

LOCAL SUSTAINABILITY AND RENEWABLE ENERGY: OPPORTUNITIES AND CHALLENGES FOR URBAN REGIONS

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Abstract:

This paper presents the results of a background research on cities setting as a target energy independence based on renewable energies. We start by stressing the importance of targets and policies at local level and present the different opportunities and challenges that communities face on their way to "100% renewable city". We then review and compare the initiatives and results of different cities. The aim of this paper is to provide a theoretic basis for scientists, policy makers and different decision makers researching or acting in the field of renewable energy at local level.

Key words: renewable energy, local sustainability, urban areas, energy turn

JEL classification: (O18, Q01, Q41, Q48, R11)

1. Introduction

The strong support for renewable energy deployment by the EU motivates more and more local communities throughout the EU to switch to green energy. Reputable climate scientists like Rahmsdorf and Schnellhuber cited by Moser et al (2009) consider that "the urban system is the ideal geographic entity to organize integrated solutions for the climate problem" stressing the importance of communication and strong collaboration between the important players. But while environmental protection, reducing the carbon footprint of cities and communes and in the end achieving environmental sustainability speak in favor of the energy-turn, concerns regarding its economic (Kyriakopoulou and Xepapadeas, 2013) (Proost and van Dender, 2001) and social impacts often slow down or even stop such initiatives. Achieving 100% renewable energy communities should not be a scope in itself but a sound economic initiative with positive effects on the local economy and society.

This paper presents the results of a background research on European cities setting as a target energy independence based on renewable energies. First we discuss about the importance of such targets and policies at local level and present the different opportunities and challenges that communities face on their way to "100% renewable city" we then review and compare the initiatives and results of different cities throughout Europe. The aim of this paper is to provide a theoretic basis for scientists, policy makers and different decision makers researching or acting at local level.

The author would like to point out that in this paper under: urban area, town and city we understand: "an urbanized area managed and represented by one or several local governments, culturally and communally understood as a city, with specific administrative and political boundaries" (Droege, 2004).

2. Arguments on the importance of local initiatives

In 2007 as a response to the increasing global concerns regarding climate change

and also to a set of events that raised important questions on energy security the EU set the 20-20-20 target aiming to achieve until 2020:

- A 20% reduction in EU greenhouse gas emissions from 1990 levels;
- Raising the share of EU energy consumption produced from renewable resources to 20%;
- A 20% improvement in the EU's energy efficiency. (EU, 2007)

To achieve this target and to be able to set ambitious and yet reasonable targets for the next decades we have to look for the actors that play the most important parts in GHG emission and energy consumption. By looking at the world map and identifying rural and urban areas we find that in 2009, 51% of the world's population lived in urban areas (3.62 out of 7.1 billion people). Forecasts say that in 2050 the world's population will reach 9.62 billion people out of which 69% (Figure 1) will live in urban areas (United Nations, 2009).

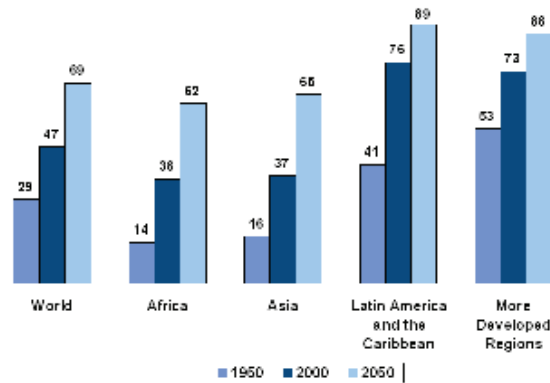


Fig. 1 World Urbanization Prospects: The 2003 Revision (medium scenario)
Source: United Nations, 2004

While at first the national and EU levels played the significant role in fostering the use of renewable energies by setting targets, creating the legislative framework and adopting support mechanisms we now see more and more initiatives on lower levels: regional, local, sub-local (small communities within town or villages like quarters) and individual. Much of the transformation to a renewable-energy society has to take place where the energy is actually consumed. Towns and cities represent due to high economic capacity, concentration of scientific and technological as well as economic know-how and decision-making competences both a concentration of causes and consequences of climate change and a high capacity for action against it by using renewable energy sources (Lechtenböhmer, 2009), (Radzi, 2013). Local governments are significant users of energy and can negotiate with their utility providers to increase production through renewable sources. There is also a tendency for local governments to play an increasingly larger role in energy supply (public-private partnerships) conducting to more affordable onsite renewable energy generation resources (Radzi, 2009). Moreover local governments can play a significant role in shaping the energy demand patterns through programs and policies. They also have the possibility to reduce the energy consume within their own operations and regulate energy efficiency in buildings, and in transit and transportation modes (SSI, 2012).

