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POLICY TOWARDS THE BUILDING ENERGY EFFICIENCY IN ROMANIA

BY

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Abstract. For future generations to enjoy the beauty and richness of the Earth, scientists have developed and implemented since 1972, the concept of sustainable development. The concept focuses on environmental issues and natural resources, especially those related to energy. The construction sector has a great impact on energy saving, and for this reason, Romania, as all EU Member States, adopted the laws, regulations and administrative provisions necessary to comply with Directive 2012/27 / EU on energy efficiency. The paper presents the development of EU Directives on energy efficiency and their implementation in building sector.

Key words: sustainability in construction; energy efficiency; passive house; active house; positive house.

1. Introduction

1.1. Sustainability in Building

The concept of sustainable development was born in 1972 in Stockholm at United Nations Conference where 113 nations present have expressed concern about how human activity affects the environment. The problems highlighted in this meeting were related to pollution, destruction of resources, environmental deterioration, extinction of species and the need to raise the

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living standards of people and environmental quality for present and future generations. The need to reorient efforts to achieve the objective of integration has resulted after 11 years of the Stockholm Conference, namely in 1983, when the United Nations established the World Commission on Environment and Development – WCED, known as the Brundtland Commission. This committee has prepared and published in 1987 the document “Our Common Future” (Brundtland Report), through which it was formulated the frame which would serve as the basis for the 40 chapters of Agenda 21 and for the 27 principles of the Rio Declaration. The Brundtland Report has defined sustainable development as “development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs”.

In June 1992, held, in Rio de Janeiro, the United Nations Conference on Environment and Development (UNCED), called “Rio Conference”, which gathered 120 leaders of states of the world. On this occasion, internationally, was officially recognized the need to integrate economic development and environmental protection into the sustainable development objective and stated the importance, in a continuous growing, of the international environmental law as a mechanism of the encoding and promotion for this objective (www.mmediu.ro/beta/domenii...).

Major changes must occur at both the conceptual and technological level if it is implemented in constructions field the concept of sustainable development. It can build sustainable, based on conceptual models of performance, with little impact to the environment, using recycled materials and/or materials with low embodied consumption of primary resources and energy. Energy use throughout the life of the building, called operational energy is one of the most important keys in the construction sector. In buildings, thermal performance or energy efficiency have significant economic, social and environmental impacts (Ciutina *et al.*, 2014).

A building and its related area must meet the following parameters: the effective selection of the site, the design in terms of construction sustainability, the material selection, the implementation of the waste management, the energy and water efficiency, the indoor air quality, and the dismantling and the reuse of recycled components. All these parameters have a great influence to the life cycle assessment of building.

Considering the huge amount of energy and materials used in construction, the environmental impact is seen, increasingly, as a necessary condition of the design process. Moreover, this impact should be considered in all phases of construction, such as: the erection, the operational duration and life end. Since the construction industry is responsible for more than half of the planet harmful emissions, estimating the impact that they have on the

environment will become a necessity in the near future, to be integrated into the design process.

Currently in Romania there is no mandatory legislation for determining the impact that newly designed buildings have on the environment. The future solutions will be those solutions that can ensure the safety and functionality of a building, leading to a minimum cost, and to a minimum impact on the environment.

By integrating into the European Union, Romania must implement and enforce regulations on sustainable development including those related to the construction works. At European level there is, within the European Committee for Standardization (CEN), the Technical Committee 350 (TC 350), which promotes the legal basis for sustainable development in the construction sector. Technical Committee dealing with this topic in Romania is CT 343, within ASRO (Standards Association of Romania). TC 350 has provided, consistently, a considerable amount of advanced and consistent information, in the sustainable development of the constructions. Also, TC 350 has developed tools for measuring the impact of buildings on the environment, and their impact on economy and society developments. In construction field, at the same time, the developed tools allow a distinctive analysis between: the fabrication stage of building products, the erection stage of building, the use stage of building, and the disposal stage of building (demolition and recycling).

