

Horizons

2030
2050

Foresight Unit News

“Bringing jointly-developed
long term strategies
into the public debate.”

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Edito In the areas covered by the ministry – energy, environment, transport and urban planning, and their inherent inertia and the scale of the long term consequences of actions concerning them, foresight has always existed in some form. However, over recent years, the relationship between foresight and decision-making has changed substantially. That relationship now relates to a context marked by a dual specificity in what is a completely new departure.

The Environment Grenelle and Factor 4, now institutionalised in matters relating to greenhouse gases explain the development of **long-term (15-40 year) strategies** alongside day-to-day initiative. The implementation of these long-term transition strategies first requires **shared visions** and broad debate to gain buy-in from those who will be directly affected subsequently. Beyond its traditional functions of forecasting and monitoring, the Unit must adopt a position in this two-pronged development. First of all, by taking a role in the joint development process and encouraging debate around a shared view of the future and then by developing long-term strategy tools (transition scenarios, road maps, etc...). For part of public action to be associated with long-term horizons and to offer a real platform for debate, **foresight has to be visible** and not confined to specialist forums as has traditionally been the case. Such is the purpose of this **Horizons 2030-2050 Foresight newsletter** which, I hope, will interest all those who, besides having a healthy interest in the long term, identify with our sustainable development ambitions.

MICHÈLE PAPPALARDO

Commissioner-General for sustainable development

Q&A with JACQUES THEYS head of the Foresight Unit

CGDD : Why this title “Horizons 2030-2050”?

JT : This issue is the first in a new series of monitoring newsletters that the Foresight Unit, set up in November 2008, will be publishing every two months. We chose the title as being illustrative of the Unit’s remit and of the topics addressed in the newsletter: to promote debate around the economic, social, ecological, institutional and technological transitions which we see us evolve into a more sustainable society according to two horizons: long-term

(2030) and very long-term (2050). Horizons 2030-2050 will be covering these transitions.

CGDD : How will the different foresight themes be addressed?

JT : Each issue will feature three sections:

- **Analyses et arguments:** a recap of analyses or controversies to help elucidate a given foresight theme or transition dynamic;
- **Foresight watch** in the form of news-in-briefs with precise information on recent events or publications;
- **Foresight news** will review publications or events concerning the Unit or other institutions and organisations.

CGDD : Will you be opening the newsletter up to outsiders?

JT : Today, the publication primarily uses the Unit’s resources. In the longer term, we would hope to see it grow into a more open, interactive platform, first of all to talk about work done elsewhere and then to hear from all actors and experts interested in foresight. This issue should be seen as a starter format which will evolve according to the needs expressed by our readers.



THE MEEDDM'S FORESIGHT UNIT

The Foresight Unit, set up in November 2008 within the sustainable development delegation (DDD) of the Commissioner-General for sustainable development (CGDD), has three crossover functions.

• **It runs foresight activities** for the central administration and decentralised services of the ministry and is its foresight resource centre. It acts as an interface with major national and international foresight networks: public foresight networks, agencies, think-tanks, European and international organisations.

• **It provides information on the challenges faced by foresight and long-term developments linked to sustainable development.** It formats monitoring and foresight elements for debate on the basis of extensive interaction. It uses foresight information in publications or for seminars, conferences and symposia on emerging themes. With a view to opening up the question both internationally and to civil society, it runs a circle dedicated to foresight themes, imagining and developing new production and consumption models in a sustainable development perspective.

• **It pilots and performs foresight work on long-term sustainable development models and transitions** through 2-year research programmes. For the period 2009-2010, the work schedule is structured around five themes corresponding to the ministry's strategic priorities.

The Foresight Unit's major structuring programmes for 2009-2010

PROGRAM 1 POST-CARBON TOWNS

Whilst there is a consensus on the major role towns have to play in greenhouse gas emissions and oil and gas consumption, controversy persists as to the possibilities of in-depth transformation of structures and the way towns function. From this postulate, the programme will assess the room for manoeuvre and existing actions in several contrasting transition scenarios towards post-carbon towns as well as the direct and indirect impacts of these scenarios.

PROGRAM 2 TRANSITION TOWARDS AN GREEN ECONOMY

Beyond what already exists on green jobs, this second programme looks ahead to the consequences of the different trajectories of the development of the French and global economies by 2030 concerning the scope of the ministry. On the basis of very profound structural changes linked to crisis, technological change, new trends in consumption patterns and value systems, the objective is to assess the constraints or new opportunities for ecology and sustainable development as well as the positioning of French economic actors in a transition scenario as we move towards a green economy. This will also be a major theme for the future debating circle.

PROGRAM 3 SUSTAINABLE TERRITORY-2030

For territorial foresight – a major challenge for the ministry and a widely-shared concern (local authorities, DIACT, agricultural ministry, etc...) – two complementary approaches will be pursued simultaneously through 2009-2010. Initially, the priority will be given to developing territorial foresight work concerning specifically the ministry's remit: after transport and coastlines, a major study on biodiversity foresight could be undertaken in close collaboration with the Directorate-General of planning, housing and nature (DGALN). Subsequently, an initiative will be co-performed with the inter-ministerial delegation on spatial planning and competitiveness (DIACT) and the ministry of agriculture, to launch a broader territorial foresight exercise for France 2030 feeding the debate on alternative visions, sustainable or otherwise, from all the economic, social, ecological, climatic and institutional angles.

PROGRAM 4 SUSTAINABLE DEVELOPMENT AND RECONFIGURATION OF NATIONAL RESEARCH AND EXPERTISE SYSTEMS

In line with its previous activities, the Foresight Unit will seek to provide useful monitoring and forecasting elements to the ministry's new research and innovation department. The preferred line of attack – in terms of transition – will be reconfiguring national research and expertise systems faced with emerging sustainable development priorities: consequences of the Environment Grenelle for scientific institutions and their relations in France, and the restructuring of public and private research systems, expert networks and thematic priorities in some major comparable countries.

PROGRAM 5 MULTI-LEVEL GOVERNANCE AND ITS TRANSFORMATIONS

The 5th programme will concern the transformation of governance generally and, more specifically, that of multi-level governance relating to the articulation of new territories both globally and locally. Two questions will be addressed: the first concerning trends in international governance in a new geo-political context, and the second, the territorialisation of public action in several contrasting institutional organisation scenarios in France.

