

Horizons

2030
2050

Foresight Unit News

CONTENTS

P2 | ANALYSIS AND DEBATE

Moving towards post-carbon cities

Six transition paths

P11 | FORESIGHT SCANNING

- > Housing
- > Marine resources
- > Financing transport
- > Green jobs
- > Renewable energies
- > Demographics and geopolitics

P14 | NOTES

Publications / Agenda /
International meetings
and conferences



**“Towns at the heart
of the transition towards
post-carbon societies.”**

Editorial

Yesterday unthinkable, except for a few isolated visionaries, the prospect of a post-carbon (or low-carbon) society is today debated and considered in more and more countries and front-line international organisations: United Nations,

G8/G20, World Bank, OECD, European Commission... Although visions of what this post-carbon society will look like still diverge, a fairly broad consensus exists for objectives regarding globally desirable

changes: a factor four reduction by 2050 of greenhouse gas emissions (for countries of the North); almost total independence of carbon-based energies (oil, but also gas and coal); sufficient capacity for adaptation to climate change; and finally, greater attention to the least acceptable situations of energy vulnerability.

Although the sustainable town cannot be reduced to those few criteria, we are talking here about major changes that all actors will progressively have to anticipate, as the threats linked to climate change and the scarcity of fossil fuels become reality. How? At what pace? With what constraints? These are the questions that are being asked of us collectively or individually. **In this context, the role of towns, and indirectly local authorities, still remains broadly open to debate.** For although everyone agrees on their importance in energy consumption and greenhouse gas emissions, disagreement remains on their room for manoeuvre given, in particular, the extraordinary inertia of urban systems... It is for this reason that the second issue of Horizons 2030-2050 is entirely dedicated to them.

JACQUES THEYS

Head of the Foresight Unit

Questions/answers with GÉRARD MAGNIN

Head of the European ÉNERGIE-CITÉS network

CGDD : By 2020, what changes can we hope to see in towns' climate policies?

GM : Ten years is not a long time. We will need to combine action and direction coherently. Action is what can actually be done “without regrets” in construction, soft transport, short routes, proximity of services and so forth. Direction is about the factor 4 trajectory: territorial quantification of emissions, quantified objectives, action plans and upgrading sectoral and urban planning policies. These are untried waters!

CGDD : Under what conditions can major changes be envisaged by 2050?

GM : Is realism on the side of radical change or gradually changing trends? Minor changes without pervading vision are often appreciated because they shake up the day-to-day hum-drum. We like major challenges when they project an area towards a future that we can proud of. This is the case of tram systems in France, towns tending towards zero fossil fuels or 50% urban cycle travel. Fixing objectives which stir enthusiasm helps overcome resistance to change.

CGDD : What place would you attribute to foresight in these transitions?

GM : Essential, but not sufficiently considered today as a public decision-making tool, more to guide short term decisions. And yet the energy and climate challenge is to align short, medium and long term futures. Looking forward to futures other than the one we know is difficult. But tomorrow will not be an extension of yesterday. Correcting damaging trends is not about changing trajectory. Collectively imagining a low consumption town on the basis of minor signals which are perceived in our towns will open up the way to the necessary transitions. Do we have any other choice?

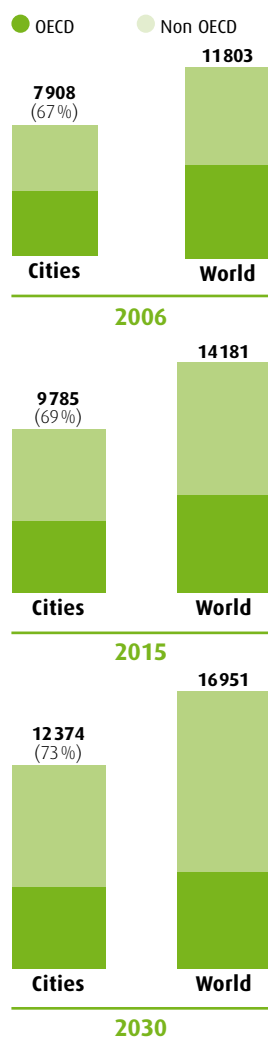


Ministère
de l'Écologie,
de l'Énergie,
du Développement
durable
et de la Mer

Moving towards post-carbon cities Six transition paths



WORLD AND CITY PRIMARY ENERGY CONSUMPTION IN THE REFERENCE SCENARIO – IN 2006, 2015 AND 2030
(in Mtoe)



Source : International Energy Agency, 2008.

* Urban areas including cities.

It is in our towns that the success or failure of transition towards post-carbon or low-carbon cities will be played out.

Paradoxically, their role in this transition, and indirectly that of the local authorities, is still largely open to discussion.

Nobody fundamentally questions the fact that cities contribute substantially to the greenhouse effect and to fossil fuel consumption. The International Energy Agency (IEA), which for the first time has dedicated a specific chapter to cities in its 2008 annual report¹, estimates that urban areas account for over two-thirds of global energy consumption and more than 70% of global carbon emissions (see graph). Even if what is truly attributable to cities is debatable (see box on page 3), even if the statistics we have are really quite incomplete, even though lower figures of the order of 50% are often cited, this recent assessment of the IEA simply confirms the now well-established acceptance of the major role that cities play in the energy

and climate crisis, but also their particular vulnerability to those same risks. What is already obvious will be much more so tomorrow, with the expected arrival by 2050 of 2 billion additional city dwellers and the creation within forty years of a **second urban world**, almost equivalent in size to that inherited from past centuries². If, in spite of this consensus on their contribution, the question of the role of cities in post-carbon transition remains open to debate, it is because there are great controversies as to the effectiveness and realism of massive urban interventions in relation to other alternative actions which are, on the face of it, simpler and less costly: industry, energy production and automobile engines. The Stern report, for example, the global reference in terms of climate policy, dedicates only a few of its

→ 650 pages to the topic; which is little in light of the 50 to 70% figures mentioned above.

REDESIGNING CITIES: UTOPIA OR NECESSITY?

In reality, today we face two extremely contrasting visions in terms of the prospects of a transition or a “redesign” of cities in a post-carbon society³.

On the one hand, an optimistic vision through which, with the extraordinary blooming of local low-carbon city initiatives, eco-cities, eco-districts, sustainable mobility projects, passive or positive energy buildings and the success of a number of emblematic experiments (Fribourg, Bedzed, Masdar City, etc.), we see the seeds of an irreversible revolution in the way we build, travel and live in the future⁴. Additionally, around these emblematic experiments very active city networks have developed, bringing a whole dynamic of innovative projects promoted by multiple forms of aid at every level, as well as normative- and incentive-based policies clearly targeting the long term⁵. Given these developments, we would it would appear that the trend towards carbon-free cities is underway, that the

“The prospect of redesigning our cities to address the challenges of a post-carbon society remains highly controversial.”

technical solutions exist and that, with suitable financing, all that remains to be done is implementation.

