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Abstract. The services sector within which is also the Health Sector is a sector with particular importance given that the majority of consumers in this sector are public services consumers. Under Directive 2006/32/EC this sector should play promoter role of developments in terms of improving energy efficiency. Given the fact that many projects in the field of energy efficiency mainly funded by donors aimed the Public Health sector because besides achieving energy savings there should also be reached the comfort level within the building as most of the Health care buildings in Kosovo lack the basic comfort level regarding internal temperature, air flow and lighting.

Keywords: Energy auditing, Health sector, Public buildings

1 Introduction

Most of the Hospitals and Family Health care Centers in Kosovo are built between 1970-1990 therefore they present low thermal insulation properties as the building codes at that time had little or no consideration for thermal transmittance. Hospital buildings are in general not provided with outside walls insulation while windows are mostly wooden double pane window or with aluminum frame. Central heating system is the most used heating alternative. This paper aims to define energy consumption in these buildings and to analyze actual projects regarding implementation of energy efficiency measures and application of the renewable energy resources. The work will be based on the findings of relevant studies and energy audits for energy consumption for heating, cooling, cooking, water, sanitation, electrical equipment and economic feasibility of efficiency measures being taken during renovations of buildings. The paper will also give recommendations on what should be done to lower energy intensity of these buildings.

2 Health Care Building Stock

Energy consumption in buildings differs from:

- Age of the buildings (construction materials)
- Function-usage
- Geographical location
- Equipment installed regarding heating, cooling, lighting and other.

Most of the public buildings including Health care buildings are built before 1999. Due to the construction year, these buildings present low thermal insulation properties. If built before 90-ies, the most common building material was full brick (1960), perforated (hollow) brick during 1970-ties and 1980-ties. There was no thermal insulation introduced in building envelope.
However, during the last decade Health care buildings among other public buildings have gone through a refurbishment process with mostly windows being changed with new PVC double glazed or wooden frame double glazed.

The total number of building stock as to the Kosovo Statistical Agency is 1440. It is divided to:

- 10 Clinics
- 7 public hospitals
- 24 private hospitals
- 477 public centers of family medicine
- 922 private laboratories and dispensaries

As the major part of buildings in health subsector belongs to periods 1961-1980 (35 %) and 1981-1999 (24 %). However a considerable part of buildings (26 %) which belongs mainly to the private sector are constructed in the period after 2000.

3 Energy Consumption

The last few years there were several Energy audit projects conducted from Donors and Kosovo Government. Health care building from public sector were on focus of these audits. Also Ministry of Economic Development conducted "Study on Distribution of Energy Consumption and Possibilities for Energy Efficiency". The outcomes of these projects show the followings.

3.1 Specific Energy Consumption

Consumption of energy in buildings differs from the size of building, number of clients (patients), heating/cooling process etc. In order to have a comparative instrument, energy consumption is given as a ratio of energy per heated area or energy per patient/client. As the sources of data are more reliable for heated area it is decided to have the sum of all energy consumers as specific energy consumption measured per year. In other terms it is given as kWh/m^2/year. A survey conducted from Studio LINKS 4 shows the following findings:

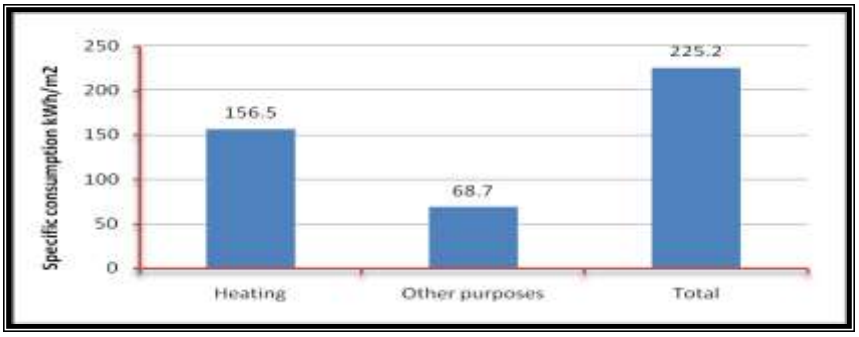

Fig.1 Specific consumption for heating purposes, other purposes and total specific consumption in the health sector

With 156.5kWh/m^2/year normally it should indicate that buildings are operating in relatively good working conditions if we take under consideration that Health care buildings usually operate 24 hours a day. However the findings from Detail Energy Audits conducted only in public owned buildings, show higher specific consumption in buildings.

