

# Ensuring environmental safety in housing construction

*Ekaterina Nezhnikova*<sup>1,\*</sup> and *Roman Obukhov*<sup>1</sup>

<sup>1</sup>Moscow State University of Civil Engineering, 26, Yaroslavskoye shosse, Moscow, 129337, Russia

**Abstract.** The article provides organization-economic facilitating mechanism for housing stock environmental friendliness, the main task of which is ensuring of building of the “green buildings” at a faster pace. Negative impact of the housing on human and environment was detected, and analyzed systems of certification of the green building in different countries reflected the necessity of implementation of obligatory housing certification into the Town Planning Code and Housing Code of the Russian Federation. Control of the housing environmental safety for life and health of the people in the form of verification procedure for correspondence of design technologies, engineering structures, and materials to the requirements of the environmental safety can be implemented through the usage of organizational-economic mechanism.

## 1 Introduction

"Green" building is an approach to the development of concepts of buildings where the construction process itself, the design and the further operation have minimal impact on the environment, at that ecoprinciples must be respected at all "life stages" of buildings: starting with project design and ending with the dismantling of the building.

Interpretation of the "sustainable construction" concept firstly was proposed in 1994 at the conference in Tampa, USA. Its known that the concept of sustainable construction is not limited by the urban development area, it's the ideas of humanism are its basis. According to this concept, the construction should contribute the sustainable development of society, the new principles of cities and houses establishment actively involve people in formation of the aesthetic, ethical and cultural aspirations [1].

To the basic principles of green building are:

1. Optimal usage of different materials and energy and water resources.
2. Application of green building materials.
3. Minimization of wastes and adverse environmental impact in general.
4. Usage of material of local origin. It performs for pollution by vehicles during the transit.

---

\*Corresponding author: [nezhnikovaev@mgsu.ru](mailto:nezhnikovaev@mgsu.ru)

5. During the construction and operation "green" try to use first of all renewable energy sources (solar energy, air masses and the energy contained in the bowels of the Earth).

6. Materials with good energy efficiency and conservation are in consumption.

One third of all consumed in the world energy is spent on maintaining the required temperature inside buildings and on their illumination. Experts claim that it is possible to save nearly half of energy resources if put "green" architectural constructions into operation gradually [2, 3].

## **2 Methods**

Construction branch far "not leader" positions in terms of the generation of wastes of production and consumption due to the sector statistics.

In particular, the level of production and consumption wastes in the branch "Building" is about 17.6 million tons in 2014, while the level of production and consumption wastes for the branch "Extraction of commercial minerals" is 4807.3 million tons respectively. However, this fact doesn't mean safety and environmentally friendly housing.

Special focus should be paid to construction waste, because it has IV hazard class and must be disposed with compliance of all safety requirements. In particular, before the import to the landfill, wastes must undergo the mandatory radiation monitoring. But in modern conditions in Russia, developers often export the construction wastes to the illegal dumps or the use pathological waste in the construction of other facilities. In this connection, finished housing stock will be environmental hazard for the future tenants [4].

In Europe, at this, processing and subsequent use of construction waste is a common practice, because processing and recycling is cheaper than storage in landfill. Unfortunately, situation in Russia is opposite, when disposal and recycling of construction waste is costlier process than the removal of construction waste and foregoing disposal in landfills.

Housing problem stated above is systemic. That's why ecological safety of housing construction is nothing but as an integral part of the global concept of sustainable development.

It should be noted that the research of housing construction ensuring with environmental friendliness must be based on the correctness of formulation of question about extent of their environmental friendliness. It's all about housing project that in not built (in practice) can be absolutely environmentally friendly (even in theory). Since every production process has negative impact on the environment, the only question is its impact. That's why only the negative impact on the environment and / or human body (permissible exposure) must be discussed in all the cases [5].

## **3 Results**

Stated above allows author to identify a number of global tendencies in the renewal of "green building" standards and claim that there is no unified system of certification and accreditation and no common principles for all market participants in the World Green Building Council.

Therefore, if the developers / investors try to ensure compliance of the new unit to the LEED or BREEAM systems for any reason, they have to approach to accredited on these questions certifiers and ensure compliance with these standards [6].

In accordance with established international practice real estate unit must comply with all defined quality standards and be certified by one of the following national systems (table 1) to be officially called the "green" one [7, 8].

