonable period of time. The profitability of the undertaking is not dependent solely on market growth and demand, but also on the technology which must be optimally effective in cost terms. It is thus vital to develop quickly accessible and reliable means of comparison for assessing, quantifying and comparing costs and profits in terms of carbon reductions, as well as in financial terms consistent with the various technical and business processes. One of the most important questions facing the IDF region concerning the cost-effectiveness of different environmental measures is that of the cost/benefit ratio of demolition and rehabilitation, especially in the case of older properties that are the hardest to insulate. While one might readily assume that the oldest buildings are too expensive to renovate, in-depth cost-benefit analysis has revealed that insulation resulting in energy savings is the most effective measure in cost terms.[92] More should also be done to improve public awareness of the various options for converting buildings to green.

At the macro-economic level, full benefit can only be derived from an opportunity cost assessment for green growth by also taking into account the possibility of a zero-sum game at the territorial level, meaning that some areas may be winners and others losers. There has been extensive research to estimate the potential losses that might be recorded in carbon-intensive sectors through promoting the growth of new green sectors (see the research on the repercussions of mitigation measures for employment: Kammen, Kapadia and Fripp (2004), Pearce and Stilwel (2008) and IEA (2009)). By contrast, very few studies have been carried out at the territorial level. Yet the economy of a region may experience adverse effects as a

92. See, for example, Power (2008), who in detail argues the case for renovation.

result of a green growth strategy implemented in another region. There are many examples of green policies introduced in an area which have a beneficial environmental impact locally, but which in reality derive from the consumption of fossil fuels elsewhere. The case of scooters at Hangzhou in China is instructive. While the city gains from the presence of countless electrical two-wheeled vehicles which are noiseless and cause less pollution in terms of local CO_2 emissions, they are nonetheless vehicles powered by electricity produced in one of the many coal power plants away from the city.[93] Indeed, the only outcome is that most of the pollution and the majority of the CO_2 emissions are shifted to around the production plant sites (Barré and Mérenne-Schoumaker (2011)). The public authorities should thus pay close attention to the scale of these "crowding-out" effects and establish means of compensation.

93. Coal combustion accounts for 55% of electricity in the Chinese grid. Furthermore, between 2005 and 2008, China brought into operation one 1 000-MWe coal power station a week (see Barré and Mérenne-Schoumaker (2011)).

BIBLIOGRAPHY

Ademe (Agence de l'environnement et de la maItrise de l'énergie) (2005), *La géothermie en Ile-de-France*, Ademe, Paris.

Ademe (2009), *Marchés, emplois et enjeu énergétique des activités liées aux énergies renouvelables et à l'efficacité énergétique,* Ademe, Paris.

Ademe/Arene (2010), *Tableau de bord de l'énergie en Ile-de-France 2010,* Arene, Paris. www.areneidf.org/medias/publications/tableau_de_bord_de_lenergie_en_ile_de_france.pdf

Aéroports de Paris (2010), *Réduction des émissions de CO_2. Les actions d'Aéroports de Paris*, Dossier de presse, 6 décembre 2010, *www.aeroportsdeparis.fr/ADP/Resources/0a5aa274-d288-4e12-9b8f-5000b893dae4-DPReductiondesemissionsC02.pdf*.

Agence Bio (2010a), *Chiffres Clés - Ile-de-France,* Agence Bio, Montreuil-sous-Bois.

Agence Bio (2010b), *Dynamique de développement de l'agriculture biologique en France*, Agence Bio, Montreuil-sous-Bois.

Agence Bio (2011), *Bio par région*, Agence Bio, Montreuil-sous-Bois.

Agence de l'Eau Seine Normandie (2004), *La consommation d'eau distribuée en Ile-de-France*, website of l'Agence de l'Eau Seine Normandie, *www.eau-seine-normandie.fr/fileadmin/mediatheque/Fiches_Etudes/fiches/gest/00gest1.htm*, accessed on 3 November 2011.