Every city is different and “all environments are inevitably local” (Scott, 2007). A state can set general targets and draw up policies but besides some general principles existing 100 percent renewable energy initiatives show that each city and community needs to find its own path. This individual path is determined by nine dimensions

identified by the World Future Council (WFC, 2010): *local climate; local resources; development history; level of global trade dependence; relation to and control over region; state of development and prosperity; government form and institutional capacity; structure and level of civil society involvement; degree of control over energy generation and distribution assets.*

3. Benefits and Opportunities

Studies of existing 100 percent (and over 100 percent) renewable energy cities show that depending on the context, resources and the individual strategy urban areas – cities and town - benefit in different ways from renewable energy initiatives. (Radzi, 2009) In the following we present the most important benefits as found in the literature and reports of municipalities.

Environment - The most evident benefit of a 100% renewable energy city is a positive impact on the environment: less air, water and soil pollution, protection of the forests and protection of the biodiversity.

Jobs: One of the most desired benefits of investing in fossil carbon free infrastructures is the creation of new jobs. Two main phases of job creation can be distinguished: the investment phase – generates a significant number of temporary jobs in the construction and installation field - and the operation and maintenance phase – long term jobs related to the O&M activity but not so many as in the first phase. We also distinguish between “direct jobs” – jobs created in the renewable energy field and “indirect jobs” - jobs in the manufacturing and associated supply-chain sectors. The second category accounts for a significantly larger share of the estimated jobs. (NREL, 2012)

Markets: Investments in renewable energy can create new local markets for biogas, pellets, solar, technology.

Business opportunities: Developing into a fossil carbon free city can create new business opportunities in the emerging growth market of sustainable urban (infra) structures. (Lechtenböhmer, 2009)

Risk management: Investments in renewable energy are for cities an effective hedge against future increasing prices and fossil fuel supply risks (Lechtenböhmer, 2009)

Image: Defining a strategic target to develop a nearly fossil carbon free city can create a positive outside and inside image and provide further first-mover advantages. Clear strategies, the proven political willpower to reach the targets and the interest shown to the people welfare have a big positive impact on the confidence in the local administration which translates into an improved political image of the leading political party.

Tourism: Many of the cities and communes that chose the renewable energy path experienced an increase in the number of tourists and income from touristic activities.

Demography: On the road to reaching their renewable energy targets some small towns experienced an increase of population. People were attracted by the clean environment and the confidence in the local administration.

Other benefits: Other benefits of a renewable energy city are: community cohesion, improved health, access to heat, electricity and transport fuel for all, social empowerment, a better city climate (<http://www.futurepolicy.org>)

The support offered on national and EU levels is a big opportunity for municipalities to take the energy-turn.

Funds that ease the burden on the local budgets can be accessed.

Supporting organisms and organizations: There are a big number of initiatives related to local sustainability to which cities can subscribe: EU institutions, policies and initiatives; EU regular events and campaigns; city and region networks, associations and initiatives.

Support schemes: Although support schemes like feed-in-tariffs and green certificates are conceived and managed at national level they are a good card for cities to play while attracting investors.

4. Challenges

Municipalities have to face a number of challenges on the path to a transformed urban energy practice, although none is insurmountable in principle. Droege (2002) identified as the most important one the fact that “local governance structures are not usually geared to end-state or long-range planning”, this leads often to a resistance vis-a-vis the adoption of long-term accounting methods (Droege, 2002).

In the scientific literature we could identify five categories of challenges that urban areas may face.

Regarding the *municipalities* and their limitations Betsill (2001) observes that because addressing climate change at municipal level is extremely time-consuming and needs dedicated personnel most cities are unable or unwilling to commit the resources for creating such a position. Often other more pressing issues have priority over climate change. Local governments also don't play a significant role in energy production and supply. Either electricity is provided by private producers and distribution companies which are different entities (in the case of Romania) or by utility companies that serve several jurisdictions. There also are cases in which some power plants are owned by the city but often in partnership with a private company.

