

An investigation about the adverse effects of un-implementation of global building code on energy saving in building in view of urban management

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Abstract— The excessive consumption of energy is one of the critical problems of the world. While the experts are continually looking for a solution of the problem in long last years, this is still a problem. The current study is aimed to investigate about the adverse effects of un-implementation of global building codes on energy consumption in building in view of urban management. Meanwhile, a descriptive-survey method of research is adopted to perform the study and data collection is performed by attributive and survey method.

Index Terms—Urban management; Energy saving; Building; Global building code; Critical problems; Energy consumption; Descriptive-survey method

1 INTRODUCTION

Energy is one of the most important, valuable and strategic issues around the world in current century [1]. All countries are looking for more contribution in energy resources by programming and considerable investment [2, 3].

The optimizing energy consumption is defined as the selection of models and use of methods and policies to proper consumption of energy so that it is acceptable in view of global economy and guarantees the continuity of energy resources availability and life [4-11]. In this framework, it is desired to determine the contribution of different types of energy in energy basket of any society in regards to long time abilities of the society, and also to use of the most efficient model of consumption to ensure that damage of energy resources are reduced and adverse effects on environment induced by misuse of energy are attenuated [12-15].

The proper use of energy is not only ensure the continuous and stable development of society but also leads to conservation of energy for futures and prevents the pollution of environment induced by improper use of energy [16]. In domestic section, it can be possible to prevent the loss of energy by optimized use of energy consumed apparatuses [17, 18].

Energy consumption is considerably increased in last decades which resulted from economic growth and increase in transportation of materials and outcomes and also may be due to low price of energy which leads to inattention to energy saving in our country [19-27]. After energy crisis in 1974, increase in price of crude oil and energy led to change in energy consumption models, systematically, in countries which have not oil resources [28-30]. As a result, oil consumer countries are looking for new types of energy to replace fossil fuels in addition to energy savings and best use from the available resources of energy [31]. Proper use of energy was the goal of countries with no resources of fossil fuels and as a result, they focused on optimizing the energy consumption in residential buildings as one of the most important sections of energy consumption [33, 34]. In recent years, many countries including Germany, Sweden, Italy and England are set special laws in construction projects and use of thermal insulations, heating and cooling methods and general structure of building to optimize the energy consumption. Interestingly, an energy saving of about 30% is obtained as a result of such laws [35-39]. Considering the present buildings in use which are not in acceptable situation in view of energy consumption, basic renovations should be performed to improve the level of energy consumption [40-43]. It is necessary to have a method to evaluate the energy consumption in a building and to recognize the resources of energy loss [44, 45].

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2 HISTORY OF PRORAMS AND STUDIES OF ENERGY SAVING IN THE WORLD

The developments of technology and industries lead to more need to fossil fuels and power. In fact, the life without energy is very troublesome and in some conditions, is impossible. At the other hand, the role of energy in today world in very crucial due to increasing rate of population. Recently, many countries are looking for to new resources of energy such as nuclear energy. The cost of derivation or collection, transportation and energy conversion is very different. Some types of energy, especially fossil fuels, are available with current technology. However, for other types of energy such as renewable resources of energy and advanced types of nuclear power plants (e.g., LMFBR/FBR and nuclear fusion) the technologies are in first steps.

By increasing rate of population and very fast increasing rate of energy demand (especially in developing countries), it is very difficult to find the necessary resources of energy. It is expected to continually increase of the energy demand. Such increasing rate of population makes huge competitions accompanying by huge opportunities for initiative, compatibility with environment and innovations. Even if the per capita income has slow increasing rate, the increase in population leads to increase in energy demand.

USA was the largest consumer of energy in the world during last years. The energy consumption in this country was higher than the total energy was used in Russia and China. In last year, the energy used in USA was the 23% of total energy that used in the world. Energy Information Agency was reported that in 2007, the energy consumed by Americans was equal to the energy used in five most energy consumed countries in the world. According to the available reports, top five most consumers of energy was USA, China, Russia, Japan and India.

The lowest per capita energy consumption were assigned to Bangladesh, Eritrea, Senegal, Haiti and Congo. Qatar, a rich and thin country, has the highest per capita energy consumption around the world equal to 21395 kg. The top five most per capita consumers of energy are Qatar, Iceland, UAE, Bahrain and Luxembourg. Per capita energy consumed in USA is estimated as 7800 kg. While USA is the largest consumer of the energy in the world, per capita energy consumption in this country is considerably lower than Qatar. The energy productivity methods in current human societies are shown that there are two general solutions to obtain the energy productivity in consumer side:

- (a) Improving the quality of products in view of energy consumption;
- (b) Replacement of cheap energies with costly energy.

This way, accounting for the problems and costs of energy transportation, environmental pollutions and the price of fossil products in and out of country, can obtain economical

productivity for both producer and consumer. Comparison of gross national product and capacity of electrical energy production in more than 100 countries have shown that there is a direct link between the measure of electrical energy and welfare of society. It should be noted that this is not in opposite of principal issue, since the important target of consumption and production management programs is not necessarily the reduction of consumption but is the increase in productivity. Using the more productive apparatuses, it can be possible to considerably save the energy. During recent years, the mandatory laws of construction standards for structures, increase in price of energy and gradual and natural penetration of new technologies in production process led to considerable saving of energy in industrial countries. In USA, during 1993 and 2000, such issues resulted to 8.5% saving in energy.

