Smart cities experiments in France and Japan: Preparing the energy transition

Yveline Lecler, Bruno Faivre d'Arcier

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Smart cities experiments in France and Japan: Preparing the energy transition[1]

Yveline LECLER
Lyons Institute of East Asian Studies

Bruno FAIVRE D'ARCIER
Transport Economics Laboratory, University of Lyon, France

Sustainable development, energy transition, reduction of greenhouse gas (GHG) emissions, have influenced public policies in recent years in most advanced economies and are also at stake in emerging ones. This is the case in Japan, which has set ambitious GHG reduction targets and placed green innovation at the core of its plans for future growth. It is also the case for France which, following EU directives, has introduced the '3 x 20' objective for 2020 in its strategic planning.

Comparing policies and their implementation between countries is not easy as the institutional or legal framework of course differs, as does the policy making process, etc. The issue on the agenda might also differ according to history, specific contexts and the priorities. All this applies to the comparison between Japan and France although both countries share some similarities, such as for example the long history of highly centralized administrative power and policy implementation, or the monopolistic position of power companies. Climate change imperatives are a priority in all countries and of course the necessity of an energy transition to reduce GHG emissions is on the agenda in both France and Japan. Although both countries seem to implement similar legal and policy frameworks to address the issue, the observation of concrete projects developed locally may reveal some differences of nuance. This is what this paper will try to illustrate by looking at the case of two cities: Yokohama, a designated city[2], and Lyon, a '*Métropole*'[3] working to build a smart city.

The definition of smart cities is generally very broad. In this paper we will use a narrow definition, limiting the issues taken into account to energy management and climate change related matters, both being closely linked to energy transition. The experiments launched in both cities are supported by the progress made in Information and Communication Technologies (ICT), environmental technology, and by the development of new products that together allow for better analysis of electricity consumption of citizens, through such devices as smart meters. They benefit from experimentation with smart-grids in several locations worldwide, including Japan and France.

This paper presents preliminary findings from a still on-going research project[4] based on

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[1] The authors are grateful to Mark Tilton and Erick Thomas for their careful English language editing work.

[2] Japanese cities are categorized according to competences they have and therefore their degree of independency but also obligations. Designated cities have almost the same competences than Prefectures, Core cities have less but still more than other cities. For a detailed analysis, see Jacobs A.J., 2011.

[3] Since 2015, January 1st, Lyon urban district (*communauté urbaine* de Lyon named Greater Lyon) was renamed Lyon *Métropole* based on the Law for the Modernization of Public and Territorial Action and for the affirmation of Metropolis said Law MAPAM, enacted in January 2014. The law extends the competences of big agglomerations by incorporating those of the former "*département*" which keeps its competences on a restricted territory composed of remaining cities and rural areas.

[4] Funded by ADEME under the PREDIT GO6 program and supported by Lyon *Métropole*, the researching group is composed of 4 members: the two authors, Benoit Granier and Nicolas Leprêtre, contractual researchers at the Institute of East Asian Studies, Lyon University.

observations and interviews with city or prefecture officials, and with representatives of companies involved in the projects, including power companies. In Japan the four areas selected under the METI "Demonstration of Next-Generation Energy and Social Systems" program launched in 2010 (Yokohama, Toyota, Kitakyushu and Keihanna (Kansai Science City, Kyoto Prefecture) have been investigated. Local level interviews have been complemented by interviews at concerned Ministries and NEDO. In France, the SPL[5] in charge of the Confluence district experiments has been interviewed, as well as some companies involved in the smart community project, namely Toshiba leading the consortium or Transdev in charge of Sunmoov. It has been complemented by several interviews in Greater Lyon (Lyon *Métropole*) with persons in charge of different policy issues and by visits and interviews at companies in charge of other projects such as Smart Electric Lyon or Bluely.

The paper is organized as follows. Part one will present the main laws and policies adopted in Japan and France to show the national energy and climate change policy landscape which serves as a framework for policy at the local level. Part two will describe specifically what is going on in the two cities while briefly presenting both the city planning tools and the on-going projects. Part three will compare the situation in France and Japan focusing on three main points: the national context and related priority setting, the role of the multi-level decision-making process which impacts the way cities implement their own strategies, and the importance of industrial strategies which put technologies at the core of the way energy transition is addressed, although the success of experimentation cannot be achieve without the participation or at least acceptance of populations.

1. The national energy and climate change imperatives

To address energy and climate change issues, France and Japan have each created a dedicated body. In March 1978, the French government created the COMES (commission for solar energy) in charge of promoting renewable energies, solar but also wind, hydro, biomass and of developing measures to reduce or rationalize energy consumption. The COMES was placed under the authority of the Ministry of Ecology, Sustainable Development and Energy (sustainable development for short). After several stages of restructuring, in 1991 it became ADEME (National Environment and Energy Management Agency), placed under the joint authority of the Ministry of Sustainable Development, and the Ministry of National Education, Higher Education and Research. ADEME is in charge of assisting the government in the definition of public policies in relation to sustainable development. This agency coordinates efforts, from research up to information diffusion, expertise, advices and funding of projects for companies, public bodies and associations. It covers waste management, soil conservation, energetic efficiency, renewable energies, air quality and noise reduction.
NEDO (New Energy and Development Organization), which might be considered as the ADEME Japanese equivalent body, was created in 1980 under the Law Concerning the Promotion of the Development and Introduction of Alternative Energy. In 1988 it was reorganized to expand its mission to the research and development of industrial technologies. Its name was changed to New Energy and Industrial Technology Development Organization (but acronym remains NEDO). In 2003 NEDO became an Incorporated Administrative Agency.
But while in France, the ministry responsible for sustainable development covers energy, transports, nature conservation that is, all environment related elements, in Japan, the landscape appears more complex. The Ministry of Environment (MOE), which was created in 2001 out of the Environmental Agency created in 1971 at the sub-cabinet level, and is responsible for global environmental conservation, pollution control, and nature conservation. However, the dominant body in charge of energy and green technologies is in fact the Ministry of Economy, Trade and Industry (METI), which, through its Agency for Natural Resources and Energy and its Industrial

[5] See later for acronym and explanation.

Science and Technologies policy and environmental bureau, defines the national strategy. The Ministry of Land, Infrastructure, Transport and Tourism (MLIT), being in charge of housing, city planning, road and transport (including vehicles), has also a role to play with for example its policy bureau including an environmental policy division. Although coordination can be made at the Cabinet Office level, which can also directly implement policies through the different body it covers such as the Global Warming Prevention Headquarter, the administrative organization of Japan implies a multi-actor commitment.

1.1 From energy saving to low carbon cities: the greening of the Japanese policy framework

Having few national resources, Japan is vulnerable in terms of energy security and strongly dependent on Middle East oil. This explains why the country started early to launch research on renewable energy with large national research programs such as "sunlight" or "moonlight" programs, which stimulated Japanese firms to develop various kinds of advanced technology. It is also why it addressed energy conservation to a greater extent than most other countries after the oil shocks of the 70s which, clearly highlighting the country's vulnerability, also had a strong psychological impact. Indeed, since the late 1970s, numerous laws focussed on energy saving, promotion of alternatives to oil and introduction of renewable energies have been enacted, often then amended or revised[6]. All these issues are still present in the more recent energy policy framework, which now also includes climate change related matters.

1.1.1 The legal framework and related plans

The **Basic Act on Energy Policy, 2002** established a basic orientation for energy policy, and this basic orientation concerns demand as well as supply of energy to guarantee energy security, adaptability to the environment, and utilization of market mechanisms. It also identifies the role of the various stakeholders, the central government, local governments, firms, and individuals and stipulates that the government has to draft a Basic Energy Plan. **The Plan** was established in October 2003 (and revised in March 2007). It became then after the Strategic Energy Plan of Japan, revised in June 2010 to be consistent with the New Growth Strategy principles. It also fixed ambitious GHG reduction targets. The main measures dedicated to the achievement of these targets included the realization of a low carbon energy demand structure, the building of next-generation energy and social systems, and the development and diffusion of innovative energy technologies. The 4th Strategic Energy Basic Plan was approved in June 2014. It addresses a variety of issues, such as the role of nuclear power in Japan's supply mix, support to the deployment of renewable energy, and options to manage the pressure of rising energy costs for end-users.

Since the mid-90s, Japan has also passed several laws addressing climate change and sustainable development. **The Basic Environment Plan** was drawn up in December 1994 based on the Basic Environment Law enacted in 1993. It was revised in 2000, 2006 and 2012 (4th plan). It emphasizes three main objectives: achievement of a low-carbon society, a sound material-cycle society and a society in harmony with nature, while ensuring security and safety. It addresses post Fukushima issues, such as decontamination, while also including policy measures for the promotion of a green economy and innovation, strategic approaches for international negotiation and cooperation, and local environmental development and capacity building.

Probably the most important law for our purpose is the **Act on Promotion of Global Warming Countermeasures** enacted in 1998 (revised several times, most recently in 2013). It stipulates that the national government shall establish a plan for attaining the targets prescribed in article 3 of the

[6] Law Concerning the Rational Use of Energy (Energy Conservation Act), 1979 amended 1983, 1993, 1998, 1999, 2002, 2005 and 2008, Law Concerning Promotion of Development and Introduction of Oil Alternative Energy, 1980, Law Concerning Special Measures for Promotion of New Energy Use 1997 (amended January 2002), Law Concerning the Rational Use of Energy and Recycled Resources Utilization 2003, Bill on the Promotion of the Use of Non fossil Energy Sources and Effective Use of Fossil Energy Source Materials by Energy Suppliers (released in March 2009), Act on Purchase of Renewable Energy Sourced Electricity by Electric Utilities, 26 August 2011.

Kyoto Protocol, but that prefectures and municipalities (especially designated cities and core cities) shall also prepare a GHG reduction plan. It established the Global Warming Prevention Headquarters placed under the Cabinet Office and in charge of defining the plans and measures and coordinating the actions of relevant ministries and agencies, and the Japan Center for Climate Change Action in charge of education, research, information gathering. The last revision fixes new targets for 2020 since the Kyoto Protocol ended in 2012. Japan's GHG emissions reduction is set at 3.8% in 2020 from the 2005 level in order to implement the Cancún agreement, and also based on the prime minister's designation of zero-based review of its 25% cut target by COP19[7]. This target is supposed to be achieved by implementing the following measures (MOE, 2014a):

- 20% improvement in energy efficiency, which is at the world leading level
- Reduction of emissions from the generation of electricity through the use of renewable energy, etc.
- Strengthening fluorocarbons countermeasures based on an amended law on fluorocarbons
- Application of the "Joint Crediting Mechanism (JCM)"
- Utilization of forest carbon sinks

The « **Low Carbon City Act** » (Eco-City Act) which was enacted in 2012 to bring in new perspective eco-friendly lifestyle in declining and rapidly aging society, goes one step further. It defines the basic policy for the reduction of GHG emissions through the implementation by municipalities of **low-carbon city plan**, giving clear objectives to be achieved and the sector on which measures will be taken (buildings, transport, energy management…).

1.1.2 Smart communities and low carbon cities in Japan

Consistent with its campaign promises, the Democratic Party of Japan (DPJ) announced in December 2009 the New Growth Strategy to be launched in June 2010. Environmental technologies and alternative/renewable energy were clearly emphasized as one of the 4 areas of focus[8].
In this domain, the targets to be achieved by 2020 are:

- Create over ¥50 trillion in new markets and 1.4 million new jobs
- Reduce worldwide greenhouse gas emissions by 13 billion tons using Japanese technologies.

The New Growth Strategy also stipulates the measures that have to be taken to reach such targets:

- Support for increasing renewable energy by expanding feed-in tariffs, etc.
- Turn homes, offices, etc. into zero-emission structures
- Speed up development of innovative technology
- Concentrate investment for creating an eco-friendly society

Based on this strategy, and according to their respective domains of action, METI, MLIT, MOE have to define the measures to be launched to promote actions.

