Transition Towards a Post Carbon City - Does Resilience Matter?

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Abstract

The aim of this chapter is to highlight the need for a paradigm shift in order to progress toward sustainable development in cities. The discussion focuses on the relations between cities and climate change. The concept of post carbon city is introduced and explained. The chapter argues that resilient thinking approaches are more appropriate than current efficiency ones for dealing with transitions toward post carbon city. The resilience approach is critical to build redundancy into a certain interpretative model, as it comes with the classical adaptive cycle, encouraging to look at the whole figure (reorganisation, conservation, release, exploitation) of the system. The argument is supported by literature review and case studies analysis derived from European projects.

Key words

resilience, energy transition, evalutation, management

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"May you live in interesting times" (Chinese curse)

1. Introduction

Current reports on the state of the world and the levels of consumption show that very little progress has been done in the field of sustainable development in cities (UN, 2014, IPCC, 2014). Currently, cities consume 75% of natural resources and about 67-76% of energy. In Europe, the finding is even more important (IEA, 2008). Moreover, considering energy vulnerability, the availability and price of energy is particularly crucial for cities which totally import their primary energy. Furthermore, cities are responsible for the majority of the world's GHG emissions (71-76%).

Although sustainable development and climate change have been debated for more than three decades, still a consensus is far away (Adams, 2008). The debate has certainly stimulated carbon reduction policies leading to a relative decoupling in some industries, but these again were offset by ever continuing growth. Both in terms of availability of renewable resources and in terms of the environmental impacts of our consumption and production, we are pushing beyond the limits, leading to acceleration of extinction rates, ocean acidification, loss of clean potable water and so on (Rockstrom *et al.* 2009, Loorbach, 2014).

According to a number of scholars (Adams, 2008; Krumdieck, 2013; Loorbach, 2014), in the climate debate, originating from the 1970s, sustainability has become an element of "standard practice" and therefore has become part of the problem. In particular, Loorbach (2014), points out that we have developed dominant societal regimes based upon (past) problem solving through central (government) planning and control, based on cheap fossil resources and linear modes of innovation. These regimes, on the foundations of modernity, are dependent on sustaining an unsustainable status-quo – he called them, "problem-industrial complex" - and, therefore, are systemically unsustainable in a fundamental way.

The Post Carbon City (PCC) has recently emerged as a concept as it emphasises the process of transformation, a shift in paradigm, which is necessary in order to respond to the multiple challenges of climate change, ecosystem degradation, social equity and economic pressures .

Energy and climate are essential issues, at the same time as long-term target (reduction of GHG) and as short-term requirements (resilience with regards to oil price rising and supply disruption). Cities are here understood not only as local authorities but as complex, adaptive, social-ecological systems, including local ecosystem of inhabitants, companies, public utilities and local governments.

According to the EU POCACITO project – *POst-CArbon CIties of TOmorrow* – foresight for sustainable pathways towards liveable, affordable and prospering cities in a world context" (SSH.2013.7.1-1), the concept of "post carbon city" implies a paradigm shift about relationships between energy, climate change and city. Post carbon cities must reach a massive reduction of greenhouse gas emissions (GHG) by a factor in 2050 of four compared to 1990, a near self-sufficiency in carbon fossil fuels -oil,

gas, coal-and develop the capacity to adapt to climate change. This implies the establishment of new types of cities that are zero-carbon as well as environmentally, socially and economically sustainable (POCACITO, 2013).

The "capacity of an urban system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks" is named urban resilience (Walker *et al.* 2004). This chapter argues that this concept of urban resilience should be appropriately applied to the study of this transition toward PCC since it derives from the observation that a given ecosystem may exist in multiple stable states, as systems evolve and adapt through time. It also enquiries about the key role of the human factor – i.e. the ability of stakeholders - in the adaptive capacity of urban systems to improve resilience (Folke *et al.* 2005).

The methodology used in this study is literature review and case studies analysis, taken from the EU MILESECURE-2050 project, "Multidimensional Impact of the Low-carbon European Strategy on Energy Security, and Socio-Economic Dimension up to 2050 perspective" (SSH.2012.2.2-2). The Milesecure-2050 research has revealed that policy-makers may be ignoring the human factor in energy transition to the detriment of rapid and significant change across Europe. This implies significantly less emphasis on technology and on top-down planning and more emphasis on the enabling of both individuals and social groups to articulate themselves and participate in the energy transformation.

