ENERGY EFFICIENCY IN BUILDINGS

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Introduction. Generally existing buildings are responsible for over 40% of the world's primary energy consumption and account for 34% of world CO2 emissions. Currently, most of the housing fund of Kazakhstan falls on old energy inefficient buildings constructed during the Soviet Union, in a period between 1956-1989, is found to be inefficient by international standards. Their energy consumption reaches 13.5% and 24% of electrical and heating energy consequently. At the same time the statistical data of 2009 shows that the housing fund of Kazakhstan is about 160 million square meters and it projected to continue growing in the next 5 years. The expected increase in housing construction will lead to higher energy consumption coming from space heating and air-conditioning systems, higher GHG emissions, and development of unsustainable energy supply that will result to energy insecurity.

Methodology. In this regard new and existing dwellings are key components to tackle ineffective use of energy in the built environment. The current project is sponsored by the Ministry of Science and Education and aims to develop scientific recommendations for designing of energy efficient and multi-comfort buildings in accordance with different climatic zones of Kazakhstan.

For the first year of implementation the following activities had been planned:

- The review of the existing situation in the construction field through literature review
- A detailed analysis of the national legal and regulatory framework in the field of effective use of energy and energy conservation in construction industry
- An analysis of existing databases of energy auditing of buildings in RK
- Development of a model of energy efficient school in the building modeling and simulation software
- Energy survey of several objects in Astana
- Development of measures portfolio to improve energy efficiency in housing sector.

Results and discussion. Analysis of the existing building codes has shown that there are discrepancies in the initial and eventual climatic parameters that significantly affect the final results while designing the project. To form a correct data for projecting energy consumption of the dwelling it is necessary to introduce amendments to local building codes according to the international experience in the field of indoor microclimate. It is essential to harmonise the local codes for windows structures with neighboring countries as they have higher requirement. For example, the thermal resistance of translucent structures in Russia should be between 1.0-1.05 m2C/W starting from 2016, and Republic of Belarus has set a target of 1 m2 for thermal resistance for translucent structures and balcony doors.

It is necessary to introduce the practice of labeling and rating construction materials according to 7 scale system in order to inform consumers about their performance characteristics and their energy intensity (A- for energy efficient, G - for energy-intensive).

The project of a secondary school has been modeled in computational software TAS Engineering, and its energy end financial effectiveness have been analysed. For the given conditions three systems were observed: a) heating and ventilation system, with fancoils (FCU), b) heating/ventilation system on constant air volume (CAV), and c) system with mechanical ventilation and central heating with air preheating. The third option proved effective and economically feasible. The general plan of recommendations for energy efficient school design is developed on the basis of the model.

Conclusion and recommendations. A comprehensive analysis on indoor comfort, energy and economic efficiency of construction objects should be implemented at the pre-stage design. The amendments to the local building codes should be introduced.