“It pilots and performs foresight work on long-term sustainable development models and transitions”



Prospects for the green economy

Working towards a broader debate on transition scenario models

One of the remarkable characteristics of most recovery plans launched since the autumn of 2008 is that a large part of those recovery plans has been dedicated to what we now call the "green economy", covering all economic activities directly or indirectly linked to environmental protection: management of scarce resources, renewable energy, climate change, risk mitigation, etc... One oft-quoted figure is that 15% of the global recovery budget has been dedicated to the green stimulus*¹ and substantially more in China, South Korea and France². Even though this figure is only an estimate – and one, indeed, that is contested – at least it indicates a

convergence of interests and expectations of major global public and private players, as made official in the final communiqué of the G20 in April 2009: "Tomorrow's economy will be inclusive, green and sustainable (...), the crisis is an opportunity to accelerate the necessary transition towards that model³". The reason that the green economy engenders such widespread hope is that it seems to be the only one that can combine the three advantages considered as crucial in today's uncertain situation: providing a solution to future climate and energy problems whilst promoting a rapid end to the crisis and the longer-term emergence of new kinds of growth. →

*See all notes on page 10



Definition

green economy

This covers all economic activities directly or indirectly linked to environmental protection, the management of scarce resources, renewable energy, climate change or risk mitigation.

GREEN JOBS: major studies

SOURCE	NB OF JOBS (thousands)	REGION	PERIOD	OTHER REMARKS
UNEP, 2008. Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World	Currently: 470 Currently: 624 + Currently: 1 174 Currently: 64 +	Global Global Global Global	2006 2006 2006 2006	In the wind and photovoltaic solar sectors In the thermal solar sector In the biomass sector In the hydro-electric and geothermic sectors
University of California 2008. Energy efficiency, policies Efficiency, Innovation, and Job Creation in California	Created: 1500 To be created: 403	California California	1977-2007 2008-2020	In the energy sector Potential innovation in areas linked to energy efficiency and climate
US Metro Economics, 2008. Green Jobs in the US Economy	Currently: 750 To be created: 2500 To be created: 4200	US US US	2006 2008-2018 2008-2038	Assuming an increase in the portion of renewable energy and further to energy efficiency measures
Political Economy Research, 2008. A Program to Create Good Jobs & Start Building a Low-Carbon Economy	To be created: 2000	US	2008	Assuming a green stimulus plan of \$100 billion
Barack Obama, 2008. Energy and Economic Policies	To be created: 5000	US	2008-2018	Assuming a green stimulus plan of \$150 billion
Gordon Brown, 2008. UK Renewable Program	To be created: 160 To be created: 25000	UK Global	2008-2020 2050	Assuming a green stimulus plan of \$100 billion –
BCG, 2008. Les éco-industries en France. Plan Ecotech 2012 Ministère de l'économie, de l'industrie et de l'emploi	Currently: 400 To be created: 280	France France	2008 2008-2020	In association with the Environment Grenelle, potential jobs in eco-industries in the broader sense (new energies and energy efficiency included)



Since the beginning of the crisis, attention has naturally been focused on its contra-cyclic effects and its potential impacts on employment – many analyses confirm that at constant investment levels, this type of activity could create two to four times more jobs than other sectors⁴ (see table on p3). There are also many sector-based assessments which show the importance of the economic benefits that could be derived from the introduction of ambitious policies in this area; the most recent in Japan for example, predicts a two-fold increase by 2020 of jobs linked to clean technologies. This aside, the green economy’s capacity to trigger longer-term growth remains controversial. Beyond the widely-anticipated sector-based

impacts, should we envisage the much wider macro-economic consequences on the economy or possibly even more radical changes in regulations and future economic models for production, consumption or trade? This is the key question if, as is the case here, we are looking at long-term transitions. It means switching from sector-based analyses focusing on supply, to macro-economic, macro-social approaches taking account of context, major growth cycles, lifestyle, socio-economic standards and value systems amongst many others. It also requires more dynamic approaches which include action planning as well as the opportunities and risks associated with any major transition.

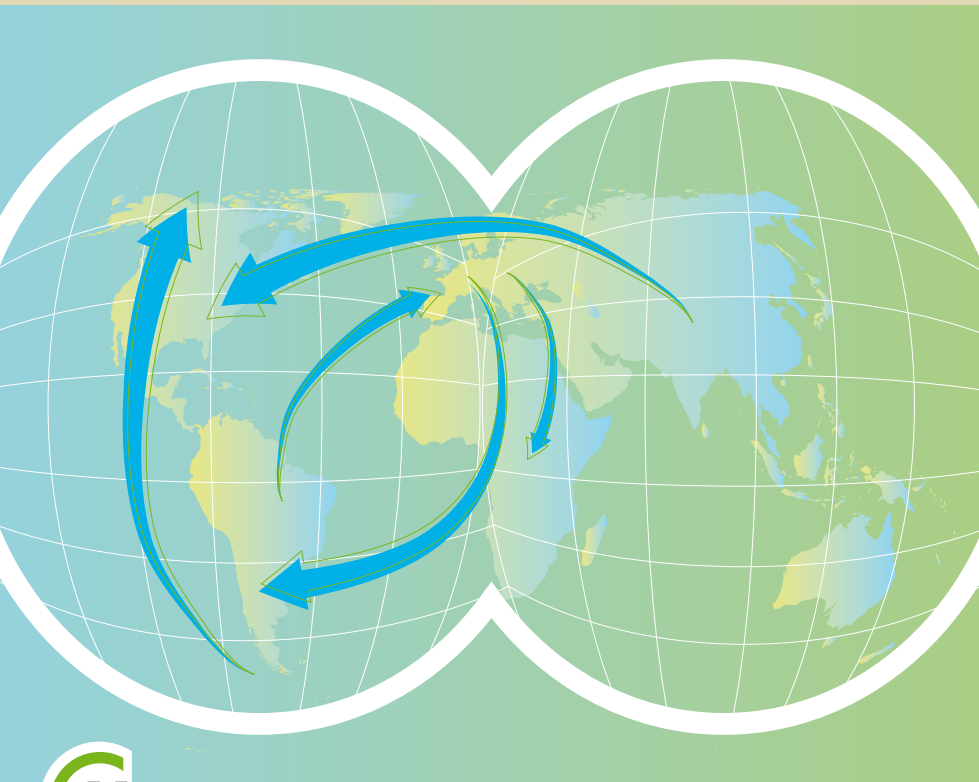
TAKING THE CONSEQUENCES OF THE CRISIS ON BOARD

Being attentive to context, opportunities and threat of course means taking the consequences of the crisis into account. Even if, as we have discussed, the green economy emerges far stronger from the crisis – many are suggesting a “Green New Deal” as a common solution to the economic or ecological crises⁵ – no hypothesis can be made on its role in a possible new growth path without taking into account the substantial changes which will result both from the current recovery and the still uncertain forms of crisis endgame. In an article published in February 2009 by the London School of

GREEN STIMULUS AND/OR LONG-TERM INVESTMENT? A multi-criteria assessment in the areas of construction and industry*

