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## **Sustainable Development Management and Its Implications in Energy Efficiency of Public Buildings**

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**Abstract:** Improving the energy efficiency of the existing fund of public and residential buildings is one of the important elements of the European Union's policy, as they are high energy consumers “being responsible for about 40% of final energy consumption and 36% of greenhouse gas emissions and about 75% of the buildings are not energy efficient” (Strategy for mobilizing investments in the renovation of residential and commercial buildings, Oct 2017).

**Keywords:** management; sustainable development; energy efficiency

**JEL Classification:** F15; O10; O31

The most common definition of sustainable development is the one developed in the report of the World Commission on Environment and Development (1987), namely “the process that meets the needs of current generations without harming the interests of future generations” (World Commission for Environment and Development, 1987). “The principle of sustainability designates the gear of the three dimensions - ecology, economy and the social sphere” (Schlussbericht der Enquete-Kommission, 2009).

In this context, sustainable development is based on the principles of sound management of global resources, on the fair use of these resources and on the distribution of benefits. The concept has evolved since the 1987 definition, notably through Agenda 21, an action plan set out following the United Nations Conference on Environment and Development (Rio, 1992) and the Sustainable Development Summit Implementation Plan (Johannesburg, 2002).

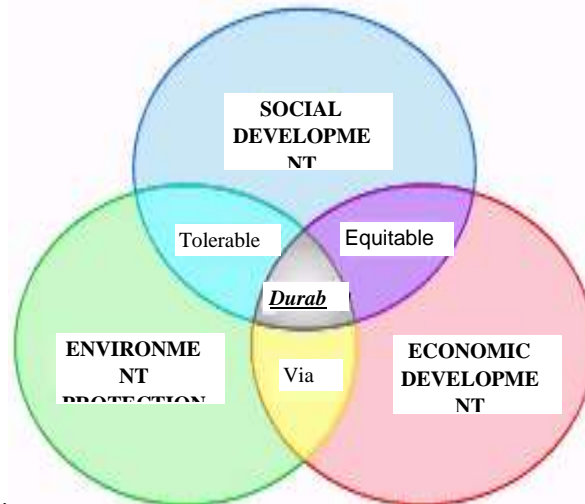
The concept of sustainable development is a fluid one, which will evolve over time, but the major principles that characterize it are the following:

- Concern for equity and fairness between countries and generations;
- Long-term vision on development;
- Systemic thinking - the interconnection between environment, economy and society.

From a graphic point of view (Figure 1), it can be a sustainable development only in the area of simultaneous overlap of the three “pillars” (economic development, social development and environmental protection) on which such a model of development is based.

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**Figure 1. The interaction of the three components of sustainable development**

*(Source: processing after Tanguay, et al, 2009)*

### **The General Objectives of the European Union's Sustainable Development Strategy**

The responsibility for implementing the Strategy lies with the European Union and its Member States, with all institutional components involved at Community and national level. Emphasis is also placed on the importance of working closely with civil society, the social partners, local communities and citizens to achieve the four key objectives of sustainable development:

- Environmental protection - possible through measures that allow the dissociation of economic growth from the negative impact on the environment;
- Equity and social cohesion - achievable by respecting fundamental rights, cultural diversity, equal opportunities and by combating discrimination of any kind;
- Economic prosperity - possible by promoting knowledge, innovation and competitiveness to ensure high living standards and an abundance of well-paid jobs;
- Fulfilling the EU's international responsibilities by promoting democratic institutions in the service of peace, security and freedom, the principles and practices of sustainable development throughout the world.

### **Sustainability Indicators**

Tanguay and colleagues appreciate that sustainable development indicators are used by organizations, but the multitude of interpretations has triggered an explosion of indicators. The Sustainability Indicators Report (Dekker et al., 2012) has taken a different approach to developing an established indicator compared to previous ones. The result is a set of basic indicators that are flexible, easy to implement, and relevant to cities, regardless of size or location.

At the same time, the Sustainable Cities Framework of Reference (CSF) is a set of tools to help European cities implement the sustainability objectives of the Leipzig Charter on Sustainable European Cities. It is an accessible and flexible way for cities to stimulate sustainable and integrated urban development, in line with the objectives of the Europe 2020 Strategy (van Dijken, Dorenbos & Kamphof, 2012). The set of indicators consists of 16 key indicators, as well as over 300 additional indicators, covering issues

such as the economy, society, the environment and governance. The instrument places particular emphasis on sustainable governance and economic activity.

For the Environment sector, the indicator is “Reducing greenhouse gas emissions/energy efficiency”, measuring “Total amount of greenhouse gas emissions per city and per capita” as well as “Percentage of energy total consumption in the city, which comes from renewable sources”.

## **Case Study**

Analyzing the concept of sustainable development in the context of regional development policy in Romania, it is observed that projects are financed by the European Union, through structural and cohesion funds. In this context, the project “Increasing the energy efficiency of the building of the Țîrgu Bujor City Hospital, Galati County” was financed as a case study, financed by the Regional Operational Program Axis 3. Supporting the transition to a low carbon economy Priority 3.1. Supporting energy efficiency, smart energy management and the use of renewable energy in public infrastructure, including public buildings, and in the housing sector.

Improving the energy efficiency of public and residential buildings is one of the important elements of EU policy, as they are high energy consumers “being responsible for about 40% of final energy consumption and 36% of greenhouse gas emissions and about 75% of the buildings are not energy efficient”.

