The challenges, dynamics and activities in the building sector and its energy demand in the Republic of Serbia

D2.1 of WP2 from Entranze Project

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The ENTRANZE project

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Project consortium:

	EEG	Energy Economics Group, Institute of Energy Systems and Electrical Drives at Vienna University of Technology
	NCRC	National Consumer Research Centre
	Fraunhofer	Fraunhofer Society for the advancement of applied research
	CENER	National Renewable Energy Centre
	eERG	end use Efficiency Research Group, Politecnico di Milano
	Oeko	Öko-Institut
	SOFENA	Sofia Energy Agency
	BPIE	Buildings Performance Institute Europe
	Enerdata	Enerdata
	SEVEn	SEVEn, The Energy Efficiency Center

The ENTRANZE project

The objective of the ENTRANZE project is to actively support policy making by providing the required data, analysis and guidelines to achieve a fast and strong penetration of nZEB and RES-H/C within the existing national building stocks. The project intends to connect building experts from European research and academia to national decision makers and key stakeholders with a view to build ambitious, but reality proof, policies and roadmaps.

The core part of the project is the dialogue with policy makers and experts and will focus on nine countries, covering >60% of the EU-27 building stock. Data, scenarios and recommendations will also be provided for EU-27 (+ Croatia and Serbia).

This report provides an overview of the building stock of Serbia and its related energy demand. It includes main buildings characteristics, space heating and cooling systems and energy consumption and is based on data collection that was carried out during WP2.

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Some definitions/scope of country report

The building sector, as it is subject of this report, refers to two main categories of buildings: residential buildings and non-residential buildings. Whereas residential buildings are relatively homogenous and can further be divided into single/two-family houses and apartments blocks, non-residential buildings are more heterogeneous. They refer to buildings in the service or tertiary sector and include several building categories (esp. office buildings, hospitals, schools and universities, hotels and restaurants, buildings in wholesale and retail trade). Within residential stock, we consider only permanently occupied dwellings.

Floor area: The floor areas do not take into account the gross floor area in the average surface per dwelling, i.e. it does not consider the common areas in multifamily buildings (e.g. corridors, etc.).

Specific consumption for space heating is calculated at normal climate: it corresponds to the energy consumption required to heat one dwelling on average, it is calculated in final energy.

Central heating systems: it includes district heating, block heating, individual boiler heating and electric heating, implies that all the rooms are well heated, as opposed to room heating, where generally a stove provides heat to the main room only.

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1. Building characteristics

1.1 Building sector

The total building stock area in the Republic of Serbia is about 197 Mm^2 from which about 164 Mm^2 is related to residential building stock and the rest relates to service sector. In the residential buildings live about 7,2 million inhabitants. In total there are about 2.5 million dwellings, from which about 47% are in multi family buildings and 53% in single family houses. In terms of residential floor area, multi family buildings have about 45 % and remaining 55% comes to single family ones.
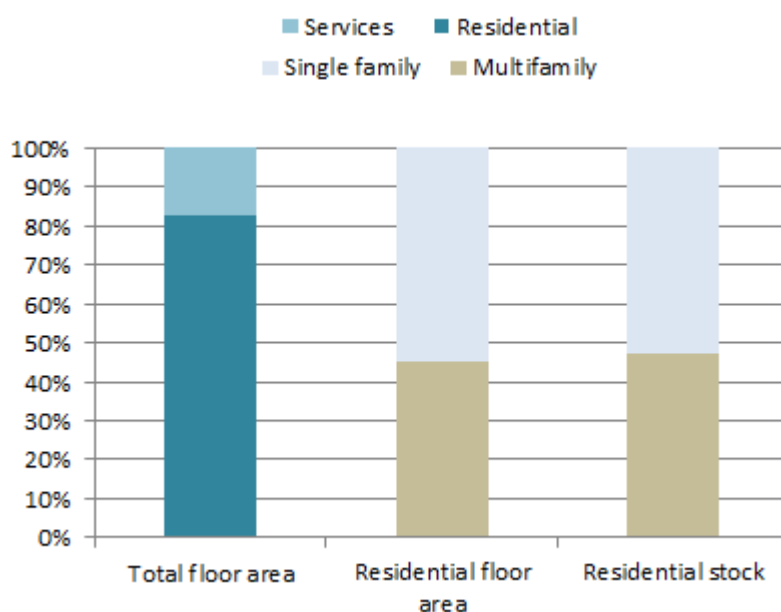
Figure 1: Decomposition of buildings by type (2010)
Source: National Statistics of Serbia and experts estimation