The other, a much more sceptical vision says first of all that past experiments still only concern a very limited fraction of urban populations and roll out arguments doubting the effectiveness and even sometimes the sense of a massive intervention targeting cities: the absence of a solid scientific basis (eg: on the relationship between urban forms and the greenhouse effect), enormous social and economic costs, a level of inertia that is incompatible with the urgency of the climate situation, insurmountable financial, training and governance issues, lack of pertinence of the urban scale and finally, the phantasmagorical nature of the ideal carbon-free city which is partly based on the “tabula rasa” myth which is inconceivable for our European cities.

In reality, these two optimistic and sceptical visions merge at some point,

each reducing in its way the importance and complexity of the changes which must take place in our cities in order to prepare the necessary transition towards the post-carbon society.

It is in this context that foresight, opening up a third way, may be useful:

- to explain possible representations and options;
- to realistically analyse their conditions of implementation and their consequences;
- to allow a debate which takes all dimensions of this complex issue into account.

The 2050 horizon is now clearly defined: overall 4-fold reduction in greenhouse gas emissions (for countries of the North), preparing the switch to other energies than oil and, to a lesser degree, gas and non-decarbonised coal, and finally adapting our future societies to the effects of climate change⁶. What is uncertain, however, are the possible ways of tackling these three challenges which, for cities, largely depend on representations that the different actors have of constraints, opportunities or possible room for manoeuvre in the decades ahead.

Cities, energy and carbon

What is it all about?

Assessing energy consumption and carbon emissions in cities raises a number of conceptual problems beyond the purely statistical or methodological. Energy data for cities are often incomplete and rarely presented in a format that allows comparison, particularly in the absence of any real consensus on what exactly a city is. More fundamentally, there are major discrepancies on what can really be attributed to cities in terms of the production and

consumption of electricity and carbon emissions:

- it could mean all energy (fossil and non-fossil) and carbon consumed, produced and emitted over a given urban area, by residents and non-residents alike;
- or the above, plus consumption, production and emission indirectly linked to that area (resulting, for example, from the construction of infrastructures), minus “carbon sinks”;
- or, only consumption and emissions not linked to industry and energy

transformation (excluding, for example, refineries and thermal power stations);

- or what is consumed, produced and emitted under the direct control or authority of the territorial authorities concerned (public transport, urban heating, municipal buildings, etc.);
- or, finally, all energy consumed and carbon emitted by the inhabitants of a given city, including when they are outside their area of residence (air travel, etc.).

It is in order to explore these avenues that the Sustainable Development Ministry’s Foresight Unit has recently undertaken a major scenario-building exercise (see page 10).

The perspective is abstract – we are talking about the post-carbon city in general. But thanks to a number of cities and the support of France’s environment agency ADEME, it can be applied to real life cases in parallel, in relation to the introduction of local climate plans. As mentioned above, urban inertia and the representation that actors have of its different forms are at the heart of this approach.



“The horizon is clearly defined. What is not are the possible ways of getting there, which depend on actors’ representations of urban inertias.”



→ Three configurations, each with two variants, are therefore envisaged:

- in the first, room for manoeuvre for change policies for cities are perceived as weak: local authorities, companies and inhabitants adapt intelligently to essentially external incentives, constraints and opportunities;
- the second foresees a massive renewal of urban and energy infrastructures but remains cautious as to the possibility of changing forms of land use and lifestyles;
- the third explores the expected conditions and impacts of large-scale changes in these two areas.

As we will see, the choice of these three very contrasting and almost caricatured ways is intended to shed light upon a number of key challenges faced by future public action in the three dimensions of a sustainable development perspective: economic, social and ecological.

1ST SCENARIO: REACTIVITY TO PRICE SIGNALS AND INTELLIGENT USE OF EXTERNAL OPPORTUNITIES:

intelligent “wait-and-see-ism”. For socio-political or financial reasons, any massive intervention targeting existing housing or urban structures is judged unrealistic, reducing intervention to reactive management of external opportunities or constraints. The idea is to adapt to a context which is largely imposed at the least possible cost, but also to promote measures which are directly effective in the short or medium term justified by the

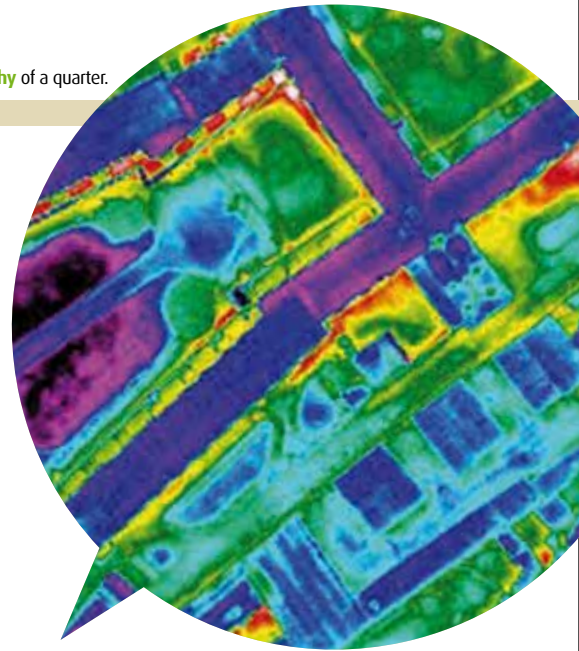
urgency of the situation⁷. **This is a business-as-usual scenario based on an association between:**

- regulation via price or information (increasing fossil fuel prices, the tax and “carbon map”, bonus-malus, urban tolls, etc.);
- technological innovations on vehicles, new housing and electrical appliances, supported by regulations;
- local actions on the functioning of transports and services: development of soft travel modes, enhanced public transport services, reduced speeds, limited parking in city centres, car sharing and pay-as-you-go transport, incentives for tele-working and remote trading, but also the use of renewable energies and energy savings in public buildings and public transports. None of this excludes the construction of eco-districts or even eco-cities but, in this hypothesis, these exemplary planning operations are limited to a few relatively circumscribed urban niches.

Along with technological innovation, price signals are, in the first scenario, a major factor of change dynamics.

This suggests two substantially different variants:

- in the first, “wait-and-see” behaviour is encouraged by the economic situation (continuation of the crisis), moderation of oil price rises and an attenuation of public concern linked to the greenhouse effect. The risk for towns is therefore to have to eventually face up to sudden crises linked to cuts in energy supply or extreme climate events;



• in the second, on the contrary, economic regulations are used actively to anticipate future constraints and promote earlier changes to behaviour. Economic instruments and stances (carbon taxes and audits, tolls, tariffs and possibly quotas) are systematically used both to change individual choices and to rank local priorities according to cost effectiveness. It should be noted that in these two cases, the chosen configuration makes drivers essentially external to the city⁸.

