Green Building

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Abstract- Needs for performing business with aims of sustainability and implementing green building construction came from every day growing number of environmentally conscious people. People are having more awareness of the threatening ecological disaster on a global level. As much as is in their power they trying to convey others in ideas and need for sustainable coexistence with their environment. In our work we will pay special attention on sustainable development and especially green building as efficient and environmentally friendly construction practices. It minimizes damaging effects on human health and environment and improving productivity by using resources in most efficient way. Green building brings environmental, economic and social benefits. It also need to be safe and secure, so special attention must be paid to fire protection, impact resistance and blast resistance. We will study sustainability of high-performing building as great challenge in modern project management and architecture. Here, building team is consisted from project manager, architect, engineers, contractor, and many other highly educated and skilled members, who must act like one and each of them, must think about project as an entirety. We will introduce you with LEED standards which develop criteria for judging greenness of building.

Index Terms- sustainable development, environment protection, Green Building, engineering management, high-performing buildings, LEED

I. Introduction

In this work we pointed at attempt made in the direction of achieving sustainability in building and housing. Green building concept represents the practice of increasing the efficiency in using resources-energy, water, materials, while reducing building impact on human health and the environment. Environment all around the world has suffered high degree of pollution from buildings that led to degradation of ecosystem and ozone layer depletion. These products of negligence to our closest surrounding culminate in global warming phenomenon.
People need a safe environment with adequate housing conditions and drinking water. The issue of energy security and stability is the cardinal question of the entire world's business, economic and social system. Correlation between the energy sector and the competitiveness of the economy leads to a willingness to earn profit hit by the importance of the struggle for sustainable development and survival.

Modern construction involves the application of energy efficiency standards, in existing as well as in the construction of new buildings. This implies need to provide conditions for the reduction of carbon dioxide emissions, while preserving existing standards of construction quality and housing. The ultimate goal in building is to achieve energy-efficiency in rehabilitation and reconstruction of existing buildings, to provide comprehensive energy savings and thus contribute to environmental protection.

II. Green building

"Green building" is a term that is in use for strategies, techniques, and construction products that are less resource-intensive and pollution-producing. [1] Green buildings use energy, water, materials, and land–more efficiently and effectively than traditional buildings.

The green building movement originated from the need and desire for more energy efficient and environmentally friendly construction practices. There are a number of motives for building green, including environmental, economic, and social benefits. However, modern sustainability initiatives call for an integrated and synergistic design to both new construction and in the retrofitting of existing structures. [2]

Benefits of Green development:

- Financial
  - ✓ Reduced capital costs
  - ✓ Lower operating and maintenance costs
  - ✓ Reduced risks and liabilities
- Environmental
  - ✓ Less impact on the natural environment
  - ✓ Healthy environments and improved productivity
- Social
  - ✓ Stronger social networks
  - ✓ Increased environmental awareness. [3]

There are several key steps in designing sustainable buildings:

- specify "green" building materials from local sources,
- reduce loads,
- optimize systems and
- generate on-site renewable energy. [4]

Perceptions of "green" are changing in people's head, they beginning to understand that sustainable technologies are not necessarily characterized with extravagant interior or cost expensive, and these constructions need not be visibly different than other buildings unless so desired. Green buildings are products of intelligent, integrated design that meet standards for sustainable project.

Green building brings together several of practices and techniques to reduce and ultimately eliminate the impacts of

buildings on the environment and human health. It often emphasizes taking advantage of renewable resources, e.g., using sunlight through passive solar, active solar, and photovoltaic techniques and using plants and trees through green roofs, rain gardens, and for reduction of rainwater run-off. Many other techniques, such as using packed gravel or permeable concrete instead of conventional concrete or asphalt to enhance replenishment of ground water, are used as well.

III. Principles and Standards in Green Building

Guiding principles that should be complied in green building:

- Structure design efficiency,
- Energy efficiency,
- Water efficiency,
- Materials efficiency,
- Indoor environmental quality enhancement,
- Operations and maintenance optimization, and
- Waste and toxics reduction.[1]

A green material is one that simultaneously does the most with the least, fits most harmoniously within ecosystem processes, helps eliminate the use of other materials and energy, and contributes to the attainment of a service-based economy. Criteria for evaluating building materials include the general categories of resources, performance and pollution. The resources required for a material can be consumed in extraction, production, use or disposal. For each category of material, performance means something quite different. For example, the performance of insulation must be judged mainly in terms of its thermal resistance, while a floor tile would be evaluated more for its durability.[5]