Agence de l'Eau Seine Normandie (2009), *Du bassin de la seine et des cours d'eau côtiers normands*, Le SGADE 2010-2015, *www.eau-seine-normandie.fr/fileadmin/mediatheque/Politique_de_leau/SDAGE2010/Schema_Directeur_d_Amenagement_et_de_Gestion_des_Eaux.pdf*.

Agence Eau Seine Normandie (2011), *Consommation en eau*, website of l'Agence de l'Eau Seine Normandie, *www.eau-seine-normandie.fr/index.php?id=2570*, accessed on 3 November 2011.

AGF (Alimentation Gouvernement France) (2011b), *Agriculture Biologique. Horizon 2012*, Ministère de l'Agriculture, de l'Alimentation, de la Pêche, de la Ruralité et de l'Aménagement du territoire, Paris.

Agreste (2011), *Donnés Ile-de-France,* Agreste IDF n° 109, Ministère de l'Agriculture, de l'alimentation, de la pêche, de la ruralité et de l'aménagement territoriale, Paris.

Ajmone Marsan, G. and A. Primi (forthcoming), *Collaborate to innovate? Variety in regional co-inventorship networks: stylized facts from the OECD REGPAT database*, OECD Regional Development Working Papers, OECD, Paris.

Apur (Atelier parisien d'urbanisme) (2009), *Une petite synthèse du Grand Pari(s)*, Editions Apur, Paris.

Arene (Agence Régionale de l'Environnement et des Nouvelles Energies en Ile-de-France) (2005), *Les filières éco-industrielles préventives. Quelle stratégie d'action en Ile-de-France ?*, Etude exploratoire, Arene, Paris.

Arene (2005), *Production d'énergie par incinération des déchets*, website of Arène, *www.areneidf.fr/fr/Production-denergie-par-incineration-des-dechets-513.html,* accessed on 3 November 2011.

Arene (2006), *Étude prospective sur le développement des activités et des emplois dans les secteurs de l'efficacité énergétique et des énergies renouvelables en Ile-de-France*, Arene, Paris.

Arene (2007), *Diagnostic et perspectives de développement des activités et des emplois dans les secteurs de l'efficacité énergétique et des énergies renouvelables en Ile-de-France*, Arene, Paris.

Arene (2010), *Le solaire photovoltaïque en région Ile-de-France : une filière en pleine expansion*, Arene, Paris.

Arene (2011), *Bilan de valorisation énergétique des déchets en Ile-de-France*, website of Arène, *www.areneidf.org/fr/Bilan-de-la-valorisation-energetique-des-dechets-en-Ile-de-France-514.html*, accessed on 25 August 2011.

Arene (2011a), *Le solaire thermique*, website of Arène, *www.areneidf.org/fr/Le-solaire-thermique-94.html*, accessed on 3 November 2011.

Arene (2011b), *La filière bois*, website of Arène, *www.areneidf.org/fr/La_filiere_bois-91.html*, accessed on 3 November 2011.

Arene (2011c), *L'énergie éolienne,* website of Arène, *www.areneidf.org/fr/Leolien-93.html*, accessed on 3 November 2011.

Barré, B. and B. Mérenne-Schoumaker (2011), *Atlas des énergies mondiales. Un développement équitable et propre est-il possible ?* Editions Autrement, Paris.

BEIDF (Biomasse Énergie IDF) (2011), *Collectivités et Entreprises, la biomasse énergie un atout*, website of Biomasse Énergie IDF, *www.biomasseenergieidf.org/collectivites-et-entreprises*, accessed on 3 November 2011.

Better Buildings Partnership (2011), *Cutting CO_2 in commercial property*, website of Better Buildings Partnership, *www.betterbuildingspartnership.co.uk/*, accessed on 3 November 2011.

CAS (Centre d'analyse stratégique) (2010), *Gouvernance du Grand Paris : quels schémas institutionnels?*, site Internet du Premier Ministre, Centre d'analyse stratégique, *www.strategie.gouv.fr/content/note-de-veille-n%C2%B0-168-mars-2010-analyse-gouvernance-du-grand-paris-quels-schemas-institution*, accessed on 3 November 2011.