The policy program for the "Demonstration of Next Generation Energy and Social Systems" which gave birth to "smart communities" was implemented in 2010 by METI as a measure dedicated to achieve the energy related priorities of the New Growth Strategy. A master plan was launched as an experiment to:

- realize large scale introduction of renewable energy,
- facilitate greater energy conservation and improve life conveniences,
- establish more reliable information networks to better match demand and supply,
- disseminate the use of Electrical Vehicles (EVs),

and so create new services and jobs.

[7] COP 19: 19th Conference of the Parties to the United Nation Framework Convention on Climate Change
[8] See Cabinet of Prime Minister 2009. For a detailed analysis see Jones and Yoo, 2011.

This extensive program, which is based on smart grid experiments conducted since the early 2000s in Japan, seems to go beyond the mere optimization of energy management. It aims at promoting the development of "smart communities", defined as a "*regional deployment of next-generation energy and social systems that combine in multiple ways concepts such as the 'coordinated use' of energy, which means effectively using not only electricity but also heat and untapped energy as well as the transformation of regional transport systems and people's lifestyle*" (sic)[9]. Linking energy and urban issues, the objective of Smart Communities is to encourage Japanese firms to implement "sustainable services" dedicated to residents, and to engage local companies, businesses, and of course people in their effective use[10].

The generalization of EMS (Energy Management Systems) makes it possible to define multiple levels of regulation of the energy demand for all components of a local community. So we speak of HEMS (Home Energy Management Systems), FEMS (Factory Energy Management Systems), BEMS (Building Energy Management Systems), connected to a CEMS (Community Energy Management System) managing the grid and battery storage systems (including EVs recharging). EMS aim at spreading the energy demand peak by storing off-peak energy production in batteries, in order to avoid costly production overcapacity. Through these approaches renewable energy production (for example from photovoltaic "positive energy" buildings) can be better valorized, and EVs offer a new advantage, as an additional storage capacity. Such an integration of energy distribution, buildings and means of transport constitutes the innovative aspect experimented with in smart communities. Largely focusing on energy, their definition implies testing new energy solutions in relation to other aspects of urban life. Thanks to alternative mobility services, the visualization of consumption by households that HEMS permit, they are supposed to contribute to population behavior change and thus to the development of a new social system.

Among the 20 cities that submitted proposals within the program, METI chose 4 sites based on the quality of the projects, but also with an eye to having a range of cities with different characteristics: a large metropolis in the case of the city of Yokohama, a provincial town in the case of Toyota city, a science park for Keihanna-Kyoto and a special area in an industrial city for Kitakyushu[11].

Smart Communities involving people, services and companies in the construction of less energy-consuming lifestyles are also addressing the issue of reducing CO_2 emissions and therefore are part of the low carbon city initiatives. In that sense, they are linked to other schemes[12] which were launched over time to promote and help cities implement their main GHG reduction or climate change plans. To name only the most important:

- The **Eco-Town Model Project** was launched (1997) jointly by METI and MOE. The program was designed to help local authorities establish a resource-recycling socio-economic system through cooperation with residents and industries. In accordance with the main environmental issues of the mid-90s, the program mainly aimed at building local environmental industries while reducing and recycling waste to be reused. 26 eco-towns were labelled under this program known as the 3Rs: Reduce, Reuse and Recycle.

- In 2004, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) started the **Environmental Sustainable Transport Model Project (EST)** jointly with MOE. Pilot cities are supported to promote public transportation, smoother car traffic, environmental improvement for bicycles and pedestrian, promotion of law-emission vehicles and so on.

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[9] METI homepage: http://www.meti.go.jp/english/press/data/20100811_01.html, accessed March 2012.

[10] The idea is that through the expertise and innovation of Japanese companies in the IT and green technologies, it is now possible to build a greener social system.

[11] For more details about each city, see their respective home page. For analysis of the program and selected cities see Lecler Y., 2012. For detailed results achieved see Japan Smart City Portal (JSCP).

[12] Some just gave a kind of label to selected cities, providing them a certain image and a greater chance for their application to subsidies from different ministries to be accepted.

- In 2008, the **Eco-Model City Project (EMC)** was launched by the Cabinet[13] as part of the revitalization policies. The project aims at building a green economy and sharing most elements with smart communities, although they are not necessarily centred on smart-grids. 13 cities[14] that have developed plans to reduce their CO_2 emissions by 60 to 80% from 1990 emission levels by 2050 have been selected as Eco-Model Cities (EMC), also called low-carbon cities. To share experiences, diffuse best practices and send relevant information worldwide, the Promotion Council for Low Carbon Cities (PCLCC) was launched in December 2008. There are 204 members (2011), mostly from governmental or local authorities (89 cities, 46 prefectures, 12 government offices), as well as 57 organizations (29 public and 28 private).
- **Future Cities Initiative** (2011/2012): 11 cities were selected, most of them in the Tohoku disaster areas. The program, considered as one of the National Strategic Projects in its "New Growth Strategy" in June 2010, appears in fact to be linked to the Low Carbon City Act. The objective of the initiative is to challenge and solve urban problems related to both the environment and aging issues by utilizing advanced technology, new socioeconomic systems and innovative business models.

The smart community and other projects have been pursued simultaneously in some cases and sequentially in others. For example, 3 of the Eco Model Cities have also been chosen as smart communities under the Demonstration of Next Generation Energy and social System program: Kitakyushu city, Yokohama city and Toyota city. Yokohama and Kitakyushu have also been selected as future cities.

1.2 The leading role of the local Climate & Energy Plan in French cities

In France, too, since the end of the 1990's, sustainable development has been on the agenda with several laws aiming at incorporating the concept in national and local planning procedures. With the 2003 'National Strategy for Sustainable Development' Report, followed by the 2004 National Climate Plan, the French government put forward the 'Factor 4' objective (reducing GHG emissions by 4 in 2050, Law on Energy, 2005). The 2007-2009 "Grenelle of the Environment", a public consultation took place at the national and regional levels[15] and gave birth to two main laws in 2009 and 2010, encouraging local initiatives such as Climate & Energy Plans implementation by cities. After the 2008 economic crisis, the government launched in 2010 a broad program on 'Investments for the Future', for which ADEME was charged with managing several areas: demonstrations and technological platforms for renewable energy and green chemistry, development of smart grids, circular economy (waste, water and soil), and vehicles for the future. In order to fulfill its international commitments on GHG emissions, the French government progressively modified its main planning procedures, introducing the '3 x 20' objective for 2020: reducing energy consumption by 20%, reaching 20% of renewable energy, and reducing GHG emissions by 20%. In 2014, after a national public debate, the law on 'the energetic transition for green growth' was approved.

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[13] Prime Minister Yasuo Fukuda mentioned in his policy speech on June 18th, 2008 that Japan would lead the international community by converting itself into a "low carbon society" which would serve as a precedent for the world to emulate. Based on it, Regional Revitalization Bureau (Cabinet Secretariat) announced that 10 cities should be selected as "Eco-Model Cities," to challenge the ambitious target of GHG emissions reduction, and realize the Eco-Model City in cooperation with local governments.

[14] First selection (July 2008): Large Cities: Yokohama, Kitakyushu; Central Cities in Province: Toyama, Obihiro; Small Towns: Shimokawa (Hokkaido Prefecture), Minamata. Second selection (January 2009): Large Cities: Kyoto, Sakai; Central Cities in Province: Ida, Toyota; Small Towns: Yusuhara (Kochi Prefecture), Miyakojima; Cities in Tokyo: Chiyoda ward.

[15] Two months of national consultation; 19 regional meetings, 8 internet forums, 2 Parliamentary debates, 31 consultative bodies involved, in all over 30,000 participants, MEDDTL 2010.

During the 2000's, the French government revised most of the national planning procedures in order to cope with the necessity of reducing CO2 emissions. The adoption of the 2004 National Climate Plan is a keystone in the evolution of public policies about climate change. Four principles underlie this plan (MEDD, 2004):

- Awareness and information to favor compliance and behavioral changes in society;
- Promoting non-carbon sources of energy and introducing ecology in the economy through innovative mechanisms;
- Developing research for a low carbon society;
- Developing an exemplary public service and encouraging local authorities to implement local climate plans.

The main measures proposed by sectors are the following:

- **Transport** (a 12% CO2 emission reduction for 2010): development of biofuels, creation of a label about the energy consumption of new vehicles (from A to G, in gCO2/km), improvement of motors in terms of energetic efficiency (to be developed with carmakers), funding of railway and 'maritime highways'.
- **Housing and building** (14% reduction): use of better performing equipment for new buildings and renovation, creation of an energy saving certification and an energetic performance diagnostic (Label A to G), tax credit and fiscal incentives for renovation.
- **Industry, energy and waste** (19% reduction): creation of a CO2 emission tradable permits market, measure for reducing GHG emissions in industrial processes, development of renewable energy supply (solar, wind farms, biomass, geothermal) for electricity and heat, sustainable air conditioning.

1.2.1 Introducing sustainable development objectives in the national planning process

Beyond this first national Climate Plan (to be revised every two years), France is also involved in the European policy to promote energy savings and sustainable development. In 2007, the European Union developed its own proposal, known as the '3x20' rule, which set three key objectives for 2020:

- A 20% reduction in EU greenhouse gas emissions from 1990 levels;
- Raising the share of renewable resources in EU energy consumption to 20%;
- A 20% improvement in the EU's energy efficiency.

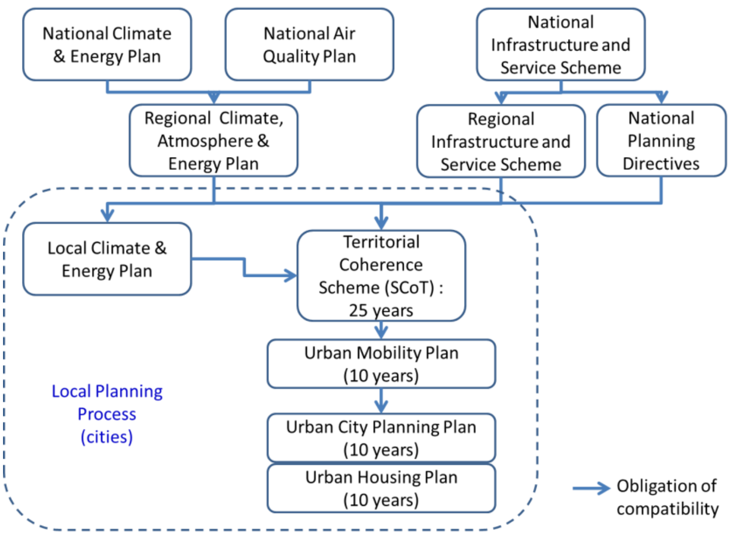


Figure 1: Evolution of the local planning process in France

In 2009, the EU adopted this ambitious policy, and implemented its Emission Trading System (ETS), which covers more than 11,000 power stations and manufacturing plants in the 28 EU member states (around 45% of total EU emissions). In 2010, France applied this new rule, while also keeping its objective of reducing GHG emissions by 80% by 2050). This led to a deep modification of the planning process at all geographical levels: regions, departments, and cities, with the obligation to implement Local Climate and Energy Plans, which should orientate all the local planning process, as shown in Figure 1.

