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OPET BUILDING

Work Package 4

**Innovative concepts and technologies for residential
building refurbishment**

DELIVERABLE 27 (TASK 4.1.1)

National Report

The residential building sector in Bulgaria



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Appendix A

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1. National policy

1.1 General policy

1.1.1 Law for Organisation of the Territory

This law regulates the social relations, relevant to the organisation of the territory, the investment designing and the construction in the Republic of Bulgaria. This is the main law concerning the building sector in the country. It is in force since January 2001 and was updated in July 2003.

In this law are given the main parameters concerning the built environment and the urban planning.

In section 6 of the law are given the requirements to the dwelling buildings as main urban buildings.

This law includes several regulations, some of them are:

- Regulation N^o 4 from 21st May 2001 for the sphere and the content of the investment projects;
- Regulation N^o 5 from 21st May 2001 for rules and norms for organisation of the territory;
- Regulation N^o 8 from 14th June 2001 for the content of urban schemes and plans.

1.1.2 Housing policy

As 97 % of the dwelling stock in Bulgaria is privately owned, the main laws concern the dwellings in blocks of flats.

In the end of the year 2002, the dwellings in blocks of flats represented 33.5% of the dwelling stock, for the towns this figure is 53.2%. About 60% of the dwellings in blocks of flats are located in complexes and are erected with industrial methods.

The management and the maintenance of blocks of flats is realized in accordance with:

- The “Law for ownership” and
- The “Rules for management, order and control in the blocks of flats”.

The owners have the obligation to maintain and to refurbish their individual parts of the building.

In cases when different parts of the building are owned by different persons, common are: the terrain on which is erected the building, the foundations, the external walls, the internal walls that separate the different parts of the building, the roofs, the main lines of all installations, etc.

Each owner has the obligation to share the costs needed for the maintenance and the refurbishment of the building according to his part.

In Bulgaria there is no preferential credit policy and state subsidy for the dwelling sector.

Nine banks grant dwelling's credits at 8 to 15% interest rate. In 2001 the interests were between 14 and 18%. For some banks the term for paying off the credit reaches 20 years. The candidates for credit should have saved about 30% of the value of the new dwelling. Mortgage is compulsory for the credit.

1.1.3 Energy policy

After 1990 in Bulgaria started reforms toward the implementation of market economy. The prices of energy sources increased considerably during the last decade and the trend is that this increase will continue. On the other hand, as a country in a process of accession to the EU, Bulgaria has to improve its legislative framework and to harmonize it with the legislation of the member states of the EU. Understanding these problems the government passed the **“Energy and Energy Efficiency Law”** in July 1999. This law was modified and complemented in December 2001. In the law is stated that “one of the aims of the law is the improvement of the energy efficiency”. Articles 139 and 140 state **“State Policy for promotion of energy efficiency and production of electrical energy and thermal energy from renewable energy sources is a component of the energy policy of the country and is implemented by the Minister of Energy and Energy Resources.”**

All state authorities are obliged to render their support to all activities for increasing the energy efficiency and the utilization of the renewable energy sources, as activities of public importance.

In order to improve the legislative framework concerning the energy, two new laws are under preparation and are expected to be passed till the end of 2003:

- Law for Energy
- **Law for Energy Efficiency.**

With the separation of the energy efficiency from the whole law concerning the energy it is stressed on its importance for the whole economy of the country.

Chapter 3 “Measures for Energy Efficiency” of the project for “Law for Energy Efficiency” includes three sections:

- Section I “Energy Management” requires from the energy consumers to work out a programme for energy saving, to present each year reports for the whole consumption of energy, to be responsible for the improvement of the energy consumption and to implement all measures for energy saving included in the programmes for energy efficiency.
- In section II “Energy Efficient Services” is foreseen to require a building certification at the design stage for new buildings and an energy investigation for existing buildings with a high consumption of energy.
- Section III “Labelling” requires a labelling of appliances.

In chapter 4 “Organisation of the Activities for Improving the Energy Efficiency” is foreseen to create a fund “Energy Efficiency”. The aim of this fund is to manage financial resources given for investment projects for development of the energy efficiency.

The activities for increasing the energy efficiency and the utilization of renewable energy sources are promoted through implementation of projects and programmes at national, sectional, regional and municipal level.

Following is presented a part of an action plan approved by the Bulgarian authorities with regard to the building sector.

Energy Efficiency Action Plan for Bulgaria

- **Policy targets**
 - Energy and Energy Efficiency Law
 - National Strategy for Development of Energy and Energy Efficiency till

2010

- Updated Governmental Programme “Bulgaria 2001”
- National Plan for Economic Development till 2006
- National Action Plan for Climate Changes
- National Plan for Regional Development

• **Proposed quantitative targets in priority areas**

- **Rehabilitation of the existing building stock.** In panel buildings the energy consumption can be reduced at least by 50%, from more than 200 kWh/m².y to about 150 kWh/m².y at least (which is a **reduction of 25%**). With special rehabilitation programmes (including the use of solar energy, the improvement of the heating system etc.) a reduction to about 100 kWh/m².y or **reduction of 50%** at least is possible.
- **Improvement of the new building stock.** New buildings can have energy consumption of less than 100 kWh/m².y, which is a **reduction of about 40%** of the actual energy consumption.