TYPE OF ACTION	TYPE OF FUNDING	SHORT-TERM FEASIBILITY (degree of maturity of projects)	EFFECTIVENESS CRITERIA FOR CLIMATE CHANGE		ECONOMIC EFFECTIVENESS CRITERIA		REVERSIBILITY OF PUBLIC SPENDING OVER TIME
			Long-term social returns	Irreversible qualitative changes over time (positive lock-in effects)	Creation of employment and multiplier effects (employment, local revenues)	Exploiting under-utilised resources	
Energy efficiency in the residential sector	Mixed public-private	best	best	medium	best	best	best
Energy efficiency in public buildings	Mixed public-private	best	best	medium	best	best	best
Renewal of boilers in private homes	Private with public incentives	best	best	medium	best	best	best
Renewal of lighting equipment	Private with public incentives	best	best	medium	best	best	best
Development of renewable thermal activities (solar, biomass, etc...)	Private with public incentives	best	best	medium	medium	best	medium
Support to micro-generation (wind, biomass) through guaranteed price mechanisms	Private or mixed public-private	medium	best	medium	medium	medium	worst
Intelligent production of energy and resources (efficiency, monitoring, regulation)	Private with public incentives	medium	medium	best	worst	worst	worst
Intelligent infrastructure and building in terms of energy and resources (efficiency, monitoring)	Mixed public-private	medium	best	best	medium	medium	worst
Supporting R&D in energy	Mixed public-private	medium	best	best	medium	worst	worst
Co-generation in the industrial sector	Private or mixed public-private	medium	best	best	medium	worst	best

Source: Iex Bowen, Sam Fankhauser, Nicholas Stern & Dimitri Zenghelis, 2009, an outline of the case for a ‘green’ stimulus, 2009, LSE Policy Brief.
*Each type of action is subject to a 3-level scoring system: the best solution, the medium solution and the worst solution.



The massive stimulus packages will inevitably change the situation internationally"

Economics and the Grantham Research Institute, Nicholas Stern and his colleagues argued the case for explicitly ranking green investments dedicated to recovery, accounting for their impact on long-term growth forecasts, and proposed a multi-criteria approach explaining the various anticipated effects over time (shown in the table to the left on energy in building and industry). Consequently, the whole future development scenario for the green economy will have been modified by the crisis – resource prices, industrial infrastructures, public debt, household income, competitiveness of energy or environmental actors – and it would be wrong to take it merely as an incident related to the economic context. Massive public investment in the green stimulus will, for example, lead to a considerable redistribution of influence between global actors in the sector and therefore will have a major impact on the future scope of these activities in France and in Europe. These impacts need to be planned for. In reality, at the present time, very few studies⁶ help assess these inevitable reconfigurations.

THE GREEN WAY DEPENDENT UPON TECHNOLOGICAL INNOVATION AND POLITICAL WILL

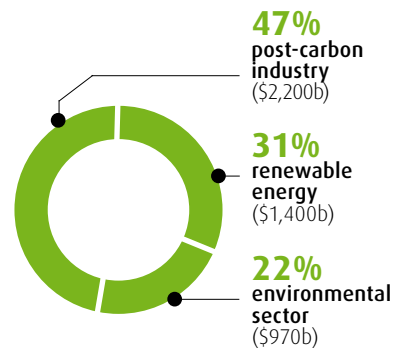
Even though they are yet to take the real consequences of the crisis on board, economic forecasts are nevertheless sufficiently convergent to suggest a global dynamic whereby the economy will become greener, going well beyond the traditional sectors of the environment.

At best, the global green market could therefore in time be worth \$4,500 billion, half of which would be outside the scope of environmental protection and renewable energy (see adjacent pie charts). This is a considerable jump compared the 2% of global GDP announced for the green economy in the past⁷. Whether expressed in terms of market size or number of jobs, the promises of a green economy reside in the prospect of separating economic growth, use of resources and impact on our eco-systems. Materialised through the development of new products, processes, services or functions, foresight is based on two key hypotheses:

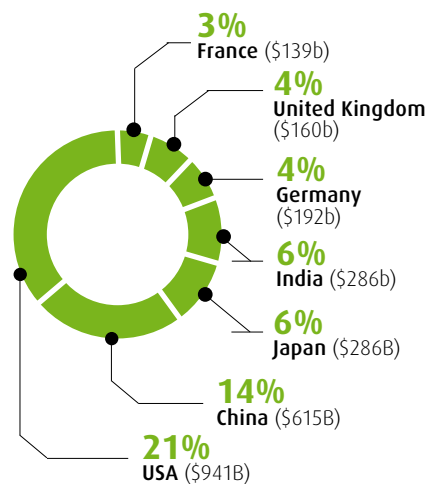
- massive use of technological innovation (cf: graph above);
- people's voluntarism, whether expected most from investors, public incentives, industrial strategies or consumer choice. →

THE GLOBAL GREEN MARKET Share and value (2008)

MARKET SHARES OF THE GLOBAL GREEN MARKET PER SECTOR (in % and billion dollars)

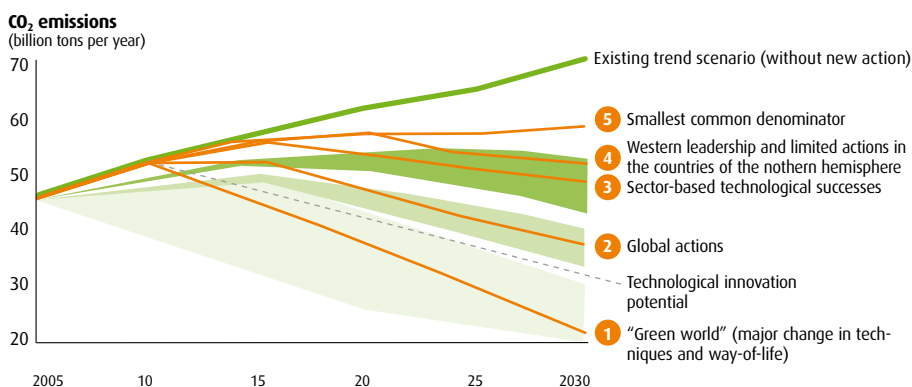


MARKET SHARES OF THE GLOBAL GREEN PER COUNTRY



Source : Berr, 2009, Low carbon and environmental goods and services : an industry analysis.

**TECHNICAL INNOVATION
in emission scenarios**



Source : Mc Kinsey, 2009. Pathways to a Low-Carbon Economy.

→ Whilst the dynamic is broadly sketched out and agreed upon, divergences do arise on transformation trajectories and strategies, both technologically and from an economic and social point of view. In general terms, the design and dissemination of innovations is based on selection and learning processes whose inertia is not particularly well understood and whose triggering or acceleration often faces multiple blockages or lock-in effects. This is particularly true in the area of transport, energy and housing, as the large number of studies recently published on obstacles to innovation in these three sectors show⁸. These difficulties vary from one technology to another, from one domain to another, but also from one country or region to another, and there is no model trajectory and therefore no incentive system which will work in every case. Many options therefore remain open with the difficulty of switching from a technological niche to radically different technical systems.