The chapter is organized as follows. Next section focuses on the relations between cities and climate change and introduces the concept of post carbon city. Section 3 discusses the concept of sustainable development and current approaches to achieve it in cities. It argues that resilient thinking approaches are more appropriate than current efficiency approaches for dealing with transitions toward post carbon city. Finally, it presents a number of case studies derived from an analysis developed by MILESECURE-2050. Section 4 provides final remarks and further developments of this study.

2. Cities and climate change

In industrialized, emerging and middle economies, cities are bearing a considerable responsibility in sustainable development and climate change. On one hand, population growth creates pressure on: urban economic system (financing of infrastructures, financing of public services); social system (health impacts, air pollution, noise pollution; employment; social integration, quality of life); environment (resource consumption, especially energy and land use). On the other hand, urban areas are exposed and vulnerable to climate change. Indeed, they can be struck by direct impacts of climate change: global warming, change in precipitation patterns, higher frequency and intensity of extreme events (heat waves, floods, droughts, etc.) or sea rise. These expected risks are extremely likely to increase, and will be borne by local authorities which will have to face their cost (ESPON, 2010) and to adapt to them.

In addition, cities are becoming the focal point of climate change mitigation strategies because they are able to respond to disturbances in their external environments in addition to internal environments (Evans 2008).

This is made clear in Fig. 1 where it can be seen that the city plays a very significant role at the

interface between policy and enabling action. While we need to act in each layer of the triangle, a useful focus for sustainable development in the first instant could well be the city and its environs. This would combine policy with action and is likely to have the greatest impact.

>Figure 1: Who does own the problem? The key role of the city (Source: Brandon and Lombardi, 2011)<

Cities, not only as local authorities but as local ecosystem of inhabitants, companies, public utilities and local governments, are today recognized at the international level for their key role in the fight against climate change. As pointed out by Vidalenc *et al.* (2014), cities are recognized to play a key role in delivering sustainable development in the context of the built environment, as follows:

- cities play an institutional role on land and urban planning through regulation, which allows setting up a long term vision on what they will look like in the future;
- cities can make use of their economic and financial power, by differentiating taxation with reference to land use may for giving incentives to change behaviours (e.g. alleviating urban sprawl, promoting energy retrofitting of buildings and/or energy savings, etc.),
- cities are able to organize urban metabolism through public transportation and local mobility management, or make coherent and sustainable choices thanks to their competence in social housing, urban heating and natural hazard protection;
- cities can implement technological solutions at a wider scale. As an example, in energy systems, electric vehicle deployment requires some new infrastructures that cannot be developed without a strong commitment from local authorities. Clearly, the private sector influences many of the above triggers.

Drawing support from associations or active networks such as Local Governments for Sustainability (ICLEI) in the 1990's, Climate Alliance and Energy-Cities, some cities voluntarily became involved in Climate Plans, energy-transition experiments, eco-district projects and, more recently, "resilient cities" (Emelianoff and Mor, 2013). Some of these initiatives and experiments have become symbolic, but the movement has far higher aspirations

The Covenant of Mayors (for sustainable local energy) was launched in 2008, under the leadership of the European Commission. It requires signatory cities to submit, within one year, an energy action plan for reducing its CO2 emissions by at least 20% by 2020.

Recently, a new conceptualization of the post-carbon city has emerged which recognizes the ability of cities to act and react to climate change (Evans, 2008; Chatterton, 2013).

According to Gruenig and Livingston (2015), cities are political powers and, in the continued absence of a global climate agreement, the ability of cities will be of critical importance in transforming the global energy regime by breaking the carbon cartel and establishing the way toward a post-carbon tomorrow. Examples can be found in: Frankfurt am Main, Germany; Lisbon, Portugal; Sao Paulo, Brazil; Nice, France; Guangzhou, China; Houston, Texas, USA.

The post-carbon builds upon issues beyond greenhouse gas (GHG) emissions, energy conservation and climate change, adding a broader set of concerns including economic justice, behaviour change, wellbeing, mutualism, land ownership, the role of capital and the state, and self management (EU

Pocacito, 2013). Post carbon cities are committed to reach the targets posed by the European Commission in 2011, launching the Energy Roadmap - *Roadmap for moving to a competitive low-carbon economy in 2050* (COM (2011) 112). This involves a cut in the EU greenhouse emissions by 80 % by 2050 (compared with 1990 levels) entirely through measures taken within Europe. To achieve this, intermediate GHG cuts of 25 % by 2020, 40 % by 2030 and 60 % by 2040 would be needed. This implies the establishment of new types of cities that are *low-carbon* as well as environmentally, socially and economically sustainable.