CESER (Conseil économique social et environnemental régional d'Ile-de-France) (2011), *Le rôle du CESER*, website of CESER, *www.cesr-Ile-de-France.fr/Institution/Default.aspx*, accessed on 3 November 2011.

CGDD (Commissariat Général au Développement Durable) (2010), *Les filières industrielles stratégiques de l'économie verte*, Ministère de l'Ecologie, de l'Energie, du Développement durable et de la Mer, Paris.

CGDD (2011a), "Etude d'impact de la loi programme pour la mise en œuvre du Grenelle de l'environnement", presentation by Olivier Teissier at the OECD, 27 April 2011, La Défense, Paris.

CGDD (2011b), *Projets de R&D dans les pôles de compétitivité : une sensibilisation croissante au développement durable*, Le point sur, n°77, mars 2011, Ministère de l'Ecologie du Développement durable, des Transports et du Logement, Direction de la recherche et de l'innovation, Paris.

Chambagri (Chambre d'Agriculture d'Ile-de-France) (2011), *L'agriculture en Ile-de-*France, website of Chambagri, *www.ile-de-france.chambagri.fr/index.php?page=territoire#a3*, accessed on 3 November 2011.

Chambre de commerce et d'industrie de Paris (2011), website of Chambre de commerce et d'industrie de Paris, *www.ccip.fr/soutenir-les-eco-activites-un-enjeu-capital-pour-l-Ile-de-France*, accessed on 3 November 2011.

Charbit, C. (2011), "Governance of Public Policies in Decentralised Contexts: The Multi-level Approach", *OECD Regional Development Working Papers*, 2011/04, OECD, Paris.

CIRED (Centre International de Recherche sur l'Environnement et le Développement, CNRS) (2010), *Impact sur l'emploi de la réduction des émissions de CO_2 en Ile-de-France*, CIRED, Nogent-sur-Marne Cedex.

City of Berlin (2011), Protection du Climat à Berlin, Senatsverwaltung für Gesundheit, Umwelt und Verbraucherschutz, Berlin.

City of London (2010), *RE:FIT, London's building retrofit programme,* Mayor of London, London Development Agency, London.

City of London (2011a), *RE:NEW – Homes Energy Efficiency for Tomorrow*, website of London Development Agency, *www.lda.gov.uk/projects/renew/index.aspx*, accessed on 3 November 2011.

City of London (2011b), *RE:FIT*, website of London Development Agency, *www.lda.gov.uk/projects/refit/*, accessed on 3 November 2011.

City of Toronto (2010), *Tower Renewal Financing Options Report*, *www.toronto.ca/city_manager/pdf/tr_financing_options_report.pdf.*

City of Toronto (2011), *Tower Renewal*, website of City of Toronto, *www.toronto.ca/tower_renewal/about.htm*, accessed on 3 November 2011.

CMC/JARC (Chicago Manufacturing Center / Jane Addams Research Corporation) (2009), *Renewable Energy Supplier Manufacturing in the Chicago Region*, Chicago Manufacturing Center, Jane Addams Resource Corporation and IEPA, Illinois.

Conseil Général des Yvelines (2009), *Le plan d'appui à la filière automobile dans le département des Yvelines*, Conseil Général des Yvelines, Versailles.

Cour des Comptes (2010), Les *transports ferroviaires régionaux en Ile-de-France*, Synthèse du Rapport public thématique, Cour des comptes, Paris. *www.ccomptes.fr/fr/CC/documents/Syntheses/Synthese_rapport_transports_ferroviaires_regionaux_Ile_de_France_17112010.pdf.*

CRIDF (Conseil régional d'Ile-de-France) (2008), *Plan régional pour la relance de la géothermie en IDF dans l'habitat et le tertiaire sur la période 2008 – 2013*, CRIDF, Paris. DATAR (2010), *Compte rendu du Comité Interministériel d'aménagement et de développement du territoire (CIADT)*, DATAR, Paris.