The Local Climate and Energy Plan has to define all the measures a local public authority intends to implement, to reach the national objectives at the local level. Moreover it takes a central role in all local planning processes, as all the other local plans should be compatible, and especially:

- **The Territorial Coherence Scheme** (*Schéma de Cohérence Territoriale* - *SCoT*) is a long-term scheme designed at the level of the conurbation, which states the evolution of land use targeted by local representatives. It proposes the main principles for the organization of the conurbation (such as a hierarchized multi-centre structure), the location of economic activities and services, as well as the new areas for housing and equipment.
- **The Urban Mobility Plan** (*Plan de Déplacements Urbains – PDU*) concerns the organization of the transport system for all modes of transport for the next ten years and is revised after 5 years. It should then be compatible with the upper-level plans: the local climate & energy plan, the regional Climate, Air & Energy Plan, the national planning directives (designed by the State, on the basis of the national infrastructure and service plan) and, of course, the Territorial Coherence Scheme. For example, it defines the rules for parking capacities on and off-street.
- **The Urban City-Planning Plan** (*Plan Local d'Urbanisme – PLU*) defines the main regulations for land use, in a more operational way, such as the minimum/maximum density of building for each plot (in relation to the proximity of public transport stations), and is the legal reference for building permits.
- **The Urban Housing Plan** (*Plan Local de l'Habitat – PLH*) is also more operational, as it defines the types of housing to be built within ten years, both by the private and public sectors. It has to, in particular, respect the rule of a minimum of 20% of social housing for each commune of the conurbation.

This recent evolution of the planning process at the local level aims at increasing the integration of transport, city planning, environment and energy management. It indicates a deep change in the previous planning process, where all these fields were managed separately, leading sometimes to several incoherencies in the choice and the design of urban projects.

1.2.2 The 2014 Law on Energetic Transition

Following a large national consultation, the government presented at the Parliament in October 2014[16] a new law on energetic transition, which should decline the priorities and main measures to cope with the objectives in the field of energy. For the medium and long run, a 50% reduction of energy consumption should be obtained in 2050 (compared to 2012), the share of renewable energy rides up to 23% in 2020 and 32% in 2030, in parallel with a reduction of the nuclear energy from 75% to 50% in 2025.

Priority is given to the housing sector with a target of 500,000 housing per year to get an energetic renovation, following the new low energy consumption standards for building. The public sector

[16] This law is still under discussion and should be voted by the Senate for a full adoption

should be exemplary, with a strong commitment for positive energy buildings. A special fund will be created to help low income households do such renovation. The transport sector is the second priority, due to its generating of a large share of overall GHG emissions. The renewal of the car fleets of public bodies should bring the proportion of clean vehicles to 50 %, while rental companies and taxis are encouraged to aim for a 10% level. Moreover, a plan to create 7 million charging stations will be implemented nationally to promote the take-off of the hybrid and electric vehicle market. A kilometric allowance for the use of bikes for commuting has also been created.

The law encourages waste reduction, recycling and a circular economy, with a target recycling rate of 55% of waste by 2020 (70% for construction and public works projects). It also intends to fight against planned obsolescence of products, by providing for judicial proceedings and penalties. The information on life duration will be compulsory for products worth more than 500 €. The willingness to double the proportion of green energy in the energy supply by 2030 leads to several measures concerning all renewable sources (wind, solar, wood, etc.). About 1,500 biogas plants are planned, and a call for tender has been made to establish 200 positive energy zones.

As can be seen through this non-exhaustive presentation of the legal and policy framework in both countries, climate change imperatives and energy transition appear as the two sides of the same coin.

2. Experimenting with smart cities in Japan and France

Let's now see at the local level how this framework is put into practice, through the cases of the city of Yokohama and Lyon.

2.1. The case of Yokohama city

Since the global warming countermeasure act of 1998, local authorities, prefectures or cities are clearly involved, having to define their own plans to address the issues at stake. Yokohama city, which is a designated city, elaborated its own global warning countermeasure plan beginning in the early 2000s, and revised it over time (most recently in March 2014) to include new elements according to new national guidance or laws and policy framework. Concrete actions are developed through projects, some of which continue along several plan periods. Since these often overlap, it is difficult to clearly distinguish what is related to one or the other. But whether focusing on energy saving, the environment, green technologies, or new mobility, they all contribute the city local action plan.
Yokohama now is a megalopolis with over 3.7 million inhabitants living in 1.6 million households, and a GDP of 12.7 trillion yen. The population, which was less than 1 million just after WW2, reached 2 million by the late 1960s, and 3 million by 1985, creating a housing shortage, destroying green space, straining infrastructure such as schools, roads and water sewage system, while residents near industrial areas suffered from pollution.

2.1.1 Policy planning: from waste and GHG reduction to energy management

In this context, although Yokohama was not labeled as an eco-town under the national framework, the city initiated the **G30 plan**, which addresses almost the same elements. Mainly centering on waste management it aimed at reducing garbage by 30% in 2010 from the 2001 level. The target was achieved in 2005, despite the population growing by 170,000 people during this time (by 2010 garbage had been reduced by 43.2%). Yokohama's two landfill sites still had 700,000 square meters in remaining capacity in 2007, thereby postponing development of new landfill sites. Compared to the seven incinerators used in 2000 only five were still necessary. All together it is estimated that 1.38 billion US$ in capital expenditure and over 7.5 million US$ in annual operational expenditures had been saved while an equivalent of 280,000 tons of CO2 emissions had been avoided (Yokohama city 2010). The plan also included some other elements such as renewable energy: a wind turbine called “Hama Wing” was completed in April 2007 and produces 1,980 kW (enough to power 860 homes) providing electricity to the Minato Mira 21 district. The 3R (reduce, reuse, recycle) actions are now continued through a 3R dream plan implemented in 2011 while renewable energy is being developed under several other plans, as we will see below.

As early as 2001, the city also implemented its first Anti-Climate Change Measure Regional Promotion Plan, which was complemented in 2007/2008 through the **CO-DO 30 action plan to stop global warming**. Presented as the Climate Change Action Policy of Yokohama city, the plan stated that if nothing is done GHG emissions would reach 20.530 Mt C02 equivalent in 2020, and set new mid- to long-term targets of a reduction of CO2 emission per person by 30% by 2025 and by 60% by 2050 from the 2004 level (5.74 t/person). It was then readjusted to fit national objectives as Figure 2 shows.

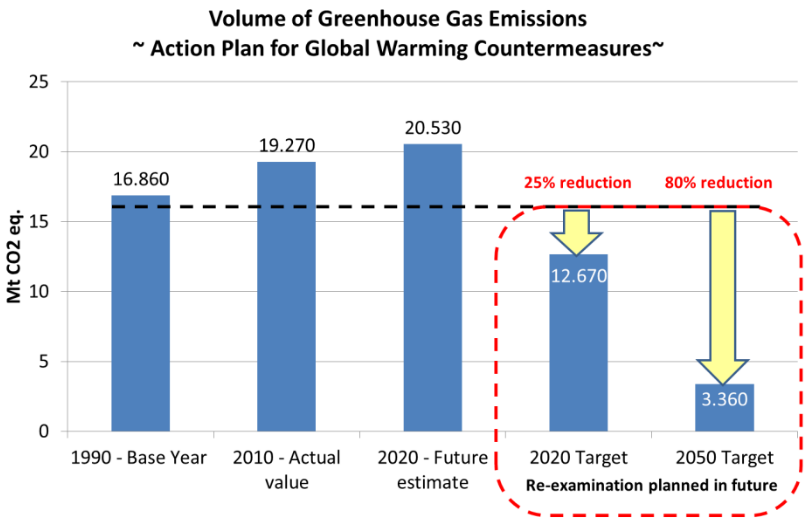


Figure 2: GHG emissions reduction targets in Japan
Source: Yokohama city, no date.

To achieve the objectives, the CO-DO 30 plan developed a roadmap of 7 points or policies to be implemented:

1. Living CO-DO to develop actions to encourage the population to behave according to climate change needs, nurture climate change specialists, and further promote the 3 Rs…

2. Business CO-DO to encourage businesses to reduce GHG emissions, adopt energy saving behaviors, and further promote the 3 Rs at companies level…

3. Building CO-DO for the planning and development of a city by constructing energy efficient buildings and renovating older ones…

4. Transportation CO-DO to develop transportation measures in the city center area, promote planning and development of new services for people to travel conveniently by foot, bikes and public transport, and restrict car use in specific areas…

5. Energy CO-DO to achieve a ten-fold increase in renewable energies, and to promote the introduction of a carbon offset, including measures to support (subsidies/taxes exemptions) the spread of solar-energy system…

6. City and Green CO-DO to create a green city through urban heat island measures including the creation of cool spots, the use of plants as a biomass source, to develop a compact city by combining advance use of land and green measures as well as untapped energy sources…

7. City Hall CO-DO to promote energy saving facilities and equipment and recyclable energies in public buildings, expand eco-friendly activities among companies through city hall activities…

To implement and coordinate policies, the city authority established the Climate Change Policy Headquarter. It has responsibility for all aspects relevant to its mission, making the organization horizontal (or cross-department) directly under the authority of the Mayor. This organizational reform intends to overcome the negative effect of the vertical administration structure, which is seen as a general Japanese governmental problem.

Despite all this, GHG emissions failed to decrease, especially in the housing, transport and business sectors, which together account for more than 60% of the city's total GHS emissions (Figure 3).

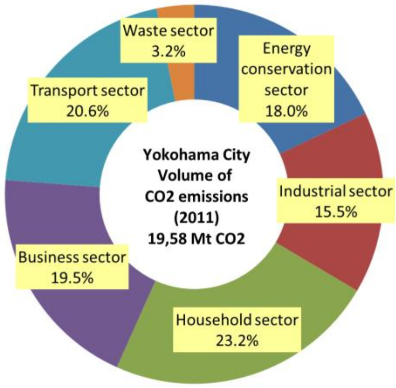


Figure 3: Yokohama City CO_2 Emissions by sectors. Numbers are for 2011.
Source: Yokohama city, no date.

The CO-DO 30 action plan was followed, after the selection of Yokohama under the national scheme, by the Eco Model City project, presented by the city as "a core project to steadily promote CO-DO 30", as well as by the Yokohama Smart City Project (YSCP), selected as a demonstration of smart communities under the next-generation energy and social system scheme.

2.1.2 Concrete projects: towards a smart and low carbon city

According to policy planning for the city, concrete projects have been launched, aiming at promoting actions along 4 main roadmaps:

- **The development of an energy-saving home building sector:** the scope of buildings that require mandatory building certification, called the Comprehensive Assessment System for Built Environment Efficiency (CASBEE), was enlarged but connected to subsidies, while newly built houses must comply with energy conservation standards. Low-interest loans are provided to home owners who wish to construct green houses.
- **Reduction of CO2 emissions from the transport sector:** including actions to improve the quality of public transport, to favor eco-driving practices. A community-wide bicycle scheme (Bay-Bike) was launched and EVs are promoted through purchase incentives and for setting up charging infrastructure.
- **The use of renewable energy:** focusing mainly but not exclusively on solar. Subsidies are provided for the installation of solar water heaters and renewable energy use in buildings of a certain size. In cooperation with Kanagawa prefecture and its smart energy concept[17], Solar Power Generation Systems were promoted and subsidized. Schools and ward offices

[17] The goal is to shift from a Centralized Energy System to a Distributed Energy System. The goal is to raise the share of electricity generated by the latter to 45% of total electricity consumption in 2030.

were equipped with solar panels, etc., but wind power generation, biomass or small-scale hydro installations are also planned.

- **Green area preservation:** trees were planted to revive green areas, and green rooftops or walls were promoted, while existing green areas (protected via the Urban Green Space Conservation Law) could benefit from a green tax for their maintenance. A water and green network along the coast was rehabilitated. It serves as a recreational area for citizens but also as a tourists' attraction.

Yokohama Mobility Project Zero (YMPZ) started in March 2009

The project was developed under the Eco Model City Project through an agreement between Nissan Motor Co., Ltd. and the City of Yokohama, signed on March 2009. It was a 5-year project outlined from 2009 to 2013 (fiscal).