According to the European Commission (DG CLIMA), "*In a low-carbon society* [LCS] *we will live and work in low-energy, low-emission buildings with intelligent heating and cooling systems. We will drive electric and hybrid cars and live in cleaner cities with less air pollution and better public transport*". This could be achieved through EU legislation, relevant subsidies and investment strategies which aim to contrast a multitude of issues which range from climate change to the expected depletion of fossil fuels, from issues of energy poverty to security of energy supply and from highly volatile energy prices to the new energy-related geopolitical realities (Pearson *et al.*, 2014).

According to MILESECURE-2050, the low carbon society have to be considered as a process by nature that it is not the mere result of intentional actions but the product of the interaction of multiple intended and unintended elements, partly attributable to operational level, but, in part, directly attributable to the cognitive level (i.e. representational, for example cultural factors and stereotypes) and to pre-cognitive processes (i.e. non-representational factors, as emotions and affects), all defining complex "societal processes" (see Fig.2).

>Figure 2: Societal process (Milesecure-2050, DoW)<

More specifically, MILESECURE-2050 aims to understand and overcome the political, economic and behavioural trends that led Europe to its difficulties in reducing fossil fuel consumption, and in diversifying its energy balance at rates which guarantee European energy security in the next years, reduce the threat of climate change, and diminish the risk of an energy gap in the coming decades. In doing so, the study has assumed a number of methodological concepts from the transition management theory, the path dependency theory and the vision of creative destruction developed by Schumpeter (1994). Such theories are relevant to examine transitional societal processes based on technological changes and how these changes impact the transitional processes.

According to MILESECURE-2050, the process towards post carbon city is the aggregation of a number of underlying transitions and incremental processes of experimentation, breakthrough, institutionalization, behavioral and cultural change. These processes are mainly driven, in our Western democracies, by distributed control, renewable resources and systemic innovation. Loorbach, (2014) says that it is a "socio-economic revolution", representing a "fundamental power shift away from powerful elites controlling resources, money and power towards diverse and distributed forms of collaboration between professionals and citizens". It is made up by a growing number of both citizens and professionals as individuals that increasingly decide to develop an alternative currency, produce their own energy, get their food from the farm, collectively organize care and set up a collective pension fund. MILESECURE-2050 research project has identified and analysed a large number of case studies and experiences incorporating the basic features of a more complex transition to environmentally sustainable ways of producing, consuming, and distributing

energy, as illustrated in the next section 3 below.

3. Approaches to Sustainable development

Since Rachel Carsons 'Silent Spring' in 1962 and the Club of Rome report (Meadows *et al.* 1972), the environmental concerns about the impacts of our economies have increasingly grown, helping to clean up industries and to create public awareness. However, current reports on the state of the world and the levels of consumption show that very little progress has been done in the field of sustainable development in cities (IPCC, 2014).

The International Union for Conservation of Nature (Adams, 2006) identifies some of the possible reasons as the elasticity of the concept, the 'three pillars model' implying falsely that trade-offs are always possible between the different dimensions, and the problem of metrics as a result of the desire to set targets and measure progress. There are numerous other reasons cited by critics – weak political will, conflict between the growth imperative and the notion of limits on consumption, failure to communicate the reality and urgency of the problem, individual self-interest, etc.

According to Adams (2008) and Loorbach, (2014), there is a profound paradox here. On the one hand, the twenty-first century is widely heralded as the era of sustainability, with a rainbow alliance of government, civil society and business devising novel strategies for increasing human welfare within planetary limits. On the other hand, the evidence (IPCC, 2014; UNEP, 2012) is that the global human enterprise rapidly becoming *less* sustainable and not more.

There is no agreed way of defining the extent to which sustainability is being achieved in any policy programme. Sustainability and sustainable development are effectively ethical concepts, expressing desirable outcomes from economic and social decisions. The term 'sustainable' is therefore applied loosely to policies to express this aspiration, or to imply that the policy choice is 'greener than it might otherwise be (e.g. the idea of a 'sustainable road building programme'). Everywhere the needs of achieving sustainable development are ignored in practical decisions. Often sustainable development ends up being development as usual, with a brief embarrassed genuflection towards the desirability of sustainability. The important matter of principle therefore becomes a victim of the desire to set targets and measure progress.