• **Overview on instruments for promotion of energy efficiency**

- Information and awareness
- Tax and pricing instruments
- Financial instruments
- Regulative instruments
- Voluntary activities

1.2 Technical standards in housing construction

1.2.1 Regulation N° 5 for “Rules and Norms for Organisation of the Territory”

This regulation is a part of the “Law for Organisation of the Territory”. In chapter 28 of the regulation are given the rules and norms for designing of dwelling buildings and dwellings.

Following are some of the norms for designing of dwellings:

- Article 120 requires direct outdoor lightening for staircases in dwelling buildings, with a minimum area of 1/10 of the staircase area;
- Article 121 requires a minimum width of 1,80 m for the main entrance of multi-dwelling buildings, and a minimum width of 1,0 for the building entrance door;
- Article 132 requires a minimum net area for the different premises as follows:
 - Living room – 15 m²;
 - Bed room for one inhabitant – 7,5 m²;
 - Bed room for two inhabitants – 12,5 m²;

- Kitchen – 4,5 m²;
- Kitchen with dining table – 7,0 m²;
- Article 137 requires direct outdoor lightning for the rooms and the kitchens. The minimum area of windows is 1/6 of the area of the living rooms and 1/7 of the area of the bed rooms;
- Article 138 requires the best possible orientation for the rooms of the dwellings. Whole dwelling orientation on North, Northeast or Northwest is not acceptable;
- In appendix 1 are given the minimum area around the buildings and the minimum distance between the buildings depending on their height.

1.2.2 Regulation for designing of thermal insulation of buildings

As about 50% of the energy use is caused by the built environment, the government passed several new laws in order to improve the energy efficiency in the building sector. One of these laws is the “Regulation for designing of thermal insulation of buildings”. This regulation is in force since April 1999 and was published in State Gazette N°007 on 26th January 1999. There are also new regulations concerning the energy efficiency of the heating installations.

In the Regulation is stated that:

The Regulation is in force for heated buildings including:

- New buildings
- Additional storey and new annexes
- Reconstruction of façades of existing buildings

The Regulation is in force for dwellings, hotels, motels, hostels, children and educational buildings, hospitals and policlinics, administrative and public buildings, shops, bars, restaurants and other places of public resort, heated industrial buildings, sports and show halls that require heating to at least 15°C for more than three months.

Thermal insulation must be estimated for:

- External walls
- Windows and external doors
- Roofs and attic’s slabs in cases of unheated attics
- Floors on soil, over unheated basement and in cases of border to external air
- Walls between premises when the temperature’s difference is more than 10°C
- Joints between the elements of the building envelope

Article 9 requires an estimation of the energy efficiency of the thermal insulation. This estimation is a part of the building’s project and on this basis the municipality will emit a permit for erection.

Norms for design of building’s thermal insulation:

According to Article 6, the maximum values of the coefficient of heat transition of external enclosure building elements ***K_{max}*** ($W/m^2\text{°C}$) must be according to the following table:

Maximum values of the coefficient of heat transition

N°	Type of enclosing building elements	Maximum values for <i>K_{max}</i> ($W/m^2\text{°C}$)
1.	External walls in new buildings and in cases of reconstruction of façades with external thermal insulation	0,50
2.	Windows and balcony doors a) in dwellings and public buildings	2,65
	b) in industrial buildings and in heated premises in industrial buildings with double glazed windows and/or ceiling windows	3,57
3.	Roofs, attic's slabs in cases of unheated attics, floors over passages and other open spaces bordering on external air	0,30
4.	Floors over unheated basements	0,50

According to Article 7, the maximum values of the summary coefficient of heat transition ***K_{m, max}*** ($W/m^2\text{°C}$) must be according to the following table where *A* is the total surface of the external enclosure building elements and *V* is the total volume enclosed by these elements.

Maximum values of the summary coefficient of heat transition

Relation <i>A/V</i> m^{-1}	Maximum values of the summary coefficient of heat transition <i>K_{m, max}</i> ($W/m^2\text{°C}$)
<0,20	1,20
0,30	1,00
0,40	0,86
0,50	0,78
0,60	0,73
0,70	0,69
0,80	0,66
0,90	0,63
1,00	0,62
>1,10	0,60

Article 16 requires cold-bridge detailing

Article 19 requires insulation against overheating during the summer season. This

insulation is required only for special cases. It should be mentioned that in Bulgaria the main problem is the heating, not the overheating. Special air-conditioning systems are provided only for luxurious office buildings, theaters and show halls.

Several articles consider the problem with the sweat insulation in cases of internal thermal insulation and the high humidity.

Several articles consider the problem with the insulation of external walls against torrential (oblique) rain. These articles must be taken into consideration with regard to the qualities of the thermal insulation.

In the norms are given several useful annexes that consider the quality of the building materials and the climate in different towns in the country.

Several articles consider the improvement of the heating systems in dwelling buildings. The installation of heat-meters on each radiator for existing buildings (the heating systems in existing buildings are disposed vertically, as no measurement was required) and on each dwelling in new buildings (the new heating systems are disposed horizontally, there is only one connection with the main pipe). In Bulgaria there are no rules for inspection of heating sources in buildings. Such inspections will be compulsory after passing the new "Law for Energy Efficiency".

1.2.3 Basic fire rules

Fire rules for Bulgaria are given in "Regulation N°2 from 5th May 1987 for the anti-fire building-technical norms". Following are given some basic rules for dwellings and dwelling buildings.