Directive 2012/27/EU recognizes the importance of implementing measures to increase energy performance in existing buildings owned or occupied by general government. According to Article 5 (1) of the Directive, each EU Member State must ensure that, from 1 January 2014, 3% of the total area of heated and/or cooled buildings owned and occupied by the public administration is renewed annually, to meet at least the minimum energy performance requirements set by the Member State, calculated on the total area of buildings with a total usable area of more than 250 sqm which does not meet the national minimum requirements set on 1 January of each year energy performance.

The project implemented by the Galati County Council starting with April 2021, is part of the provisions of the Galati County Development Plan 2016-2021. The infrastructure of the medical units with the county importance class are a priority, due to the volume and the impact on the population given by the offered services. There can be no question of restricting activities or restructuring them in order to rationalize energy consumption. Țîrgu Bujor City Hospital serves a population of over 63,000 inhabitants in Galati County, as it is the only hospital within a radius of 65 km. The costs incurred for the payment of the utilities related to the spaces of the Țîrgu Bujor City Hospital were over 3 million lei during 2016 (the year prior to the elaboration of the technical documentation for the project). Energy efficiency of public buildings is a real need, so that the budget of the public institution is balanced and allows to increase the quality of services, in parallel with the decrease of maintenance costs. The need to implement the project is based on the state of infrastructure designed 50-60 years ago, when the need for health services was different from today's realities. The proposed investment for the building of the Țîrgu Bujor City Hospital in Galati County aims at: reducing utility costs, streamline public spending, reduce primary energy consumption, reduce energy consumption from finished sources and increase the contribution of renewable energy sources - macro, they are translated into: reducing pollutant emissions, reducing the greenhouse effect, reducing the level of dependence on finite energy sources.

The objectives of the project are as follows:

The general objective of the project is to increase the energy efficiency of the building of the Targu Bujor City Hospital, Galati County, which is the main building where the continuous flow medical activities are currently carried out.

The specific objectives of the project are:

- Use of renewable energy resources for Targu Bujor City Hospital, Galati County;
- Ensuring optimal energy values for Targu Bujor City Hospital, Galati County.

The results of the project will contribute to the fulfillment of the project objectives and to the achievement of the targets set by the European Union for Romania:

- Result 1 related to the rehabilitated building: - the estimated annual level of greenhouse gases (equivalent to tons of CO<sub>2</sub>) at the beginning of the project implementation is 64,087 and at the end of the project implementation it will be 8,547.
- Result 2 related to the rehabilitated building: - the annual primary energy consumption at the beginning of the project implementation is 344894.33 kWh/year and at the end of the project implementation it will be 202113.156 kWh/year. The decrease of the annual primary energy consumption is given by the difference between the value calculated at the end of the project implementation and the value calculated at the beginning of the project implementation.
- Result 3 (additional project indicator) related to the rehabilitated building: - the final annual energy consumption in the public building (from non-renewable sources) at the beginning of the project implementation is 23,518.9 Final energy consumption in public buildings (Mtep) and at the end of the project implementation will be 2.93 Mtep.
- Result 4 related to the rehabilitated building: - the specific annual primary energy consumption (from non-renewable sources) at the beginning of the project implementation is 551.24 kWh/m<sup>2</sup>/year and at the end of the project implementation it will be 89.222 kWh/m<sup>2</sup>/year.
- Result 5 related to the rehabilitated building: - the total annual specific consumption of primary energy (from non-renewable sources) for the heating/cooling system at the beginning of the project implementation is 247.69/3.48 kWh/m<sup>2</sup>/year and at the end of the project implementation will be of 15.75/0.90 kWh/m<sup>2</sup>/year.
- Result 6 related to the rehabilitated building: - The annual consumption of primary energy using renewable sources (kWh/year) at the beginning of the project implementation is 0.00 kWh/year and at the end of the project implementation will be from 112307.61 kWh/year.
- Result 7 (additional project indicator) related to the rehabilitated building: - the total annual consumption of primary energy from renewable sources for heating/cooling at the beginning of the project implementation is 0.00 kWh/year and at the end of the project implementation will be 58184.39/1667,662 kWh/year.
- Result 8 (additional project indicator) related to the rehabilitated building: - the total annual consumption of primary energy from renewable sources for hot water preparation at the beginning of the project implementation is 0.00 kWh/year and at the end of the project implementation will be 33456, 588 kWh/year.
- Result 9 related to the rehabilitated building: - the total annual consumption of primary energy from renewable sources for the electrical system at the beginning of the project implementation is 0.00 kWh/year and at the end of the project implementation it will be 18998.97 kWh/year.

- Result 10 related to the rehabilitated building: - the specific annual primary energy consumption (from non-renewable sources) for the heating/cooling system at the beginning of the project implementation is 251.17 kWh/m<sup>2</sup>/year and at the end of the project implementation it will be 16.65 kWh/m<sup>2</sup>/year.
- Result 11 related to the rehabilitated building: - total primary energy consumption after the implementation of the measures which is achieved through the use of renewable energy sources (at project level) -22.69%.

## Conclusions

For Romania, as a member state of the European Union, sustainable development is not one of the possible options, but the only rational perspective of becoming national, resulting in the establishment of a new development paradigm through the confluence of economic, social and environmental factors.

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