It is important not to underestimate the results that could reasonably be expected from this first business-as-usual scenario, especially in the second variant, and this in spite of the low price elasticity of fuel and domestic energy consumption (see table). The quadrupling of the oil price between 2004 and 2008 actually resulted in a substantial change in mobility behaviour with, for the first time, a reverse of the historic upward trend in certain large towns and, as witnessed with the bonus-malus system, price signals do work.

However there are at least three things which make this type of approach precarious and difficult to uphold:

- this scenario is exposed to substantial technological uncertainties both for alternatives to oil in transport and renewable energies in housing⁹;
- it results in an unfair transfer to future generations of the inevitable investment required on buildings which will be greater and more random the later action is taken¹⁰;
- finally, and most importantly, this hypothesis may lead to such inequalities and such social problems that it will be unacceptable. Given that transport spending today already varies in the ratio of 1:3 according to whether you live in the town centre or in the suburbs, and that it can reach up to 30% of the least well-off households' spending in distant suburbs, it is easy to imagine the consequences that regulation acting primarily on prices and carbon taxation might have. Indeed, an extremely interesting piece of research, published in 2006 by CIRED¹¹,

calculated that in the event of a rapid increase of 50% on fossil fuel taxes and given the rigidities of the land and property markets, the effects of the imbalance on the urban system could spread over a period of 50 years, with, in particular, a substantial decline (between 15 and 30%) of consumer "wellbeing" during half of that period. The shock would be such that very quickly more structural interventions would be needed on housing and land, as envisaged in the following two scenarios.

“The business-as-usual scenario will eventually lead to substantial social problems.”

2^e SCENARIO : A MASSIVE RENEWAL OF URBAN AND ENERGY INFRASTRUCTURES

Compared to the wait-and-see attitude of the first scenario, the second is more voluntarist, which means massive renewal of urban and energy infrastructures tackling the risks associated with both the climate and oil. Near, in spirit, to the Environment Grenelle or "green plans" recently promised as part of the economic stimulus plan, **this second hypothesis entails several changes of scale in relation to exemplary actions already undertaken in several towns:**

- a massive change of dimension in energy renewal in old housing and buildings, seeking to divide current fossil energy consumption by three at least¹² and, in Europe, potentially concerning up to half of the existing housing stock;
- a change of dimension in the restructuring of local energy supply and production systems, leaving a greater part to renewable energies and heat recovery;
- a change of dimension also in protective infrastructure against the consequences of climate change (rising sea level, risks of flood, fire, cyclones and air conditioning, etc.);
- and finally of course, a change of dimension in public transport infrastructure, with the objective of adopting the calcula- ➔

PRICE-ELASTICITIES* of household's energy consumption (base 1)

	SHORT TERM	LONG TERM
Domestic energy	- 0,06	- 0,17
Fuels	- 0,19	- 0,40

Source: M. Clerc et V. Marcus (Insee, 2009).

* Price elasticity of consumption reflects the percentage increase or decrease in consumption resulting from a 1% increase in the price of energy.

→ tion applied to Fribourg (one-third cars, one-third public transport and one-third soft transport modes).

To give a ballpark idea of the scale of these changes, two figures come to mind: 10 to 15 % investment in housing for private individuals and an equivalent proportion of investment in infrastructures (including housing infrastructure) for all actors involved¹³. With profitability in the medium term (3 to 15 years) because of the sustained reduction in energy and transport bills, great job creation potential, **this strategy, as previously, could be broken down into two variants:**

- the first, more centralised, which would promote major energy networks and individual actions;
- the second, much more devolved, prioritising local energy production and collective solutions (storage of shared energy in micro networks, use of biomass, etc.).

In these two versions, this scenario would on the face of it have the advantage of not being opposed to the major constraints of urban territorial organisation and the localisation of companies and housing. Also, its funding could benefit from the integration of towns into European or global carbon market mechanisms¹⁴. Here again, however, **even in this much more voluntarist hypothesis, it seems unlikely that it would be possible to avoid a much broader redesign of towns and regions.**

Three new reasons for this:

- First of all, it is difficult to imagine that such massive renewal of energy and transport infrastructures and those protecting against climate risks would not have consequences in terms of urban planning. In the major cities, one of the questions which would surely be posed very early on in this configuration would be the choice between refurbishment of existing buildings and their reconstruction on the same, or different,

sites: in any event, there would be major land-use and spatial planning implications.

- We also know that such a strategy would be complex, costly and slow to implement, given the rate of renewal of housing stock and the time it takes to implement such projects. There would be financial problems, a lack of skilled personnel, regulation of markets for renewable energies, etc. Also, some social groups would be unable to pay (the sharp increase in “energy precariousness”)¹⁵. The efficiency of such a scenario may therefore be more limited than forecast, which should justify the development of other types of intervention in parallel: land-use, social housing, development and traffic management...

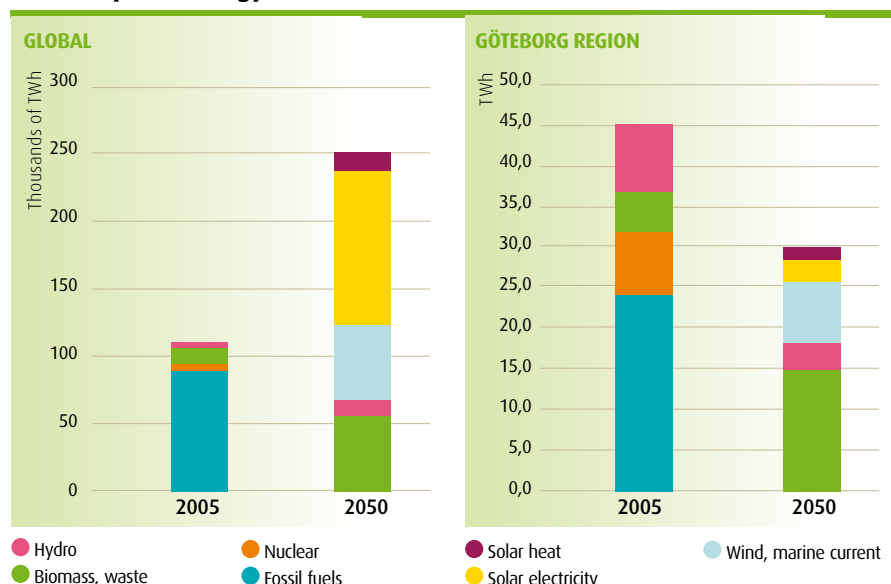
- Finally, and most importantly, it is debatable whether the benefits of such a scenario, which is so unsuitable for denser areas, would not rapidly be cancelled out by the consequences of urban sprawl or the dynamics of uncontrolled localisation. We know that beyond a certain population and employment density threshold, expensive public transport infrastructures, for example, cannot be profitable. More precisely, it has been calculated that CO₂ gains that could be achieved from massive energy renewal policies in existing stock would be almost completely cancelled out by the additional cost of consumption or emissions due to the expansion of towns and the corresponding mobility that would be needed¹⁶.