Analysts agree that one reason for the widespread acceptance of the idea of sustainable development is precisely this looseness (Adams, 2006, John Drexhage and Deborah Murphy, 2010). The concept can be used to cover very divergent ideas and currently; infact, environmentalists, governments, economic and political planners and business people use 'sustainability' or 'sustainable development' to express sometimes very diverse visions of how economy and environment should be managed. "The Brundtland definition (WECD, 1987) was neat but inexact. The concept is holistic, attractive, elastic but imprecise. The idea of sustainable development may bring people together but it does not necessarily help them to agree goals. In implying everything sustainable development arguably ends up meaning nothing" (Adams, 2006, p. 3).

The conventional understanding of sustainable development, based on the 'three pillars' model is flawed because it implies that trade-offs can always be made between environmental, social and economic dimensions of sustainability. However, in practice, development decisions by governments, businesses and other actors do allow trade-offs and put greatest emphasis on the economy above

other dimensions of sustainability. This is a major reason why the environment continues to be degraded and development does not achieve desirable equity goals.

The three 'pillars' cannot be treated as if equivalent. First, the economy is an institution that emerges from society: these are in many ways the same, the one a mechanism or set of rules created by society to mediate the exchange of economic goods or value. The environment is different, since it is not created by society. Thinking about trade-offs rarely acknowledges this. Second, the environment underpins both society and economy. The resources available on earth and the solar system effectively present a finite limit on human activity. Effective limits are often much more specific and framing, in that the capacity of the biosphere to absorb pollutants, provide resources and services is clearly limited in space and time. In many areas (e.g. warm shallow coastal waters adjacent to industrialised regions) that capacity is close to its limits (Adams, 2006, p.4).

An alternative view is proposed by Hart (2002) and later by Brandon and Lombardi (2005). As represented in Fig.3, the dimensions are nested - economy within society, and both economy and society within the environment. This approach nests the sustainable development dimensions as three concentric circles - economy within society, and both economy and society within the environment. In fact, economics is a part of, only exists within, and was invented by, the human realm. Thus, it is appropriately positioned within the society dimension. This recognises that a city, or an urban system, is a socio-ecological system, allowing to take better decisions based on appropriate understanding of the trade offs between elements.

>Figure 3: Model of Sustainable development (Hart, 2002)<

According to this view, the following assumptions can be made:

- Socio-ecological systems are linked: one impacts upon another and society is depending on the environment.
- Socio-ecological systems are complex adaptive systems.
    - There is no certainty of determined outcomes and the behaviour on the long term is unpredictable;
    - Expertise can help in putting attention to observable thresholds, but it is not sufficient to infer the cause-effect relation.

The above assumptions are clearly in contrast or, at least, in contradiction with current business strategy with regard to sustainability. This is dominated by an eco efficiency approach, defined as the "increasing of productive output while using fewer resources" [Schmidheiny, 1992]. The result is almost universally seen as advantageous to both the economy and the environment, as well as encouraging sustainability. From a strategic business perspective, the eco efficiency approach allows measurable objectives that are consistent with a continuous improvement philosophy or quality-focused management culture; eco efficiency is therefore convenient within the frames of current theory and magnitudes of business economics.

Despite all the benefits of eco efficiency, we have now realised that these improvements can bring price reductions that in turn may provoke increased consumption. Talking about environmental sustainability, it is the well known "rebound effect", i.e. the phenomenon by which improved

efficiency on an intensive (or per product) basis creates new demands for products that adversely impact the environment on an extensive basis (total consumption) (Lombardi and Trossero, 2013). From a broader systems perspective, eco efficiency may have counter intuitive effects regarding long term sustainability (Alcott, 2005), reducing flexibility, increasing externalisation and losing spare capacity, in one word, decreasing resilience.

Resilience can be defined as adaptive capacity of urban systems is the "capacity of an urban system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks" (Walker *et al.* 2004). It is the ability of stakeholders – i.e., human actors – to improve its resilience (Berkes *et al.* 2002, Folke *et al.* 2004, Resilience Alliance 2005, Folke *et al.*, 2005; Foxon *et al.*, 2009) to fluctuating environmental and socio-economic pressures, such as long-term changes in urban resident demographics, city and rural migration patterns, and potential city health concerns.

Resilience thinking involves exploring interacting hierarchies of nested systems: higher-level systems are driven by slow variables and lower-level systems are driven by fast-changing variables.

Currently, most urban resilience research focuses on the societal capacity to respond and adapt to natural disaster events. These processes, oriented around maintaining security and stability, are most often viewed from a short-term engineering resilience perspective, referring to the time needed for a system to return to a stable equilibrium state. However, there is an increasing interest in exploring how to incorporate approaches around longer-term systemic transformation (incorporating risk mitigation within the recovery processes).