Table 1: Decomposition of dwellings by type (stock and floor area, 2008)

	Stock (k)	Floor area (km2)
Total Residential	2469	163755
Multi-family	1166	74181
Single-family	1303	89575
Service		33592

Source: National Statistics of Serbia and experts estimation

Between 2000 and 2008, 39874 of new residential buildings have been constructed, accounting 9.32 Mm^2 of floor area. Data for service sector are not available.
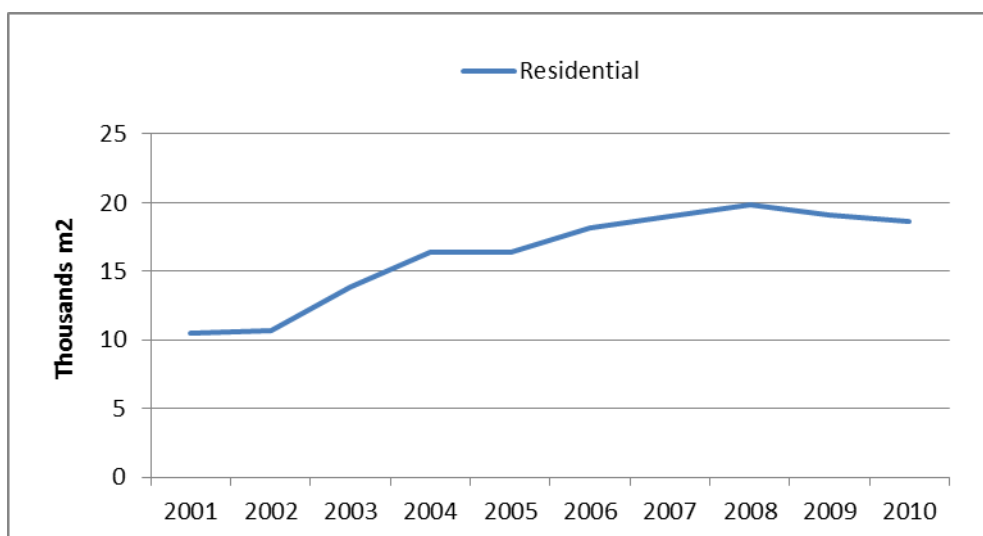
Figure 2: Dynamics of building construction
Source: Statistical Office of the Republic of Serbia

1.2   Residential sector

The average age of buildings and the share of new buildings in the total stock represent a good indicator of the quality and standards of construction.

Following the 1973 international energy shock, the flow of international financing to Yugoslavia increased, spurring a boom in housing construction. Houses were built based on the promise of cheap energy. This pattern continued in the 1980s. The combination of relatively inexpensive energy and building materials (bricks, cement and concrete) and a lack of knowledge led to the construction of houses with poor thermal characteristics. 42% of the buildings were constructed in the period 1971-1990.

In 1987 new normative requirements were applied and the thermal requirements were increased with about 17.2% .

