The rise of human factor in the change of energy systems: the case of 20 sustainable districts in Europe

Giovanni Caiati: Laboratory of Citizenship Sciences – LSC, Rome
Gabriele Quinti, Laboratory of Citizenship Sciences – LSC, Rome

Abstract

Although there is a broad agreement about the need for energy transition, the most effective way to achieve this remains unclear. Many of the attempts made so far, that have not been able to get the expected results, are based on a vision of change in which both the social and the individual dimensions are relegated to a function of "acceptance" of decisions that come from the outside. These attempts risk to consider the human factor as a mere receptor, not an agent of change. In this framework the paper deals with some of the findings of the FP7 - MILESECURE-2050 project, and in particular the ones obtained from the analysis of a set of 20 sustainable districts. These case studies can be considered as “anticipatory experiences” of Energy transition, i.e. local experiences that contain some of the fundamental characteristics (thus, anticipating them) of a more complete transition to environmentally sustainable way of producing, consuming and managing energy. Introducing the holistic approach of “Human Energy”, the paper shows how in these districts the emergence of a low carbon society is accompanied by the rising of the human factor, from a peripheral role (which occurs only downstream in the process of change), to a lead role in the change of energy systems (upstream in the process of change).

1. INTRODUCTION

Europan Sustainable Districts anticipates a low carbon society

This paper is based on some findings of the MILESECURE-2050 project. The project carried out a Europe-wide study into communities that anticipate at the local level some basic features of a future low-carbon society, i.e. **Anticipatory Experiences - AEs**. This “anticipatory” approach was developed in order to face the challenge of studying possible future dynamics focusing on concrete factual elements and not on mere hypothesis. The research team analyzed **over 90 projects in 19 European countries** which were selected from a long list of **over 1,500 potential candidates**. Some of the experiences analysed attempted to change a single aspect of their communities such as better sustainable transport, energy efficient housing, or the generation of property-level renewable energy. Others wanted to produce a holistic sustainable community that incorporated a fully functional and independent low-energy network. In synthesis, all AEs developed, or are actively developing, sustainable ways of producing, consuming and transporting energy. The AEs were found to be operating at different local scales ranging from neighbourhoods and towns to major cities. Their anticipatory character may be assimilated to their ability, at the present time, to take decisions and

develop practical solutions to resolve issues that all the societies will have to confront in the near future, first of all those of climate change and the depletion of “carbon” energy resources. In this sense, **anticipatory experiences can be considered as already existing pieces of a future low-carbon society**.

Among the Anticipatory Experiences, 20 sustainable districts were studied. As shown in the following table it was found that in these districts a large set of actions related to different energy sectors were carried out.

	Sustainable District	**Country**	**Start year**	**Renewables**	**Transports**	**Housing**
1	Eko Viikki (Helsinki)	Finland	1999	X		X
2	Vauban (Freiburg)	Germany	1996	X	X	X
3	Eva Lanxmeer (Culemborg)	The Netherland	1994	X	X	X
4	Augustenborg (Malmo)	Sweden	1998	X	X	X
5	Western Harbour (Malmo)	Sweden	2007	X	X	X
6	BedZed (London)	United Kingdom	1998	X	X	X
7	Hammarby Sjostad (Stockholm)	Sweden	1994	X	X	X
8	Kronsberg (Hannover)	Germany	1990	X	X	X
9	One Planet Sutton	United Kingdom	2009		X	X
10	Zac De Bonne (Grenoble)	France	2001	X	X	X
11	Rennaissance/Concerto – Lyon	France	2003	X		X
12	Quartiere Cristo	Italy	2007	X		X
13	Noorderplassen-West (Almere)	The Netherlands	2007	X		X
14	Zac Pajol (Paris)	France	2007	X		X
15	Ile de Nantes (Nantes)	France	2006	X	X	X
16	Lehen Sustainable District (Salzburg)	Austria	2007	X		X
17	Brussels Sustainable Neighbourhoods	Belgium	1993	X	X	X
18	Bahnstadt (Heidelberg)	Germany	2001	X	X	X
19	SUperblocks (Vitoria Gasteiz)	Spain	2009		X	
20	Eco quartier des Brichères (Auxerre)	France	2003		X	X