And the fact that industrialists are adopting risk-limiting diversification strategies does not conceal the sustained opposition between incremental and radical innovation (see table below), and these changes will surely have great influence on the success of any transition to a sustainable economy.

A WAGER ON PROCESS OR HORIZON?

The voluntarist hypothesis, linking processes in progress and long-term horizons, faces an even deeper cleavage:

- the first position considers that if the greening of the economy were to prevail as a horizon, the processes in place today would lead to it in one way or another;
- a second position suggests that if the greening of the economy were to prevail as a process, the horizon would be reached in one form or another.

Of course, in practice, such a clear-cut debate does not exist. But, depending on the scale (global or local), dimension (supply or demand) or sector in question, references to an emerging green economy navigate between these two transition models. The fact is that the problem is not about choosing between prescriptive planning (top-down) or adaptive management (bottom-up), but rather looking at what their future balance or point of convergence will be. Indeed, these two ways correspond to two apparently contradictory trends for which we have difficulty seeing the possible interactions over the medium or long term. It is perhaps better to talk about a dual movement which will tend to reduce ecological challenges to a series of essentially economic problems on the one hand, and on the other, modify our vision of the economy according to principles which directly derived from ecology. Even if this differentiation is familiar, we need reminding of its major precepts.

**INCREMENTAL INNOVATION OR MAJOR CHANGE TECHNOLOGY?
Two diverging industrial strategies**

ELEMENTS OF COMPARISON	INCREMENTAL INNOVATION (adaptive technology)	RADICAL INNOVATION (integrated technology)
Global productivity	↘ (Existing trend)	↗ (Potential)
Production costs	↗	↘ (Potential)
Investment, access and information, adaptation or reconversion costs	-	+
Compatibility with companies	+	-
Economic risk	+	++
Position on the Ecotech market	+	+++ (Potential)
International competitiveness	↘ (Existing trend)	↗ (Potential)

Source : 2001. Cécile Patrice, Gérard Valenduc and Françoise Warrant, 2001. Technological innovation serving sustainable development – summary report. Fondation travail-université, Namur.

THE "ECONOMIZATION" OF ECOLOGICAL ISSUES

A first approach is based on the stance that ecological challenges do not imply, on the face of it, a change in the forms and frames of representation of growth on condition that the economy makes best use of them.

GROWTH WILL MECHANICALLY LEAD TO THE GREENING HORIZON

By mechanically, we mean attaching a system of prices and property or exploitation rights to increasingly scarce resources. This opens up the possibility of optimum equilibrium, reflecting a



general consent to pay in order to preserve such-and-such an element of natural capital. If we suppose that a set of techniques or knowledge can, without restriction, substitute them, this type of analysis shows that there is an option where the asset remains globally constant as resources dwindle. This option too is optimal. However, growth leads to the desired greening horizon since it is judged to be a necessary part of the process of reducing environmental impacts (Kuznet's curve).*

GROWTH WILL LEAD TO THE GREENING HORIZON ON CONDITION THE STATE INTERVENES

Whether through the introduction of taxes or permit systems, state intervention is necessary in order to correct market's failure to put a price on damage to the environment (pollution abatement costs, preservation and regeneration costs, etc...).

Faced with a trajectory with constraints, optimisation requires enhanced regulation instruments, with the inherent questions about levels of incentives, the basis upon which taxes are calculated, their progression and effectiveness over time towards these different horizons, their fairness, etc... One of the major aims of such regulation should be to single out the critical portion of natural capital, separating it from the substitution principle discussed elsewhere. But all

As the intensity of debate on the introduction of a pollution permits market in the US¹⁰ and the carbon tax in France¹¹ shows, the choice of the right price signals which take international competitiveness issues into account will always require relatively long and uncertain adjustments and actors of the green economy will need to take this on board.

THE ECOLOGIZATION OF ECONOMIC CHALLENGES

The second trend, based more on specifically ecological contributions, favours on the contrary, a profound transformation of economic development mechanisms. The characterisation of the ideal way can also - but again very broadly - be divided into two key postulates.

Facts and figures

2008
80 % of American capital risk is invested in the green economy.

2008
the global photovoltaic market doubled in size.

may 2009
for the first time ever, a hybrid car topped the best-seller list in Japan.

"The emerging green economy is wavering between two transition models."

resources, including environmental public goods and services (eg: services rendered by biodiversity) must be valued, either to guide investment or facilitate compensation negotiation.

If price signals work well and competitiveness distortions avoided⁹, growth can, under all these conditions, be the main driver of a successful and controlled ecological transition.

INSTITUTIONAL CHANGE IN THE GREENING PROCESS: VARYING DEGREES OF SPONTANEITY

If information is sufficient and values shared, private arrangements will trigger a restructuring of institutions to create devolved industrial eco-systems or shared service systems¹². First of all introduced by companies, the process evolves on the basis of voluntary commitment and win-win →

★ Kuznet's curve

Tool comparing countries with different levels of development and making a dual interconnection between income per inhabitant and environmental quality. Up to a certain development threshold, pollution increases with incomes, but beyond that point, the trend is reversed. This bell-shaped curve is fairly controversial.

→ co-operation tying in consumers, inhabitants, public authorities, and so forth. This enables industrial ecology to meet a 4-fold challenge: recovering waste, closing the production-consumption cycle loop by minimising waste, de-materializing products (service or functionality economy) and relieving the

world of its dependence on fossil fuels. One assessment taken from an Australian foresight exercise shows that in fact, the employment potential of such a trajectory involving the de-materialization of the economy may be quite considerable (see graph below).

THE GREENING PROCESS INVOLVES FOREGOING QUANTITATIVE GROWTH IN FAVOUR OF QUALITATIVE GROWTH

This second type of analysis, of more radical inspiration, argues in favour of maintaining our natural assets constant over time to demonstrate the inevitable limits to growth and recommends long-term assessment assuming practically stationary, or even declining, economies. The difference between this and the Rome Club era is that today's limits "are not only linked to the finite nature of resources, but also to the capacity of nature to absorb emissions from pollution and waste"¹³. Considering the four decades between the publication of that report (1972) and now, the innovation economists Giovanni Dosi and Marco Grazi recently¹⁴ drew two conclusions in terms of long-term transition:

- "The idea that growth takes care of itself in terms of consequences on the environment is neither analytically nor empirically proven";
- "Even sky-rocketing prices of fossil fuels will not be sufficient to endogenously create sustainable consumption trajectories" and "major changes in paradigm are necessary both in terms of innovation and lifestyle to prevent the limits of growth being reached or exceeded".

It is important to bear in mind that the notion of 'limit' suggests that the green economy of tomorrow should be seen in very different terms than as a straight-forward extension of current trends.