Deciding what is "green" is sometimes quite relative. Some products in a certain category might be the greenest simply because the available alternatives are so destructive (for example, CCA-treated wood or PVC plastic). It is often inevitably comparing the energy-intensity of one product with the toxicity of another. Objective rating for every product and material will always be a difficult. It should be pursued, but evaluators, particularly those who synthesize available data to help consumers make the best possible choices, will simply have to do the best they can. [5]

As a result of the increased interest in green building concepts and practices, a number of organizations have developed standards, codes and rating systems that let government regulators, building professionals and consumers embrace green building with confidence. In some cases, codes are written so local governments can adopt them as bylaws to reduce the local environmental impact of buildings. [6]

This approach has since been formalized in a number of assessment and rating systems, such as the BREEAM (BRE Environmental Assessment Method), standard introduced in Britain in 1990, and the LEED (Leadership in Energy and Environmental Design) standards developed by the United States Green Building Council (USGBC) starting in 2000. [7] Systems for environmental certification, LEED and BREEAM were made to support the construction of environmentally friendly and energy-efficient buildings.

The LEED standards are intended to produce "the world's greenest and best buildings" by giving developers a straightforward checklist of criteria by which the greenness of a building can be judged. Points are awarded in various categories, from energy use (up to 17 points) to water-efficiency (up to five points) to indoor environment quality (up to 15 points); the total then determines the building's LEED rating. Extra points can be earned by installing particular features, such as renewable-energy generators or carbon-dioxide monitoring systems. A building that achieves a score of 39 points earns a "gold" rating; 52 points earns a "platinum" rating. A gold-rated building is estimated to have reduced its environmental impact by 50% compared with an equivalent conventional building, and a platinum-rated building by over 70%. [8]

The example of platinum-rated building is Aldo Leopold Legacy Center, Baraboo, WI. This center is located in a Cold-humid climate region, with building type(s): Interpretive Center, Commercial office. It is a new construction on 11,900 ft2 (1,100 m2), completed in April 2007. Rating: U.S. Green Building Council LEED-NC, v.2/v.2.1--Level: Platinum (61 points) Rating: Zero Energy Building.[9]

The Foundation located the project on a previously disturbed site, which it is restoring to native ecosystems. The project team used crushed gravel in place of blacktop or concrete paving, increasing rainwater infiltration and blending the developed areas into the surrounding landscape. The native landscaping requires no irrigation. Waterless urinals, dual-flush toilets, and efficient faucets reduce water consumption by 65%. An on-site well provides potable water, and an existing septic system treats wastewater. [9]

Thinning the Leopold forests improved forest health while providing 90,000 board feet of wood for use in the project. More than 75% of all wood used in the project was certified to Forest Stewardship Council standards, and 60% of all materials were manufactured within 500 miles of the project site. [9]

The Legacy Center was designed to use 70% less energy than a comparable conventional building. A 39.6-kW rooftop photovoltaic array produces more than 110% of the project's annual electricity needs. This excess renewable energy, along with on-site carbon sequestration, offsets the greenhouse gas emissions resulting from the project's operations. Day-lighting eliminates the need for electric lighting during most of the day. Ground-source heat pumps connected to a radiant slab provide heating and cooling, and an earth-tube system provides tempered fresh air. [9]

IV. HPG Buildings

High-performance green (HPG) buildings are "green" or "sustainable" buildings which exhibit maximum energy efficiency of envelope, mechanical and lighting systems coupled with improved indoor environmental quality to enhance occupants' well being. HPG buildings are conceived to reduce energy costs, and to improve the health and productivity of occupants. [10] Early decisions in the planning and the design process of a building project lead to improved building performance outcomes. Competence of project teams is essential

for HPG building project success. HPG buildings are designed to reduce resource consumption through recycling, water and energy conservation strategies, and emissions reductions.
Low-energy buildings mean that building must have a high level of insulation, very energy efficient windows, a high level of air tightness and natural/ mechanical ventilation with very efficient heat recovery to reduce heating/cooling needs. Passive solar building design may boost their energy performance to very high levels by enabling the building to collect solar heat in winter and reject solar heat in summer and/or by integrating active solar technologies (such as solar collectors for domestic hot water and space heating or PV-panels for electricity generation). In addition, other energy/resource saving measures may also be utilized, e.g. on-site windmills to produce electricity or rainwater collecting systems.