It aimed at promoting ecological driving, at testing a route guidance system and at promoting EVs and setting up charging infrastructure. Concretely, in 2009, 100 rapid electric charging units were subsidized at a level of 200 000 yen per unit and in 2010, 300 EVs, including plug-in hybrid vehicles, were subsided at a rate of 150,000 yen per vehicle. The program also established charging infrastructure at Nissan facilities and introduced EVs into the Yokohama municipal vehicle fleet. The purchase of these EVs (Nissan Leaf mainly) was subsided through a MLIT scheme. Finally a micro-electric car sharing system was launched by Nissan Motor Company in October 2013 with Choi Mobi using 70 Nissan New Mobility Concept cars (Renault Twizy). Choi Mobi was initially planned for one year but was then extended for another year. 63 pick-up/drop-off locations (stations) were created around the Yokoyama Station, Minato Mirai, and Kannai areas in downtown Yokohama. As of September 2014, the system was used by 10,651 registered members (60% Yokohama residents; 40% outsiders). Since prolongation, the number of locations (stations) was reduced to 60 and the number of EVs in circulation to 50 while a new fare system more suitable to companies was implemented to attract business users and encourage firms to reduce or at least not increase their company fleets.

Yokohama Eco School (YES), opened in July 2009

The Yokohama Eco School (YES) aims at informing and educating people about climate change and sustainable imperatives. Activities include lectures, events and workshops on environmental and global warming issues conducted by NPOs, business owners and universities with a public participation. As of 2013, YES's 133 registered partner organizations had organized 431 lectures attended by some 35,000 people.

Yokohama Green Valley (YGV) started in January 2010

It is a concept to rapidly promote GHG reductions by boosting green innovation and support economic revitalization by developing environmental industries and commercializing green technologies mainly in the Kanazawa ward. Actions were taken in three directions: (1) Understanding local energy supply and demand, promoting energy management in each community, and transitioning to a low carbon society through the utilization of EVs and untapped energies such as waste heat recovery from factories etc.; (2) Development of environmental and energy industries by matching company's environmental technologies with products, supporting manufacturers to develop products that contribute to realization of a low-carbon society, while promoting energy conservation in manufacturing processes, public facilities…; (3) Establishing an Environmental Education Center in collaboration with universities in the city, to foster environmental education for kids, organize educational tours for visitors, etc.

Yokohama Smart City Project (YSCP) started in April 2010

Presented by the city[18] as an initiative "in collaboration with the private sector to work on various

[18] See http://www.city.yokohama.lg.jp/ondan/etc/pdf/eco-panphlet-eng.pdf accessed on February 2015.

projects such as introduction of renewable energy, energy management of households, buildings and local communities and next generation transport systems", and "to establish overseas expansion of Japan's smart grid", YSCP appears to be the most comprehensive project as far as energy and energy transition is concerned, and it will therefore be described in more detail.

Selected under the "demonstration of next-generation energy and social system" national scheme, the project mainly relies on private companies involved in a firms' consortium led by Toshiba. Each company is in charge of its own experimentation and reports to Toshiba, the city hall, and METI which funds companies directly. The Yokohama Climate Change Policy Headquarter in charge of the project, follows the whole operation and plays a major role in the relation with citizens: informing but also selecting households to take part to experiments, defining and eventually providing spaces for experiments, developing local policies and incentives to supplement experiments, or informing about national fiscal and subsidy schemes of different ministries that companies or households could use for example to purchase an EV, to install solar panels or an HEMS.

Three districts were designated for the experimentation: Minato Mirai district, Kohoku new town, and Yokohama Green Valley (Kanazawa ward). While all three are urban districts composed of both, new and old houses or buildings, they are also differentiated. Minato Mirai (3600 inhabitants[19]) is composed of large business and commercial buildings, Kohoku New Town (76000 inhabitants) of large housing complexes and stand-alone houses, and Kanazawa Ward or Green Valley (87000 inhabitants) of a mix of apartment complexes and industrial parks. In all cases, citizens were encouraged to participate through incentives etc., but considering the difficulty of reaching the number of volunteers necessary for the experimentation in these districts (4000 were first announced), the selection was finally extended to the whole city.

The project's total cost is estimated at 74 billion yen, and includes: Large-scale introduction of renewable energy; the introduction of home, building, factory energy management systems (HEMS, BEMS, FEMS), eventually combining fuel cells and storage batteries in condominiums; Mutual Supplementation between Community Energy Management Systems (CEMS) and Large-scale Power System Networks; Next-generation Transport Systems by introducing a large number of EVs and by developing charging infrastructure[20].

The city now counts 249 public locations where solar panels have been installed[21], 2 wind turbines, 3 locations for small hydropower generation, 6 locations for biomass generation: 2 generating power from biogas issued from sludge treatment and 4 from heat coming out of waste burning.

The development of a Community Energy Management System (CEMS), specifically designed for the control and monitoring of energy consumption at the community level, constitutes the core element of the project and took even more importance after Fukushima. The system collects all data of consumption from houses, buildings, storage batteries and EVs (including charging stations) integrated in the experiment, while controlling renewable energy produced by solar panel or other alternative energy sources available. A SCADA battery, which virtually aggregates numerous and various batteries, was jointly developed and linked to CEMS to manage the various batteries simultaneously and conduct peak cuts according to needs. Tests are also conducted on charging and discharging 2000 EVs by integrating HEMS and BEMS with EV data center in such a way as to regularize electricity feed at the community level. EVs (or PHEVs) are not only included in the experiment to test the impact of their charging on energy management and to prepare for a move towards clean mobility to come. They are also used to verify the Vehicle to X technology (standing

[19] Numbers given during interview at Toshiba headquarter on 2013, March 6th.

[20] See the project master plan available at: http://www.city.yokohama.lg.jp/ondan/english/pdf/initiatives/master-plan-of-yscp.pdf, accessed February 2015.

[21] According to the Promotion Council report of 2014, available on line at: www.meti.go.jp/committee/summary/0004633/pdf/017_02_01.pdf (P. 9), if including private locations, the city had 10 000 PV installed in 2013.

for Vehicle to anything: Vehicle to Home/to Building etc.), which was on the test agenda of some smart communities, but gained much greater interest after the Fukushima accident. By using car batteries as additional storage capacity, V2X is seen as a solution to provide electricity in emergency cases. It was estimated that a Leaf for example would cover three days' needs of a three person family. Households are equipping their homes, and companies now tend to propose the device to clients at the time of house construction, making the installation less costly and therefore enlarging the market.
By utilizing data collected, the CEMS can estimate the electricity demand for the next day. It also has the function to predict the amount of electricity that the solar power generation systems will be able to generate according to weather forecasts. When consumption peak is forecasted, the CEMS sends alerts and demands for action. Stimulated through a kind of dynamic pricing system making electricity price vary according to peak or non-peak time, houses and buildings participating in the project are requested to respond taking consumption saving measures. This demand/response (D/R) process verified twice a year during summer and winter, is at the core of the experiment, which now is targeting 3500 households equipped with HEMS, six buildings equipped with BEMS (one added in 2014), and one FEMS-equipped factory.

In fiscal 2013, DR requests were issued 14 times in summer (for the period between 1pm to 4pm) and 10 times in winter (for the period between 5pm to 8pm) to 1200 households equipped with solar power generation systems and HEMS. The Critical Peak Pricing (CPP), in which the electricity rate is set at a high level during certain periods, is the method used in Yokohama to encourage behavior change. By shifting some housework out of this CPP period, such as using water heaters or household appliances at night when electricity rates are low, a maximum peak demand reduction rate of 15.2% was achieved (JSCP, 2014/06/18).

2.2 The case of Lyon *Métropole* (Greater Lyon)

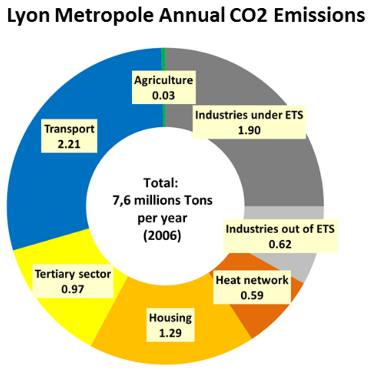
At the end of 2013, almost 400 local authorities had adopted a Climate & Energy Plan, defining detailed measures to cope with the '3x20' rule. In order to illustrate this process, let's consider the example of Lyon *Métropole*. The *Métropole*, including the city of Lyon (9 arrondissements) and its agglomeration (58 cities), is the largest after the Paris region. The 59 cities of Lyon *Métropole* (here after shorten to Lyon) represent a population of 1.3 million inhabitants.

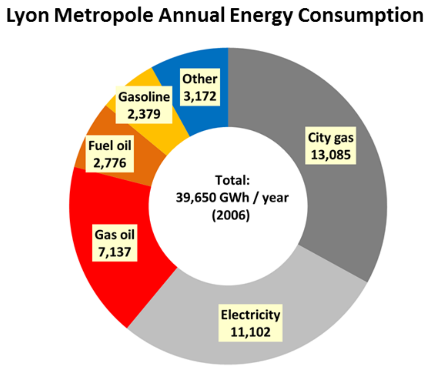
2.2.1 The role of local Climate & Energy Plans

The Climate & Energy Plan was drawn in a 3-step approach:

- A diagnosis on climate (2009): what do we know today? What are the orders of magnitude to cope with?
- Designing scenarios for a low carbon city (2011): what should we do and how?
- Defining detailed measures to reach the '3x20' rule (2013): for each actor/sector of the city, what specific actions are to be taken?

The diagnosis helped the city to identify the level of energy consumption per sector, and its evolution over the past ten years. It showed in particular the fields in which the city can act directly, and those that involve other actors (economic activities, households). The city can act directly on its own properties (buildings, waste management, water services), which represents only 5% of the total emissions. Indirectly, the city can influence other sectors, through adapted public policies and regulations, such as new buildings, social housing, public transport, heat networks and city planning (20% of total emissions). This means that 75% of total emissions remain under the responsibility of economic activities and households.
The industrial sector is responsible for 27% of the energy consumption and 41% of GHG emissions, the transportation sector 24% and 29% respectively, housing 29% and 20% and the tertiary sector 17% and 12.7% (Figures 4 and 5).





Source: Grand Lyon, 2011, Conférence Energie Climat - Vision 2020 pour une agglomération sobre en carbone, 142 p. [on line] available at
http://blogs.grandlyon.com/plan-climat/files/downloads/2012/01/GDLYON_Vision-2020_V14-BD.pdf

Figure 4: Annual CO2 emissions for the Lyon Métropole per sector

Figure 5: The Lyon Métropole annual energy consumption by sources

The second step was built by a large consultation of the different stakeholders at the city-level. More than 100 organisations participated in different workshops, while several models were used to measure the potential impacts of different strategies and measures for each sector. A 'Business-As-Usual' scenario (BAU) was designed for each sector, taking into account the different trends in energy consumption and GHG emissions, technological evolutions, the potential evolution of energy prices, and the short and long run elasticity of consumption.