This means that integration strategies concerning cities’ energy and climate challenges of the future cannot be limited to infrastructure or urban functions but must also look at the geography of localisations, urban forms and lifestyles. This leads us to the third scenario.

3rd SCENARIO : A SUBSTANTIAL RECONFIGURATION OF URBAN AREAS UNDER CLIMATE AND ENERGY CONSTRAINTS

The third reconfiguration scenario for urban areas is the one that comes to mind most spontaneously when considering what the

GÖTEBORG (SWEDEN) 2005-2050
An example of energy transition



Globally the population increases from 6 to 10 billion people in a sustainable world in the future. An equitable energy use of **25 000 kWh** per capita is assumed. This means that the global energy supply will be double that of today. This energy is supplied with renewable energy resources. A breakthrough in the use of solar electricity is assumed, as are the energy storage system inherent in the Hydrogen Society.

In the GÖTEBORG region, the population increases from 850 000 to 1.2 million inhabitants in a future sustainable society. Each person uses **25 000 kWh** which is half of that of today. This means that the region energy supply is reduced by one-third. The energy will come from biomass, wind and marine current energy, solar electricity and hydro power. Solar heat will apply half the yearly hot water supply and some of the district heating.

Source : City of Göteborg.



“Cities’ adaptation to climate and oil challenges will not be able to depend solely on investment in energy infrastructure, housing and urban transport.”

post-carbon city will look like: more compact, better balanced conurbations which combine functional and social mix, well structured by high-performance public transport systems... **In reality it is also the most difficult scenario to design, and this for two very different reasons:**

- **The first obstacle is scientific.** Indeed, controversy rages as to what the “ideal” urban structure would be from a climate risk point of view. On the basis of a reference article published in 1989 by Newman and Kenworthy, the emphasis has been placed on the relationship between urban density and fuel consumption per inhabitant: between Ho Chi Minh City and Atlanta, CO₂ emissions due to transport vary by a factor of 1 to 100 and by a factor of 1 to 10 for the most developed conurbations. This density polarisation – certain researchers talk about the “obsession of density” – was criticised at the end of the last century, in particular by Alain Bertaud, a World Bank consultant, for whom the way in which populations, jobs, urban amenities and public transport networks are geographically distributed around secondary centres (and the city centre) is at least as significant as density itself in explaining energy consumption linked to travel¹⁸. Observing that the ideal model of “urban villages” – self-sufficient in jobs and services and linked up by efficient public transport services – has unfortunately never worked in any town, he also questions the general

preference for a polycentric urban structure and pleads either in favour of dense mono-centrism (example of Shanghai), or moderate poly-centrism compatible with effective of public transport networks (see graphs). Given that all this research neglects the issue of energy in housing, we are forced to observe that the conclusions to be drawn for action plans are not obvious and undoubtedly multiple.

- **The second, a socio-political one,** is overcoming the dominant scepticism as to the possibility of profound change, or simply a change in trend, in urban structures and localisations. It is one thing to observe that there are more or less suitable measures for our future post-carbon society. It is quite another to imagine, and more importantly to implement, the transitions that will be needed to move to a desirable outcome. A very interesting 2006 simulation by the École des Mines de Paris¹⁹ on the Indian town Bangalore showed that by combining a number of very precise policies, it is possible to halve fuel consumption and CO₂ emissions over a period of 20 years: land-use control targeting densities, blocking urban sprawl around major transport networks and exchange centres (“glove fingers’ planning), strong “disincentives” for car use (speed limits etc.), development of a functional mix of employment and inner circle housing (with social mix and re-conquest of industrial and urban wasteland), control of commercial ...→

Statistics

Over 1,500 of the world’s cities are today members of low-carbon or post-carbon networks

3,500 of public transport routes will be required in Atlanta to make the city accessible primarily by public transport

77 climate plans are currently under way in French cities

amenities and main traffic generators (hospitals, universities, large companies, etc.).

This scenario is interesting for the post-carbon city on the face of it, but does not naturally reflect all the practical difficulties of implementing such a transition.

- First of all, obviously, there is the force of inertia, in particular in European towns where urban transition²⁰ already seems well advanced²¹.
- Secondly, as suggested in the long list of measures proposed for Bangalore, there is the great complexity of action systems to be developed: modifying urban forms does not only mean interfacing land-use, property and transport policies but also intervening in the localisation of companies, the employment market, local taxation and services, with the inherent problems of governance.
- There is also the question of scale: the scale of the conurbation appears less and less suitable as a space for structuring travel and organisation of the major urban functions to such an extent that it may even be more efficient to rethink not our cities but spatial planning and urban regions which, in another way, re-raises the issue of poly-centrism.
- Finally, and most importantly, there are major implications for **lifestyle** and social relationships in the abovementioned policy changes. The historical decline in densities observed over two centuries in Europe, which have accelerated since the mid-1970s, can be explained by very deep-seated reasons which are not only linked to the

development of transport system and the property market but to lifestyle choices, family organisation, individualism, preferences for nature, fear of others, etc. And yet, as Marc Wiel, former director of the Brest urban planning agency expresses so well, *“as we move towards post-carbon cities we won’t get everything at the same time: density and CO₂ emissions, speed of travel, cost of housing, access to nature and services, lifestyle and organisation of time... We are really going to have to choose”*²².