In this paper we will summarize the results of the study of Anticipatory Experiences focusing on and providing examples from the 20 european sustainable districts that

"anticipate" the low carbon society. To do that, we will focus on (i) introducing the Anticipatory Experiences of the Low Carbon Society (ii) discussing the problem of human factor in the context of energy transition; (iii) presenting the holistic approach of "Human Energy (iv) highlighting the evidence that came from the analysis of "anticipatory" sustainable districts; (v) drawing short conclusions on the rise of human factor in sustainable districts in transition.

2. **THE CONTEXT**

The Problem of Human Factor in Energy Transition

Environmental and energy perspectives – and their implications on the political, economic and social spheres – have for at least 20 years (since the 1992 UNCED in Rio de Janeiro) been central to the international agenda of the big issues facing the world.

This has resulted in a gradual change of the paradigm underlying the management of the global energy system. **The "old" paradigm** that oriented energy policies at different levels (production, distribution and consumption), was based on the unlimited (or at least very abundant) availability of energy resources; on the irrelevance (or minor relevance) of the impact on the environment caused by the exploitation of energy resources; and on the idea of decreasing costs of energy resources.

However, what gradually emerged, mainly among the scientific community, the policy makers and the CSOs, was a new paradigm produced by the **profound changes brought on by the emergence of new threats and challenges**, such as the scarcity of non-renewable energy resources; the low environmental sustainability of the energy system; the increase in energy costs (especially for traditional sources).

Obviously, **this paradigm shift also affected the European countries**.

If it true that this paradigm shift is just one of the issues related to energy transition (fuel dependency, costs, risks and resiliency, geo-political relations, integration of EU energy system, etc.), it is also true that the change of paradigm described above is a issue highly connected to all the others. In fact, in order to face the challenges of climate change and energy security, Europe, now more than ever, is facing the need to rediscuss and renew its ways of producing and consuming energy. Reduced emissions, increased use of renewable energy and energy saving, are in fact some of the key objectives that Europe has set in its strategy for 2020 and beyond.

… but how to realize it?

Although there is a broad agreement about the need to carry out this change, **it remains unclear what is today the most effective way to achieve the transition**

toward a low-carbon society.

The attempts made so far, that have not been able to get the expected results, can be traced to three main approaches (or combinations thereof):

- those based on the penetration into society of new greener and efficient **technologies** (technological drive);
- the approaches based on the introduction of **new rules or restrictions** that citizens must accept (normative drive);
- the perspective in which **new attitudes** toward energy consumption (and savings) **must be interiorized** by the population (ethical drive or lifestyle drive).

If it is true that each of these approaches is needed to realize energy transition, all three are based on a vision of change in which both the social and the individual dimensions are relegated to a function of "acceptance" of decisions that come from the outside. It is true that these visions of the energy transition recognize the importance of social and anthropological feedback, but they **tend to consider the human factor as a mere receptor, not an agent of change**. What actually is lacking, is the **perspective of human agency, as a constitutive element of the transformation of the energy systems**.

3.THE APPROACH

Human Energy as holistic approach to frame the human factor in sustainable district development and management

With the aim of addressing and overcoming the problem presented above, MILESECURE 2050 adopted an approach to **make explicit and visible the latent role that the human factor exerts in energy systems in transition**. Studying the AEs it is clear that, for the analysis of energy systems in transition, it is crucial to adopt a broader concept of energy that does not just include technological aspects but also social and personal dynamics. That is why during the project a new approach was developed, that is the **Human Energy Approach, an holistic and all inclusive understanding**, articulated in **three dimensions** that show different ways in which the human factor lies behind the energy system:

a) **Social energy** (S) is the human capacity to bring together different forms of social activism that coordinate, and orient different social actors toward common goals and to overcome conflicts and oppositions that may represent a waste of energy;

b) **Endosomatic energy** (P) represent the human capacity of effecting profound changes at the personal level in one's daily actions and convictions, in view of using the body in synergy with the energy system as a whole;

c) **Extrasomatic energy** (E) is the human capacity to activate and use the natural resources through the adoption of all kinds of equipment, technology or machinery (using all energy sources, whether carbon or low carbon).