Table. 1 Specific heat consumption before, after and savings

	Building	Specific heat consumption before EE [kWh/m2/ann]	Specific heat consumption afterEE [kWh/m2/ann]	savings [kWh/m2/ann]
1	QKMF, Rahovec	318	193	125
2	Ndërtesa e Hemodializes, Prizren	323	273	50

3	Ndërtesa e Infektivës, Prizren	299	169	130
4	Instituti Special, Shtime	387	226	161
5	Ndërtesa e Internos, Prizren	323	273	50
6	Ndërtesa Qendrore e Spitalit, Prizren	303	213	90
7	QKMF, Lipjan	243	152	91
8	Spitali Rajonal, Ferizaj	372	260	113
9	Blloku Internistik, Pejë	420.97	289.41	99.68
10	Blloku Kirurgjik, Pejë	213.13	171.68	41.45
11	QKMF-Emergjenca, Mitrovicë	272.4	127.38	144.6
12	QKMF, Drenas	355	148	207
13	Ndërtesa e Instituteve, Prishtinë	291	141	149
14	Klinika Gjinekologjike, Prishtinë	435	178	257
15	Klinika Kirurgjisë, Prishtinë	301	149	152
16	Klinika Ortopedisë, Prishtinë	370	166.9	203.1
17	Klinika Neurologjisë, Prishtinë	317	198	119
18	Klinika Infektive, Prishtinë	243.7	150.2	93.5
19	Ambulanca Specialistike, Pejë	369.56	275.07	84.54
Konsumi per tere sektorin		**324.04**	**197.56**	**124.26**

The data shown in the above graph were taken during survey and represent the reported energy consumption for the existing conditions in building. On the other hand the data from Table 1, (Energy auditing reports) show specific energy consumption normalized for comfort conditions in the building. The difference between these two sources indicates that Health care buildings are operating under standard comfort which is an internal temperature of 20-22^{0}C. This comes as a result of:

- Not insulated building envelope
- Old windows
- Inefficient Heating/cooling system
- Not efficient lighting system

3.2 Distribution of Energy Consumption

Energy consumption in buildings is distributed among main consumers such as space heating, sanitary water, equipment etc. As in other sectors from Public Sector Buildings, Health Care buildings consume the vast of energy for space heating. The survey shows the following findings:

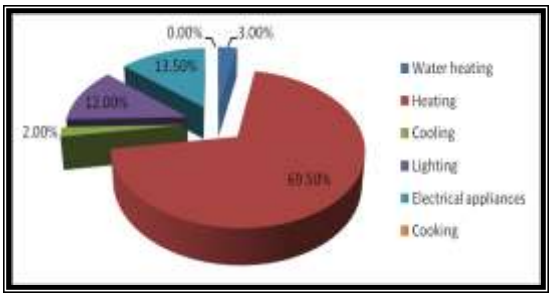

Fig. 2 Energy distribution as to the "Study on Distribution of Energy Consumption in Services Sector and Possibilities for Energy Efficiency Improvement"

Similar results are given from energy auditing in public buildings.

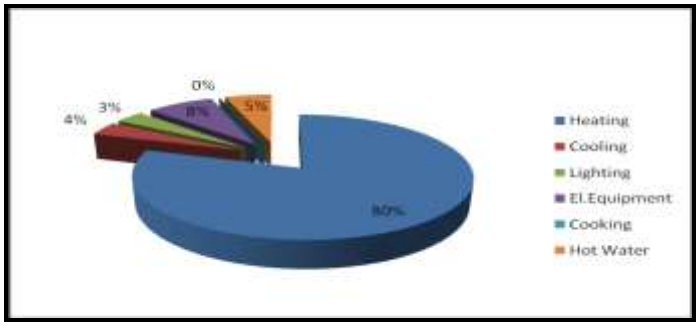

Fig. 3 Energy distribution as to the "Study on Distribution of Energy Consumption in Services Sector and Possibilities for Energy Efficiency Improvement"

It indicates that the Energy is mostly consumed for Heating and then other consumers are aproximatly evenly distributed.

