INTEGRATING RENEWABLE ENERGY IN THE PROCESS OF DEVELOPING SMART AND SUSTAINABLE CITIES OF ROMANIA

Alexandra Diala[1]

Abstract:

We have cities and we have energy. The interaction between energy sources and urban forms entails a fundamental relationship, which goes beyond the scenario where energy is used by the city to power daily life. The cities represent a complex form of human settlement, with multiple urban endowments, usually based on administrative, industrial, commercial, political and cultural dimensions.

Energy plays a crucial role in global economy, being one important pillar to provide wealth and security. We can all agree that, until recently, fossil fuels like coal, oil or natural gas were considered the most affordable and prevalent sources of energy. Besides cases of environmental damage during extraction or production, fossil fuels have also been a major source of carbon emissions. Alarming statistics show that, among European cities, high percentages of greenhouse gas emissions and energy consumption are recorded. Sustainability has become a national and international concern, rooted in many organizational processes.

This paper aims to focus on Romania's commitment to reduce the share of greenhouse gas emissions and other pollutants which can harm the environment or, worst, people's health. To accomplish this responsibility, Romania has assumed several measures and actions, like implementing smart technologies or increasing the use of renewable energy sources, which are in order to be taken.

In order to have a cleaner environment, a high level of energy security and to substantiate a sustainable future, Smart Sustainable Cities are becoming an imperative of our times. It represents a complex process, which can be materialized by adopting smart technologies. Also, an improved cooperation and a higher level of involvement by a variety of stakeholders would help in reaching the best results.

Smart Sustainable Cities will guarantee while still achieving the targets set by EU leaders (20-20-20 until 2020, for example), an integrated approach to climate and energy policy.

Several positive effects, such as better quality of life, jobs, and growth are just some of the consequences of implementing actions addressing energy systems, climate change, and air quality.

Keywords: smart cities, sustainability, greenhouse gas emissions, renewable energy systems

JEL Classification: O13, R11, Q42, Q55

1. The contribution of renewable energy sources to a sustainable future

Nowadays, people are facing a new kind of challenge, a pressure which gathers together governments, institutions and organisations aiming the same thing: to bring down energy resource reductions along with decreasing the amount of carbon emissions. The implementation of carbon offset strategies, which could lead to mitigation of impacts on climate change, and increasing the use of renewable energy sources through adopting specific measures represent only two important steps that must be taken on the path to a sustainable future.

Most of us know how big the importance of renewable energy sources is and how they contribute to the achievement of many national strategic objectives. Due to the major impact it has in achieving security of energy supply, while ensuring sustainable and competitive development, in saving primary energy resources and also in contributing to the reduction of the greenhouse gas emissions, the increased use of renewable energy sources represents a strategic objective in each national energy policy and it is mandatory to be improved. In order to reach the main national and European objectives in the field of energy and sustainable development, a series of measures are needed: increasing the use of renewable energy sources in terms of economic efficiency for electricity and heat production; facilitating access to the grid, in the investment phase; developing the green certificates (to attract private capital investment in renewable energy sources); promoting the mechanisms for supporting the use of renewable energy sources for the production of heat and domestic hot water; using Structural Funds.

[1] Ph.D. student, The Romanian Academy, Romania, adiala2003@yahoo.com

Romania has rich resources and diverse energy sources: biomass, hydropower, a big potential of geothermal, energy wind, solar and photovoltaic. They are distributed throughout the country and they should be exploited more widely as the technologies' performance-prace ratio will be improved through the development of new generations equipment and facilities.

In the past, the industry was the largest consumer of energy nationwide. During centralized economy, the development of the Romanian economy was based on the development of the branches of the heavy intensive energy industry. Restructuring the economy led to a major decline in final industrial sector energy consumption. These effects were enhanced by the economic crisis. Therefore, between 2009-2010, the industrial sector no longer occupied the leading position in terms of final energy consumption, the role being taken over by the household sector.

In the national energetic context, a sustainable development is based on ensuring energy needs, but not by increasing its use (excluding renewables), but by increasing energy efficiency, upgrading technology and restructuring the economy. The energy intensity is one of the main macroeconomic indicators to analyze the efficiency of energy use and it is included in the list of indicators by international organizations which support sustainable development.

At the EU level, European leaders set five goals for 2020, through the Europe 2020 Strategy. The targets proposed to the Member States on climate and energy dimensions are: 20% reduction of greenhouse gas emissions (or even 30%, under favorable conditions) compared to 1990 levels, increased share of renewables up to 20% and 20% increase of energy efficiency.