The main criticism of the engineering "bouncing back" perspective relates to the probability that old and unsustainable urban patterns will be maintained. The need to return to a stable state prevails over possible transformation and a long-term view, which sustainable

development requires. A generalized example of a hidden "lock-in" (mainstreaming old patterns of consumption) is the dependency on energy consumption and its consolidation through installing air conditioning when adapting buildings to increasing temperatures.

According to the different possible long-term scenarios related to any short-term decision, building resilience in social–ecological systems never fully removes vulnerabilities, but can alter the configuration of system resources and capacities, which implies a shift in space and time of system vulnerabilities.

The new resilience-thinking approach may make some processes poor in terms of eco efficiency, but supportive of a systemic and wide sustainability overview [Korhonen & Seager, 2008], since resilience, for social-ecological systems, is then related to (i) the magnitude of shock that the system can absorb and remain within a given state; (ii) the degree to which the system is capable of self-organisation; and (iii) the degree to which the system can build capacity for learning and adaptation. Management can destroy or build resilience, depending on how the social-ecological system organises itself in response to management actions [Ernstson et al, 2010]. Thus, resilience, for social-ecological systems, can be defined as the capacity of a system to cope with change, either trough persistence, adaptation or transformation.

The study of the transition towards future production and consumption systems that involve the not only a more efficient usage resources but also a resilience building among communities requires the presence of innovative case studies. In Europe there are a number of case studies representing "anticipatory experiences of energy transition" (AEs). These are about 1500 cases (but 90 have been deeply analysed by the MILESECURE-2050 project, see: Deliverable 2.2, available at: http://www.milesecure2050.eu/en/public-deliverables) which have developed environmentally sustainable ways of producing, consuming and transporting energy. Such experiences have been understood as already existing "parts" of a future post-carbon society allowing to focus on concrete factual elements and not mere hypotheses. Examples can be found in:

- Eva-Lanxmeer, a social-ecological district of 24 ha that has been built on a former farmland surrounding a protected drinking water extraction area;
- Vitoria-Gasteiz (Spain) providing an integrated model to regulate traffic, access and urban space organisation through the definition of so-called superblocks;
- Copenhagen's Green Structure Plan named the Five Finger Plan, to control urban development and to ensure that people are always able to access to open space, parks and undeveloped, natural areas on a regional scale.

AEs have incorporated the basic features of a more complex transition to an environmentally sustainable society and that anticipate the basic features of a broader and more complex transition to environmentally sustainable ways of producing, consuming, and distributing energy. Their anticipatory character may be assimilated to their ability, at the present time, to take decisions and develop practical solutions to resolve issues related to the future (Lombardi, 2015).

The main result of the analysis of AEs is that energy transition does not seem to present itself as a gradual change. In fact, it does not take the form of the mere penetration into society of new greener and efficient technologies (technological drive); nor it is "merely" the introduction of new rules or restrictions that citizens must accept (normative drive or consent drive); neither it consists only in new attitudes toward consumption (and savings) to be interiorised by the population (ethical or lifestyle drive). Each of the above drives is present in the experiences considered, but all three are based on a vision of change in which both the social and the anthropological/individual dimensions are relegated to a function of "acceptance" of measures and decisions that come from the outside.

Although these visions of energy transition recognize the importance of social and anthropological impacts and feedback, they tend to consider the human factor as a mere receptor, not an agent of change. Therefore, what is actually lacking is the perspective of human agency, as a constitutive element of the transformation of the energy systems.

In short, the human factor becomes the driver of energy transition in at least three distinct levels.

1. The set-up of energy production and consumption becomes more visible and closer to citizens. In this framework we witness citizens gaining the ownership of the means of energy production; the spread of new technical skills; the activation of social networks for the installation and maintenance of low-carbon technologies.

2. The energy issue becomes a direct interest of citizens who actively participate in the regulation, orientation, management (also in economic terms) and monitoring of measures and policies of energy transition.
3. There is a strong personal effort on the energy transition through an intense emotional involvement; a highest attention to several aspects of everyday life (food, waste collection, energy consumption, body care and health); an increased use of physical effort in the field of mobility (but not only), i.e. through the use of bicycles or with an increased inclination to move on foot or by public transport.