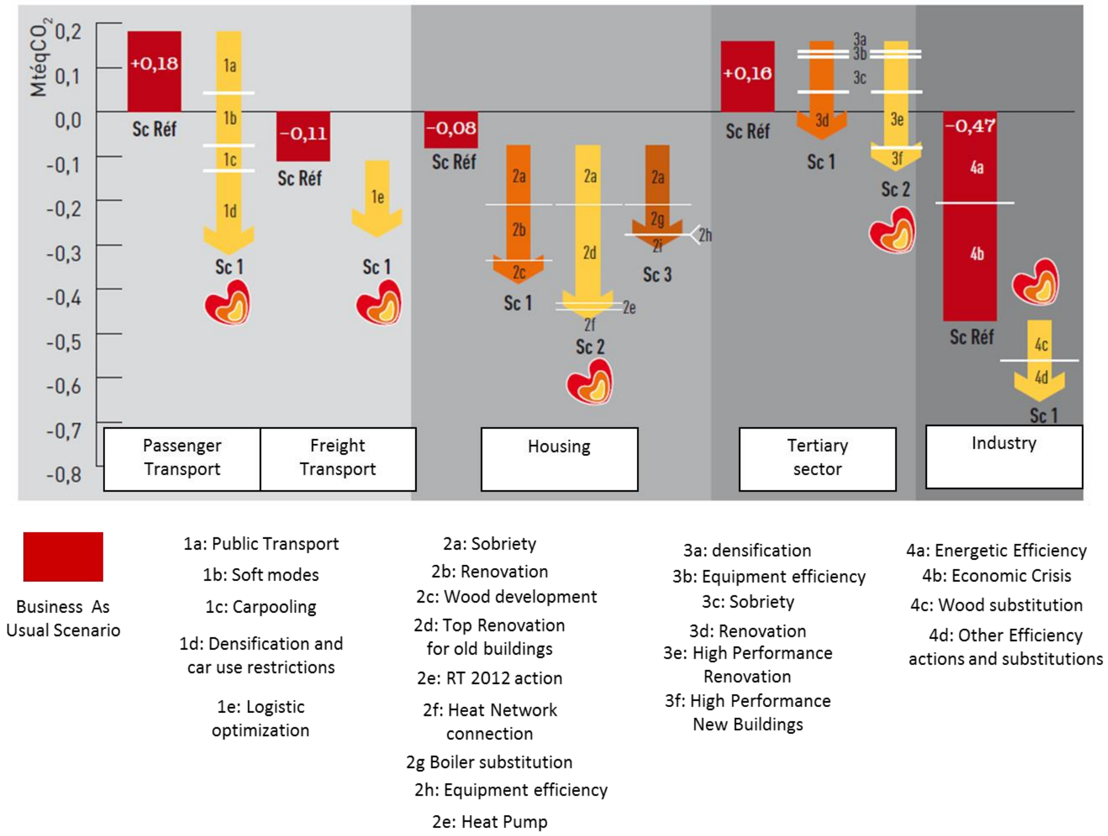


Figure 6: The Lyon Métropole's Climate & Energy Plan 2020 scenarios
Source: Grand Lyon, 2013

Scenarios are based on a series of measures to be applied. As shown in Figure 6, the passenger transport and tertiary sectors are the two where an increase of CO2 emissions is expected in the

BAU scenario, due to the increase of transport demand and of new offices. For freight transport and housing, emissions are expected to slightly decrease, due to the improvement of energy efficiency of the rolling stock (Euro 6 standard) and of norms in the construction industry. Otherwise, the industrial sector will see a larger reduction, due to the strong incentive to reduce energy costs, and partly due to the evolution of economic growth.
Overall, these scenarios forecast a significant decrease of emissions, subject to the implementation of a package of measures adapted by each sector.

2.2.2. The Smart City projects and the demonstrations in the field of energy management

The success of the Climate & Energy Plan will depend on strong collaboration between concerned actors, and this explains why Lyon decided to invest in several research and demonstration projects with many companies. Four main fields of research and test domains were chosen, in order to define a 'smart city' project: Innovation & Initiatives (Part-Dieu District), Energy and Smart Grids (Confluence District, Part-Dieu District), Bio Technologies (Gerland District) and Social Business (Carré de Soie District). Additionally, two other fields led to experiments on new mobility (Velo'v, Bluely) and digital services (Optimod, a multimodal mobility information system).

These innovative projects testify to the willingness of Lyon to play a leading role in the development of new green technologies in relation to the Climate & Energy Plan. These projects can benefit from several sources of funding, but aim primarily at involving private companies working on these technologies.

As Figure 7 shows, projects are quite numerous and describing all of them is impossible in the limit of this paper. Before taking the example of the Confluence district, a large full scale experiment which includes a smart community demonstration launched in 2012, and represents Lyon's strategy, let's briefly list projects directly related to the field of energy management:

- The implementation of smart meters (LINKY) in 12 Greater Lyon municipalities (175,000 households) is the opportunity to test this new device for electricity consumption management. After this first step, three million additional smart meters will be installed in the country for 2016 (generalization for 2022).
- A web-based electricity consumption data-tracking system (WATT & MOI): through a panel of 1,000 tenants equipped with Linky meters, this 2 year experiment (2012-2014) aims at helping individuals understand and adapt their energy consumption, and better manage their energy bills. A large majority of users are satisfied with this information system, and nearly half of them consider it helped them to reduce their energy consumption.
- The implementation of 35,000 gas meters (GAZPAR) in two municipalities (Lyon and Caluire-et-Cuire) to help to improve billing based on real-time consumption.
- A European Research and Development Program (TRANSFORM) applied on the Part-Dieu CBD, to define an energy transition process (modeling the region's future energy needs, building performance analysis, and brainstorming on new energy-planning guidelines).
- The test of a smart grid on a large scale in different part of the city (GREENLYS), integrating renewable energy facilities, EVs, and Linky meters, associated with consumer behavior studies.
- A large scale test project (SMART ELECTRIC LYON) proposing innovative services and products to 25,000 Lyon households and businesses, to manage power by cutting energy peak and reducing consumption.

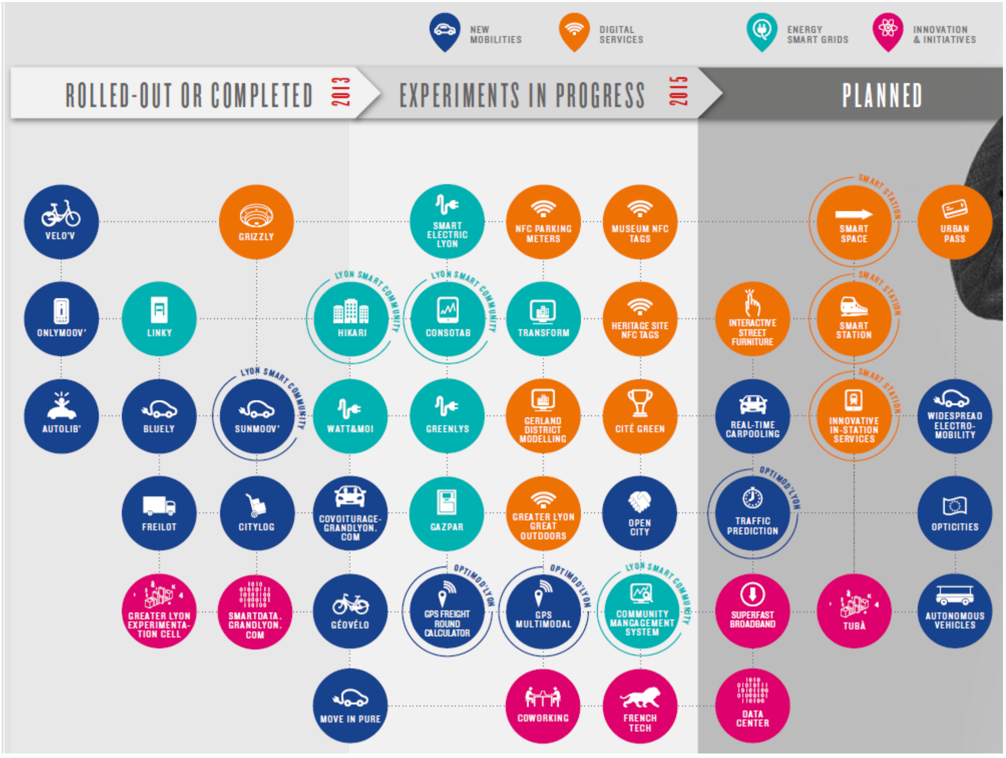


Figure 7: The 40 projects of the Lyon Smart City Project

Source: Grand Lyon, 2012

The Confluence eco-district and the Smart Community Project

Located at the south of the peninsula, at the confluence of the Rhone and the Saone rivers, the Confluence district is an old historical area that became an industrial district during the 1960-70s. As most of the economic activities moved to peripheral locations, this large area (150 ha) was an opportunity for the extension of the old center of the city, with a potential for 18,000 inhabitants and 27,000 jobs. In 1999, a semi-public company was created to plan the renewal of this district, and was transformed into a local public development company in 2008 (*Société Publique Locale d'Aménagement – SPLA*), which devised a concrete, balanced programme of sustainability. SPLA managed the urban-project consultation process, the High Environmental Quality (HEQ) of buildings, soil decontamination, public-space re-vegetation, and a resident mix. The company has been awarded by the EU's Concerto-Renaissance project for the housing and offices around *Place Nautique* (2004), partly funded by the EU (3.5 M€), which supports projects that meet HEQ requirements: consuming 80% renewable energy and reducing their energy needs by 40%, through bioclimatic building design. Recently, the project was labeled as a WWF sustainable district and got the French eco-district certification.

In 2010, a partnership was signed between Greater Lyon and NEDO for demonstrating projects relating to new sources of, environmental, and industrial technologies. The Lyon Smart Community Project was then launched, integrating more than 30 partners on the basis of a 4 task programs:

Task 1: Implementation of positive-energy buildings: The Hikari project (12,000 m²) is composed of three mixed-use buildings (office, commerce, housing) and benefit from Japanese technologies: electricity production using the roof and facade-mounted solar panels, energy storage using batteries**,** and energy coordination with a BEMS for the building's common parts and service areas. Moreover, residential units are also equipped with HEMS. The building should reach high-energy efficiency and will return energy to the CEMS.

Task 2: Promoting Sustainable mobility – a car-sharing scheme with a fleet of electric vehicles to be powered by solar energy: The Sunmoov' car-sharing system implemented in the Confluence district has 30 EVs and 6 charging stations. It provides a new mobility service, enabling employees and residents to travel without their own car. This system complements the Public Transport network (with a tramway line crossing the district from North to South) and a layout of streets in favor of soft transportation modes (pedestrian and bikes). In the framework of this experiment, the electric energy supplied for charging the vehicles will come from PV panels to be installed on the roof of a sports hall located in-district (presently, the electricity is coming from an hydroelectric power plant on the Rhone river). The system is connected to the CEMS and is designed to be used during the day by companies and at night by residents. One of the greatest challenges for the project is to manage the energy balance between the various sources of renewable energy in the district and the recharging needs of these EVs, but V2X technology is not included.

Task 3: Implementing a House Energy Management System in social housing: One of the focuses of the experiment concerns the question of existing housing renovation. A local social housing body (Grand Lyon Habitat) developed an ambitious 'eco-renovation' program on the *Cité Perrache*, an estate block of 275 apartments. The idea is to combine the eco-renovation with an energy monitoring system (electricity, gas and water use) in order to inform residents in real-time about their consumption (through Toshiba Consotab) and help them to master their energy budget.

Task4: The Community Energy Management System: The Community Energy Management System (CEMS) will gather a large and diverse quantity of data from a range of locations, including buildings, electric vehicle charging points, renewable energy production sources, energy consumption outlets, and so on. The CEMS provides both management and forecasting, and will facilitate planning energy resources and requirements. The goal of the experiment is to test the devices, and to assess where to reduce energy consumption. The CEMS, which is the masterpiece of the experiment, is carried out by Toshiba. However, at the end of the project Lyon will get back the equipment and related data for managing energy demand in the district.

Unfortunately, the Smart Community Project is partially late, and results are not available. In particular the positive energy Hikari building, which is at the core of the CEMS demonstration, is still under construction. Also, the pace of urbanization in the Confluence district seems lower than expected, partly due the present economic crisis. The CEMS has been developed. Toshiba has made simulations of the reduction in peak hours or in overall energy saving that the "*cité Perrache*" visualization experiment, Hikari complex, and PV generation for Sunmoov electric car-sharing system could lead to, but results cannot be verified as the whole system is not operational yet. The project supposed to terminate in December 2015, has recently been prolonged to December 2016.