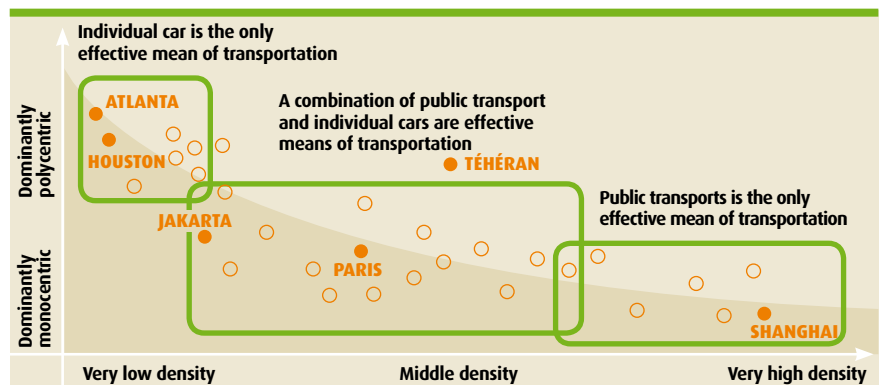
This again suggests two possible variants to the third scenario:

- in the first variant, the essential levers of transition would be local authorities and territorial reorganisation policies or urban planning regionally;
- in the second, major transformations would result from sea changes in lifestyle and value systems, with a marked trend towards more urban and more frugal

societies. In both cases, one of the keys which would seem crucial in the move towards a redesign of our cities in a post-carbon society should be to clearly differentiate, and subsequently better interface, the different territorial levels. Once again, Marc Wiel proposes **an interpretation of possible changes in urban policy and lifestyle at four different levels:**

- district, the access point to housing and local services;
- conurbation: coherence between employment, housing and services;
- urban (or metropolitan) area: a space where urban planning and configuration of major infrastructures are controlled;
- spatial planning (extra-urban), the space for key arbitration between nomadism and sedentarism, real and virtual activities, jobs and leisure... and therefore the major choices in terms of lifestyle and use of time. Herein, undoub-

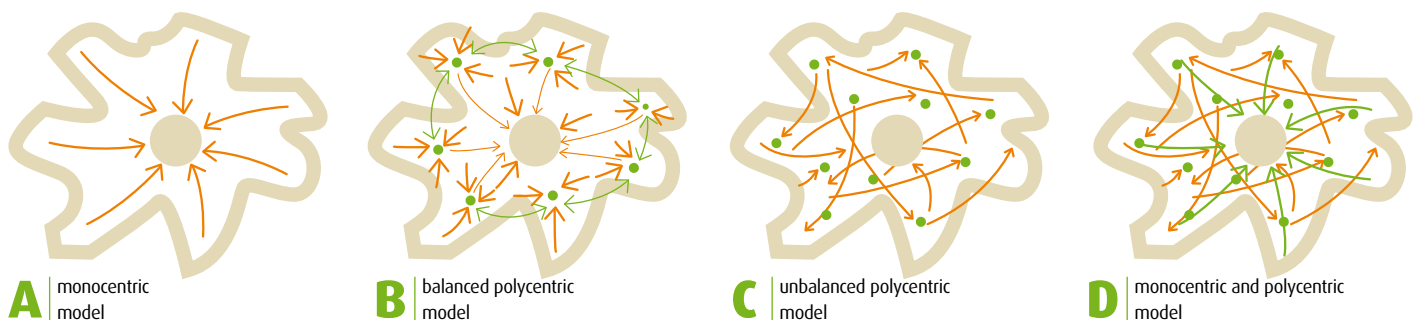
RELATIONS BETWEEN ENERGY CONSUMPTION IN TRANSPORTS, POPULATION DENSITY AND URBAN STRUCTURE (monocentric or polycentric)



Source: A. Bertaud et S. Malpezzi, Annales de la Recherche Urbaine (2007).

Representation of TRAVEL PATTERNS WITHIN AN URBAN AREA

Source: A. Bertaud.





“The issues of urban forms and lifestyle are linked and should be approached at four different levels.”

tedly, lies an additional complexity. But it is impossible to conceive of such a radical transition as the switch to post-carbon cities without considering, at the same time, all the implications of the diverse levels evoked. This indirectly, and in conclusion, brings us back to the theme of sustainable development.

BETTER INTERFACING URBAN TEMPORALITIES

The three scenarios – each with their two variants – described above are only, for the moment, a roadmap for an exercise which largely remains to be completed (see page 10). This already spotlights several challenges or obstacles which will be key to any transition towards post-carbon cities. This includes the most vulnerable populations, financial engineering and the differentiation of scale of governance. The exercise will only naturally take shape when practical analyses and assessments have been carried out.

The initial aim of each scenario is to reflect the attitudes of specific actors. But it is also important to understand that all of them are placed at different points on a timeline. Through this project, the idea is to contribute to better interfacing the

different urban policy horizons: the duration of election terms and day-to-day actions, the times for major investment programmes and the times for long or very long term approaches, to the town and to the climate. It is there that the paths of foresight and sustainable development cross... ●

Footnotes

PAGES 2-3

1 Source: “The world energy outlook”, International energy agency, 2008.

2 The expression “second urban world” is borrowed from the CSTB. It is worth remembering that in 2009, the global urban population was 3.3bn inhabitants and that the increase of 2bn expected by 2050 would only concern cities of the South.

3 Source: Jacques THEYS: “Repenser les villes dans la société postcarbone?” a presentation at a symposium organised by the European Commission in 2007 on “the post-carbon society” (<http://ec.europa.eu/research/social-sciences/pdf/towardspostcarbonsociety.en.pdf>)

4 Sources: Cyria Emelianoff, “Sustainable districts in Europe: an urban turning point?” Urbia No. 4, Lausanne, 2007, www.unil.ch/igul; Taoufik Souami, “Écoquartiers, secrets de fabrication”, les Cahiers de l’Info, 2009.

5 The best example being the Environment Grenelle and its two laws – with, in the area of housing for example, very ambitious objectives: reducing energy consumption in old buildings by 38% by 2020 and applying new low-consumption building regulations to all constructions by the end of 2012 (under 50kwh/m²/year in primary energy).

6 These three objectives are a way of “normatively” defining the post-carbon city.

PAGES 4-5

7 Given existing uncertainty surrounding “peak-oil”, “peak-gas” and global warming, all strategies leading to short or medium term results can be beneficial.

8 With the exception of the choice of introducing urban tolls or not.

Footnotes

PAGES 4-5

9 It is important to add that even in the most favourable hypotheses, these technological innovations should alone allow us to achieve only 40 to 50% of the objective of cutting greenhouse gas emissions four-fold...

10 See, on this point, the article published in December 2005 by Dominique Dron in the *DIAC Review "Territoires 2030: Transport, énergies et facteur 4"*.

PAGES 6-7

11 International Centre on the environment and development, François GUSDORF and Stéphane HALLEGATTE, "Behaviors and housing inertia are key factors in determining the consequences of a shock in transportation costs", December 2006.

12 Whith a mix, to be defined, between energy savings and substitution.

13 Which, on the global scale, would by 2030 represent \$20-30 trillion of the \$200 trillion estimated by the OECD and the International Agency as being required in the energy field. It is important to remember that the Environment Grenelle is looking to commit over €400bn by 2020 to investment, a large part of which would concern cities (€36bn for urban transport, €192bn for the renovation of old buildings, €87bn for renewable energies mostly targeting cities, etc.).