Chapter 2 "Flammability and fire resistance of buildings and equipment" states that:

There, building materials and constructions are divided in three groups of flammability according to the following table:

N°	Group of flammability	Characteristic by flammability	
		Materials	Constructions
1	Fire resistant	They don't light, smoulder or carbonise under the impact of fire or high temperature	From non-flammable materials
2	Hardly flammable	They are hardly flammable, hardly smoulder or carbonise under the impact of fire or high temperature	From hardly flammable materials, or constructions with flammable materials protected from the fire impact through non-flammable materials
3	Flammable	They light or smoulder under the impact of fire or high temperature, and continue to burn or smoulder after removal of the source of fire	From flammable materials, not protected from the impact of fire or high temperature

Buildings and equipment are divided in five degree of fire resistance depending on the limits of fire resistance and the groups of flammability of the structural elements. In the following table are given the groups of flammability and the minimal limits of

fire resistance of the structural elements of buildings and equipment:

Degree of fire resistance of buildings and equipment	Elements of buildings and equipment							
	Bearing walls and columns, staircases' walls	Horizontal slabs between storey	Non-bearing external and internal walls	Landings, beams and steps in staircases	Walls between sections, walls on corridors and other ways for exit	Buildings roofs		
						Bearing roofs' structure	Without horizontal attic structure	Covering
I	Non-flammable 2h 30 min	Non-flammable 1h	Non-flammable 30 min	Non-flammable 1h 30 min	Non-flammable 1h	Non-flammable 15 min	Non-flammable 1h	Non-flammable
II	Non-flammable 2h	Non-flammable 45 min	Non-flammable 15 min Hardly flammable 30 min	Non-flammable 1h	Non-flammable 45 min	Non-flammable 15 min	Non-flammable 45 min	Non-flammable
III	Non-flammable 1h 30 min	Non-flammable 30 min Hardly flammable 45 min	Non-flammable 15 min Hardly flammable 30 min	Non-flammable 1h	Non-flammable 30 min	Flammable	Non-flammable 30 min Hardly flammable 45 min	Flammable
IV	Hardly flammable 30 min	Hardly flammable 15 min	Hardly flammable 15 min	Hardly flammable 15 min	Hardly flammable 15 min	Flammable	Hardly flammable 15 min	Flammable
V	Flammable	Flammable	Flammable	Flammable	Flammable	Flammable	Flammable	Flammable

Chapter 3 “Fire safety barriers, fire stairs and ways” requires sufficient ways for evacuation of buildings in case of fire.

Article 163 The maximum distances from the doors of the premises to the nearest exit from the building or the nearest staircase are given in the following table:

Degree of fire resistance	Maximum distance to the exit, m	
	From premises and dwellings situated between stairs or external exits	From premises and dwellings with exits to corridors with one exit
I and II	40	25
III	30	20
IV	25	15
V	20	10

Article 164 The width of the stairs must be maximum 2,4 m.

In article 170 is stated that staircases in dwelling buildings must have natural ventilation and outdoor lighting, and to be separated from the storey by self-closing

doors and non-flammable walls.

Chapter 11 “Dwelling and public buildings” requires the following:

Article 402 (1) The number of storey and the admissible built-up area of dwelling and public buildings depending on their degree of fire safety are defined in the following table:

Degree of fire safety	Admissible number of storey	Admissible built-up area between anti-fire barriers, m ² , up to:
I	No limit	2200
I	9	4000
II	9	3000
III	3	1800
IV	1	1400
IV	2	1000
V	1	1000
V	2	800

(2) Attic areas in buildings with flammable and hardly flammable roofs have to be divided in parts with maximum 40 m length and area of up to 300 m² through fire – resistant walls that reach fire-resistant covering (tiles and others).

1.2.4 Energy labelling and certification of dwelling buildings

Currently there is no building certification in Bulgaria. Understanding the importance of the energy saving measures, the Energy Efficiency Agency to the Ministry of the Energy and the Energy Resources worked out a draft “**Law for Energy Efficiency**” in pursuance of p.3”g” of Resolution of the National Assembly from 17th July 2002 for ratification of Energy Strategy of Republic of Bulgaria, in order to implement conditions and efficient mechanisms for utilization of the considerable potential for improving the energy efficiency in the field of the production and the consumption.

According to the requirements of Directive 2002/91/EU of the European Parliament and the Council of EU from 16th December 2002 concerning the energy characteristics of buildings in the draft law are included compulsory norms, that must be observed in cases of construction, refurbishment, renovation and exploitation of buildings with significant energy consumption.

Chapter two, article 15 states that: “To determine the consumption of energy and the conformity of investment projects for construction, refurbishment and renovation of buildings, as well as for existing buildings in exploitation are made assessments and investigations for energy efficiency.”

Article 16 Each project for construction, refurbishment and renovation of buildings is subject to assessment for conformity with the main requirements to the construction given in the “Law for Organisation of the Territory”.

Article 17 (1) Each building in exploitation whose annual energy consumption is over the limits given in Regulation N° 4 is subject to assessment of energy efficiency.

(2) Each building in exploitation – state or municipality property with useful area over 1000m² is subject to assessment of energy efficiency.

(5) The aim of the assessment of the energy efficiency is to identify specific possibilities for decreasing the energy consumption.

(6) The assessment of the energy efficiency determine:

- The consumption of energy;
- The level of the technologies and the rational use of energy;
- The conformity with the standards for energy efficiency.

1.3 Energy prices

1.3.1 Authority and responsibility

The State Commission for Energy Regulation accomplishes the state regulation in the energy sector.