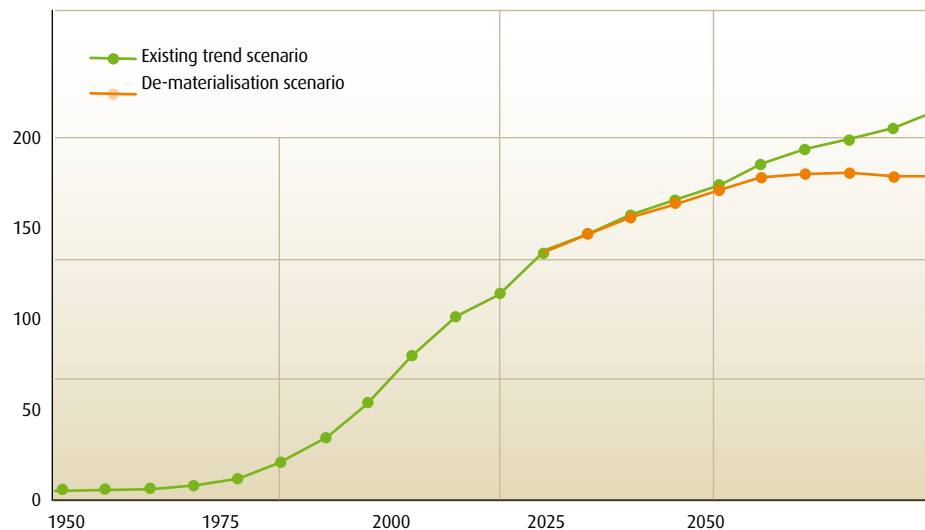
A CHIAROSCURO SOCIAL CHANGE

As announced, these two trends situate uncertainty respectively in a precise definition of the process (at nation and local levels, what are the most effective substitution resources or regulation tools?), and a detailed description of the horizon (at global level, what will an industrial eco-system, an ecological economy or a so-called stationary economy look like?). And yet, more often than not, these questions come down to questioning trends or possible social or way-of-life revolutions.

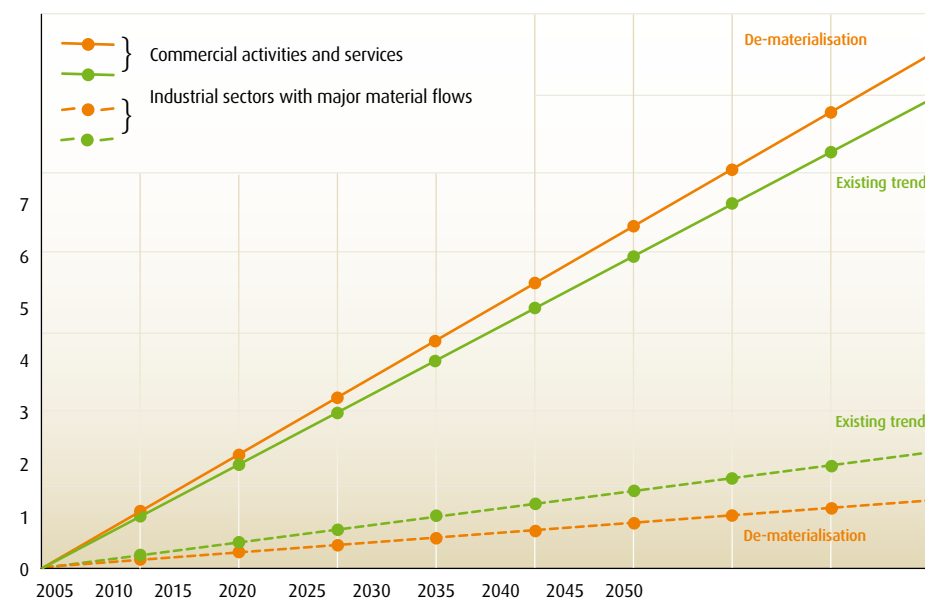
All technology-dominant scenarios imply demand structuring to which neither public

ECONOMIC IMPACTS OF A DEMATERIALISATION TRAJECTORY: an Australian scenario

GDP per inhabitant (index: 2011=100)



Jobs created (millions)



Source : Graham Turner et Heinz Schandl, 2008, The dematerialization potential of the Australian economy, CSIRO Working Paper Series

“Any model proposing the transition to a green economy carries with it considerable social and political indeterminacy.”

actors nor companies alone have the key. Faced with possible developments such as long-term increases in energy and raw material prices (linked in particular to global demographic pressure), stiffer carbon constraints or more aggressive sector-based strategies, great uncertainty bears down upon supposed or expected social change: multiple rebound effects, global demand crisis, cultural inertia on consumer behaviour, uncertainty of consent to pay the price, etc... and long-term modelling tools give no clear representation of the dynamic relationships between economic growth and forms of development¹⁵ embodied by consumption, technology uses or spatial patterns. Inevitably, any model of transition towards a green economy will develop from a position of great social and political uncertainty.

Hence the need¹⁶ for more than basic forecasting (each actor's specificities and inequalities in relation to others are not sufficiently taken into account), which is sometimes contingent (industrial or societal choices?) and always unstable (difficulty in predicting conflicts, political change and obstacles inherent to such social changes).

DEBATING CONTRASTING VISIONS TO BUILD ROBUST POLICY

Rather than arbitrating on or analysing the difference between one trajectory or another, the convergence of the long-term, voluntarism and uncertain futures means that foresight as a discipline has to diversify its scenarios. Since increasing uncertainty goes hand-in-hand with increasing knowledge, it seems particularly useful to strive for a better articulation between the unequivocal

optimum and the broader notion of robustness. By opening up very long-term perspectives, foresight has an important role to play in the development of economically, ecologically, scientifically but also socially and politically robust policies. ●



Footnotes

PAGE 3

1 As we wait for consolidated data from the OECD, the HSBC global survey dated February 25th 2009 and entitled 'A climate for recovery' values at \$430 billion the investment dedicated to green stimulus throughout the world. Beyond the massive environmental expenditure undertaken by China (\$221 billion, i.e. 38% of the Chinese plan) and the US (\$112 billion, i.e. 12% of the American recovery plan), the study pinpoints the performances of South Korea which is dedicating 80% of its recovery plan to green stimulus.

2 Of France's \$14.5 billion 2009-2010 recovery plan, the green component accounts for 35%, i.e. 3.13% of 2008 GDP. When the expenditure undertaken as part of the Grenelle commitments is added to this, almost €16 billion of public money has been committed for the period 2009-2010, i.e. around 0.5% of 2008 GDP (source: Manuel Flam, Les Relances vertes dans le monde, CGDD/DDD, June 2009).