High-performance green buildings have the potential to reduce the environmental and economic footprint of buildings by minimizing energy use, reducing resource consumption and waste, and providing healthy and productive environments for occupants. [11]

Irrational use of raw materials and consequently their disappearance created a need for using alternative energy sources while the rising costs of energy made a stimulus for consumers of energy to conserve. Initial construction costs: 60% to 85% of a building's real costs are associated with building operations while the construction cost totals 10%; the majority of operational costs are related to heating, ventilating, and air-conditioning (HVAC), and illumination loads of buildings consume 40% of energy in the United States. [11] High-performance buildings reduce energy consumption significantly through utilization of high efficiency HVAC, lighting, and envelope systems. The Sustainable Building Task Report, examining 33 green building projects in California, confirmed that high-performance green buildings are 25% to 30% more energy efficient and demand, on average, 10% lower, peak electrical loads when compared to traditional buildings.

V. Nearly zero-energy buildings

Many European countries started their energy efficiency policies in early eighties. Today in Europe there are new buildings whose annual energy consumption for heating per unit of useful floor area does not exceed 10 kWh / m2 and existing buildings that consume a lot more and continue to participate in final energy consumption with 38 percent of the total consumption of the European states. Existing buildings account for about 90 percent of the building, which means that the technology is quite advanced, but still consumes a lot of energy because even in Europe did not perform significant energy rehabilitation of existing buildings. The biggest obstacles to the implementation of energy efficiency in existing buildings are residential buildings, i.e. their energy rehabilitation. [12]

A nearly zero-energy building is "a building that has a very high energy performance. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby". This is defined in Article 9 of Energy Performance of Buildings.

Article 9 requires that "Member States shall ensure that by 31 December 2020 all new buildings are nearly zero-energy buildings; and after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings". Member States shall furthermore "draw up national plans for increasing the number of nearly zero-energy buildings" and "following the leading example of the public sector, develop policies and take measures such as the setting of targets in order to stimulate the transformation of buildings that are refurbished into nearly zero-energy buildings".[13]

Plans and aim of Directive on the energy performance of buildings (EPBD) are that by 2020 all new buildings constructed within the European Union after 2020 should reach nearly zero-energy levels, all new buildings should demonstrate very high energy performance and their reduced or very low energy needs will be significantly covered by renewable energy sources. Principles for a nearly zero-energy buildings definition should take into account all financial, legal, technical and environmental aspects and should meet the present and future challenges and benefits. Various Member States have already set up long-term strategies and targets for achieving low-energy standards for new houses. [14]

Reduction of energy consumption and the use of energy from renewable sources in the buildings sector constitute important measures needed to reduce the Union's energy dependency and greenhouse gas emissions. Together with an increased use of energy from renewable sources, measures taken to reduce energy consumption in the Union would allow the Union to comply with the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC), and to honor both its long term commitment to maintain the global temperature rise below 2 °C, and its commitment to reduce, by 2020, overall greenhouse gas emissions by at least 20 % below 1990 levels, and by 30 % in the event of an international agreement being reached. Reduced energy consumption and an increased use of energy from renewable sources also have an important part to play in promoting security of energy supply, technological developments and in creating opportunities for employment and regional development, in particular in rural areas. [14]

European Union financial instruments should be used to give practical effect to the objectives of this Directive, without however substituting national measures. In particular, they should be used for providing appropriate and innovative means of financing to catalyze investment in energy efficiency measures. They could play an important role in the development of national, regional and local energy efficiency funds, instruments, or mechanisms, which deliver such financing possibilities to private property owners, to small and medium-sized enterprises and to energy efficiency service companies. [14]

VI. Conclusion

In today's modern world, when we look up to the future it seems uncertain. Necessary steps are to turn to programs aimed at sustainable development. Conventional natural resources are being consumed without any plan or control, energy production, has brought great damage to nature, and if we continue this way

the consequences will be fatal to the plants, animal world, atmosphere, and consequently to . Turning to sustainability is a necessary for protecting the environment. Great contribution in the manner of utilization of renewable energy sources, reduced emissions of greenhouse gases are giving teams of engineers also their achievements in the advancement of technology for achieving sustainability are of great importance.

In building applying the most widely used green building rating system, the LEED, is especially helpful. The impact of buildings and infrastructure on the environment has increased the need for building industry professionals to embrace sustainable practices. Sustainable design and construction is a major trend that is helping to drive process change within project, requiring an integrated workflow with more information brought into earlier stages of design.

Many countries have included energy requirements into their building codes. The European Union has addressed this issue in its Directive on the Energy Performance of Buildings (EPBD), which requires Member States to set minimum energy performance requirements for buildings, taking also into account the positive contribution of solar thermal and other renewable energy sources. The directive implies that from the year 2020 onwards all new buildings will have to be “nearly zero energy buildings” and comply with high energy-performance standards and supply a significant share of their energy requirements from renewable sources. For public buildings these standards need to be met by the end of 2018.

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