The Commission is a state authority to the Council of Ministers. In the draft “Law for Energy” it is foreseen the State Commission for Energy Regulation to accomplish the state regulation of the energy prices.

The Council of Ministers determine compulsory rules for making and applying the prices and tariffs of electricity, heat energy and natural gas on the suggestion of the Commission.

Subject to regulation are:

1. The prices of electricity sold by the producers, the transfer company and the companies for distribution;
2. The prices of heat energy sold by the producers or the transmission company;
3. The prices of natural gas sold by the transfer company or the companies for distribution;
4. The prices and the tariffs for transfer of electricity, heat energy and natural gas;
5. The prices and the tariffs for connecting to the networks.

1.3.2 Energy prices

Prices for electricity:

- Day time up to 75 kWh – 0,098 BGN/kWh
- Day time more than 75 kWh – 0,125 BGN/kWh
- Night time 0,068 BGN/kWh

Prices for:

- Natural gas - 500 BGN/1000 Hm³
- District heating – 44 BGN/MWh
- Black coal – 130 BGN/ton
- Brown coal – 115 BGN/ton
- Briquettes from coal – 120 BGN/ton
- Wood – 80 BGN/ton
- Wood briquettes – 190 BGN/ton
- Propane-butane – 804 BGN/ton
- Oil – 1018,8 BGN/ton

The following comparative table for the monthly value of heating of 80m² dwelling area and 200m³ volume at average necessary thermal energy of 4 Mcal/h and 2.88 Gcal/month gives a more realistic idea about the real price of heating (prices at June 2003), taking into consideration that the average monthly salary is 280 BGN.

Fuel	Caloricity of fuel	Efficiency of the system	Average price of fuel	Consumption of energy carrier per month	Cost of heating per month in BGN**
Wood – pyrolysis boiler	2 600 kcal/kg	83 %	80 BGN/ton	1 334 kg/month	106.7
Wood	2 600 kcal/kg	70 %	80 BGN/ton	1 582 kg/month	126.6
Wood briquettes–pyrolysis boiler	4 500 kcal/kg	83 %	190 BGN/ton	771 kg/month	146.5
Wood briquettes	4 500 kcal/kg	70 %	190 BGN/ton	914.2 kg/month	173.7
Black coal	6 000 kcal/kg	70 %	130 BGN/ton	684.6 kg/month	89.0
Brown coal	3 500 kcal/kg	70 %	115 BGN/ton	1 173.6 kg/month	134.96
Briquettes from coal	4 200 kcal/kg	70 %	120 BGN/ton	980 kg/month	117.6
District heating	Natural gas, oil, coal		44 BGN/MWh	3.34 MWh	147.0
Natural gas	8 000 kcal/Hm ³	85 %	500 BGN/1000 Hm ³	423.5 Hm ³ /month	211.8
Propane-butane	11 950 kcal/kg	85 %	804 Levs/ton	281 kg/month	225.9
Electricity*	860 kcal/KWh	98 %	0.075 BGN/kWh	3 417 kWh	256.3
Oil	10 000 kcal/kg	85 %	1 018.8 BGN/ton	338.822 kg/month	345.2

*Since 1st July 2003 the prices of the electricity have increased to 0.125 BGN/kWh (day time) and 0.068 BGN/kWh (night time).

** 1 Euro = 1,9558 BGN (Bulgarian Lev)

1.4 National housing support programmes

1.4.1 The programme of the Ministry of Regional Development and Public Works

In a report for the situation of the housing policy in Bulgaria (April 2003) experts from

the Ministry of Regional Development and Public Works made the following general conclusions for the situation of the dwelling sector:

- The affordability of dwelling is more and more difficult because of the high prices of dwellings and the low incomes of the households that need a dwelling;
- The condition of the dwelling stock is getting worse due to a bad management and maintenance;
- The amount of new dwellings decreases significantly;
- Dwelling areas are used for other purposes;
- The state budget expenses for the building sector are very low and are destined only to paying off old loans of the state and the municipalities;
- There is no system for dwelling subsidizing;
- It is very difficult to get a credit for construction, renovation or refurbishment.

A public discussion on the project for National Housing Strategy is forthcoming. The main aim of the new housing policy is: to stop the process of degradation of the dwelling fund and to create a working market mechanism for ensuring accessible dwellings (privately owned and rented). For the realization of this aim it is necessary:

- To create conditions for starting a large-scale refurbishment of the existing dwelling stock;
- To create conditions for accumulation of private dwelling capital for investing in accessible private dwellings;
- To start the construction of new rental dwelling fund for accommodation of homeless and other vulnerable groups.

For the realization of the main priorities of the housing policy, according to the programme of the Ministry of Regional Development and Public Works for 2003 – 2004, the following tasks have been carried out or are in course of realization:

- A project for “Law for dwelling-savings banks” has been elaborated;
- A project for law with draft heading “Law for stimulating the construction and the refurbishment of the dwelling fund”. In the draft law should find place the following decrees according to the preliminary content:
 - The establishment of a specialized institution for research and analysis of the situation of the dwelling stock, the dwelling market and the needs of dwellings, and for managing the resources of a dwelling fund for the development of the dwelling sector;
 - The creation of a dwelling fund;
 - The implementation of a system for dwelling subsidizing;
 - The implementation of a system for tax concessions for refurbishment of dwellings and buildings;
 - The integration between the communal and the private sector (social rental houses and the integration);
 - The settlement of housing associations, which will gradually undertake part of the commitments of the municipalities for the erection and the management of social rental dwellings;
 - The settlement of associations of owners, especially owners of flats in big

- multi-dwelling buildings;
- Improvement of the system of management and maintenance of blocks of flats;
- Facilitating the system for execution of extensions and other activities in blocks of flats;
- The infrastructure of the dwelling districts.