14 Source : Alexia LESEUR (CDC): "Les marchés carbone pour les villes" presentation at the third seminar of the "Post-carbon city" programme, October 2nd 2009.

15 According to the ADEME, one in five French households spends over 10% of its income on heating and would therefore, according to the English definition, be considered to be in a 'precarious' situation. For the poorest households (first quintile) this percentage represented almost 15% in 2006, two-thirds of which

were for housing, against 10% on average in 2001 (source: working document, September 2009).

16 See the works of J.C. Traisnel for the *Clip Energie*. However, there is a controversy on this point linked to the observation that, in practice, energy "renewal" of housing is easier for individual houses in non-dense areas.

PAGES 8-9

17 Newman P.W.G., Kenworthy J.R. (1989): "Cities and automobile dependence: an international sourcebook", Aldershot: GOWER, UK.

18 Source: A. Bertaud: "Metropolis, a measure of spatial organization of seven large cities" <http://alain.bertaud.com>

19 Giraud P.N., Lefevre B (2006) "Signature énergétique des transports urbains, un outil d'évaluation de la durabilité des dynamiques urbaines", PUCA, MEEDDAT.

20 By analogy, with the notion of demographic transition.

21 Which does not, however, include a certain level of renewal. For example, we could estimate that more than one-third of the housing stock existing in 2050 is not yet built today.

22 Source: Marc Wiel: "Intégrer la question énergétique à la planification territoriale" in *Études foncières*, No. 123, October 2006.

The programme

Rethinking cities in a post-carbon society

The *Rethinking cities in a post-carbon society* programme was launched at the end of 2008 and is currently the major programme of the CGDD Foresight Unit.

Its ambition is strategic: to establish practical conditions for the transition to towns which, by 2050, will satisfy

THREE OBJECTIVES:

- dividing carbon emissions by four compared to 1990 (for countries of the North);
- oil, coal and partly gas independence;
- adaptation to the effects of climate change.

The ADEME joined the programme at the beginning of 2009.

The originality of the programme is to tightly interface

FIVE COMPONENTS:

- a foresight reflection led within a pilot workgroup by two programme commissioners and Futuribles (V. Lamblin);
- a research programme structured around a number of key transition elements: the impact of economic incentives, governance of local

climate policies, foresight on lifestyles, redistributive effects, energy renovation in existing housing, interfacing urban energy climate forms and land-use tools;

- a seminar allowing researchers and actors over ten sessions to debate the results of this research and compare them with other international contributions (run by Cyria Emelianoff and Elsa Mor from Maine University);
- action research with a number of local authorities (Grenoble, Tours, Mulhouse, etc.) essentially financed by the ADEME;
- an exhibition of student projects with the ENS d'Architecture de Paris La Villette.

The programme should be completed during the first half of 2011, with the publication of a summary report proposing long-term action recommendations and an international symposium.



@ HOUSING WRITING: Jacques Theys

POST-CARBON HOUSING FOUR ENGLISH VISIONS

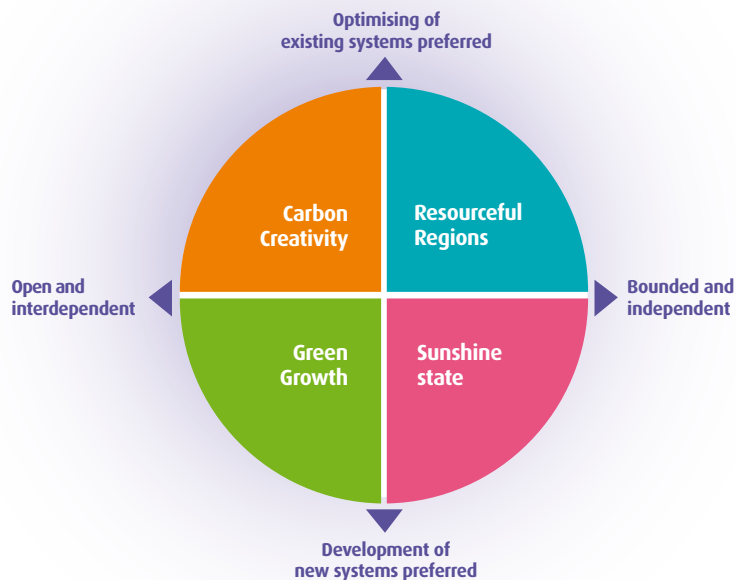
Whilst many countries and towns are committed to building post-carbon scenarios, the reference today is the exercise published in 2008 on the theme of housing by the unit responsible for scientific foresight in Great Britain²³ under the heading "Powering our lives: sustainable energy management and the built environment".

This strategic document is particularly notable through the originality of its visions of transition towards post-carbon housing. The choice was to construct these visions on what appeared to be two major uncertainties within the scope considered for horizon 2030-2050: on the one hand, the success or failure of "change technologies" in terms of energy and, on the other, the degree of integration (or autonomy) of British society in the global economic system.

The crossover of these two levels of uncertainty led to four very contrasting scenarios:

- **the first, "Resourceful regions"**, is an intelligent implementation scenario of local resources and optimisation of existing systems. It prioritises the cost reduction and national or regional energy security;
- **the second, "Sunshine state"**, is resolutely positioned within a framework of change in relation to the current development model both in terms of technologies, lifestyles and measurement indicators (surpassing the GDP indicator). According to its designers, it supposes some sort of protectionism;
- **the third, "Green growth"**, promotes international openness and sees in new green opportunities a chance to reposition the English economy in global economic competition;
- **the last, "Carbon creativity"**, more sceptical about the new technological wave, based on a global carbon market, extended to include consumers and inhabitants and a

driver of successful transition towards post-carbon housing. These four scenarios, in another originality of the English approach, are venues to test the robustness of policies envisaged by the British government. In conclusion, this exercise has produced precise and well-demonstrated actions, particularly in the development of individual behaviours.



SOURCE: www.foresight.gov.uk

23 – Foresight Unit, The Government Office for Science.

@ MARINE RESOURCES WRITING: Jacques Theys

MORE THAN HALF THE FISH CONSUMED IN THE WORLD NOW COMES FROM FARMING



A symbolic threshold was crossed in 2009 in fisheries and marine resources. According to work of an international research team under the direction of the University of Stanford, published by the American Academy of Science, more than half of the fish consumed in the world now comes from farming. From 1995 to 2007, production tripled, partly because of extremely high demand for Omega 3, reputed to attenuate cardiovascular disease. Paradoxically, this substitution of natural fish by farmed fish has not reduced pressure on marine resources in

equal proportions since to feed the former, which are indeed highly polluting, there is great reliance on the latter. To the extent that in 2008, fish farming alone was equal to more than one-quarter of wild fishing in the world. Even if the species concerned by this transfer are not the same, this is a good example of the limits of the substitutability of natural resources.