DATAR (2010), *Les Indicateurs du développement durable 2010*, Observatoire des territoires de la DATAR, Paris.

Department for Transport (2011), "Creating Growth, Cutting Carbon: Making Sustainable Local Transport Happen", Local Transport White Paper, London. *www2.dft.gov.uk/pgr/regional/sustainabletransport/pdf/whitepaper.pdf.*

D'Haultfoeuille, X. *et al.* (2011), "The Environmental Effect of Green Taxation: the Case of the French 'Bonus/Malus'", Document de travail de la Direction des Etudes et Synthèses Economiques, G 2011 /14, Insee, Paris.

Direction générale des collectivités locales (2011), *Cartographie 2011*, Ministère de l'Intérieure d'Outre-mer des Collectivités Territoriales et de l'Immigration, website of Ministre de l'Intérieur, de l'outre-mer, des collectivités territoriales et de l'immigration, *www.dgcl.interieur.gouv.fr/sections/a_votre_service/statistiques/intercommunalite/cartographie_des_epc/cartographie_2011/view*, accessed on 3 November 2011.

DREIF (Direction régionale de l'Equipement d'Ile-de-France) (2003), Rapport du groupe de travail *Développement économique à long terme de l'Ile-de-France*, Ministère de l'Equipement des Transport et du Logement, Paris. *www.ile-de-france.equipement.gouv.fr/IMG/pdf/gr5-rapport_cle615dac.pdf.*

DRIAAF (Direction régionale et interdépartementale de l'alimentation de l'agriculture et de la forêt d'Ile-de-France) (2009), *Plan de développement 2009-2013 de l'agriculture biologique en Ile-de-France*, Préfecture de la région d'Ile-de-France, Paris. *www.iledefrance.fr/fileadmin/contrib_folder/Rubriques/Environnement/Plan_bio_vote_18-06-09.pdf.*

DRIAAF (2011), *Ile-de-France – Conjoncture*, Préfet de la région d'Ile-de-France, Paris.

DRIEA-DRIEE (forthcoming), *Etude sur les réseaux de chaleur en Ile-de-France*, DRIEA-DRIEE, Paris.

DRIEE (Direction Régionale Interdépartementale de l'Environnement et de l'Energie) (2011a), *Energies renouvelables*, website of DRIEE, *www.driee.ile-de-france.developpement-durable.gouv.fr/energies-renouvelables-r190.html*, accessed on 03 November 2011.

DRIEE (2011b), *Eolien*, website of DRIEE, *www.driee.ile-de-france.developpement-durable.gouv.fr/eolien-r191.html*, accessed on 03 November 2011.

EIDER (2011), *Tableaux détaillés*, website of EIDER, *www.stats.environnement.developpement-durable.gouv.fr/Eider/tables.do#*, accessed on 3 November 2011.

ELPS (Environment Law & Policy Center) (2011), *The Clean Energy Supply Chain in Illinois: Wind Solar and Geothermal*, Environment Law & Policy Center, Chicago.

Ernst & Young (2010), *Rapport d'évaluation du Grenelle de l'Environnement*, Ernst & Young, Paris.

EU (European Union) (2011b), *Les politiques de l'Union Européenne*, website of European Commission, *http://ec.europa.eu/agriculture/organic/eu-policy_fr*, accessed on 3 November 2011.

Gilli, F., J.-M. Offner (2009), *Paris, métropole hors les murs : aménager et gouverner un Grand Paris*, Presses de Sciences Po, Paris.

IAU (Institut d'Aménagement et d'Urbanisme) (2002), *L'eau en Ile-de-France : aspects sanitaires et environnementaux*, Note Rapide No.312, IAU, Paris. *www.iau-idf.fr/fileadmin/Etudes/etude_170/nr_environnement_et_sante_312_eau_en_idf.pdf*.