1.4.2 The programme of the Energy Efficiency Agency

In the frame National Analysis of the refurbishment of panel buildings in the Republic of Bulgaria conducted by the Energy Efficiency Agency are given the following recommendations for the improvement of the legislative framework in the country:

- **With regard to the buildings** the national legislative framework should implement a system for:
 - Constant periodic observation of their physical condition and their energy consumption;
 - Ensuring data and mechanism for data collection for the buildings and for implementation of the relevant building and energy audits;
 - Specifying all possible and advisable measures for rational refurbishment;
- **With regard to the owners** the national legislative framework should implement a system for:
 - Promoting the benefits of the refurbishment;
 - Instructions for sustainable attitude and reaction towards inhabited buildings;
 - Mechanism for assuring steadily legal representation of the owners of dwellings or group of dwellings when concluding agreements for refurbishment, in order to normalize their owner status on the plots assigned by the municipalities and property of the buildings;
 - System for financial support and stimulation of different methods of refurbishment of the blocks of flats, including when implementing solar systems for hot water, heating and electricity.
- **With regard to the municipalities** the national legislative framework should implement a system for:
 - Assigning terrains for all existing and future blocks of flats in the country with rules for their exploitation, maintenance and development of public services, including the necessary coordination with the surrounding public territory;
 - Mapping, with the relevant authorities, the different terrains and properties of the blocks of flats in deeds for property of all owners in the building;
 - Financial support of these municipalities that ensure in the most rational way the sustainable development of their complexes of panel buildings.
- **With regard to the different ESCOs** the national legislative framework

should implement a system for:

- Unobstructed obtaining of the necessary for the implementation of different projects data for the blocks of flats from the municipalities, the energy companies and the owners;
 - Normal concluding, acting and payment of their relatively long term contracts, often connected with construction works;
 - Their sustainable supplying with new technologies and materials.
- **With regard to the financial frame** the national legislative framework for refurbishment of the dwelling fund should implement a system for subsidizing, financing, stimulating and reducing the taxes for all the actors in the process of refurbishment, explaining that these activities are directly connected with the main national, state and governmental priorities and aims and with the realization of national social, energy and environmental strategies, as well as international commitments of the country on the climate changes.
- **With regard to the technologic frame** after the future determination of all complex measures for building refurbishment depending on their type of construction, national standards, norms and requirements concerning each type of building should be elaborated.

Taking into consideration the progressive physical and energy degradation of panel buildings, it is necessary to undertake short, medium and long term activities.

- **Short term activities** - the formation of prerequisites for market conditions for building refurbishment should include:
- An urgent preparation of all suggestions for changes of the legislative framework;
 - The preparation of the municipalities for assignment of the terrains and the properties of all blocks of flats and their respective registration in all documents for property;
 - The organisation of the information of the citizens and training of ESCOs;
 - The preparation of the structure, the priorities and the content of a National Programme for Building Refurbishment;
 - Investigation of all conditions for the stability of the buildings on earthquake and on renovation and protection of their structure.
- **Medium term activities** – should be on the basis of market mechanism, as a result of the short term activities and in accordance with the passed National Programme for Building Refurbishment. Following this, a number of buildings, parts of building complexes or whole building complexes should be refurbished.
- **Long term activities** – all the panel buildings in the country should be refurbished, the refurbishment of other multi-dwelling buildings should continue.

1.4.3 The support of the World Bank

The strategy of the World Bank foresees Sofia to become centre of the Balkans. There are three main topics in the strategy :

- Economy;
- Town management and
- Public services.

The erection of new complexes with multi-dwelling buildings is not foreseen. The main topic for the next 10 years is the refurbishment of the panel buildings, following this the World Bank suggests:

- The formation of centres for multi-dwelling buildings acting as training centres for building owners;
- An investment fund will start within two years with 10 millions Euro subsidized by the World Bank. The fund will grant credits with low interest rates or funds for projects for thermal insulation of flats, improvement of heating installations and changing of windows.

2. Residential building sector

2.1 Country overview

2.1.1 Geography, climate and demography



The Republic of Bulgaria is located in the south eastern part of Europe in the Balkan Peninsula. The country borders on Turkey and Greece to the south, Former Yugoslav Republic of Macedonia and Serbia to the west, Romania to the north and the Black Sea to the east. The total area of the country is 111 000 km².

The climate is temperate with four distinctive seasons and varies with altitude and location. The Black Sea coast features a milder winter as opposed to the harsher winter conditions in the central north plains. For example, the average monthly temperatures for the capital city Sofia range from -3,7°C in December to 28,2°C in August. The duration of the heating season varies between 160 and 220 days for the different locations.

The average wind speed is 1,2m/s (1,3m/s in winter time), while prevailing winds are west or northeast.

The following table presents the average monthly temperatures for various Bulgarian cities, situated in the north, the west, the south and the east part of Bulgaria.