The distribution of the residential dwellings per construction period is presented in Figure .
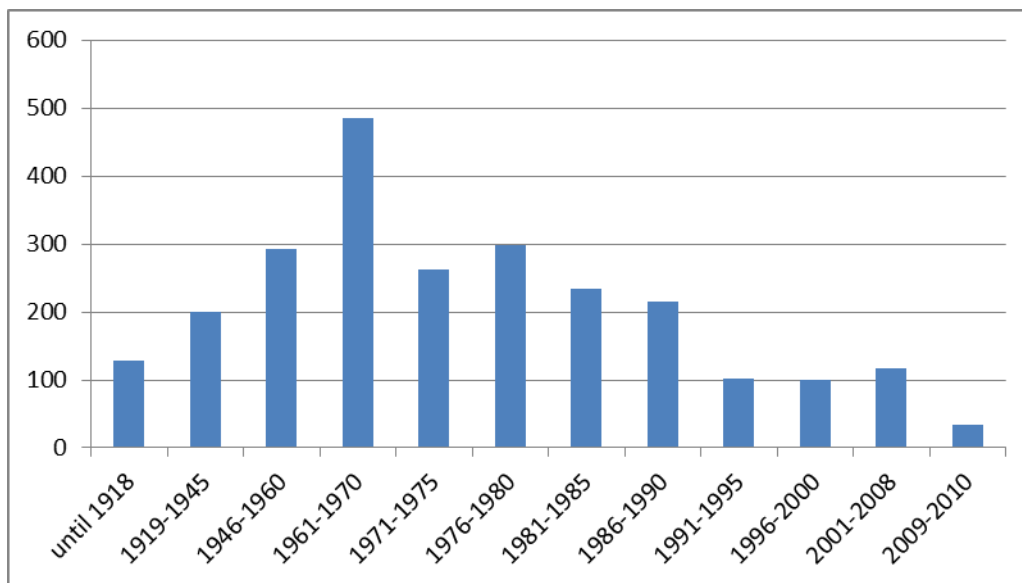
Figure 3: Residential dwellings according to construction date (2010)
Source: First Action Plan for Energy Efficiency (2010-2012)

Figure 4 shows the U-values thatmeasure heat loss in building elements: wall, floor, windows or roof, i.e. how well the buildings components are insulated. In the Republic of Bulgaria, U-values have decreased in several periods but most significantly after 1999 when Ordinance 1 for design of heat insulation of buildings were adopted. After that the requirements were strengthen in 2004 and 2009.
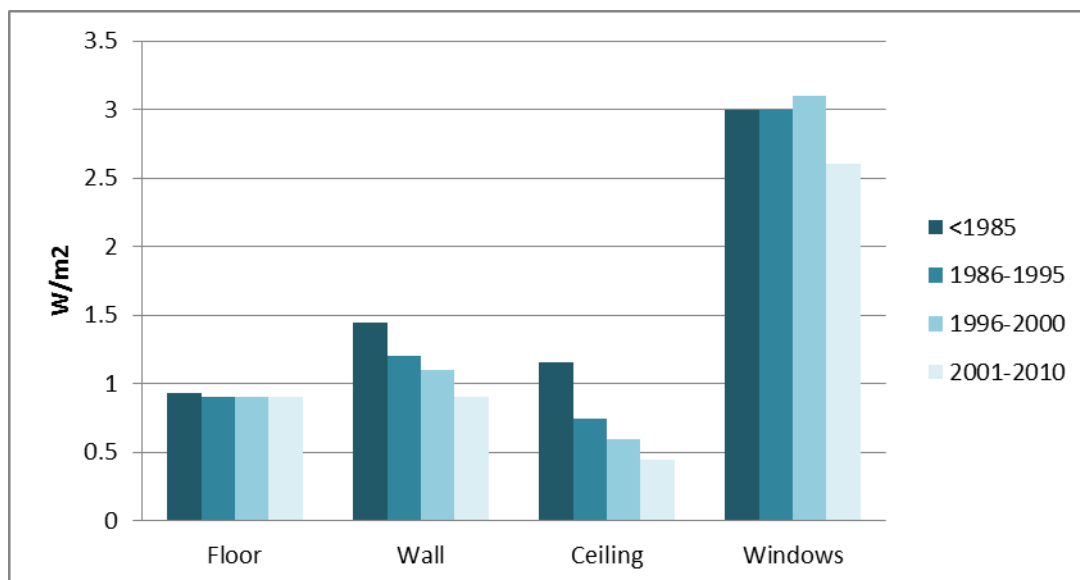
Figure 4: U-values by construction period (multifamily and single family, 2011)
Source: National Statistics of Serbia, SRPS U.J5.600 (Serbian standard)