3 Source: final communiqué of the G20 in London in April 2009.

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4 Source: DWS: 2008, Economic Stimulus: The Case for 'Green' Infrastructure, Energy Security and 'Green' Jobs.

PAGE 5

5 The major initiative in this domain was the UNEP's, in March 2009, with its report published by a workgroup on the green economy entitled 'Global Green New Deal'.

6 According to the latest stage audit of the Ecotech 2012 strategic plan, introduced by the ministry of economy, industry and employment, 'if France does not develop corresponding industries in its territories, it will forego half of the new jobs and most of the export potential (BCG, 2008). The international competitiveness aspect therefore seems crucial, at least in the medium term.

7 According to market forecasts, this will increase from 2 to almost 9% of global GDP.



Footnotes

PAGE 6

8 See a number of recent examples of these works in the news-in-brief section of this newsletter.

PAGE 7

9 See recurrent debates on the Porter hypothesis and the more general problem of understanding whether economic gains linked to environmental innovation can compensate for costs incurred through regulations. For a discussion on this, referring to France, see in particular the CAS report entitled 'Preparatory Works of the Environment Grenelle'.

10 See the bill on energy and climate introduced on March 31st by

two democrats, Henry Waxman (California) and Ed Markey (Massachusetts), adopted on May 21st by the energy and trade commission.

11 See the experts' "carbon tax" conference held at the beginning of July in Paris under the chairmanship of Michel Rocard.

12 See in particular debate around the notion of a "functionality economy"

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13 Quote from W.A. Brock & M.S. Taylor, 2004, Economic growth and the environment. A review of theory and empirics, NBER Working papers,

National Bureau of Economic Research.

14 Source: Giovanni Dosi & Marco Grazzi, 2006, Energy development and the environment. An appraisal of three decades after the Limits to Growth debate, LEM, Sant'Anna School of Advanced Studies.

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15 Source: Jean-Charles Hourcade & Renaud Crassous, 2008, Low-carbon societies: a challenging transition for an attractive future, in Climate Policy; n° 8.

16 On this subject, see the works of Raskin and his arborescent vision of long-term trajectories. Source:

Raskin, 2008, Wordlines: a typology for exploring global pathways, in Ecological economics, n°65.

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17 Source: see the dossier of the programme posted on the sustainable development ministry's intranet site on the Foresight Unit page.

18 See in particular for France, the BCG study dedicated to eco-industries carried out in 2008 as part of the Ecotech 2012 strategic plan, at the initiative of the ministry of economy, industry and employment.

A new programme

In 2009, the Foresight Unit launched a programme entitled "transition(s) towards a green economy". Beyond existing reflections on green growth, this project will focus on structural changes to the economy and to French society as well as the role that the different aspects of "ecology" could play.

THE PROGRAMME OPENS UP:

- a debate on the nature and scale of transformations in play (sectoral changes or more radical changes in terms of way-of-life, economic regulations, etc....);
- a multitude of scenarios taking possible developments into account, including emerging phenomena (opportunities, blockage or uncertainty factors);
- the possibility of identifying action options for the positioning of the

French economy and for companies faced with the foreseen transformations. Because of its broad, open attitude to all hypotheses and uncertainties on horizon 2030, this foresight programme¹⁷ on the transition to green economy should be a useful addition to the vast array of works already engaged on the green economy within a more sectoral-based perspective¹⁸.

For information about the programme, please contact Sébastien Maujean at the Foresight Unit (+33(0)1 40 81 34 87).



ECONOMIC TRANSITION

A VISION OF FRANCE COMMITTED TO SUSTAINABLE DEVELOPMENT TOWARDS 2030

On average, **France could gain** half a point of growth per year between now and 2030 if it was to commit to a global sustainable development strategy.

This is one of the major findings of the study carried out by BIPE for its 50th anniversary and presented to the secretary of state for ecology in January 2009. According to BIPE, this improved economic performance should be the result of drivers expected in the four major sectors of the economy:

- first of all, those linked directly to sustainable development which should have knock-on effects on all businesses and on employment: renewable energy, home automation, rehabilitation of buildings, rail transport, nano-technologies, organic products, etc.
- secondly, dynamic sectors whose growth will be indirectly stimulated by the transition towards sustainable development on condition that private investment grows as a part of

the whole: cultural and leisure activities, public transport, personal services, etc.

- thirdly, sectors undergoing transformation which will be need to operate major changes to fall in line with sustainability trajectories but whose pace of growth will not decline: real estate, engineering, industrial maintenance, financial services, etc.
- and finally, inevitable transition sectors which will lose some of their traditional market share and will have to focus on new value-creating themes: automobile, road transport, certain agro-foods sectors, trade, chemicals, etc.

Beyond these sectoral changes, the BIPE says that the major impact of a sustainable development strategy should be in-depth changes to eco-



nomical and regulation models. Existing borders between sectors and activity areas will be redefined with a switch from a product/service-based logic to a functions-based logic. Internalising environmental, social and societal externalities into the economic system and the integration of overall cost into price indicators will have a profound impact on competition between products and forms of mobility. New accounting rules and new types of control bodies will emerge to radically change

regulation mechanisms and approaches. Which raises the question as to who, at international level, will define the rules and control the information systems responsible to measure their application?

SOURCE: BIPE, January 2009, 30-year vision for a France committed to sustainable development.

GREEN TAXATION

BOULDER: THE FIRST AMERICAN TOWN TO EXPERIMENT WITH CO₂ TAXATION



In April 2007, Boulder, Colorado was the first American town and one of the first in the world to introduce carbon tax in an urban area. Based on the number of kilowatt hours used by private individuals and companies, the tax is collected by electricity suppliers and used to finance the local climate plan to a value of around \$7m. The municipality has now voted a substantial increase since the existing taxation level is not sufficient to meet Kyoto Protocol targets (-7% in 2012

compared to 1990). This first assessment of a unique experiment world-wide is particularly interesting at a time when France is considering the climate-energy contribution as part of what is clearly a very different approach.

SOURCE: The New York Times, April 2009.

@ LOW CARBON SOCIETY

ENERGY TRANSITION: WHAT ARE THE MAIN BARRIERS TO INNOVATION?

After an initial wave of energy foresight works which focused primarily on identifying Factor 4 scenarios for 2050,

sapplied industrial economic approaches now exist which rank the obstacles and opportunities involved in the transition to a post-carbon society. The best example of this new wave of studies is that carried out in 2008 by the Oakridge National Laboratory for the American department of energy (DoE) under the heading 'Carbon lock-in: barriers to deploying climate change mitigation technologies'. All barriers to innovation – economic, technological, social, regulatory, fiscal – are listed as part of a scope which covers most major de-carbonisation technologies – fuel cells, CO₂ capture, photovoltaic, wind energy, insulation of buildings, electric vehicles, etc...