SOURCE: <http://www.ens-newswire.com/ens/sept2009>



TRANSPORT

WRITING: Jacques Theys

HOW WILL WE FINANCE URBAN PUBLIC TRANSPORT IN THE FUTURE?

More sustainable mobility at local level will largely depend upon the development of urban public transport provision.

Securing long-term financing is therefore crucial. In this area, historical and current dynamics are of some concern: in spite of increased supply, use is falling (except on the major networks), costs are growing steadily and the gap between income and expenditure is increasing with, as a result, bigger operator losses at a cost to the "public purse". From 1995 to 2005, this cost doubled (from €680 to €1,380m)

and is expected to increase 50% more by 2015... It was in this context that Predit asked the Laboratory

of transport economics to undertake foresight research seeking both to anticipate funding problems anticipated by 2015 and assess room for manoeuvre to address them. Submitted at the end of 2008, the final report, which compares French cities (outside the Paris area) to their European counterparts, is based on a trend hypothesis (business-as-usual) and four scenarios based on the search for solutions. In the first three, the author is primarily attached to testing the realism of break-even control policies. The final, more prospective, solution (S4) is keyed into a sustainable mobility approach and explores the consequences of increasing public transport in a context where the users' consent to pay is greater. The exercise reaches two conclusions which at first sight seem contradictory but are in fact complementary:

- the first shows the need for better urban transport performance overall. A financial crisis cannot be avoided without deep reforms to local transport systems, targeting operating cost control, attractiveness of services and pricing policies;
- the second, on the contrary, suggests that faced with the challenges of urban transport and its sustainable mobility ambitions, solutions to funding problems can probably not be found only internally through better management of the transport system. In order to address increasing demand, external resources will be called upon, taking the multi-functionality of public transport and its social and living environment impacts into account: revenues from tolls, specific financing for the poorest users, added value products linked to

land-use and infrastructure, carbon tax, etc. Finally, the major originality of this research is to simultaneously suggest deep internal reforms in the management of local transport policies and their imperious depar-
titioning.

SOURCE: B. Faivre d'Arcier, "Prospective pour un financement durable des transports publics urbains", Predit, September 2008.



GREEN JOBS

WRITING: Jacques Theys

TWO MILLION JOBS COULD BE CREATED BY 2030 IN RENEWABLE ENERGIES IN EUROPE

Two million additional jobs, on top of the 1.4 million which already exist, could be created by 2030 in Europe in the renewable energies field if Community targets are met. This is one of the conclusions of a research reports submitted to the Commission in April 2009 by a consortium of six European institutions: Ecofys, Franhofer, Energy Economics Group, Rütter and Parter, the Lithuanian Energy Institute and the European Economic Society.

The study is the first detailed analysis of the direct and macroeconomic effects of the deployment of renewable energies at European level and of each of the 27 countries concerned. Even though these results are not binding for the European Commission and the approach is in many ways open to criticism, the well-informed reader will find a lot of useful information on the economics of these resources, their costs, technologies, sectoral impacts and impacts on employment.

Apart from this conclusion in terms of gross creation of jobs, two original interpretations emerge. First of all on the positioning of European indus-

tries on the global market: whilst in 2006 Europe occupied around 70% of the market, according to the hypotheses, this could fall to somewhere between 30 and 55% by 2030 (with the challenge of the creation of over 100,000 additional jobs). Macro-economically, according to the research consortium, these impacts will in any event be positive, both in 2020 and in 2030, but below the growth of the sectors concerned because of the effects on costs and the price competitiveness of new energies. Hence the study's major recommendation: to deploy active innovation policies everywhere in Europe to reduce the costs of future technologies and ensure competitiveness on the world market.

SOURCE: EMPLOYRES, The impact of Renewable Energy policy on economic growth and employment in European union, April 2009 (for the European Commission, DG Tren).
<http://europa.eu.int/comm/dgs/energy/transport/forum/index>.



RENEWABLE RESOURCES

WRITING: Annabelle Berger

VISIONS OF FRENCH FORESTS 2050-2100:

THE IMPACTS ON THE WOOD SECTOR

Faced with the Environment Grenelle objectives of increasing the proportion of wood used in construction to 15%²⁴ and renewable energies to 20 million tons equivalent oil²⁵ by 2020 (energy climate package), in 2008 the French agriculture, food and countryside council carried out a foresight study of the development of forestry for the period 2050-2100, according to the scale of demand for wood as a construction material and an energy source.

On the basis of the INRA forecast published 10 years earlier, the approach cross-references hypotheses on the internal functioning of the industry and the external context. The five scenarios forecast the level of demand for wood resources, the impact on the structuring of the wood sector and support that the State may or may not provide through its forestry policy:

- the first two scenarios forecast sustained forestry profitability with three times more wood being cut than today in the “all-for-energy” scenario and a doubling in the “all-for-sustainable-development” scenario. In the former, the level of demand stems from the development of renewable energies. In the latter, the forest is perceived as a natural space and source of renewable products, whose development includes harvesting of wood as an eco-material;
- in the following two scenarios, the scale of demand for wood or food and land-use conflicts will affect how land is allocated. Competition between the growth in demand for wood-for-energy and the increasing demand for food results in a slight reduction in forestry area in favour of agricultural land.

This contraction is amplified in the “all-for-food” scenario where France consolidates its comparative advantage in cereal production;

- the last scenario, entitled “Forestry land”, presuming failure of international climate negotiations, simulates accelerating extreme phenomena. The frequency of storms destabilises the wood market which imports in order to meet demand. Urbanisation takes over forestry land which is primarily made up of windfall. Agriculture also contracts. This latter scenario is particularly important in the context of international negotiations where questions of adaptation are in-



creasingly on the table. In a forestry productivity sustaining approach, the CGAER encourages greater resilience of French forests. This means new research considering interactions between ecological functions.

SOURCE: Conseil général de l’agriculture, de l’alimentation et des espaces ruraux, march 2009, La forêt française en 2050-2100, Essai de prospective.

24 – i.e. 9 million m³ more construction wood. 25 – i.e. the mobilisation of 12 million m³ of energy/industry wood.