3. Comparing Japan with France: between differences and similarities

As previous parts have illustrated, climate change imperatives, reduction of GHG emissions, and energy management are taken seriously in both countries, whether at the national or city level. But, as mentionned in the introduction, although policies seem rather similar in both countries the context in which the measures take place still matters, and might explain some differences in the way policies are implemented or in their expected longer term outcomes.

3.1. The difference of the context in France and Japan

The obligation for Japan to cut 6% of its greenhouse gas emissions by 2012 compared to the 1990 level under the Kyoto protocol has been a timely incentive to cut GHG. However, in the context of long lasting crisis of the 90s, the Voluntary Agreements implemented as early as 1997 were not sufficient to encourage firms to go beyond targets[22]. Since the 1992 Kyoto Protocol, France also

[22] More recently, the Keidanren established a Voluntary Action Plan to which major Japanese companies have committed to stabilize CO2 emission from fuel combustion and industrial process at 1990 level by 2008-2012. 34 industrial organizations participate accounting for 44% of total emissions of Japan in 1990 (see Kang Seung Woo, Won Yeou Ju, Kim Jin Yong, Jung Jae Su, 2012)

started to deal with CO2 emissions through several measures in different economic sectors, including Voluntary Agreements under the Association for the reduction of GHGs for companies in the industry and energy sectors (Kang SW, Won YJ, Kim JY, Jung JS, 2012).

As Figure 8 shows, CO2 emissions in Japan continued growing except when production volume dropped due to the financial crisis in late 2008. Emissions increased again since recovery, except for the transportation sector which was the second highest CO2 emitting sector. Thanks to improvement in transportation efficiency such as better energy efficiency of engines, promotion of alternative vehicles (hybrid mainly)[23], etc., transportation now is behind the "commercial and other" sector which trend remains increasing over time, even though it similarly witnessed a cut during financial crisis years. The same trend can be observed for the residential sector although increases or cuts are less pronounced.

In France, as shown by Figure 9, the stabilization of total emissions comes from improvements in energy conservation, as well as in industry. Results are moderate for the housing and tertiary sector[24], partly due to the growth of services in French economy. In Japan, industry clearly is the lead emitting sector, while in France the transport sector is the highest. France's transportation continues to be increasing in emissions, due to its strong dependency on oil consumption. Stabilization appeared at the beginning of the 2000's due to a reduction of the total annual mileage of vehicles: this can be explained by different measures taken to discourage people from using their cars, but also for fear of an oil price increase. In 2013, transport was responsible for 35% of the total CO2 emissions, far from the housing and tertiary sector (24%) and industry (23%).

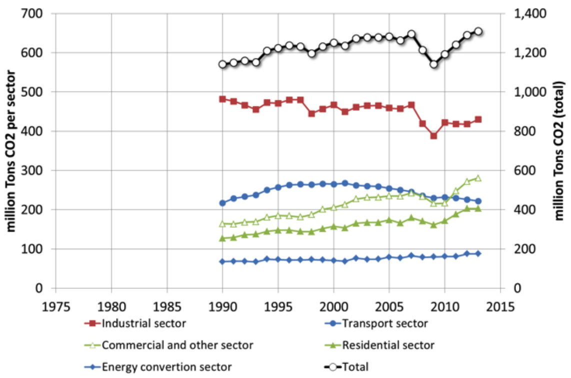


Figure 8: Evolution of CO2 emissions per sector in Japan

Source: Ministry of Environment 2014b (for 1990-2011); MOE and JNIES (for 2012-2013).

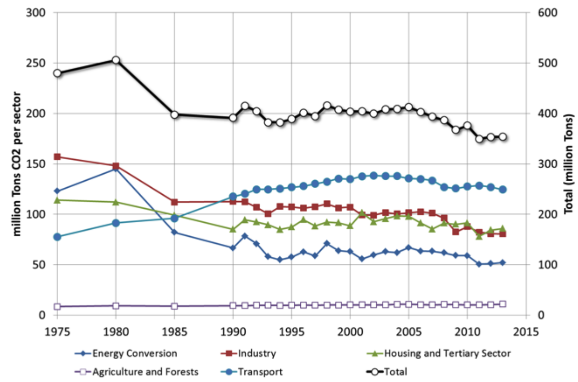


Figure 9: Evolution of CO2 emissions per sector in France

Source: CGDD, 2014 (data from CITEPA)

As was the case for Japan, the main reason for the reduction of CO2 emissions in France since 2008 is the economic crisis. However, while emissions continue to decrease in France, in 2013 Japan reached the highest emissions levels since 1990. This can of course be explained by the stop in nuclear energy production and the correlated increase in fossil fuel power generation after the earthquake (Figure 10).

[23] For more detail on this, see Faivre d'Arcier and Lecler, 2014.

[24] Unfortunately categories are differing in France and Japan which separates housing from tertiary sector while France does not do.

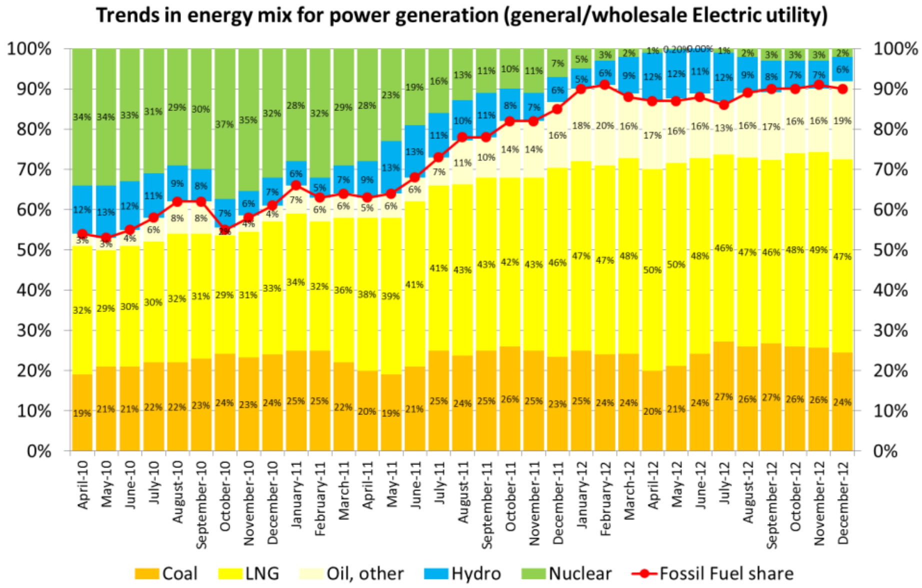


Figure 10: Energy mix since Fukushima
Source: MOE 2014c

In such a context, reaching the ambitious targets the country has set makes it unavoidable to turn to much more renewable energies. As presented in the first part of the paper, introducing renewable energies is not a new agenda for Japan. By referring to numbers before the Fukushima accident, it appears that Japan was not doing much better than France (2009) with electricity generated from renewables, respectively at 3.5% and 2.4% of the total power generated (figure 11 below).

When during the 2009 campaign Hatoyama (DPJ) surprisingly announced a 25% reduction target of GHG emissions by 2020 (on the 1990 level), investing in innovative clean technologies and using more renewable energy came immediately (or once again) to the agenda. Although voices said such a reduction would ruin Japanese firms which had already been heavily invested in; or that PV energy, still too expensive, would increase the energy burden of households to such an extent that poverty would grow further, etc.[25], the 2010 version of the Basic Energy Plan which outlines the energy strategy of the country confirmed the DPJ's commitment to a large reduction of GHG emissions. However, differences with the Liberal Democratic Party (LDP) strategy might not have been huge in that matter. Indeed, the energy mixed proposed by the plan was promoting renewable energies up to some 20%, but also nuclear generated electricity (around 50% instead of the roughly 30%)[26].

To achieve the goal of 20% renewable, it was assorted with a more suitable Renewable Portfolio Standard (RPS), all still low: 10% to 2020[27], Feed-In-Tariff[28], carbon tax etc.: all instruments for which Japan was still lagging behind due to, as explained by several authors, the rather weak role of the Ministry of Environment (MOE) and in contrast the domination of METI, in charge of industries including energy, and therefore strongly linked to enterprises and their organizations.

[25] A quite contested survey was used to argue on these aspects, see: Iida Tetsunari and De Wit Andrew, 2009.

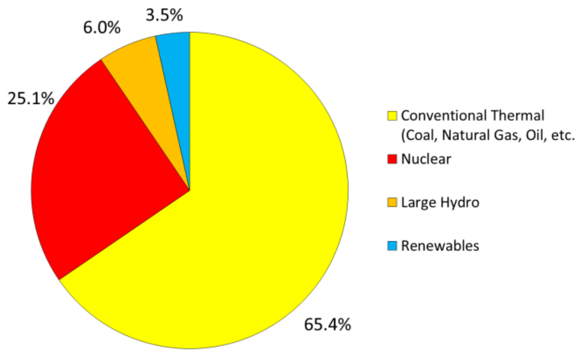
[26] Among overs, see Huenteler, J., et al, 2012

[27] The Renewable Portfolio Standard (RPS) system implemented in the 2000s did not really bring results. The constraint given to electricity providers to distribute 1.63% in 2014 of power from renewable was too small for guarantying earnings able to stimulate investments. According to JREPP 2011, the number in 2010 was 1.35%. For example, California fixed it at 33% by 2020, Germany at 50% by 2030 (Iida Tetsunari and De Wit Andrew, 2009).

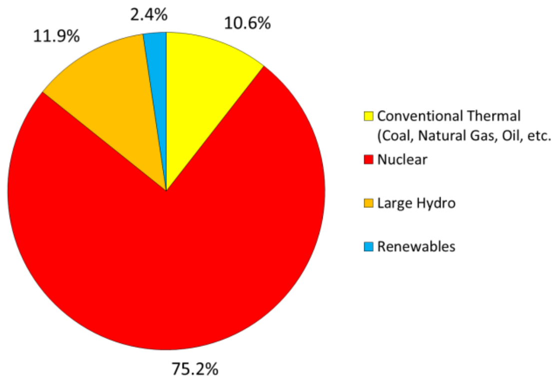
[28] Just before the election, METI took the initiative to prepare a FIT law that it urged to pass on the Diet. Opposite to most other countries making an obligation for electricity companies to buy all energy produced, the law gives only obligation to buy the surplus after self-using the electricity, making the scheme much less attractive to households or to businesses to engage in (see De Wit and Iida, 2011).

2009(FY)	Japan	
Renewable type	**TWh**	%
PV	**3.0**	0.3%
Wind	**3.8**	0.3%
Geothermal	**2.8**	0.3%
Small-scale Hydro	**17.3**	1.6%
Biomass	**11.6**	1.1%
Total Renewables	**38.5**	3.5%

2009	France	
Renewable type	**TWh**	%
PV	**0.1**	0.0%
Wind	**7.8**	1.5%
Other sources	**4.3**	0.8%
Total Renewables	**12.2**	2.4%



Japan



France

Figure 11: Proportion of domestically generated renewables in the total of power generated in Japan and in France in 2009, by source

Source: Japan: ISEP and JFS 2011
France: RTE, Bilan électrique 2009 [on line] available at
http://www.rte-france.com/sites/default/files/rte_bilan_electrique_2009.pdf

The Japanese electricity market is divided in 10 regional power utilities. These 10 companies control about 85% of the available power and have a *de facto* regional monopoly[29]. They entertain deep relations with METI bureaucrats whose great majority is pro-nuclear. These vested interests[30], as argued by De Wit and Iida (2011), or the collusion between industry and bureaucracy often pointed out by political scientists, have always played in favour of a *status quo.* This is certainly part of the reason why, Japan which has started R and D on renewable energies early, which has hosted the Kyoto protocol and has been a leader for energy efficiency, has lost its leadership. But the long crisis of the lost decade which provoked a slowing of investments in the area of energy conservation and renewable energies introduction also has played its part. As a result, although Japan has high potential in renewable energies the country lead seems to be melted away. Germany has taken the lead in terms of renewable, and Japanese companies are losing part of their world exports markets share of solar panels to Chinese ones.