Unsurprisingly, the economic barrier heads the obstacle list with a structural imbalance between the additional cost of new techniques to be launched on the market and an 'avoided carbon price' which is too low or even zero.

But the originality of the study is in its demonstration of the interaction between three other series of barriers which are key in the US, as they undoubtedly are in Europe:

- first of all, anti-trust practices which stem the tide of promoters of innovation and prone the status quo: obstacles to the filing of patents for new entrants, public aid to research which puts large enterprise first, the excessive caution of

capital riskers, unsuitable regulatory niches, etc;

- secondly, excessive uncertainty as to the conditions required for the large-scale deployment of future technologies: lack of visibility on construction of the new infrastructures that will be required, doubts about the labour market's capacity to provide the technical skills needed, difficulty in forecasting public reactions, opacity of future tariff regimes;
- finally, prohibitive transaction costs linked to the lack of information on public policies, trends in scientific debate, performances and cost of competing techniques, industrial sectors and supply sectors, energy price, etc...

All these obstacles – and the report identifies 50 or so – are closely linked and, according to the authors, means that global innovation aid strategies must systematically taking all dimensions into account. These conclusions converge very largely with those of another assessment published more recently by the European Commission's technological foresight institute on the more restricted scope of energy technologies in building (towards additional policies to improve the environmental performance of buildings, IPTS, 2009).

SOURCE: www.osti.gov/bridge, *Carbon lock-in : Barriers to deploying climate change mitigation technologies, January 2008.*



INNOVATION STRATEGIES

THE HYBRID VEHICLE, AT THE CROSS-ROADS OF AN AUTO- MOTIVE TECHNOLOGY REVOLUTION IN THE COMING DECADES

For the first time in its history, the automotive industry is facing profound technological change without any substitution solution to existing vehicles emerging as a categorical solution. In this uncertain structural context, a study recently published by Strasbourg University's Bureau d'économie théorique et appliquée (BETA) as part of the PREDIT 'transport policies' group, shows the importance of the hybrid vehicle as a key element of the transition towards the automobile of the future.

On the basis of an approach through investment strategies in uncertain situations entitled 'approach using real options', the authors, Arman Avadyan and Patrick Llerena justify the option of hybrid vehicles through the conjunction of four complementary arguments:

- first of all, it capitalises on progress achieved in thermal engine technology and guards against uncertainties linked to alternative solutions;
- it is sufficiently flexible to serve as a frame to a multitude of highly diverse technological innovations;
- thirdly, it prepares the transition towards change technologies such as the electric or hydrogen vehicle;
- finally, it reconciles short and long-term greenhouse gas reduction objectives, guaranteeing more immediate and greater gains than the other solutions.

The overarching image depicting these arguments is one of a flexible innovation platform promoting technological synergies and the coexistence of cautious strategies and high risk-taking.

Accompanied by precise, up-to-date information on the various strategies of global manufacturers, BETA's research resituates the vast array of information and recently-published factual studies in a convincing theoretical framework of alternatives to thermal engines. This is what makes it a potentially very useful aid to decision-making.

SOURCE: Bureau d'économie théorique et appliquée, Louis Pasteur University, Strasbourg, February 2009, «Transition technologique, stratégies d'investissement et options réelles. Le cas des véhicules hybrides, 118p [for PREDIT].

 **SUSTAINABLE MOBILITY**

TRANSVISION : SEVEN SCENARIOS FOR THE FUTURE OF TRANSPORT IN EUROPE

In March 2009, the European Commission (DG TREN) published what should, for some time to come, be the reference document on the future of transport in Europe: Transvisions, report on transport scenarios with a 20- and 40- year horizon. The major originality of this foresight study was to cross-reference quantified modelisation works on transport trends between now and 2030 with more qualitative assessments through to 2050, combining the respective benefits of the two – quantitative and qualitative – approaches.

Seven scenarios are proposed, of which four for 2050 ('Move alone', 'Move together', 'Move less' and 'Stop moving'):

- the first focuses on technology and auto-organisation of supply;
- the second, part of a European White Paper, promotes tariff-based, modal transport and land management policy;
- the third envisages more radical changes in lifestyle and production systems;
- the last is a crisis and blockage scenario based in particular on the hypotheses of the failure of oil-substitution technologies.

In spite of low growth, it is this blockage scenario which generates the lowest reduction in greenhouse gas emissions by 2050 (-33%), whilst the other two regulation scenarios through public policies ('Move together') or changes in lifestyle ('Move less') both promise a 55% reduction in CO2 emissions from transport over the next 40 years, an improvement on the Factor 4 scenario.

The findings of the report offer two major messages: technology will undoubtedly be decisive but no significant result in terms of greenhouse gas emission reductions will be achieved without a combination of all the envisaged regulation instruments controlling transport supply and demand – standards, taxation, tariffs, investment, research, land control, etc.

SOURCE: Tetraplan (pour la DG Tren), mars 2009, Report on transport scenarios with a 20 and 40 years strategy.

 **POPULATION FORECASTS**

GLOBAL DEMOGRAPHICS: A PREVIEW OF THE NEXT 40 YEARS

Published on January 15th 2009, the United Nations Economic and Social Council report on global population trends is, in under 25 pages, the most recent and concise forecast on global demographics for the 40 years ahead. It addresses all themes: population growth, development in fertility rates, international migration, life expectancy, child mortality, ageing populations, urbanisation... per major geographical regions of the world and differentiating countries by level of development. A few of its major messages, some already well documented, others less so, are as follows:

- the global population, currently 6.8 billion, should increase to 7 billion by 2012, 8 billion by 2025 and 9 billion by 2045. All this growth will occur in developing countries and primarily in towns, whilst the population of all

developed countries (1.25 billion) should start to decline towards 2030... The population of Africa will double over the next 40 years, like that of all the poorest countries, whilst Europe could, including migration, fall from 730m to less than 670m inhabitants. India, Nigeria, Pakistan and Congo will be the only countries to see their populations grow by over 100 million inhabitants, whilst almost 45 countries will see their demographic size decline, in particular Russia, Japan and Germany;

- the percentage of the global population aged over 60 will double, increasing from 11% in 2009 (8% in 1950) to 22% in 2050 – which, in absolute terms, corresponds to a 3-fold increase (740 million in 2009, 2 billion in 2050). However, this general ageing of the population will be much more marked in developed

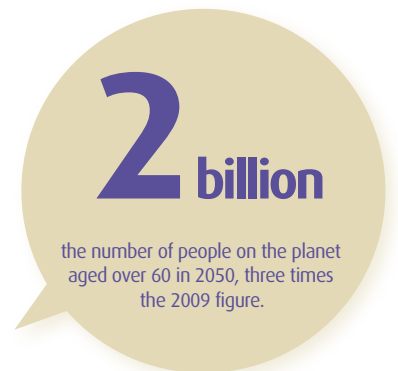
countries where the elderly population will increase from 21% today to over one-third by 2050 (35% in Europe), more than twice the size of the population under 15;

- 30% of the population will still live in rural areas in 2050. Over a period of 40 years, the number of city dwellers who, for the first time in 2008 outweighed rural dwellers, will increase by more than 3 billion to 70% of the global population by the end of the period and more than 85% in developed countries. The countryside stands to lose almost one billion inhabitants, having peaked around 2020...