This multidimensional approach was applied to frame the role of human factor in the Anticipatory sustainable districts development and management.

4. **EVIDENCE AND RESULTS**

Three emerging social function in Sustainable Districts

Energy is the capacity to do a work. Milesecure 2050 shed a light on **how human factor may be able to make energy transition work**. Human energy is essential both to trigger energy transition, and to manage and overcome risks that energy systems in transition run. The research analysed this twofold role of human energy by interpreting each of its three dimensions **in terms of a social action** conductive to the success of the transition. In the study of "Anticipatory Sustainable Districts", **three social functions** were identified, corresponding to the three dimensions of human energy. Those functions are listed below, providing on example from the district cases for each function.

Social energy: the cybernetic function

The social dimension of human energy can be interpreted as **an adjustment of human and social relations that emerge in the context of the energy transition** as a tendency of self-regulation. Such an adjustment – fulfilling what was called the **cybernetic function** – allows the governance of the energy transition. Tensions and conflicts that arise in the energy systems in transition are managed through a series of continuous, coordinated and simultaneous actions, as stated below.

- the active participation of citizens in decision making;
- the widespread practice of negotiation for the resolution of conflicts and disputes between different social actors in the area;
- the ability to maintain a continuous and multilateral communication on multiple levels (from informal to institutional communication);

- the creation of an institutional space for the energy transition, by including in the transition the traditional institutions, but also by actions such as the creation of new institutions or the transmission of the collected experiences to others.

EXAMPLE1: Eva Lanxmeer, Culemborg, The Netherlands

Eva-Lanxmeer is a social-ecological district that has been built on a former farmland surrounding a protected drinking water extraction area. Located near the Culemborg railway station, Lanxmeer consists of 250 dwellings, 40.000 m2 of offices and business units, an urban ecological farm (assuring biological food and contact with nature), an information centre, wellness centre, congress centre, bars, restaurants and a hotel. Lanxmeer integrates different urban functions providing good equilibrium between social, economic, cultural, educational, recreational and sustainable interests. The Lanxmeer project features far-reaching residential participation, inhabitants took active part in workshops and in the overall planning process. Environmental measures include a closed water circuit, an integral water management system, a biogas production facility, use of sustainable building materials, use of RES, organic food production.

Cybernetic function and human energy: residents participated in: urban planning; in housing design; in communal balance; in the development of the green space and park; in the formation of a local energy company; in the city farm. In Eva Lanxmeer the participation degree is about 70%. Other relevant phenomena recorded were: an approach based on internal motivation instead of external incentives; an active negotiation between promoters (NGO) and municipality on the vision for the development of the district; the presence of negotiators from Eva Lanxmeer working permanently with the local authority; An active communication activity carried out at different levels both formal (newsletter, website) and informal (tam-tam between residents); a permanent exercise of overcoming dissent by weekly discussion; a work on the quality of decision; the adoption of a deliberative democracy approach.

The cybernetic function has been recognised during the research in other sustainable districts as BedZed (London); Vauban (Freiburg); Superblocks (Vitoria . Gasteiz) and Hammarby Sjostadt (Stockholm).

Endosomatic energy: the repositioning function.

For centuries the dominant trend has been to minimize the physical effort through the use of machines. It seems that in the context of the energy transition we witness an albeit partial reverse of this trend. In fact, in the energy transition **individuals must reposition** themselves into a new energy (and social) system in which the relationship

between the human body and the surrounding social reality changes deeply. The endosomatic (or personal) energy is activated in energy transition to face the challenges associated with the **increased use of the body in the daily lives**. This action – fulfilling what was called "**the repositioning function**" – is to be considered as a **continuous work of psycho-physical adaptation**. Repositioning function refers to phenomena such as:

- increased resort to muscular strength and the use of the body, not only in the field of mobility (walking or cycling), but also in other fields (such as an increased use of body warmth to face the low temperatures heating system);
- new attention toward practical issues of everyday life, such as food, health and physical well-being, waste management, etc.;
- spreading of energy literacy;
- spreading of a perception of self that is reframed within the energy system (eg. you feel to be "physically" a part of the new energy system).