Although public Health care buildings use dominantly the central heating system in buildings yet in other hand they lack of central hot water boilers while they use electricity for heating of sanitary water. In relation to sanitary water heating it is worth mentioning also the low percentage of solar energy use for this purpose (only 1 %). This indicates the high potential for energy saving which can be realized by installing solar panels for water heating in this subsector.

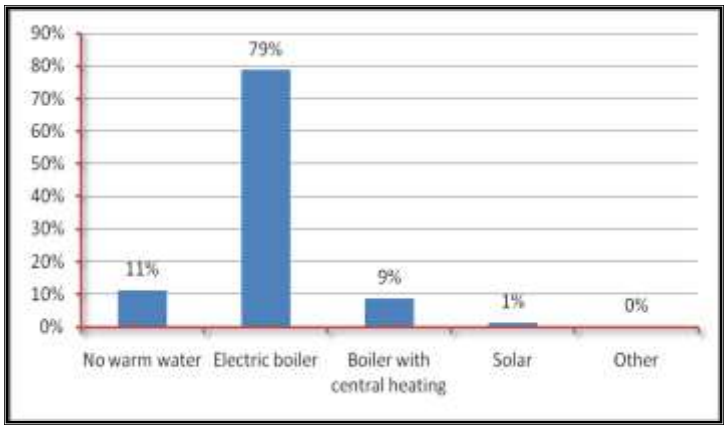

Fig.4 Water heating mode in health subsector as to the "Study on Distribution of Energy Consumption in Services Sector and Possibilities for Energy Efficiency Improvement"

3.3. Energy saving potential

The high values for specific energy consumption for comfort conditions indicate that there is also a huge potential for saving energy. If the highest consumption of energy is for space heating then saving potential should be within the same category.

There are two main groups recommended for energy efficiency:

- Group of measures for reduction of heat load
- Group of measures for reduction of hot sanitary water load.

From the results of this survey and from existing studies in the field of energy efficiency, it was concluded that buildings in Kosovo that are constructed after 2000 are very well build regarding energy savings and the practice of this kind of buildings is growing.

The focus is more concentrated to the buildings constructed before 1999 where the JUS standards of that didn't enforce the energy saving and also the market was poor regarding the thermal insulation materials.

3.4. Measures for reduction of energy demand for heating

In order to reduce e heat load following measures must be implemented:

- Thermal insulation of external walls of buildings
- Replacement of windows and external doors with higher quality regarding the heat efficiency
- Thermal insulation of the ceilings
- Thermal insulation of the floors (this measure has to be thoroughly examined since the floors that are in contact with ground has small difference of temperature therefore heat loss are not high; on the other point of view the return of investment for renovation of floors is taking longer time) and
- Replacement of insufficient heating systems with those who have higher efficiency.

3.5 Application materials and their presence in local market

Local market is rich enough with all kind of materials necessary for application regarding the energy efficiency. Most of those materials are imported but some of them are also produced in the local factories or they are taken as a raw material or semi-manufacture and are processed in local factories for final use or trade.

4 Conclusion

Presented results in this paper show that energy consumption for the need of heating is the highest share of the total consumption for Health Care building sector. Therefore, the focus of institutions for improvement of energy efficiency must be on the tentative for improvement of thermal characteristics of buildings in this sector.

Based on the trend of energy consumption and in the experience of the regional countries some of the measures that are recommended for Kosovo are:

- Drafting a program for renovation of public buildings of services sector
- Implementation of schemes (procedures) for certifying of buildings regarding the energy performance
- Application of solar panels and geothermal heat pumps in public buildings.

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3. **NNP Studio Links 4:** Programi mbështetës – Auditimi I Energjisë në ndërtesat e shërbimit Publik