The report addresses all the consequences that these major demographic changes will necessarily have on business levels, the financing of pensions, health care, assessment of migratory flows, spatial planning,

etc. Whilst the sustainable development challenges and consequences are not directly addressed in the report, everybody is aware of their crucial importance.

SOURCE: United Nations, Economic and Social Committee, Commission on Population and Development, Demographic Trends, 42nd session, April 2009.



The Foresight Mission



Publications

1 | RESEARCH REPORTS

ENTPE-RIVES,
La participation politique et ses défis : territoires, action collective et registres
proceedings of the symposium of December 10th and 11th 2007 in Lyon, under the direction of Bernard Jouve, July 2008, 205 p.
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SAMARCANDE,
Foresight and PREDIT, Sustainable Development Ministry, July 2008, 209 p.
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2 | ARTICLES AND BOOKS

SÉBASTIEN MAUJEAN, JACQUES THEYS,
Impliquer la société dans les politiques de recherche. L'expérience d'Agora 2020,
revue Futuribles, n° 350, March 2009, p. 45 to 64
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JACQUES THEYS, SERGE WACHTER,
Trois scénarios pour les villes post-carbone, dossier « La Ville durable en question(s) »,
revue Urbanisme, n° 363, November-December 2008, p. 48 to 52
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(under his supervision),
Dictionnaire de l'aménagement du territoire; état des lieux et prospective,
ouvrage collectif publié avec l'appui de la mission prospective, ministère du développement durable, éditions Belin, March 2009, 320 p.

Forthcoming publications

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CLAUDE SPOHR
Vers une prospective territoriale post Grenelle de l'environnement Questions et modes d'emploi,
studies and documents, Commissariat-General on Sustainable development, October 2009
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SERGE WACHTER,
Promesses et impasses de l'architecture numérique,
revue Flux, October 2009
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Events

October 2nd

Ministry of Sustainable Development, Paris la Défense.

→ **3RD SEMINAR FOR RESEARCHERS-ACTORS ON THE POST-CARBON TOWN,** "The impact of price signals and economic incentives on local behaviour and policies"

October 12th-13th

Château Les Fontaines, Chantilly.

→ **RESIDENTIAL SEMINAR ON THE TRANSITION TOWARDS A GREEN ECONOMY:** "Crisis, long duration, transition scenarios"

October 15th

Foresight Mission
Department of water and biodiversity, Ministry of Sustainable Development.

→ **LAUNCH OF CALL FOR TENDERS** "Biodiversity foresight in France towards 2030"

November 13th

Ministry of Sustainable Development, Paris.

→ **4TH SEMINAR FOR RESEARCHERS-ACTORS ON THE POST-CARBON TOWN,** "Urban morphologies and energy: can urban forms adapt?"

December 3rd

Paris La Défense.

→ **2ND INTERDEPARTMENTAL PILOTING GROUP:** "Inventory of MEEDDM's foresight activities"

December 18th

Ministry of Sustainable Development, Paris.

→ **5TH SEMINAR FOR RESEARCHERS-ACTORS ON THE POST-CARBON TOWN,** "The post-carbon town: biomass and bio-energies"





Publications

CENTRE D'ANALYSE STRATÉGIQUE

Notes de veille n° 139, 140 and 141, triple publication, Special Issue on Copenhagen, June 2009, www.strategie.gouv.fr
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PHILIPPE DESTATTE, PHILIPPE DURANCE,

Les mots-clés de la prospective territoriale, DIACT, La Documentation française, 2009, 64 p.
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Scénarios sous contrainte carbone, étude Cired/Enerdata/LEPII, 92 p.
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EUROPEAN PARLIAMENT, POLICY DEPARTMENT/ ECONOMIC AND SCIENTIFIC POLICY,

Eco-innovation – putting the EU on the path to a resource and energy efficient economy, Study and briefing notes, 2008, 126 p., poldep-esc@europarl.europa.eu
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The impact of renewable energy policy on economic growth and employment in the European Union to the year 2020, DIACT, April 2009, 208 p. <http://europa.eu.int/comm/dgs/energy/transport/forum/index>
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A literature review on sustainable lifestyles and recommendations for further research, 2009, 34 p., www.sei.se
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WORLD BUSINESS COUNCIL FOR SUSTAINABLE DEVELOPMENT,

Transforming the market: energy efficiency in buildings, April 2009, www.wbcsd.org
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FORESIGHT UNIT, GOVERNMENT OFFICE FOR SCIENCE

Powering our lives: sustainable energy management and the built environment, Futures report, 57 p., www.foresight.gov.uk
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Conferences

Past events

26 TO 28 MAY

Brussels

⇒ SUSTAINABLE DEVELOPMENT SYMPOSIUM, The challenges facing European research
European Commission, DG Research

28 JUNE TO 1 JULY

Marseille

⇒ 5th SCIENTIFIC CONFERENCE ON URBAN RESEARCH, Towns and climate change: working to urgent timelines
World Bank, www.urs2009.net

17 TO 19 JULY

Chicago (USA)

⇒ WORLD FUTURE 2009, Towns: innovation and creativity in a complex world
World Future Society, www.wfs.org

20 TO 30 JULY

Cerisy-la-Salle

⇒ CERISY SYMPOSIUM, Serendipity in science, art and decision-making
Under the supervision of Pek Van Anandel and Danièle Bourcier, www.ccic-cerisy.asso.fr

15 AND 16 SEPTEMBER

Davos (Switzerland)

⇒ WORLD RESOURCES FORUM 2009, FIRST DAVOS WORLD FORUM ON RESOURCES.
www.worldresourcesforum.org

26 AND 27 OCTOBER

Farnham Castle (United Kingdom)

⇒ TOWARD A LOW CARBON INNOVATION REVOLUTION, University of Creative Arts, Farnham.

4 AND 5 NOVEMBER

Paris

⇒ GLOBAL FORUM ON ECO-INNOVATION, OCDE
gfsd.eco-innovation@oecd.org

Forthcoming publications

2010

25 and 26 February 2010, University of Sussex
⇒ ENERGY TRANSITIONS IN AN INTERDEPENDENT WORLD, (Energy Group), www.sussex.ac.uk/sussexenergygroup/conference

19 and 20 May 2010, Dunkerque

⇒ 6th CONFERENCE ON SUSTAINABLE EUROPEAN TOWNS, ICLEI, www.dunkerque2010.org

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