Romania has set the target of the renewable energy share to 24% for the year 2018. Surprisingly or not, today, Romania has already reached the threshold of 27%, already marking the initial proposed target in the EU2020 Strategy. Romania will be able, as well, to achieve the target for 2020 for the reduction of primary energy consumption by 19%, but not due to energy efficiency measures, but because of industry closure. The target linked to energy efficiency seems to be difficult to achieve in our country and, therefore, this requires an amplification of measures for the improvement of energy efficiency. Moreover, Romania will be facing new challenges on energy efficiency field, giving the fact that the European Commission is launching a public debate on the new Directive on Energy Efficiency.

The accelerated dynamics at the EU level in providing a policy framework that facilitates renewable energy, energy efficiency and the reduction of greenhouse gas emissions. Also, due to the reality of economic development, The European Commission has launched the framework for 2030 on climate and energy fields on January 2014. The framework proposes new targets and measures for 2030,in order to enhance competitiveness, safety and sustainability of the EU economy and energy system. It includes targets for reducing greenhouse gas emissions and increasing the use of renewable energy, but while also proposing a new system of governance and performance indicators.

In particular, it proposes a binding target of reducing EU greenhouse gas emissions by at least 40% by 2030 compared to 1990 levels, a mandatory objective at EU level on energy consumption from renewable sources by at least 27% in 2030 and an indicative target at EU level to improve energy efficiency by at least 27% in 2030.

The EU leads in terms of technologies for producing energy from renewable sources. It owns 40% of patents in the field of renewable energy worldwide and, in 2012, almost half (44%)[1] of the global capacity for producing electricity from renewable sources (excluding hydropower) are in the EU. The EU legislation on promoting renewables has evolved

[1] http://www.europarl.europa.eu/atyourservice/ro/displayFtu.html?ftuId=FTU_5.7.4.html

significantly in recent years. Transposition of EU legislation is a positive side providing a legal framework and also some specific new financing mechanisms.

The main ministries and institutions responsible in the field of energy in Romania act to promote renewable energy, to improve energy efficiency and to reduce emissions of greenhouse gases through enhanced dialogue with other EU leaders, but mostly through adopting the measures, recommended by the European Commission, that are also consistent with our country's specificities.

2. Smart cities are not just a trend

Lately, the label "intelligent" was designated to those cities which are able to find innovative solutions for the challenges they are facing. The increased need of infrastructure, jobs, clean energy and environment or the lack of other elementary goods are some of the reasons for which many citizens choose to move abroad, in search of a higher quality of their life. If until recently, the concept of „smart city" has been used by the companies promoting new technologies, nowadays the cities are looking for innovative solutions based on a more holistic vision, the needs and prefferences of citizens being placed on front row.

Unlike traditional communities and localities, the developed modern society is facing serious challenges, such as a major increase of the number of inhabitants and of territory occupied by them, increased consumption and volume of public services infrastructure, electronic communications services etc.

In terms of urban agglomeration, the trend is going up related to the number of inhabitants in urban areas and, according to the United Nations, it is estimated that, by 2050, in developed countries, the percentage of urban population will reach around 70%[1]. Large cities tend to expand encompassing the neighboring localities and the number of cities population exceeding 10 million might grow.

The emergence of "smart" cities requires intense collaboration between the municipality, the public and private sector, in order to facilitate decision-making and progress on how to initiate public policies at local level and to improve the relationship between citizens, business environment and government institutions. A "smart" city means a more inclusive city which offers equal opportunities for everybody. Technology is not necessary a luxury, but on the contrary, it has been proven that it simplifies our existence and makes it less expensive from many points of view. "Smart and tech" means more educated, healthier, less expensive, more opportunities for business and citizen benefits which can be translated through improved quality of life. The concept goes beyond the relationship between citizens and public service providers and offers tools that encourage citizens to be more active and participative in community life. A "smart" city is rather a continuous process that will take place with and for the citizen and it aims to turn every city into a community with a high standard of living as in all respects.

In the field of energy, "smart" grids represent a central pillar of a "smart" city. The European Technology Platform "Smart Grid" defines "smart" grids as "electricity networks which can intelligently integrate the behavior and actions of all users connected to it - generators, consumers and those which fulfill both roles – in order to ensure a sustainable, economic and secure process of energy supply"[2]. Perfect energy systems will ensure the availability of universal and absolute of energy in quantity and quality required to satisfy the requirements of every consumer. Government, along with community members, should focus on identifying modalities of implementing those solutions that target energy efficiency at consumer level, but also in the production area, in particular through the use of green energy,

[1] https://esa.un.org/unpd/wup/publications/files/wup2014-highlights.Pdf
[2] http://www.smartgrids.eu/

renewable (solar, wind and geothermal). The promotion of projects which involves the use of solar panels in each building in order to produce hot water and photovoltaic panels for the production of electricity is one of the more affordable methods for the gradual increase of technology usability for the production of green energy. If this approach is supported by the State, through the financing of the projects from national funds, community or other available funds, it creates the prospect of lowering energy costs and increase the momentum among travelers required to implement and use on a global scale, both green energy and "smart" technologies, as well as those for controlling interior and exterior lighting, environmental parameters control (temperature, humidity, etc.), the quality of air in premises, control of electricity consumption, locally or remotely, via the Internet. The widespread use of heat pumps and giving the great geothermal potential of Romania, the use of geothermal sources (where they are more easily accessible), may represent the proper solutions for the future. Cogeneration represents as well an effective alternative for the production of electrical and thermal energy that can be implemented and used by communities and cities where there are sufficient production capacities.