IAU (2004), *Les éco-activités en Ile-de-France : une filière innovante, un fort potentiel de développement*, Note rapide n° 363. IAU, Paris. *www.iau-idf.fr/fileadmin/Etudes/etude_301/nr_363_les_eco_activites_en_idf.pdf.*

IAU (2007), *Bilan Carbone de la Région Ile-de-France, Collectivités Territoriales de l'ADEME*, IAU, Paris. *www.iau-idf.fr/fileadmin/Etudes/etude_371/pdf_bilan_carbone_ia_48947.pdf.*

IAU (2008), *Schéma directeur de la région d'Ile-de-France* (SDRIF), *www.iau-idf.fr/fileadmin/user_upload/Enjeux/Sdrif/sdrif_adop_25-26_09.pdf.*

IAU (2008), 170 millions de kilomètres par jour : les distances parcourues quotidiennement par les Franciliens, IAU, Paris.

IAU (2010a), "Panne de la construction : la mobilité résidentielle et professionnelle pénalisée", Note rapide n° 504, IAU, Paris.

IAU (2010b), "Mobilité résidentielle et professionnelle pénalisée", Note rapide n° 507, IAU, Paris.

IAU (2010c), *Les Industries des ENR en Ile-de-France : Quel potentiel de développement ?* « Partie 1. L'industrie photovoltaïque », IAU, Paris.

IAU (2010d), *Le logement, un champ d'étude et d'action pour Paris Métropole*, IAU, Paris.

IAU (2010e), "Vers une industrie photovoltaïque en Ile-de-France ?", Note rapide n° 525, IAU, Paris.

IAU (2010f), "Quelles perspectives pour l'intercommunalité francilienne?", Note rapide n° 527, IAU, Paris. *www.iau-idf.fr/fileadmin/Etudes/etude_751/NR_527_web.pdf.*

IAU (2011a), *Rapport de base préparée par l'IAU pour l'OECD*, IAU, Paris.

IAU (2011b), *L'environnement en Ile-de-France, Mémento 2011*, IAU, Paris.

IAU (2011c), *Nourrir 12 millions de Franciliens*, IAU, Paris. *www.iau-idf.fr/fileadmin/Etudes/etude_787/NR_535.pdf.*

IAU (2011d), "Recul des espaces ruraux et construction en baisse", Note rapide n° 537, IAU, Paris.

IAU (2011e), *Les Industries des ENR en Ile-de-France : Quel potentiel de développement. 2. L'industrie éolienne*, IAU, Paris.

IAU (2011f) *Evaluation de l'impact du T3 sur les prix de l'immobilier résidentiel*, IAU, Paris.

IAU-Insee (2011a), *Chiffres Clés 2011 de la Région Ile-de-France 2011*, Insee, IAU, CRCI, Paris.

IAU-Insee (2011b), *Près d'un emploi sur cinq est peu qualifié en Ile-de-France*, website of IAU, *www.iau-idf.fr/detail-dune-etude/etude/pres-dun-emploi-sur-cinq-est-peu-qualifie-en-ile-de-fr.html*, accessed on 3 November 2011.

IDF (Ile-de-France) (2010), *Plan régional pour le climat. Livre Vert : Etat des lieux des enjeux climatiques*, IDF, Paris. *www.iledefrance.fr/fileadmin/contrib_folder/Rubriques/Environnement/Livre_Vert_Plan_Regional_pour_le_Climat_IDF.pdf.*

IDF (2011a), "Travaux de la mission stratégie et des partenariats régionaux : Etat des lieux de l'Ile-de-France", dans : IDF (2011), *Stratégie régionale de développement économique et d'innovation*, IDF, Paris.

IDF (2011b), *Stratégie régionale du développement économique et de l'innovation*, IDF, Paris.

IDF (2011c), *Lancement du plan filière éco-activités*, Direction du développement économique, *www.iledefrance.fr/uploads/tx_base/lancement_filiere_eco-activites.pdf.*

Iddri (Institut du développement durable et des relations internationales – Sciences Po) (2010), "Habitat Facteur 4: Etude d'une réduction des émissions de CO_2 liées au confort thermique dans l'habitat à l'horizon 2050", *Les Cahiers du Club d'ingénierie prospective énergie et environnement (CLIP)*, n°20, Iddri, Paris.