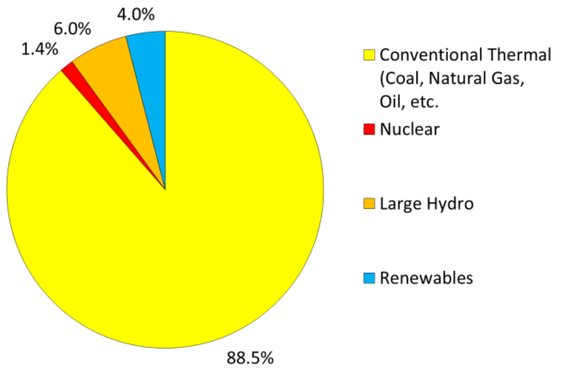
The Fukushima accident following the earthquake and tsunami of March 11th, 2011 changed the situation. Facing power shortage, the population who did not care much about where its electricity was coming from due to the efficiency and stability of the grid, realized that energy matters. All nuclear power plants were closed and although two reactors were restarted in July 2012 (Oi city), the opposition of nuclear energy remains strong enough to avoid, on the short term at least, a return to the former situation (30%), and of course to an expansion of the nuclear power share to the previously forecasted 50%. This situation is not favourable to the Japanese economy, which has to import fossil energies to an extent that led to a huge commercial balance deficit. Neither does it help reduce CO2 emissions; at the same time though, the 4th Basic Environmental Plan (revised in 2012)

[29] A reform is under way which, among other elements, aims at separating production and distribution of electricity towards 2016/2017.
[30] Not only with power companies, but also with most large firms, such as those of sectors like cement, steel etc.

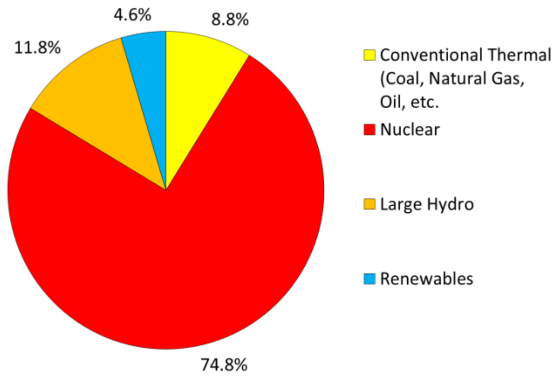
has reaffirmed Japan goal of an 80% reduction in GHG emission by 2050 (on the 1990 level)[31]. The transition towards renewable energies (PV, wind, biomass, geothermal, small scale hydro) has become an important issue in Japan, although the LDP government, back to power, is in favour of a nuclear power restart. Yet, looking at numbers shows that although the share of renewables increased in Japanese domestically generated electricity between the 2009 and 2012 fiscal years, the increase remains lower than in France (figure 12) which also is a country where renewable in electricity generation is rather limited, especially if excluding large hydro power which stands at 11.8%.

2012 (FY)	Japan	
Renewable type	**TWh**	%
PV	**7.6**	0.7%
Wind	**4.8**	0.4%
Geothermal	**2.6**	0.2%
Small-scale Hydro	**17.4**	1.6%
Biomass	**12.2**	1.1%
Total Renewables	**44.7**	4.0%

2012	France	
Renewable type	**TWh**	%
PV	**4.0**	0.7%
Wind	**14.9**	2.8%
Other sources	**5.9**	1.1%
Total Renewables	**24.8**	4.6%



Japan



France

Figure 12: Proportion of domestically generated renewables in the total of power generated in Japan and in France in 2012, by source
Source: Japan, ISEP 2014
France: Source: RTE, Bilan électrique 2012 [on line] available at
http://www.rte-france.com/sites/default/files/rte_bilan_electrique_2012.pdf

The French context is certainly different from Japan's, even if the impact of Fukushima is worldwide. The country has made efforts and improved its energy efficiency since the 2000s, but the weight of nuclear power generation in France and the EDF (*Electricité de France*) strategy highly in favour of nuclear can explain the lower involvement in renewables compared to Germany for example. Similar to Japan's monopoly of the 10 regional power companies, the long lasting monopoly on electricity production and distribution (since WW2) of EDF in France and its lobbying capacity is part of the reasons why changes are difficult to implement.
Surely the deregulation of the energy sector which progressively occurred in France between 2000 and 2007[32], leading in 2008 to the creation of ERDF (*Electricité Réseau Distribution de France*) as a subsidy of EDF, brought changes, such as the CNR (*Compagnie Générale du Rhône*) exploiting

[31] First announced by Prime Minister Fukuda Yasuo in June 2008, Japan would strive to reduce its GHG emissions by 60%-80% from the existing levels by 2050, and by 14% by 2020. For more details see Noriko Sugiyama and Tsuneo Takeuchi, 2008.
[32] The Law for the modernization and development of the public service of electricity of February 2000, followed by several laws (2003, 2004, 2005) progressively opened the market and gave the new orientation of energy policy, leading in 2007 to a complete opening of electricity and gas markets in France.

the large scale hydro generation of Rhône river, which since deregulation provides direct electricity to business clients (and to Confluence Sunmoov charging stations for instance). It also allows new solutions in decentralized generation and new distribution services to progressively emerge.
The electricity reform to come in Japan in 2016-2017 will probably act the same way. So while the deregulation was encouraged by the EU directives in the French case, the Fukushima accident clearly was the detonator to electricity reform in Japan.

3.2. The multi-level decision process and the importance of cities

When comparing the policies implemented in France and Japan it is also important to point out the difference in levels of decision.

France is committed to apply EU regulation adding one level to the policy framework. While the EU remains a community of states, each one is keeping to its own prerogatives. However, the EU may push to enlarge or accelerate changes due to the influence of more advanced countries in environmental consciousness such as Germany or Northern Europe, while a coordination of actions and measures could appear necessary to favor a common policy. This is the case on the question of CO2 reduction, with the creation of the European Emission Trading System (ETS) which intends to focus on the main industrial companies. It is the same with the eco-tax system, which will price CO2 emissions for freight road transport in each European country (even if the implementation of this system recently failed in France due to huge protests of transport companies).
This is also the case in the field of energy and especially electricity supply, as all the distribution networks are connected to facilitate exchanges[33]. Not only did the EU define regulation to allow transfers, such as the design of technical specifications to harmonize electricity production, but it also opened markets that were dominated by national monopolies. This does not mean though that there is a common policy in the field of energy: each country still decides its energy mix. For example, Germany decided to stop nuclear production in the future, while France is still promoting its nuclear industry.
Climatic impact will not stop at the border of each country, and this explains why coordination is stronger in the field of GHG emissions. Objectives for the reduction of CO2 emissions are defined on 3 levels in a top-down path: EU → State → Local authorities[34]. Guided by EU directives, the national level fixes its own and enacts laws or takes measures to encourage the local level to conform (namely cities). Cities develop their climate plan and elaborate concrete projects independently, though. To fund these projects, cities may apply to one or another organization such as ADEME, for example, or negotiate arrangements with private companies. They may also directly apply to the EU, which has its own incentive schemes. Thanks to these, the EU can also efficiently promote action at the local level, independently from State policy; at the same time, it adds to the complexity of the management of environmental issues. As the case of Lyon has shown, numerous projects are carried out simultaneously, some having been proposed by companies looking for a test bed of their technologies or for new markets for their innovative services (Velo'v, Bluely, Smart Electric Lyon), while some others are funded by EU or even by foreign sources such as Confluence project and the smart community (City, EU, NEDO).

On the contrary, Japan which has no supranational level to deal with presents, at least apparently, a simpler situation: a 2-level system (State / Local), which can help to a greater coherence in policy implementation. The government fixes objectives and enacts laws according to which concerned ministries have to implement policies measures. This is achieved by launching programs or

[33] In Japan the regional distribution networks still are separated. The electricity reform to come makes it an obligation to the 10 regional power companies to connect their grids.
[34] Under local authorities, we group the Region level and cities. Sure Regions in the French case, or Prefectures in the Japanese one, may also develop a strategy and implement subsidies schemes by their own to help funding cities. But as far as GHG or energy are concerned, including the regional/prefectural level would not add anything to the analysis.

schemes, to which cities may apply alone or jointly with a company consortium. In this way, Japanese prefectures or cities only rely on the national level for subsidies and funds to invest in new projects. As we have seen in the first part of the paper though, the organization of Japanese administration and the fragmentation of responsibilities between Ministries and their different bureaus or agencies also leads to a certain complexity in managing the local level. As the case of Yokohama has shown, projects are overlapping, and actions taken under one individual project might be connected to another one and benefit from subsidies from other schemes. For example in Yokohama, to launch Choi Mobi (the car-sharing system of YMPZ), EVs were bought by the city of Yokohama using the EVs subsidy scheme of the Road Transport Bureau of MLIT. In the smart community project of Toyota city (METI), the micro-electric vehicles (Toyota Coms) used for the car-sharing system (HaMo ride) were also subsidized by the MLIT bureau.

Regardless of the two or three levels of decision making, it is obvious to say that states need cooperation from the local level to reach the defined targets. In both countries, even if national rules can be defined in order to favour more constraining energy consumption or GHG emissions standards for the industrial sector or the construction sector, the concentration of human activity in cities makes urban areas the place where challenges can be addressed and where tools for managing energy can be verified. Therefore, both countries, which as mentioned in the introduction despite decentralization that occurred in past years have a long tradition of centralized administrations tend to address the issue mixing both top-down and bottom-up processes. Objectives are fixed from the top and travel down along the two (Japan) or three (France) levels of decision making, but projects are elaborated from the bottom and then funded locally or by upper levels. The difference between the two countries seems to be more of a difference in the degree of central involvement than in the nature of the implementation. The Japanese government creates specific programs or schemes, which competitively select cities' projects and develop "models" to be reproduced elsewhere. The French government seems to give priority to regulation through the evolution of the planning process and the definition of standards, choosing not to draw specific national programs or schemes. The best practices coming out from cities experimental projects are studied and welcomed but the development of "models" is not really an issue.

On either side, both countries cities are aware of what is at stakes in terms of energy management and climate change and are willing to play a leading role in finding the best solutions. It is also a question of image for the future, and they are ready to compete to be exemplary, to become a showcase for innovation. Even if they remain largely dependent at the state level for financial reasons, they are also aware of the importance of the development of green technologies for their attractiveness and local employment. This brings the question of industrial transformation or revitalization to the surface and with it the industrial strategy of countries.

3.3. The importance of industrial strategies and the technology orientation of projects

The energy transition needed to address climate change benefits from the technological developments of recent years, and also encourages new technical solutions. Supporting the development of new technologies, including green technologies, is therefore on the agenda in France like in Japan.
When comparing both countries, industrial dynamics appear much more emphasised in the case of Japan, putting companies at the core of most policy schemes dedicated to climate change or energy. Although projects had to be jointly developed with a local authority, does not mean cities have the major role. Having participated in several schemes, Yokohama has quite a positive image, but in the case of YSCP for example, most of funding is devoted to corporations. Indeed, the "Demonstration of Next Generation Energy and Social Systems" program involving both public and private sectors was also clearly a part of an industrial strategy addressing the conversion of Japanese flagship

industries[35]:

- The consumer electronics industry is losing speed compared to Asian neighbors on its traditional segments (computers related products and so on), while new green technology such as information systems for energy or transportation use can be seen as the markets of the future.
- The car industry which is facing overcapacities in at least the triad economies, while mobility behaviors of population namely in urban areas is changing along with progress of information and communication technologies, but also with gasoline prices and a certain consciousness of environmental and energy transition issues.