Month / Town	Pleven	Sofia	Pazardzhik	Varna
January	2.5	1.5	2.5	4.1
February	5.3	8	4.4	4.2
March	4.8	2.9	4.7	4.9
April	14.7	13.1	14.3	13.2
May	16.9	14.7	17.0	15.8
June	22.4	20.0	21.9	21.1
July	24.1	22.2	24.2	22.7
August	24.5	22.1	23.7	23.8
September	16.7	15.1	16.9	17.8
October	12.8	11.6	12.9	14.4
November	3.5	3.7	5.3	6.8
December	-3.1	-3.7	-0.9	0.8
Average annual value	12.1	10.6	12.2	12.5

Average monthly temperature, °C (1998)

The heating degree days for indoor temperatures of 20°C vary between 2100 and 3500 for different regions in Bulgaria. For Sofia these are 2500 on average.

The population of the country dropped from 8 950 000 in 1985 to 7 928 900 in 2001. Apart from the negative natural growth, the drop was caused mainly by a steady emigration trend. More than 500 000 people have left the country over the last decade. Currently 68,1% of the population lives in urban areas and 31,9% in rural areas. The average live expectancy is 68.53 years for men and 75.23 years for

women.

2.1.2 Current situation

In 1990 in Bulgaria started reforms towards the implementation of market economy in the country. These reforms lead to a downturn in the economy and big changes in the living standard of the Bulgarian citizens. During the last two years the situation has improved significantly. The registered unemployment rate that reached 27% in 1996 decreased to 17% in June 2003 (here it should be taken into consideration that the unemployment rate decreases significantly during the summer season). The unemployment rate in 2001 was 21.6%. The hyperinflation from 1997 has been put under control and for 2002 the registered inflation rate was around 4%. The gross domestic product reached a decrease of 9.5% in 1996, but the trend during the last five years is towards a steady increase that reached 9.2% in the year 2000.

In spite of the above mentioned improvement of the economy, the conditions are still difficult for most of the people. The cost of living in some cases is near to this in the EU countries, but the average annual salary is only 2 880 BGN (1 EURO = 1,9558 BGN). Moreover, there is a trend towards increasing of the differentiation among social groups.

2.2 General review of the residential building sector

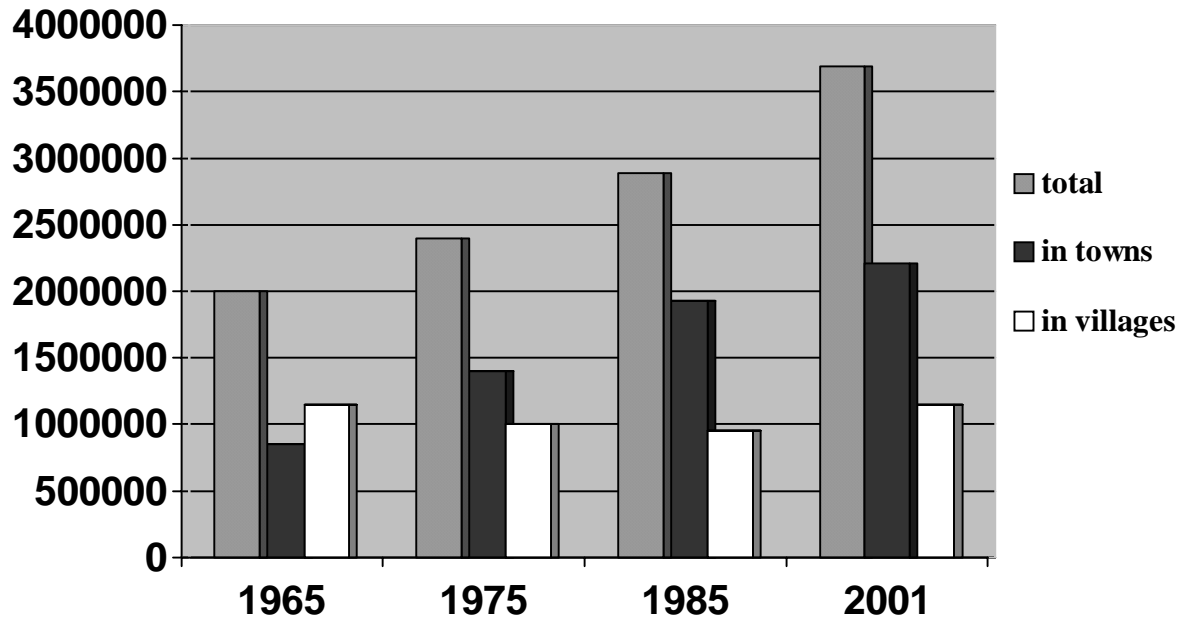
2.2.1 Dwelling stock

In Bulgaria after the second world war the migration from the villages to the towns increased a lot. This led to an increased demand for dwellings and a fast industrialization of the building process.

Type of dwellings:

- **Inhabited dwellings of common type.** These are all inhabited dwellings in dwelling buildings.
- **Uninhabited dwellings.** These are inhabitable dwellings where nobody lives permanently.
- **Dwellings in hostels** (for students or workers). These dwellings have specific purpose and serve for temporarily inhabitation.
- **Primitive dwellings.** These dwellings are not suitable for inhabitation, these category includes basements, attics, dwellings in ruining buildings, caravans, etc.

Towards 01.03.2003 the dwelling stock in Bulgaria amounted to 3 688 802 dwellings from which 328 726 in buildings for temporarily inhabitation (rest houses, villas, etc.) and 7 851 are primitive dwellings. The amount of the other dwellings is 3 352 225 and represent an increase of 9.4% in comparison with the registered dwellings during the 1992 Public Census. The uninhabited dwellings represent 15.9% of the whole dwelling stock, this is due mainly to the decrease of the population (from 1992 to 2001 the population has decreased by 554 333 people).