1.2. Energy Consumption in a Building

During the service life of the building, it is consuming various forms of energy to provide: heating in winter, cooling in summer (air conditioning), artificial ventilation, lighting, operation of various devices and equipments.

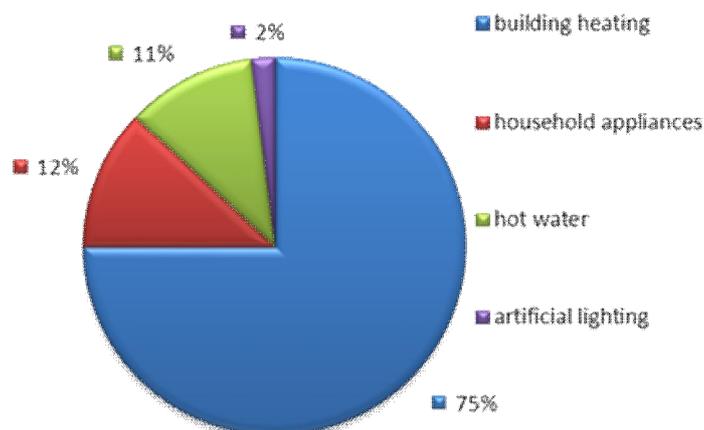


Fig. 1 – Forms of energy consumption in a residential building.

In the literature review it is shown that the energy consumption for a residential building located in Romania is split into four major domains: building heating, household appliances, hot water and artificial lighting (Fig.1).

Energy consumption for heating is the most important in terms of quantity, and also, must be mentioned that the heat supply used in Romania is the most polluting. For this reason, reducing energy consumption for heating is the most effective action that can be undertaken in a building, in order to implement the principles of sustainability and energy efficiency, and also, to reduce environmental impact.

When using different forms of energy (electricity and gas) each amount is to be converted into primary energy consumption, analyses which take into account the yields of generation, transmission, and distribution. Reduce the total energy consumption is achieved by implementing the “Trias Energetica” principles. These principles are based on the following criteria:

- a) Reduce energy demand by avoiding waste – proper insulation, efficient closures, etc.
- b) Use of renewable energy sources instead of fossil fuels - solar panels, heat pumps, etc.
- c) More efficient production and use of fossil fuel-derived energy.

2. Current State of Energy Efficiency in Romania

2.1. The Legislative Framework

In March 2007, the leaders of the EU member states have set three key targets to be achieved by 2020: reducing emissions of greenhouse gases in the EU by 20% from 1990 levels, leading to an increase in the share of renewable energy to 20% from total EU energy consumption and a 20% improvement in energy efficiency of the European Community.

Moreover, the document entitled "Energy Roadmap 2050", presented by the European Commission in December 2011, shows that, to achieve the target of reducing by 80% the emissions of greenhouse gases by 2050, regardless of the particular sources of energy used, an higher level of energy efficiency is necessary.

In the EU, energy efficiency is mainly governed by the following directives: Directive no. 2012/27/EU on energy efficiency, Directive no. 2009/28 /EU on the promotion of renewable energy and Directive no. 2010/31/EU on the energy performance of buildings.

In Romania on July 17, 2014 was promulgated the Law 121/2014 on energy efficiency in Romania. By adopting this law, Romania meets its commitments to the European Parliament and the EU Council to put in force the laws, regulations and administrative provisions necessary to comply with Directive 2012/27/EU on energy efficiency. The purpose of this law is to create

the legal framework for the development and implementation of national policy, in order to achieve the national target of increasing energy efficiency.

Policy measures for energy efficiency apply throughout the chain: primary resources, manufacturing, distribution, supply, transportation and consumers. By 2020, the law sets a national indicative target of reducing energy consumption by 19% approximately.

2.2. Energy Efficiency Policy

Improving energy efficiency is a strategic goal of national energy policy because it has major contribution to the achievement of security of supply, to the sustainability and competitiveness, to save primary energy resources, and to reduce emissions of greenhouse gases.