An important but difficult role of municipalities is the role of mediators because as Del Rio and Burguillo (2009) show: to achieve long-term sustainability not only the substantive sustainability - economic, social and environmental dimensions of sustainability - is important but also procedural sustainability - taking in account the opinions and interests of all stakeholders.

The market and *regulatory incentives* also influence the direction of technological advance and investments. Weak or nonexistent environmental policies conduct to low investments in the development and diffusion of new environmentally beneficial technologies (Jaffe et al, 2005). On the other hand strict environmental regulations protect the environment but also increase costs and may lead firms to stop operating or move to another country (Kyriakopoulou and Xepapadeas, 2013) which could lead to a welfare decreasing effect. (Proost and Van Dender, 2001)

This leads us to another important challenge that local governments have to deal with: reshaping urban infrastructures comes at a high cost. While converting all buildings to low energy passive buildings would mean important savings in future the cost of such an endeavor is too big for most municipalities. (Lechtenböhmer, 2009)

Here is where the *community* steps in and brings in the resources for making the shift. However studies have shown that this level also has its limitations. Rogers at all (2008) found that although many households are interested in community renewable energy there are few to none leaders for this kind of projects. The main reasons are limited success of past initiatives and lack of specialized knowledge. Sovacool (2009) also identifies three categories of *cultural impediments*: public apathy and misunderstanding, conceptions of consumption and abundance, and psychological resistance.

Still there are cities that found their individual path to overcome the obstacles and are now models of initiative, inspiration, drive and dedication to achieve an ecological society.

5. 100% renewable energy cities

In this chapter we will look at six towns in Europe which reached each in its own way the 100% renewable energy goal.

Table 1 Renewable energy cities in Europe

City	Starting of the project	Targets	Results	Biggest challenges	Energy source
Chippenham (UK)	1999	100% Renewable Energy in Europe by 2050	Supplies 100% Renewable Electricity and Heat	Reorganization of the utility company	Wind Solar Photovoltaic Small hydro Tidal power
Güssing (Austria)	1990	Supplying the town and then the whole region with renewable energy.	The town is a net renewable energy exporter, producing about 10 times more energy than it needs and approximately 40 times more electricity than it can use.	Criticism from local entrepreneurs and temporary blocking of EU funds.	Biomass and biogas plants Biodiesel
Östersund (Sweden)	1973	100% renewable electricity and heat 1TWh of wind power by 2015	100% Renewable Electricity and 90% Renewable Heat With Local Sources	Promoting community participation and re-education	Biomass Wind Solar
Reykjavik (Iceland)	1970	100% renewable electricity and heat Replacement of petrol-driven cars with cell-powered vehicles	100% Electricity and Heat from Geothermal Energy	Lack in technical expertise regarding fuel-cell technology	Geothermal energy
Samsø Island (Denmark)	1997	Energetic self sufficiency within 10 years	100% Renewable Electricity, 70% Renewable Heating. 100% Carbon Neutral Transportation	Reaching out to the community was the biggest challenge. (Once this was overcome, the community became one of the most important driving forces.)	Wind energy Biogas Individual renewable energy heating systems
Woking (UK)	1990	Reduce CO2 emissions from 1 million to 200.00 tones/year until 2090 and promote sustainable development	ESCO model – public-private joint venture energy services company	Corporate commitment, cross-political party agreement and coordination	CHP heating Solar Energy from waste Alternative fuels

Source: Compiled by author from <http://www.go100percent.org> and (Radzi, 2009)

As we can see, ambitious energy projects can be achieved. Still patience and determination is needed because such projects tend to need approximately 20 years to develop.

Conclusions

The increasing number of local initiatives is slowly but surely replacing the questions of whether the energy turn will take place with the question of when transition period will this end and how it will take place. The increasing population of urban areas and the growing experience regarding renewable energy solutions determine scientists to believe that cities have the solution to manmade climate change by developing fossil carbon free infrastructures and economies (Lechtenböhmer, 2009). They can do this by changing their governance structure, developing and deploying special-purpose external organizations, or using their existing capacities more effectively and with a new purpose. Although in energy matters local governments have big powers of influence and can become effective in implementing strategies to achieve 100% renewable energy in energy matters they have been passive stakeholders. (Radzi, and Droege, 2013) Now it is time to show government commitment, initiative, inspiration, drive and perseverance that will result in a cleaner and healthier environment, a more equitable economy and social empowerment.

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