3 RESULTS AND DICUSSIONS

In model of energy consumption in the country, residential and commercial sections are the most principal consumers of the energy compared to other sections such as industry, transportation and agriculture. Considering to different types of energy consumptions in residential and commercial sections, the largest contributions are cooling, heating and ventilation systems. Therefore, it can be found that about 15-20% of the total energy consumed in the country is related to heating, cooling and ventilation of buildings. As a result, it is necessary to evaluate the pattern of use of heating, cooling and ventilation systems in buildings. To saving energy in heating, cooling and ventilation systems in buildings there are numerous issues such as functional improvement of buildings, wall, roof and floor insulations, reduction in area of windows and use of seamless doors and windows and double walled windows, setting of hot and cool water temperatures and use of suitable controlling systems or setting of them, as possible. For example, it can be shown that the construction of a building with area of about 90 m² with following the principles of heat loss prevention, namely use of insulation, double walled windows and wooden doors other than metal ones lead to 22.1%, 7.8% and 3.2% energy saving, respectively. The recognizing the resources of energy loss in buildings and in cooling and heating systems are possible with energy auditing. Energy auditing is, in fact, the evaluation of situations and method of energy consumptions and is operable in different levels. These levels are including elementary energy auditing, short term energy auditing and comprehensive or detailed energy auditing. The selecting of each level is depend on the building situation and determined targets for saving and they are differentiated in view of cost, time and number of skilled workers. Anyway, some of the most important issues in energy saving which should be considered in energy auditing (in all levels) are listed as:

- (a) Selection of suitable equipments with enough capacity (with safety factor lower than 10%) in new build-

ings and replacing old equipments with more efficient ones in present buildings.

- (b) Use of measuring and control systems to ensure from proper efficiency of equipments and continuous monitoring and preparing and installation of them if they are not presented in buildings.
- (c) Full analysis of energy consumption optimization in cooling and heating systems.
- (d) Setting the controllers so that there is not general impact on other characteristics of system.
- (e) Insulation of cool and hot water pipelines and air ventilation channels.
- (f) Preventing from leakage and inspection of entraps performance.
- (g) Use of insulated tanks to storage of hot or cool water in non-peak times.
- (h) Performing periodic combustion analyses and setting the temperature of hot water and steam torch or other combustion systems torches.
- (i) Maintenance of thermal convertor levels.

However, it should be noted that some of these methods such as double walled windows or use of wooden doors are costly which unfortunately, there need a long time to return of investment due to low costs of energy compared to other costs. In the current study, using the data derived from standard questionnaires, an investigation was performed about the adverse effects of un-implementation of national building code in view of urban management. After accreditation of data in questionnaires and analyses of responses, results are obtained and discussed and finally, functional recommendations are provided and some proposals are proposed to future studies. According to the results, it is recommended that responsible institutions follow more effective supervision patterns. In addition, motives and preventing methods to confute contractors should be designed and reduced the cost of the project, as one of the obstacles in full implementation of the law, by domestic products and use of low cost materials. Practical issues which are recommended, especially for municipalities, are listed as following:

- (j) Construction of a example model of energy saving building.
- (k) Creation of native and cheap standard construction materials exhibition.
- (l) Creation of optimizing energy office in municipalities.
- (m) Energy auditing and performing the resulted models in public and governmental buildings.
- (n) Review of national building code.
- (o) Creation of suitable media to easy performing of code.
- (p) Determining and prophecy of disciplinarian code for offenders.

- (q) Introducing the responsible office and direct in charge office for performing laws to contractors.
- (r) Use of industrialized construction technologies in the country.
- (s) Performing continuous periodical educations to executers of law.
- (t) Tuition of law in academic references.
- (u) Use of new technologies.

4 CONCLUSIONS

In the current study, by an overview to responses of managers and contractors of construction projects, it was found that following issues can be very helpful to better and effective performing of the law: a) full performing of the law by direct responsible systems, b) continuous and correct supervision of the performing of law, c) presence of practical guarantee of the law, d) reducing the costs by educating and creating the experienced workers, e) producing standard, cheap and available materials and equipments, f) continuous and correct education to contractors, managers and supervisors of the law, g) culture making for the law among the people and who are get involved in construction projects, h) use of new technologies in this industry, i) enough clearance in law during performing, j) preventing high costs to building which in turn has a preventing effect on contractors for implementation of the law.

5 FUTURE STUDIES

It is recommended for future studies that commercial (gross) construction or private construction to be considered as an effecting factor and also more attention paid to cultural effects in this field as an active factor in energy saving. Finally, due to value and legal position of the issue and possibility of programming for who are get involved in this field, some recommendations are proposed for future studies as:

- (a) Study about industrialized construction and state of the art technologies.
- (b) Investigation of Asian countries experiences in use of new energies in building construction.

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