National policy of energy efficiency is an integral part of the state and its aims are (Law no. 121/2014...):

- 1° removal of barriers to energy efficiency;
- 2° promoting energy efficiency mechanisms and financial instruments for energy savings;
- 3° the final consumer education and awareness on the importance and benefits of the measures to improve energy efficiency;
- 4° cooperation between end users, manufacturers, suppliers, distributors of energy, and public bodies, in order to achieve the objectives set by national policy for energy efficiency;
- 5° to promote basic and applied research in the field of efficient energy use.

The law defines also the energy efficiency as being the performance which is the ratio between result consisting of services, goods or energy produced and the amount of energy used for this purpose.

National energy efficiency policy defines the specific targets and the improvement measures of energy saving related to all sectors of the national economy, especially referring to (Law no. 121/2014...):

- a) introduction of energy efficient technologies in industry, modern systems of measurement and control and energy management systems, for monitoring, ongoing evaluation of energy efficiency and energy consumption forecasting;
- b) promotion of the equipments and energy efficient appliances for the end-users, and promotion of renewable energy use;
- c) reducing the environmental impact of the production, the transportation, the distribution and the consumption of all forms of energy;
- d) the application of modern principles of energy management;
- e) providing financial and fiscal incentives for renewable energy use, in the law;
- f) developing the market for energy services.

3. Concepts of Buildings with Low Energy Consumption

Since the 80s, various concepts of sustainable or energy-efficient houses have been developed in Europe and worldwide. Firstly they came with “solar houses” (so called because these were equipped with solar thermal/photovoltaic panels), followed by the houses with “low energy” (typically by 25-50% below the minimum requirements of the regulations), and then with the “3-liter houses” or houses with “zero energy consumption” or “zero emission”. These concepts of sustainable houses, failed to turn into a general and homogeneous concept because in this area have not been adopted clear rules. The definitions of these concepts vary from country to country, but in the last 10,....,20 years have managed to impose the three concepts described further.

3.1. Passive House (Passivhaus)

The exact definition of passive house (Fig. 2), is given by the Passivhaus Institute in Germany and refers to a set of nine parameters with strict limits of variation, the most important being the thermal energy of the building, which is described as: “heating demand below 15 kWh/m²·year”.

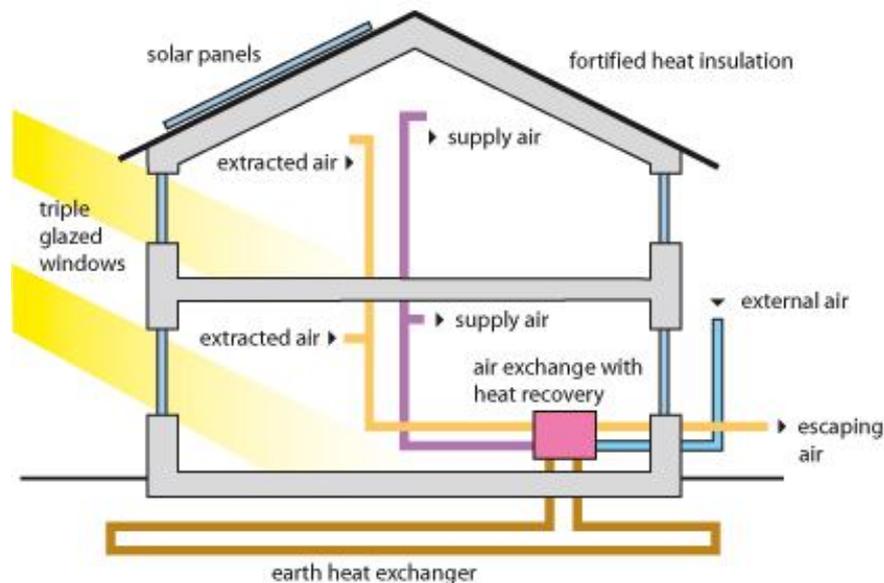


Fig. 2 – Scheme of passive house (www.optimacasa.eu).