1.3 Service sector

Education (32%) and wholesale and retail trade (about 21%) represent the highest share of total service sector floor area in 2010. Offices (18%) follow. Other types of buildings have about 29% share.
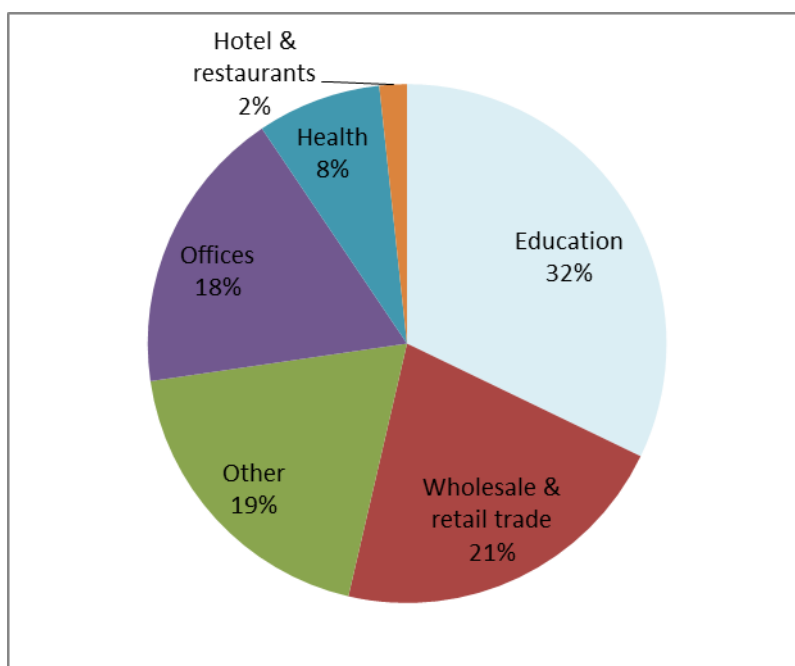
Figure 5: Decomposition of service building areas by type (2008)
Source: SOFENA's experts estimates

2. Space heating and cooling systems

Dominating energy source for space heating (especially for single family houses) is coal. District heating covers densely populated urban area and has 18% share. Coals are cheap and still used mainly in single family houses and rarely for public buildings. Gas network for residential building has lowest share together with oil.
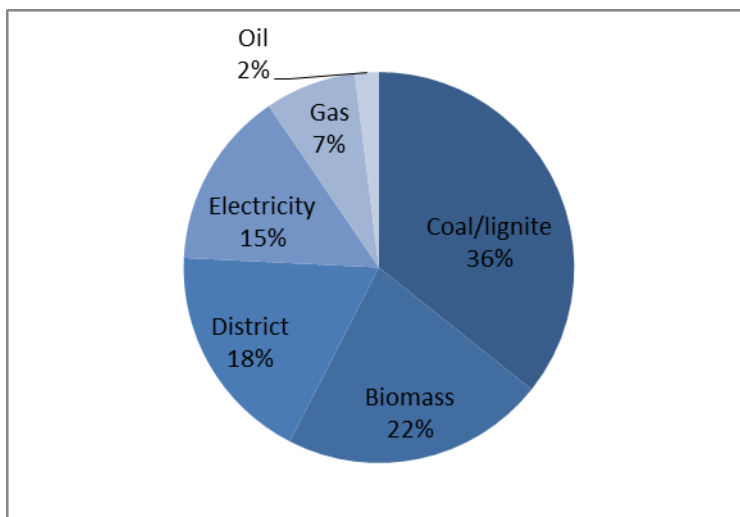
Figure 6: Dwelling stock according to space heating systems by energy (2002)
Source: Dr Slobodan Ruzic, Energy Saving Group ltd .Belgrade, Serbia