DEMOGRAPHICS AND GEOPOLITICS

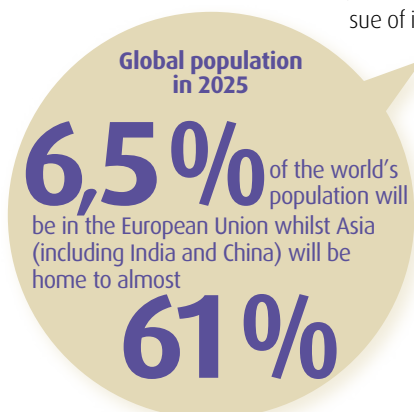
WRITING: Nathalie Etahiri

“EUROPE-WORLD” CHALLENGES IN 2025

The increasing influence of Asia and impending socio-ecological transition are major foresight considerations for the world of 2025, according to a recent report from the Commission’s European Research Area. Discussions of the group of experts have consolidated existing and accelerating trends concerning geopolitical transformations in terms of population, economic development, international trade and poverty, to better reduce pressure on natural resources, migration and urbanisation. On the subject of demographics, their observations are somewhat alarming. One-third of the world’s population is underfed and future pressures on food markets should increase see the figure grow. 3bn people will be short of water in 2025. Malnutrition and obesity will affect emerging countries twice as badly as ours, producing substantial pressure on health systems: the 30m suffering from “fat diabetes” in the world in 1985 would increase to 350m by 2030 – a tenfold increase in a little over 50 years! Furthermore, given that 80% of the world’s urban population will be living in the countries of the South (and especially Asia) and that “without major immigrant

inflow, the European population will probably start to decline from 2012”, the issue of international migration will have a strong impact on Europe’s positioning in respect of these global demographics. It is for this reason that the European Union is preparing to deal with globalisation’s demographic and ecological challenges by thinking about urban transitions and new “territorialities” in the world, demographic transition and “active ageing” amongst its member states. This very puts it on the road to the transition towards an integrated “greater Europe” and “Europe in the world”.

SOURCE: ftp://ftp.cordis.europa.eu/pub/fp7/ssh/docs/le_monde_en_2025_fr.pdf



The Foresight Unit



Its publications

CGDD Collections

—
CLAUDE SPOHR,
Vers une prospective territoriale post Grenelle de l'environnement. Questions et modes d'emploi.

collection Études et documents, Commissariat général au développement durable, October 2009

— Forthcoming publication

SERGE WACHTER,
La ville numérique sera-t-elle durable ?

collection Études et documents, Commissariat général au développement durable, January 2010

Research reports

—
EDGAR MORIN ET ALFREDO PENA-VEGA,
(under the supervision of),
Au-delà du développement. Pour une politique de l'humanité ?

Institut international de recherche, politique et civilisation, 2009

BERTRAND ZUINDEAU,
(under the supervision of),
La problématique du développement durable vingt ans après : nouvelles lectures théoriques, innovations méthodologiques, et domaines d'extension.

Conclusions of the International Symposium at the University of Lille, 2009

Articles and publications

—
JACQUES THEYS,
Les quatre transitions. Contribution au groupe de prospective de la Commission européenne sur le Monde en 2025.

September 2009

JACQUES THEYS,
Le développement durable 20 ans après : plaidoyer pour une deuxième étape, in « Développement durable, la deuxième étape » (with Christian du Tertre and Félix Rauschmayer, introduction by Bertrand Zuindeau), Éditions de l'Aube, November 2009



Agenda

December 4th

Sustainable Development Ministry, Paris.

→ MEETING OF THE « Scénarios pour des territoires durables en 2030 »

December 18th

Sustainable Development Ministry, Paris.

→ 5TH SEMINAR OF POST-CARBON CITY RESEARCHERS-ACTORS, "Post-carbon cities, biomass and bio-energies"

January 15th

Sustainable Development Ministry, Paris.

→ 1ST MEETING OF THE PROJECT GROUP ON "Biodiversity foresight"

January 25th

→ LAUNCH OF THE CALL FOR RESEARCH PROPOSALS "Transition towards an ecological economy"

January 28th-29th

→ RESIDENTIAL SEMINAR OF THE POST-CARBON CITY FORESIGHT GROUP, "Scenario building"

February 17th

Sustainable Development Ministry, Paris.

→ 6TH SEMINAR OF POST-CARBON CITY RESEARCHERS-ACTORS, "Habitat and post-carbon districts"

March 25th

Sustainable Development Ministry, Paris.

→ TERRITORIAL FORESIGHT SYMPOSIUM: "Working towards post-Grenelle environment futures in the State's devolved services"

Foresight elsewhere



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GUILLAUME ALMERAS AND CÉCILE JOLLY,
Méditerranée 2030,
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JEAN-MARIE CHEVALIER
(under the supervision of),
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Economica, 2009
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DANIEL COHEN
(under the supervision of),
Sortie de crise. Vers l'émergence de nouveaux modèles de croissance ?
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FRÉDÉRIC DENHEZ,
Quelle France en 2030 ?
Armand Colin, 2009
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JÉRÔME C. GLENN, THEODORE J. GORDON, AND ELIZABETH FLORESCU,
2009 State of the Future
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actes du colloque inaugural de la chaire Modélisation prospective au service du développement durable,
Mines Paris, Presses Paristech, 2009
.....

STOCKHOLM ENVIRONMENT INSTITUTE
A European Eco-Efficient Economy. Governing climate, energy and competitiveness
Report for the 2009 Swedish Presidency of the Council of the European Union, 2009
.....



International meetings and conferences

Held in 2009

OCTOBER 12TH-13TH

Bologna (Italy)

⇒ LOW CARBON SOCIETY RESEARCH NETWORK (LCS RNET), FIRST ANNUAL MEETING,
LCS-Rnet@iges.org.jp

OCTOBER 22ND

Paris

⇒ LAUNCH OF THE "TERRITORIES 2040" FORESIGHT,
DATAR

DECEMBER 2ND-4TH

Amsterdam (The Netherlands)

⇒ AMSTERDAM CONFERENCE OF THE HUMAN DIMENSIONS OF GLOBAL ENVIRONMENTAL CHANGE, "Earth System Governance. People, Places and the Planet",
www.earthsystemgovernance.org/ac2009/

DECEMBER 10TH-11TH

Strasbourg

⇒ THE SUSTAINABLE, CONNECTED TOWN, ACIDD

To be held en 2010

FEBRUARY 2ND-3RD

Lyon

⇒ THE SUSTAINABLE TOWN: STRATEGIES, METHODS AND KNOW-HOW, CERTU discussions,
www.lesentretiensducertu.fr

FEBRUARY 3RD-4TH

Versailles (Palais des Congrès)

⇒ MOBILITY AND THE FUTURE OF OUR TERRITORIES,
Congrès ATEC-ITS France

APRIL 6TH-10TH

Genève (Switzerland)

⇒ TRANSITIONS TO THE GREEN ECONOMY, UNEP and the International Association for Impact Assessment
www.iaia.org

MAY 28TH-30TH

Bonn (Germany)

⇒ 1ST WORLD CONGRESS ON CITIES AND ADAPTATION TO CLIMATE CHANGE "RESILIENT CITIES"
www.iclei.org/bonn2010

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