EXAMPLE 2: Superblocks City: Vitoria-Gasteiz, Spain

An integrated model to regulate traffic, access and urban space organisation through the definition of so-called superblocks is one of the strategies the city developed and tested in the last years. The objectives of this initiative are to reorganise traffic to free up space, redefine the public transport network to improve accessibility and coverage, consolidate the network of cycling paths, set up a network of pedestrian walkways, and identify infrastructure required for parking and delivery of goods. The scheme is targeting a reduction of at least 10 – 15 percent in overall traffic flows in the controlled areas, and 30 percent of travels to be made by bus or bike. Pedestrian areas increased by more than 50 percent and bicycle lanes extended from 38km to 148km. A new traffic light system give priority to public transport, which reduce travel times. Ongoing Educational campaigns are sensitising citizens to safe and energy-efficient driving, which is projected to result in 15 percent savings in fuel.

Repositioning function and human energy: car usage in this superblock was replaced by pedestrians and bicycles; increased use of cycle in the area; increased pedestrian movement in the area; decrease of car use in the area; emotional involvement of individuals in the project; spread of awareness of the risks associated with climate change and the role of transport; volunteer action to promote new transportation scheme; change in lifestyle and physical "sacrifice" of the resident to obtain a radical change in transportation mode; Superblocks concept for access restrictions to the

neighbourhood; Pedestrian surface in the demonstrative superblock increased from 45% of the total surface before the action to 74% after it; 4th generation public bike system.

The endosomatic function was active in other sustainable districts such as BedZed (London); Vauban (Freiburg); One Planet Sutton (Londo Borough of Sutton); Brussels Sustainable District (Brussels) and Augustenborg (Malmo).

Extrasomatic energy: the localization function

The localization function regards the way in which the change from carbon energy sources to low carbon and efficient technologies takes place. In the energy systems in transition, the technologies and the services for the production, transport and consumption of energy, **become more accessible and visible** to the people who are led to **develop a direct control of energy systems**, both at the personal level, both at the collective level. Localisation function refers to phenomena such as:

- a localized production of energy;
- the activation of networks for the installation, the maintenance, and the technical assistance of the new sustainable technologies in a given area;
- the presence of technical skills also spread among the citizens;
- the shared ownership of the means of production and self-production of energy.

EXAMPLE 3: Western Harbour, Malmo - Sweden

In the Western Harbour district polluted industrial areas have been replaced by office buildings and residential houses. The first development, Bo01, was designed to use and produce 100 per cent locally renewable energy over the course of a year. Buildings receive energy from solar, wind and a heat pump that extracts heat from an aquifer, facilitating seasonal storage of heat and cold water in the limestone strata underground. Bo01 was the first area to use a local green space factor to promote biodiversity, incorporating local vegetation, as well as rainwater through open storm water management and connection to the sea. The Western Harbour incorporates an eco-friendly transport system, with buses connecting the areas every five minutes. Bicycle lanes are easily accessible.

Localisation function and Human Energy: Adapting the technology to production

sectors and to local resources; Training for architects and engineers; Training for local technicians and installers; technical training of residents; Access to networks of professionals for technical assistance; start-up of mantainance services; individual production of energy; resident participation at local energy company; daily use of low carbon technology technology by residents.

The localisation function was found in many other sustainable districts. Some example are: BedZed (London); Vauban (Freiburg); Hammarby Sjostadt (Stockholm), Eva Lnxmeere (Culamborg) and Ile de Nantes (Nantes).

5. CONCLUSIONS

The rise of Human factor in Anticipatory Sustainable Districts

What can be observed in the anticipatory sustainable districts, and that represents a discontinuity and a break with the past is, on the contrary, the rising of the human factor, from an ancillary or peripheral role (which occurs only downstream in the process of change), to a lead role in the change of energy systems (upstream in the process of change).

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