The demonstration program clearly intended to define an ‘exportable model’ which Japanese companies are now testing in Japan and abroad (such as the Confluence smart community funded by NEDO) in order to be ready to sell their products or technological solutions worldwide. It certainly explains why each enterprise involved has its own contract with and is directly funded by METI, and also is obligated to directly report results to METI and to a university professor whom research group has been appointed to comparatively analyze data on the demand/response results.
The still dominant position of METI, [36] which is of course concerned with industrial competitiveness and maintains strong lineages with private companies, may certainly explain the importance given to industry support in all strategic plans and policy frameworks.

In the case of France, the government also has implemented schemes or competitive funds to encourage private companies to develop and test new technologies. Be it through ‘Investment for the Future’, or ADEME call of proposals, companies can apply for funding of their R&D whatever for smart-grid test projects, or any green technology. Depending on the rules of each competitive fund, companies may be constrained to jointly apply with a public researching organization, or through a competitiveness cluster, but the cooperation with cities or local authorities is not as preeminent as it is in Japan. In fact, although a city’s and company’s interests can match, each actor is independently responsible for its own projects and searches for funding independently or by negotiating public private arrangements. French cities, as is the case of Lyon are also concerned with attracting private companies or foreign investment and provide employment opportunities for their citizens. But contrasting with Japan, sustainable development which now is part of attractiveness, as the concept of smart cities proves, is usually treated separately as measures or new services dedicated to the improvement of the quality of life within the city. This less integrated method may lead to less coherence between projects implemented. As is the case of Lyon smart-grids are tested separately in several areas while two independent EVs car-sharing systems have been launched (Bluely in the whole city of Lyon except in the Confluence district where Sunmoov was developed). On the city side, the idea seems to be that, as long as they remain consistent with the general strategy and help achieve its objectives (CO2 reduction, energy consumption etc.), it is worth to make the most of all innovative opportunities in a trial-and-error approach. The numerous on-going projects in Lyon give an image of a city at the forefront of green innovation but at the same time aims at defining the best solutions for the future.

Concluding remarks

That policies are more specifically centered on industrial interests or on sustainable development does not prevent all experiments to be mainly based on technologies or new technical systems. To

[35] Since 2011, it is also seen as a solution for the future in the necessary reconstruction of areas devastated by the March 11 tsunami. Japanese authorities have selected eight “smart city” projects as candidates to receive subsidies (up to 8 billion yens) through 2016 among 50 initiatives from Fukushima, Miyagi and Iwate prefectures (6 were selected among the 11 Model Cities under the Future Cities Initiative launched in December 2011 for 5 years).

[36] Although METI lost some power since the 90s, the MITI analysis by Chalmers Johnson (1982) in his seminal book remains rather accurate.

succeed, they need the population to accept a change in their way of life, and it is on this aspect, quite present in discourse but less in reality, that we would like to conclude.

Indeed, in Japan for example, a smart community's definition emphasizes the development of a new social system as one of the main goal of the experiment[37], but observations show that all aspects remains quite technological. Although educational programs are developed to increase the level of awareness on climate change and energy consumption, the degree of involvement of households who, up to now, did not pay close attention to their energy consumption or CO2 emissions, remains low despite an increase after Fukushima.

The focus on industrial development of new systems and products is clearly dominant in Japan. This can explain why social issues are taken less into account. The urgency of securing the energy supply after Fukushima has accentuate this tendency and might explain how priorities have been modified in the Smart Community demonstrations. The "social system" question no longer seems to be at the centre of the process, coming down more so to verifying consumer's willingness to reduce peak hour consumption.

In France, the strong impact of the present economic crisis put the question of unemployment first, and as a consequence, environmental awareness is now decreasing, leading to cities turning priorities to investment attraction and a population concerned with other preoccupations.

Some preliminary results from the Japanese smart communities show that the incentives for reducing electricity consumption (without disturbing 'quality of life') gave interesting results the first year (-15%); but the efficiency decreased the last year (-10%), showing that people do not seem ready to a constraining daily management of their energy consumption. The visualization of consumption that the HEMS allows has been attractive for a while. Playing the demand/response game to be top of the community ranking, was seen as a funny challenge. However, as with any game, it does not remain attractive after a certain time. To avoid this behaviour, Toshiba introduced in the last YSCP test period a new device that allows the CEMS to automatically generate the needed response, such as reducing air conditioning by one degree for example.

In the case of Lyon's smart community experiment, it was predicted that people living in social housing would be sensitive to the possibility of reducing their electricity bill using the visualization device (Consotab of Toshiba to be integrated in the CEMS experiment). However, residents said they still can afford the freedom to choose the temperature of their home and the argument of reducing costs in fact failed. On the contrary, the cost argument seems central for the decision to buy an EV or PHEV. Strong financial incentives to encourage people to buy clean vehicles explain the development of the market in Japan, but how will it evolve when subsidies which allow the price of these new vehicles to be at the same level as a standard vehicle end?

All of these elements show that social change is the key point to reach the targets in terms of energy consumption and GHG emissions. Testing technical innovations is of course necessary, as they are needed to facilitate the energy transition, but experiments also show that technologies will not be sufficient, and that more social elements should be studied carefully.

References

Cabinet of Prime Minister, Japan 2009: New Growth Strategy (Basic Policies) Toward a Radiant Japan. Available at http://www.kantei.go.jp/foreign/topics/2009/1230strategy_image_e.pdf:), last consultation April 2012.

CGDD (Commissariat Général au Développement Durable), 2014, Les comptes des transports en 2013, Tome 1 – 51ème rapport à la Commission des comptes des transports de la nation, 176 p. [on line] avalable at http://www.statistiques.developpement-

[37] It is again at the core of Future City Initiative.

durable.gouv.fr/fileadmin/documents/Produits_editoriaux/Publications/References/2014/comptes-transports/references-comptes-transports2013-edition2014.pdf, consultation February 2015.

DE WIT Andrew and IIDA Tetsunari, 2011: The Power Elite and Environmental Energy Policy in Japan, *The Asia pacific Journal* vol 9, issue 4, January 24.

FAIVRE D'ARCIER Bruno and LECLER Yveline, 2014: Promoting Next Generation Vehicles in Japan: the Smart Communities and their experimentations, in *International Journal of Automotive Technology and Management*, n°3/4, fall, pp. 324-346.

Grand Lyon, 2012, Lyon Smart Community – at Confluence of energy and the environment, 24 p. [on line] available at http://www.business.greaterlyon.com/fileadmin/user_upload/fichiers/site_eco/20141124_gl_lyon_smart_city_metropole_intelligente_plaquette_en.pdf, consultation February 2015

Grand Lyon, 2013, Vision 2020 pour une agglomération sobre en carbone, document préparatoire à l'élaboration des plans d'actions des partenaires de la Conférence Énergie Climat, 142 p., [on line] available at http://blogs.grandlyon.com/plan-climat/files/downloads/2012/01/GDLYON_Vision-2020_V14-BD.pdf, consultation February 2015

HUENTLER, J., et al., 2012, Japan's post-Fukushima challenge – implications from the German experience on renewable energy policy. *Energy Policy* (2012), doi:10.1016/j.enpol.2012.02.041

IEE Japan, 2011: EDMC Handbook of Energy & Economic Statistics in Japan.

IIDA Tetsunari and DE WIT Andrew, 2009: Is Hatoyama Reckless or Realistic ? Making the Case for 25% Cut in Japanese Greenhouse Gases" *The Asia-Pacific Journal* Vol 38-4-09, Sept. 21.

JSCP (Japan Smart City Portal), 2014: Japan's Largest Ever DR Verification Experiment Supported by CEMS Achieves a Maximum Peak Demand Reduction Rate of 15.2%, Release: 2014/06/18, available on line at http://jscp.nepc.or.jp/article/jscpen/20140618/403214/index.shtml, accessed on January 20th.

ISEP and JFS 2011: Current Status of Renewable Energy in Japan (2011), accessed February 2015, www.japanfs.org/en/news/archives/news_id031513.html

ISEP 2014: Renewables Japan Status Report 2014, "Executive Summary", http://www.isep.or.jp/en/wp-content/uploads/2014/07/JSR2014_Summary_EN.pdf, accessed February 2015.

JACOBS A.J., 2011: Japan's Evolving Nested Municipal Hierarchy: The Race for Local Power in the 2000s, in *Urban Studies Research*, Hindawi Publishing Corporation, Article ID 692764, 14 pages, doi:10.1155/2011/692764

JONES R.S. and YOO B., 2011: Japan's New Growth Strategy to Create Demands and Jobs, OECD Economics Department Working Papers, N° 890, OECD Publishing. http://dx.doi.org/10.1787/5kg58z5z007b-en.

JOHNSON, Chalmers, 1982: *MITI and the Japanese Miracle, the growth of Industrial Policy, 1925-1975*, Stanford University Press.

JREPP, 2011: shizen energy hakusho (Renewables Japan Status Report). Downloadable at http://www.re-policy.jp/jrepp/JSR2011/index.html.

KANG Seung Woo, WON Yeou Ju, KIM Jin Yong, Jung Jae Su, 2012: National Greenhouse gas reduction policy trends from voluntary agreements to negotiated agreements and its implications, in Matsumoto Mitsutaka, Umeda Yasushi, Masui Keijiro, Fukushige Shinichi ed., *Design for Innovative Value Towards a Sustainable Society: Proceedings of Eco-Design 2011 7th International Symposium on Environmentally Conscious Design and inverse Manufacturing*, 2012 Springer Verlag 942-945

LECLER Yveline, 2012: Smart communities in Japan: testing next generation energy, Paper prepared for the 9th *EastAsiaNet Research Workshop*, Aveiro, Portugal, 19-21 April.

MEDD (Ministère de l'Ecologie et du Développement Durable), 2004, Plan Climat, 88 p. [on line], avalaible at http://www.developpement-durable.gouv.fr/IMG/ecologie/pdf/PLAN-CLIMAT-2004-2.pdf accessed on February 2015.

MOE, Ministry Of Environment, Japan, 2014: Japan Climate Change Policy, available at http://www.env.go.jp/en/focus/docs/files/20140318-83.pdf, accessed on 17/2/2015.

MOE (Ministry of Environment) 2014a: Annual Report on the Environment, the Sound Material-Cycle Society and the Biodiversity in Japan 2014, available at http://www.env.go.jp/en/wpaper/2014/index.html, accessed February 2015.

MOE (Ministry of Environment) 2014b: kankyotokeishu (statistics on environment), on line, accessed February 2015, www.env.go.jp/doc/toukei/contents/pdfdata/H26_2.pdf

MOE 2014c: Ministry of Environment, Japan Climate Change Policy, 18 March 2014, on line, accessed 17/2/2015, http://www.env.go.jp/en/focus/docs/files/20140318-83.pdf

MOE (Ministry of Environment) and JNIES (Japan National Institute for Environmental Studies) 2014: Japan's National Greenhouse Gas Emissions in Fiscal Year 2013, preliminary figures, on line www.env.go.jp/press/files/en/591.pdf, accessed February 2015

SUGIYAMA Noriko and TAKEUCHI Tsuneo, 2008: Local Policies for Climate Change in Japan, in *The Journal of Environment Development* volume 17, number 4, 424:441

Yokohama City 2010 (Climate Change Policy Headquarter): Dynamic, creative and smart city achieved through city and citizen partnership, available at http://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1270074782769/6925944-1288991290394/Day2_P3A_3_Yokohama.pdf , accessed February 2015

Yokohama city, no date: Climate Change Policy Headquarter, Smart and Low Carbon city planning of City of Yokohama, on line power point presentation http://www.iges.or.jp/isap/2013/PDF/PL6/ISAP_PL6_4_Nakajima.pdf, accessed February 2015.