IEA (International Energy Agency) (2009), "Ensuring Green Growth in a Time of Crisis: The Role of Energy Technology", OECD/IEA, Paris. *www.iea.org/Papers/2009/ensuring_green_growth.pdf.*

IEA (2010a), *CO_2 Emissions from Fuel Combustion Highlights*, OECD/IEA, Paris. *www.iea.org/co2highlights/co2highlights.pdf.*

IEA (2010b), *Energy Technology Perspective 2010*, OECD/IEA, Paris.

IEA (2011), *Key World Energy Statistics 2011*, OECD/IEA, Paris.

Insee (Institut National de la Statistique et des Etudes Economiques) (2007), "Les entreprises spécialisées dans l'environnement : les éco-activités", *Courrier des statistiques*, n° 120, fiche n°10, *www.insee.fr/fr/ffc/docs_ffc/cs120m.pdf.*

Insee (2008), *Répertoire des entreprises et des établissements*, website of Insee, *www.insee.fr*, accessed on 3 November 2011.

Insee (2010a), "Arrivées de l'étranger: l'Ile-de-France attire les jeunes qualifiés", *A la page*, n° 343, Insee/IAU, Paris. *www.insee.fr/fr/insee_regions/idf/themes/alapage/alap343/alap343.pdf.*

Insee (2010b), "La machine à innover des PME franciliennes : un rendement perfectible au regard du potentiel élevé", *A la page*, n° 345, Insee/IAU, Paris. *http://insee.fr/fr/insee_regions/idf/themes/alapage/alap345/alap345.pdf*.

Insee (2010c), *Production d'énergie primaire d'origine renouvelable*, website of Insee, *www.insee.fr/fr/themes/tableau.asp?reg_id=0&ref_id=NATTEF11335*, accessed on 3 November 2011.

Insee (2011a), "La population légale de l'Ile-de-France", Note n° 249, Insee/IAU, Paris.

Insee (2011b), *Comptes régionaux base 2000*, website of Insee, *www.insee.fr*, accessed on 3 November 2011.

Insee (2011c), *Net ralentissement de la hausse du chômage en 2010*, *www.insee.fr/fr/insee_regions/idf/themes/don_cadrage/be2010/docs/be10_chomage.pdf*.

Insee (2011d), "Les Franciliens utilisent autant les transports en commun que la voiture pour se rendre au travail", n° 353, Insee/IAU, Paris. *http://insee.fr/fr/insee_regions/idf/themes/alapage/alap353/alap353.pdf*.

ITF (2010), "Implementing Congestion Charges", Document de travail No. 2011-02, ITF, OECD, Paris. *http://internationaltransportforum.org/jtrc/DiscussionPapers/DP201102.pdf.*

Kammen, Kapadia and Fripp (2004), "Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?", RAEL Report, University of California, Berkeley.

Kennedy, C. *et al.* (2009), "Greenhouse gas emissions from global cities", *Environmental Science & Technology*, Vol. 43, No. 19, pp. 7297-7309.

Kennedy, C. (2011), Calculations (a personal source) adapted by Christopher Kennedy, October 2011, using the methodology of Kennedy, Christopher *et al.* (2009), based on the data of Ademe/Arene (2010), IAU (2011b), IDF (2010), IEA (2010a).

Lecoueur, C. *et al.* (2009), *Plan de mobilisation nationale sur les métiers liés à la croissance verte – Agriculture et Forêts*, Le Grenelle Environnement, République Française, Paris.

Lefèvre, C. (2007), "Londres et Paris: deux métropoles aux antipodes", *Pouvoirs Locaux*, n° 73, pp. 58- 63.

Lefèvre, C. (2009), "Le système de gouvernance en Ile-de-France : entre décentralisation et globalisation", *Pouvoir Locaux*, n° 80, pp. 97.

L'Express (2011), *Pourquoi Bolloré a tout fait pour remporter Autolib',* website of l'Express, *http://lexpansion.lexpress.fr/entreprise/pourquoi-bollore-a-tout-fait-pour-remporter-autolib_245470.html*, accessed on 3 November 2011.