In terms of environmental protection, an increased use of electric cars will help to complete the framework for the "smart" cities of Romania. The reduction of polluting emissions, providing system services in electric network and guaranteeing energy security by decreasing dependency on fossil fuels and through supporting the integration of renewable energy sources represents the benefits of using such vehicles.

Reducing the general energy consumption and the materials by using "smart" technologies and data collected from the equipment used in the provision of "smart" services, intelligent design of the development of villages, are ways through which human communities under the auspices of an "smart" Administration, can achieve the synergy for a sustainable development.

3. Romania's commitment in implementing smart technologies

Decision-makers in Romania, next to the private sector and with the contribution of the Romanian Academy, is supporting the process of developing "smart" cities, already carrying out a series of concrete measures for the purpose of encouraging the development of a larger number of "smart" cities in Romania. The Government Decision No. 929 from 21 October 2014 approves the **National Strategy for Research, Development and Innovation 2014-2020**, which contains a section dedicated to the innovative solutions for public sector. The Romanian Academy published the **National Strategy in the field of research and innovation for the Romanian Danube Region** in august 2014**.** In the same year, the Ministry for informational society from the Romanian Government adopted the **National Strategy for Romania's Digital Agenda.** For its implementation in practice the **Agency for Digital Agenda** was created. In 2016, CNADNR signed a contract with Erns&Young for services the **Strategy for the Development of Intelligent Transport Systems** drafting. The examples mentioned above are accompanied by the activity of the various NGOs, where the civil society is involved. Market leaders such as IBM, Orange, Telekom, Vodafone, Teamnet, Luxten or Siemens are just some of the multinationals present in Romania which provide expertise and come with valuable "smart" solutions and initiatives. The business environment has a huge role in stimulating innovation and in providing smart solutions. The clusters, the innovative hubs, the structures for entrepreneurship, the internationalization (globalization) of the businesses are some of the ideas and solutions that have worked in associative cities considered as stories of success. Another decisive factor, and probably the most important one, is the civil society which has a crucial role in catalyzing the process. Without doubt, in any urban community, the main actors are the citizens. Even when using the highest Digital technology, a city will not be "smart" if its inhabitants are not the same in their turn (to make

this clear, when speaking about "smart" inhabitants I do not refer to the IT connoisseurs or erudite people, but to those who are sensitive to "smart" facilities available and who are using them for their own or of the community benefit).

According to Deloitte's vision addressed in the „Smart Cities Deloitte Technology Report„[1] - "a city can be termed as 'smart' when human and capital investments and as well the traditional infrastructure (transport) and modern communications (ICT) are fueling a sustainable economic development and a high quality of life, with a wise management of natural resources". In the National Strategy for Energy Efficiency, it is mentioned that Romania is at point to invest into implementing a low-carbon economy and also in projects dedicated to energy efficiency (buildings, lighting systems and smart cities). Talking about funding, the biggest EU funding program in the field of innovation and research is Horizon 2020 - the framework program for research and innovation of the EU, launched in early 2014, assumes that in the course of seven years (2014-2020), 80 billion euros[2] will be invested in research and innovation. In line with the Union Strategy for international cooperation in research and innovation, Horizon 2020 is open to researchers from all around the world. For 2016 -2017, through the Horizon 2020 Program, the European Commission allocates a budget of 16 billion euro, targeting a series of initiatives to modernize the European manufacturing industry (1 billion euro), automatic control technology and standards for motor vehicles (over 100 million euro), the Internet of things (139 million euro), digitization of EU industries and circular economy (670 million euro), smart and sustainable cities (232 million euro)[3]. If Europe expects to find solutions to societal challenges and to be able to stimulate growth and competitiveness, it needs a fully functional network of excellence in research - a European Research Area. This single market for knowledge, research and innovation is developed using EU funds and it helps the researchers, their knowledge and their results to circulate freely in Europe. Turning to the situation and stage of development of „smart" cities in Romania, almost every medium-sized city is more or less in the same situation: it has few applications of "smart" which are operating some future projects, but without a „smart" strategy or a concrete action plan. To be optimistic, an example of success in Romania is Bucharest due to the fact that it has been selected by IBM in 2013 and given a scholarship named "Smart Cities Challenge" (aimed at developing of an Integrated Operational Center). Another relevant example is Piatra Neamț where several progresses have been registered as well. Piatra Neamț has several functional components of a "smart" architecture such as waste management system which can be considered a component of the concept "green city", a video monitoring system (even if it's not very complex), which can be considered a first component of implementation concepts "security smart" and "intelligent traffic" or a system of online access to public services (including street offices) and online payments for the local taxes, which is a component of implementation concepts "smart government" and "smart public service".[4] Smart development is no longer just one option among many, but a manifestation of social responsibility. Active consultation and voluntary involvement of citizens and business environment in terms of citizens' comfort of the citizens and for establishing local conditions for developing businesses is the best option for local development, from within of human communities and creating opportunities for sustainable development thereof. The process in which a city becomes „smart" is continuous, and before being initiated, the process should be premeditated (organised). For that, you need leadership, planning and financing. You also need to anticipate potential obstacles that could stop or slow down this process and to be prepared with a back-up plan. It is our choice whether our local community keeps the pace with these changes, or we'll remain glued (as in so many other times) in a different world than that of the young, businessmen, tourists or of services providers (eg. social entrepreneurs) of public space that we share with.