**Table 1.** Criteria and points of some national systems of standardization of ecological construction

Country	System name and year of its creation	Criteria	System of scoring
United Kingdom	BREEAM (Building Research Establishment Environmental Assessment Method-1990)	Management Energy usage Health and wellness Pollution Transport Land tenure Ecology Materials Water	Satisfactorily Good Very good Excellent Outstanding result
Germany	GSBC (German Sustainable Building Council-2008) from the DGNB (Deutsche Gesellschaft für Nachhaltiges Bauen)	Quality of the environment Economic benefits Social benefits Quality of the solution of technical questions Process management quality Location of the building	Bronze Silver Gold
Singapore	Green Mark (2005)	Energy efficiency Water consumption. Environmental protection Quality of the internal environment Environmental innovations	Certified Gold Gold + Platinum
USA	LEED (The Leadership in Energy Environmental Design-& 1998) from USGBC (U.S. Green Building Council)	Stable platforms Water consumption effect Energy and atmosphere Materials and resources Quality of the internal environment Innovation and design Regional bonuses	Graduated (certified) Bronze Silver Gold
France	HQE (1996)	Buildings and surroundings Comprehensive range of materials and techniques Careful building methods Energy consumption management Water consumption management Wastes and repair Visual comfort Quality of the air inside Water quality Sanitation	Base Good result Very good result
Japan	CASBEE (2002)	Q (Environmental Quality) Internal Environment Quality of services OM State outside the building L (load on the environment) Energy Resources and materials Environment outside the territory	C (weak) (B) B + (A) S (excellent)

Also the advantage of the LEED system, which is in its priority focus on criteria of quality and sustainability of the housing stock should be noted. Author believes it's very important for the native housing construction (especially in terms of environmental pollution), though it is time-consuming and difficult to perform [7, 9].

The results of research conducted by us suggest that in a variety of voluntary certification of green building materials, structures and technologies construction of housing is not compulsory routine (protocol) procedure. Unfortunately, this choice depends entirely on professional competence and conscience for the implementation of civil duty by the designers [10].

Therefore, it's necessary to bring in the prescribed manner the provision on mandatory certification of housing by the independent from the builder and developer organization to the Construction and Housing Code to enhance the feasibility of the construction of "green buildings" in housing. Such certifying organization in terms of legal form, may be authorized by either a state or a private company.

## **4 Discussion**

The result of the author's research is the development of the organizational-economic mechanism to ensure sustainability of the housing stock. The main objectives of a mandatory environmental certification should include:

- control of ecological safety of the housing stock for the environment and life and health of the people who live there as a conformity assessment procedure of design technologies, structures and materials of environmental safety;
- assistance to population in competent choice (expertise, consultations, explanations, etc.) of the housing stock, which was claimed as green by the developers;
- Protection of citizens-consumers from unscrupulous developers and builders (for example, from green washing), including quality assessment of the project and construction, expert opinions preparation and participation in court proceedings;
- protection of developers and construction companies of housing profile from unsubstantiated claims of citizens-consumers, including expert opinions preparation and participation in court proceedings.

Imputation of mandatory certification of the institute to ensure sustainability of the housing stock by including in Art. 5 Sect. II "Empowerment" of the Provision "On the Federal Service for Supervision of Consumer Rights Protection and Human Well-being" in economic practice allows to ensure higher rate for the "green buildings" in housing.

## **5 Conclusion**

Expediency of the construction of "green buildings" in housing construction is the increase in life expectancy and productivity of the population. Widespread development of real "green housing" rather than "green washing" allows:

- to implement new environmental, green, energy-efficient and energy-saving construction technologies and production of green construction materials);
- improve the environmental safety of housing both during construction and during the whole life-cycle (including compliance with environmental safety and prevention of environmental pollution at placing, processing, transportation, disposal and burial of industrial and consumer waste).

## **References**

1. M.Nazari, R. Mehdi. Pacific Science Review. **22**, (2016)
2. N. Ivanov. Procedia Engineering, **153**, 228-231, (2016)
3. N. Ivanov. Appl. En. Res., **10**, 42415-42418, (2015)

4. Yang, B., Xu T, Shi L. Journal of Cleaner Production, **141**, 868-880, (2017)
5. Report of the United Nations Conference on Environment and Development. Rio de Janeiro, 3-14 June 1992 T.I. United Nations, New York, 528, (1993)
6. Charter for sustainable development of European cities. The documents of the European Conference on Sustainable Cities. Olsborg, 28, (1994)
7. V.Dikareva, N.Voytolovskiy. Procedia Engineering, Volume 165, 1197-1202, (2016)
8. J. He, J. Wu. Regional Science and Urban Economics, **57**, 46-53,(2016)
9. Dieci R., F.Westerhoff. Journal of Economic Dynamics and Control, **71**, 21-44,(2016)
10. Y. Jin, L. Wang, Y. Xiong, H. Cai, Y.H. Li, W.J. Zhang. Energy and Buildings, **85**, 155-164 (2014)