Dwelling stock by Public Census years

	1997	1998	1999	2000	2001
Number of dwellings	7452	4942	9824	8795	5937
Useful area	646797	421241	831084	758954	541324
Living floor area	489003	314968	614323	573116	401069

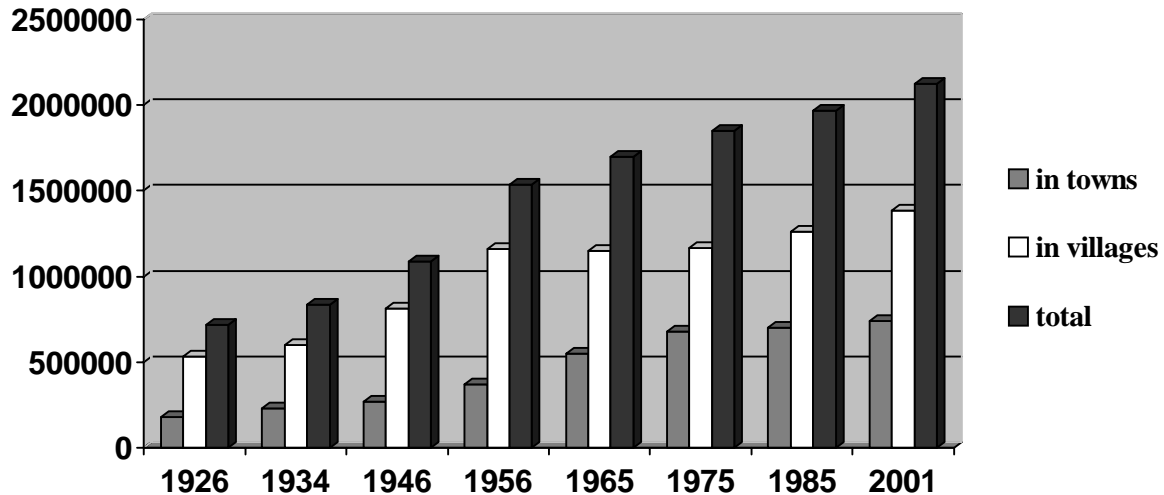
Completed dwellings by years

As in other countries, the level of activity in the Bulgarian building sector is cyclical and depends on the whole economic situation in the country. After a huge increase in 1999, the level of activity shows some decrease in 2001.

The amount of the dwelling stock is 422 dwellings per 1000 capita, which is a good figure. Nearly 16% of the dwellings are not inhabited, this could be a good factor with regard to the possibility for a higher mobility, but most of them are in unattractive regions or in bad condition.

2.2.2 Dwelling buildings stock

Towards 01.03.2003 the dwelling buildings stock in Bulgaria amounted to 2 124 533 buildings from which 740 450 are in the towns and 1 384 083 in the villages. For the period 1926 – 2001 the trend is towards increasing the number of dwelling buildings. The highest increase is in the period 1946 – 1956. For the last 15 years the dwelling buildings stock has increased with 8.2%.



Dwelling buildings stock by Public Census years

The oldest part of the building stock (erected before 1919) represents 2.35% of the whole building stock and includes 90278 dwellings.

49.7% of the buildings are erected after 1970.

Most of the dwelling buildings in the country are one-storied single family houses (64.1%) and two-storied single or double family houses (31.4%). 4.5% of the dwelling buildings are multi-storied buildings. The dwellings in high buildings (6 and more storeys) are 16453.

	TOTAL	NUMBER OF STOREYS			
		1	2	3-5	6 and more
In towns	740450	410987	247846	65239	16378
In villages	1384083	951668	419364	12976	75
TOTAL	2124533	1362655	667210	78215	16453
%	100	64.1	31.4	3.7	0.8

Dwelling buildings stock by number of storeys

The inhabited buildings with more than 20 dwellings in them represent only 1.3% of the whole inhabited dwelling buildings. In spite of their small percentage, in such buildings live more than 33% of the population. The original intention of the big multi-dwelling buildings was to satisfy as much households as possible with dwellings, but during the years this intention has shown many disadvantages. As in these buildings there are many households with different characteristics and different income, their maintenance is extremely difficult. Following this, after 1990 the erection of big buildings with more than 20 housings has decreased significantly.

	1985	2001	%
1 housing	1459482	1259087	-13.7
2 housings	112135	156913	+39.9
3-5 housings	40472	50846	+25.6
6-9 housings	9790	11671	+19.2
10-19 housings	9145	11183	+22.2
20-49 housings	10286	11378	+10.6
50 and more housings	6548	8741	+33.5
total	1647858	1509819	-8.4

Inhabited dwelling buildings according to the number of housings in them

2.2.3 Dwelling stock by type of building materials

From 1958 till 1990 a lot of dwelling buildings were erected with prefabricated concrete panels or with cast-in-situ concrete external walls. This led to a negative impact on the physical qualities of the dwelling fund and the built environment as a whole.

Up to the year 2000, the statistic data examined four types of construction:

- prefabricated panel,
- cast-in-situ concrete walls and slabs, traditional (with bearing concrete structure and brick walls),
- massive (with bearing brick walls and concrete slabs) and
- frame-built.

Greater problems are observed in buildings erected with prefabricated panels. There are 11 128 dwelling buildings erected with this technology. These buildings include 787 096 dwellings where live more than 2 000 000 people.