MCC (Ministère de la Culture et de la Communication) (2008), "Le Grand Pari de l'Agglomération Parisienne : Note d'orientation stratégique", Ministère de la Culture et de la Communication, Paris. *www.antoinegrumbach.com/pdf/080415_GP_NOTE-STRATEGIQUE.pdf.*

MCC (2008), "Le Grand Pari de l'Agglomération Parisienne : Note d'orientation méthodologique", Ministère de la Culture et de la Communication, Paris. *www.antoinegrumbach.com/pdf/080415_GP_NOTE-METHODOLOGIQUE.pdf.*

MEEDM (Ministère de l'Ecologie, de l'Energie, du Développement durable et de la Mer) (2009), *Rapport du comité de filière énergies renouvelables*, Ministère de l'Ecologie, de l'Energie, du Développement durable et de la Mer, Paris.

MEEDM (2010a), *Stratégie nationale du développement durable 2010-2013*, Ministère de l'Ecologie, de l'Energie, du Développement durable et de la Mer, Paris.

MEEDM (2010b), *Plan de mobilisation des territoires et des filières sur le développement des métiers de la croissance verte*, Synthèse des travaux des comités de filières, Ministère de l'Ecologie, de l'Energie, du Développement durable et de la Mer, Paris. *www.developpement-durable.gouv.fr/IMG/pdf/rapport_emplois_croissance_verte_1_.pdf*.

MEDDTL (Ministère de l'Ecologie, du Développement durable, des Transports et du Logement) (2009b), *Métiers de la croissance verte*, website of Grenelle Environnement, *www.legrenelle-environnement.fr/spip.php?page=rubrique-dossier2&id_rubrique=25&id_article=279*, accessed on 31 August 2011.

MEDDTL (2010), *Plan bâtiment*, website of MEDDTL, *www.developpement-durable.gouv.fr/Nouvel-article,13149.html*, accessed on 12 July 2011.

MEDDTL (2011), *L'observatoire national des emplois et métiers de l'économie verte*, website of MEDDTL, *www.developpement-durable.gouv.fr/L-observatoire-national-des,18551.html*, accessed on 3 November 2011.

Nieberg H. *et al.* (2011), *Förderung des ökologischen Landbaus in Deutschland – Stand, Entwicklung und internationale Perspektive*, Johann Heinrich von Thünen Institut (vTI), Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz, Berlin.

OECD (Organisation for Economic Cooperation and Development) (2005), "Opening markets for environmental goods and services", OECD Policy Brief, September 2005, OECD, Paris.

OECD (2006), *OECD Territorial Reviews: France*, OECD, Paris.

OECD (2010a), *Cities and Climate Change*, OECD, Paris.

OECD (2010b), *Mesurer l'innovation: Un nouveau regard,* OECD, Paris.

OECD (2010c), *OECD Territorial Reviews: Guangdong, China 2010*, OECD, Paris.

OECD (2011a), *Towards Green Growth*, OECD, Paris.

OECD (2011b), "Cities and green growth: a conceptual framework", OECD Regional Development Working Papers 2011/08, OECD, Paris.

OECD (2011c), *OECD Reviews of Innovation Policy: Regions and Innovation Policy*, OECD, Paris.

OECD (2011d), *La politique d'innovation et les régions*, OECD, Paris.

OECD (2011e) "Redefining urban: A new way to measure metropolitan areas in OECD countries", document de travail de la Division des politiques régionales, GOV/TDPC/TI(2011)3, OECD, Paris.

OECD (2011f), "Measuring the environmental performance of metropolitan areas with geographic information sources", document de travail de la Division des politiques régionales, GOV/TDPC/TI(2011)6, OECD, Paris.

OECD (2011f), *Making the Most of Public Investment in a Tight Fiscal Environment. Multi-level Governance Lessons from the Crisis*, OECD, Paris.

OECD (2011h), *Etudes économiques de l'OECD : France*, OECD, Paris.