[1] https://www2.deloitte.com/za/en/pages/public-sector/articles/smart-cities.html
[2] http://www.research.gov.ro/ro/articol/3285/programe-interna-ionale-orizont2020
[3] https://ec.europa.eu/programmes/horizon2020/sites/horizon2020/files/H2020_RO_KI0213413RON.pdf
[4] https://www.primariapn.ro/misiunea-smart-city

4. Conclusions

The transition to an efficient economy with a perspective of resources use can be achieved through massive reduction in greenhouse gas emissions and moving towards eco-efficiency as well as a „smart" tech dimenssion. In this regard, we need new technologies to further improve energy efficiency and reduce CO2 emissions in the energy supply field. Just imagine what would the quality of our life be in the European Union in the absence of rigorous environmental measures, against a background of steady growth of the economies. It is obvious that without a solid policy agenda, as the one EU is proposing, there would be devastating environmental pressures, with impact on ecosystems and human health. Romania, as Member State, is rallied to all these policies. The results our country registered in recent years are also validated by the European Environment Agency. We managed a decrease in emissions of greenhouse gases by almost half, as we also managed to diminish the harmful effects of other air pollutants. Romania has set the target of the renewable energy share to 24% for the year 2018. Surprisingly or not, today, Romania has already reached the threshold of 27%, marking the initial proposed target in the EU2020 Strategy. Romania will be able, as well, to achieve the target for 2020 to reduce primary energy consumption by 19%. All these means progress for our country. But there are a lot of measures left untaken and many other efforts to be assumed in order to create as many "smart" cities in Romania as we can. The emergence of "smart" cities requires intense collaboration between the municipality, the public and private sector, in order to facilitate decision-making and progress on how to initiate public policy at local level and to improve the relationship between citizens, business environment and government institutions. A "smart" city means a more inclusive city which offers equal opportunities for everybody. The main ministries and institutions responsible in the field of energy in Romania acts to promote renewable energy, to improve energy efficiency and to reduce emissions of greenhouse gases. Romania has rich resources and diverse energy sources: biomass, hydropower, a big potential of geothermal, energy wind, solar and photovoltaic. They are distributed throughout the country and they'll be able to be exploited more widely as performance-price ratio of the technologies will be improved through the maturation of the related new generations of equipment and facilities.

Smart development is no longer just one option among many, but a manifestation of social responsibility. It is up to us to decide in which kind of society we would like to live in, as a "smart tech" society might mean a better life and a higher standard of living for all of us.

References

1. Castells, Manuel, *The Informational City: Information Technology, Economic Restructuring, and the Urban-Regional Process*, Basil Blackwell, Cambridge. 1989;
2. Graham, Stephen and Simon Marvin, *Telecommunications and the City: electronic spaces, urban places*, Routledge, London, 1996;
3. Stalberg, Christian E., *Digital Telematics: Present and Future,* Telematics and Informatics, Vol. 4, No. 3 , 1987;
4. https://www2.deloitte.com/za/en/pages/public-sector/articles/smart-cities.html;
5. http://www.resarch.gov.ro/ro/articol/3285/programe-interna-ionale-orizont2020;
6. https://ec.europa.eu/programmes/horizon2020/sites/horizon2020/files/H2020_RO_KI0213413RON.pdf;
7. https://esa.un.org/unpd/wup/publications/files/wup2014-highlights.Pdf
8. http://www.smartgrids.eu/
9. http://www.europarl.europa.eu/atyourservice/ro/displayFtu.html?ftuId=FTU_5.7.4.html
10. https://www.primariapn.ro/misiunea-smart-city