Figure 7 shows the penetration of heating systems. In the Republic of Serbia room heating has an high share (70%) as due to the fuel poverty it is common that not all rooms in the dwellings are heated.
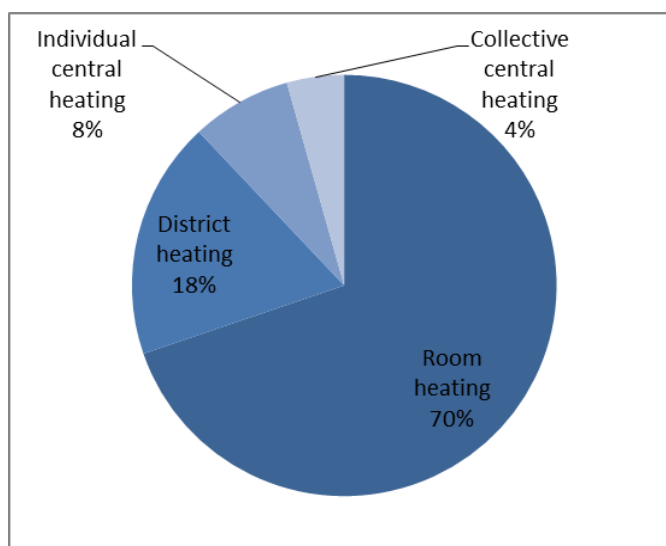
Figure 7: Dwellings according to centralisation of heat supply (2002)
Source: Republic of Serbia census 2002, Dr Slobodan Ruzic (Energy Saving Group ltd .Belgrade, Serbia).

There is no statistical information for the diffusion of efficient and renewable heating systems,

such as condensing boilers, biomass boilers and heat pumps.

Diffusion of air conditioning is steadily increasing due to improving comfort in public and residential buildings. Detailed statistics are not available.

3. Energy consumption

Electricity has the highest share in the energy consumption in buildings (52.7%). The other sources are district heating (15%), coal, natural gas, biomass and oil, which have smaller share (Figure 8). Biomass and coal are not used in the service sector where the use of energy from oil is pretty relevant.
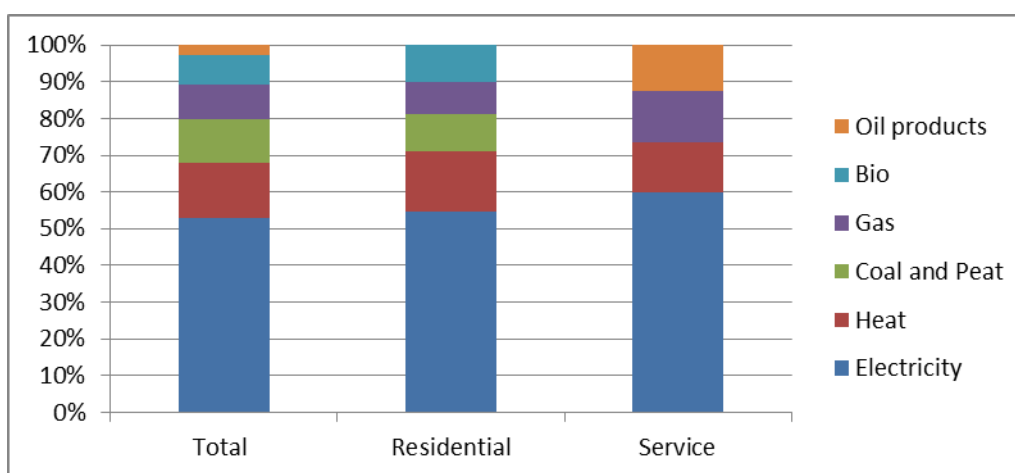

Figure 8: Total energy consumption of the building sector (2009)
Source: IEA, Energy Balance of Serbia (2009)

4. Conclusions

Serbia has 7,2 million inhabitants living in about 2.5 million dwellings. Residential buildings represent 83% of total floor area of buildings, the rest are service buildings. Buildings constructed before the 1985 present similar characteristic and make up the 74% of the residential building floor area.

In the period 2000-2010 162 662 new dwellings (i.e. around 6.6% of total stock) were constructed in compliance with the "Rules on energy efficiency of buildings" ("Official Gazette of Republic of Serbia", no. 61/2011) Serbian building norms require maximum U-values for the building elements: wall, floor, ceiling (roof), windows; "Rules on Energy performance certificates" on Buildings has been published with the previous one.

There is no statistical data on the number of systems on solar energy, biomass and heat

pumps.

Coal has the highest share for heating in the housing stock with 32% share followed by biomass (22%) and district heating (18%). Room heating is applied in 70% from the dwellings due to the fuel poverty.

Heating represents 65% from the total energy consumption per end use as the share of air-conditioning (cooling) is also increasing in the last decade. The share of other end uses is also significant for office equipment and appliances.

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