Concluding remarks

This chapter has argued that a paradigm shift is necessary in order to progress toward sustainable development in cities. This is related to urban resilience defined as "capacity of an urban system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks" (Walker *et al.* 2004). The resilience approach is critical to build redundancy into a certain interpretative model, as it comes with the classical adaptive cycle, encouraging to look at the whole figure (reorganisation, conservation, release, exploitation) of the system.

In this perspective, urbanisation could be seen as a way of human life following the climate stabilisation / permanent agriculture / permanent settlement, in the scale up of the manipulation of nature, rather than coping with its dynamic challenges. The rapid technology advancement made humans incredibly adapting, but here comes the paradox of urban resilience: cities have been designed to remove or minimise environmental disturbances [cfr. Alberti et al, 2004]. The benefits of urban inhabitants and cities derive from ecosystem processes including, for instance, improved water and air quality, storm protection, flood mitigation, sewage treatment, micro climate regulation, recreation and health values [Collier *et al.*, 2013]. Such "ecosystem services" are inextricably linked to ecological processes [Harvey, 1996], whose negative outcomes, though, are often externalised, by omitting the local environmental impacts due to the production/disposal phases, or by addressing the external cost to unequal financial instruments.

The resilience approach demonstrates the importance of living with disturbances when a city is likely to be unpredictably tackled by climate change effects, and therefore favour the blooming of self-organised tools and measures to face the quick change. When the urban community is well self-organised, and can rely on traditional knowledge about coping with changes without external help, resilience increases and disaster/emergency response gives better outcomes. This concept implies significantly less emphasis on technology and on top-down planning and more emphasis on human factor in the analysis of energy transition.

The study of the transition towards future production and consumption systems that involve the not only a more efficient usage resources but also a resilience building among communities requires the presence of innovative case studies. From this perspective, it could therefore be the case of a critical evaluation of the radical innovation and the strategic rethinking needed by universities.

The concept of "Living Lab" scales indeed the length of the urban border condition to the campus' one, and takes students, teachers and administrative staff as "citizens" of this portion of the city; the

support of private industries and governmental task forces foster the role of university in the co-creation of sustainable life conditions. The vast partnerships among universities and among academia and its environment (thanks to European funded project for advanced education schemes, collaborative researches, consultations with local government for urban reforms or real estate development projects, industry preferred tests beds, or among society through economic exchanges as it will be specified in the following paragraphs) lead many universities to assume a highly ambitious role of collaborating with diverse social actors to create societal transformations in the goal of sustainability. This is also seen as part of the so-called "third mission" of universities which refers to a further goal to add to the universities traditional teaching and research missions: the perceived need to engage with societal demands and link the university with its socio-economic context. From this perspective, it could therefore be the case that a critical evaluation of starting studying the transition towards sustainable universities, to understand the further resilience and sustainability management of the wider urban environment.

As well as any other urban district, different campus plan do influence the sustainability performance of the overall city - this is the main aspect to consider when scaling from building to neighbourhood sustainability evaluations. However, when investing in the social dimension of the energy transition problem, the Well-being, Land Use, Mobility, Social Equity, Urban Economic Sustainability and Energy Sources and Infrastructure are special factors in a Campus Community (Sonetti, 2015).

Of course, this scale-up is not costless: decision making at urban level requires complex methods to evaluate different features and guarantee the sustainability and the resilience for a large number of stakeholders, that in the case of a University are far from homogeneous: short staying students (from one month or one year) to long-staying one (5 years or more) to permanent staff and daily visitors are a community difficult to target in term of differentiated strategy and communication level. Plus, the quadruple helix approach (Lombardi, 2011) highlights problems related to the contemporary satisfaction of all the stakeholders interplaying with the university as a place of knowledge transfer, urban node and variegate social actors: decision makers/urban planners, investors/developers/construction companies, designers (engineers, architects), grant managers, building owners, SMEs/IT solutions providers, citizens, and finally students, professor, peer universities, research centres, not to mention the legislative (regional and ministerial) compliances.

In this perspective, some of the criteria for the resilient city seem to be applicable to the campus dimension even without the disaster response, with the hypothesis that resilient community building as a fertile ground for user behaviour leverages for energy reduction in university campus. Institutions now have the responsibility, more than ever before, to integrate sustainable development and resilience requirements into all their teaching, research, community engagement and campus operations to make the difference into the run to innovate a the new urban and citizen paradigm toward a low carbon society.

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Figure captions

Figure 1: Who does own the problem? The key role of the city (Source: Brandon and Lombardi, 2011)

Figure 2: Societal process (Milesecure-2050, DoW)

Figure 3: Model of Sustainable development (Hart, 2002)

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