OECD (2011i), *Stratégie pour une croissance verte : agriculture et agroalimentaire*, Rapport préliminaire, OECD, Paris.

OECD (2011j), "Compétitivité des villes portuaires : Le cas de l'Axe Seine (Le Havre, Rouen, Paris, Caen) – France", OECD, Paris.

OECD (forthcoming, a), *Compact Cities report*, OECD, Paris.

OECD (forthcoming, b), *OECD Territorial Review: the Chicago Tri-State Metro-Region, United States*, OECD, Paris.

OKSE Center of Expertise (2010), Finnish Cleantech Cluster, Kuopio.

ORDIF (Observatoire Régional des Déchets d'Ile-de-France) (2011), *Emploi dans la filière déchets en Ile-de-France en 2008*, ORDIF, Paris.

Pearce and Stilwel (2008), "Green-Collar Jobs: Employment Impacts of Climate Change Policies", *Journal of Australian Political Economy*, n° 62, University of Sydney, Sydney, pp. 120-138.

Plisson P. (2010), *Ecologie, Développement et aménagements durables. Politiques de Développement Durable*, Assemblé Nationale, Paris.

Power, A. (2008), "Does demolition of refurbishment of old and inefficient homes help to increase our environmental, social and economic viability?", *Energy Policy*, Vol. 36, No. 12, Elsevier, pp. 4487-4501.

Préfecture de la région Ile-de-France (2007), *Stratégie régionale d'innovation d'Ile-de-France (SRI) 2007-2013*, Note de diagnostics et d'orientations stratégiques partagées pour la préparation de la Stratégie régionale d'innovation 2007-2013, in IDF (2011), *Stratégie régionale de développement économique et d'innovation*, tome 2, base documentaire, IDF, Paris.

Réseau TEE (Observatoire Francilien des Emplois de l'Environnement) (2009), *Emplois de l'environnement : Constats et tendances en Ile-de-France*, TEE Ile-de-France, Paris. *www.tee-idf.net/images-documents/prod/TEEIDF_Emplois_environnement_Ile_de_France.pdf.*

Sassen, S. (1991), *The Global City: New York, London, Tokyo*, Princeton University Press, Woodstock, Oxfordshire.

SER (2010a), *Annuaire des acteurs industriels français du chauffage au bois domestique 2011*, Syndicat des Energies Renouvelables, Paris.

SER (Syndicat des Energies Renouvelables) (2010b), *Annuaire des fabricants et fournisseurs de l'industrie éolienne*, SER, Paris.

Service-publique.fr (2011), *Plus-value immobilière*, website of Service Public, *http://vosdroits.service-public.fr/F10864.xhtml*, accessed on 3 November 2011.

Société du Grand Paris (2011), *Schéma d'ensemble du Grand Paris*, website of Société du Grand Paris, *www.societedugrandparis.fr/fr/l-acte-motive-et-le-schema-d-ensemble-_24.html*, accessed on 3 November 2011.

The Economist Intelligence Unit (2009), *European Green City Index*, Siemens AG, Munich.

UNEP, UN-HABITAT, World Bank (2010), *International Standard for Determining Greenhouse Gas Emissions*, World Urban Forum, Brazil, March 2010.

UNFPA (United Nations Population Fund) (2009), *World Urbanization Prospects: The 2009 Revision*, UNFPA, New York.

UN-Habitat (2010), *State of the World's Cities 2010/2011,* UN-Habitat, Nairobi.

Van Donkelaar, A. *et al*. (2010), "Global Estimates of Exposure to Fine Particulate Matter Concentrations from Satellite-based Aerosol Optical Depth", *Environmental Health Perspectives*, vol. 118, U.S. National Institute of Environmental Health Sciences, National Institutes of Health, Department of Health and Human Services, pp. 847-855.

World Bank (2011), *Representative GHG Baselines for Cities and their Respective Countries*, *http://siteresources.worldbank.org/INTUWM/Resources/GHG_Index_Mar_9_2011.pdf*.