The design and execution of passive houses are focused on:
a) energy relies on heat pumps and on passive solar energy;

b) isolation of the building almost perfect: no leaks, no thermal bridges, windows with “low u-values”;

c) use of controlled mechanical ventilation for air fresheners;

d) all equipments (heat pumps, circulation, boilers, refrigerators, etc.) are energy efficient.

This concept houses was promoted especially in the Nordic countries. The main disadvantages of this concept refers to the thermal insulation (the materials used and their manufacturing technologies), which limits the technical feasibility, and the costs increase more.

3.2. Energy Positive House (Plus Energy House)

The house has its own sources of renewable energy, and the energy produced equals to or exceeds the annual consumption level. There are approximately the same technical requirements as for the passive house, but not so drastic. The greatest challenge is the storage and recovery of energy for use in winter as heat. Most cases uses for this purpose the heat pumps. The main disadvantage for Romania is the high cost of the heat pump.

3.3. Active House

The concept was promoted by the “Active House Alliance”, an alliance of manufacturers, researchers, and public institutions actively acting for energy and construction materials, having as the main objective to sharing knowledge in the energy efficiency research field.

Active house is an integrated concept that provides to consumers, houses with an indoor climate (much more) healthy and (more) comfortable, without negatively impacting the environment.

Three areas are important for this concept and they are:

1° *the energy efficiency* – active house has own renewable energy sources used in collective systems located nearby;

2° *the comfort* – it targets a comfortable and healthy indoor climate by providing with own renewable energy sources: the artificial lighting, an inside adjustable temperature according to necessities, the fresh air quality, and the operation of house equipments;

3° *the environment* – it interacts positively (ecological) on the environment throughout its lifetime through optimal use of resources, and by integrating the local architecture and culture.

Active houses built are distinguished by advanced technologies to control light and ventilation, inevitably associated with high costs for building on worksite (these houses were made as a pilot for research purposes, not developed as commercial real estate projects).

4. Conclusions

In the last years, in Romania, the decision makers have began to implement the concept of sustainable development and energy efficiency. Because of the development policy of the EU, Romania, itself, also makes progress in this area and the first step that compels and, also the most important, is the approved Law no.121/2014 on energy efficiency. By adopting this law Romania fulfills its commitment to the European Parliament and the EU Council, to put in force the regulations and administrative provisions necessary to comply with Directive 2012/27/EU on energy efficiency. Based on this law, Romania in the coming years must comply with EU policy and, by the end of 2020, to meet its targets, namely to reduce energy consumption by 19%.

Regarding the housing concepts developed over the past 20 years (with low energy consumption or with almost zero energy consumption, and/or with own sources of renewable energy), should be made a clear and effective analysis to devise a solution proper for Romania. The performance on energy efficiency can be affected by the building location, in terms of the intensity of action of climatic parameters. In this analysis should be considered all geographic areas in Romania due to the large variability of actions as: the wind, the snows, the outside temperature regime, and the earthquake. We must also take into consideration the local potential of renewable energy sources: the geothermal, eolian or hydroelectric energy.

A detailed study showing all the advantages and disadvantages of these conceptual evaluations could be the result of a prototype house that meets energy efficiency requirements and that can be implemented widely in Romania.

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POLITICA DE EFICIENȚĂ ENERGETICĂ A CONSTRUCȚIILOR ÎN ROMÂNIA

(Rezumat)

Pentru ca generațiile viitoare să beneficieze de frumusețea și bogăția Pământului, oamenii de știință au dezvoltat și pus în practică încă din 1972 conceptul de

dezvoltare durabilă. Conceptul este legat de problemele de mediu, precum și de criza resurselor naturale, în special a celor legate de energie. Sectorul construcțiilor are un impact major asupra economiei de energie, iar din acest motiv, România la fel ca toate statele membre UE a adoptat actele cu putere de lege și actele administrative necesare pentru aplicarea Directivei 2012/27/UE privind eficiența energetică. Lucrarea prezintă evoluția directivelor UE privind eficiența energetică și punerea în aplicare a acestora în sectorul construcțiilor.