Since 1990 the erection of buildings with prefabricated concrete elements has been stopped. The main type of construction currently in use is monolithic concrete structure with brick walls.

Since 2001 the National Statistical Institute has identified three main types of construction:

- Concrete structure. This type includes buildings erected with prefabricated concrete panels, cast-in-situ concrete walls and slabs, concrete structure – slabs and columns. The dwellings in this type of buildings represent 31.4% of the dwelling stock.
- Solid structure. These are buildings erected with bearing brick walls and concrete slabs. The dwellings in these buildings represent 56.3% of the dwelling stock.
- Other buildings. These are buildings erected with stones, wood or wooden boards.

	1965	1975	1985	2001

	Num.	%	Num.	%	Num.	%	Num.	%
Total	1696437	100.0	1846747	100.0	1963511	100.0	2124533	100.0
Concrete structure	9954	0.6	15539	0.8	31328	1.6	94233	4.4
Solid structure	1003738	59.2	1430833	77.5	1598835	81.4	1672019	78.7
Other	682745	40.2	400375	21.5	333348	17.0	358281	16.9

Dwelling buildings fund by type of construction according to the census

2.2.4 Structure of the dwelling stock by building services

Only 58 % of the dwellings in the country have electricity, water supply system and sewerage; 24 % have electricity, water supply system and sewer shaft; 10 % have only electricity. In 2 % of the dwellings there is no building service.

There are big differences in the level of building services of the dwellings depending on their location. In the towns 85 % of the dwellings have electricity, water supply system and sewerage, while in the villages these percentage is only 14 %. In the villages 50 % of the dwellings have electricity, water supply system and sewer shaft.

The level of building services in **inhabited dwellings** is higher. 65 % of the inhabited dwellings in the country have electricity, water supply system and sewerage. Nearly 100 % of the inhabited dwellings have electricity, 85 % of the inhabited dwellings in the towns and 14 % of these in the villages have sewerage.

60 % of the inhabited dwellings have water supply system, bathroom and lavatory. There are again big differences between the dwellings located in towns and these located in villages: 81 % of the dwellings in the towns have water supply system, bathroom and lavatory, while this percentage is only 24 % in the villages.

Building services	In towns %	In villages %	Total %
Electricity, water supply system, sewerage	88.5	17.0	65.1
Electricity, water supply system, sewer shaft	8.1	57.4	24.2
Electricity, water supply system	1.3	10.0	4.2
Electricity	2.0	15.2	6.3
Without any building service	0.1	0.4	0.2
Total	100	100	100

Inhabited dwellings by building services

A very important element of the building services is the heating system. 16.6 % of the inhabited dwellings in the country are connected to district heating, all these dwellings are located in towns. Only 2.8 % of the dwellings have local heating systems.

A very high percentage of the dwellings in the country use electricity as main energy

source for heating. 19.8 % of the inhabited dwellings in the country use electricity as only energy source for heating, 5.4 % use it as additional energy source for heating.

33.7 % of the dwellings in the country use wood and coal for heating. The main energy source for heating in the villages is wood. More than 50 % of the dwellings in the villages use it as only energy source for heating and 37 % use coal and wood. In the towns the dwellings heated with coal and wood are 16 %.

2.2.5 Size of dwellings

Useful area. This area includes the rooms, the services and the kitchen.

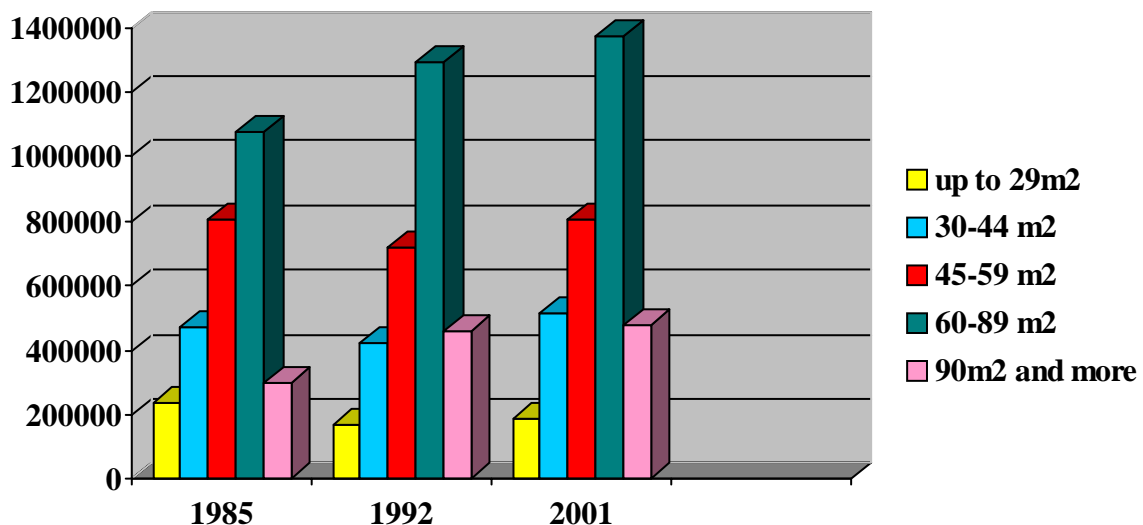
Living area. This area includes the rooms in the dwelling.

Living premises. They have several purposes: sleeping, living, eating, etc., this category includes kitchen.

Rooms. A room is each part of the dwelling which is separated by walls, has an area more than 4m² and natural lighting (excluding kitchens).

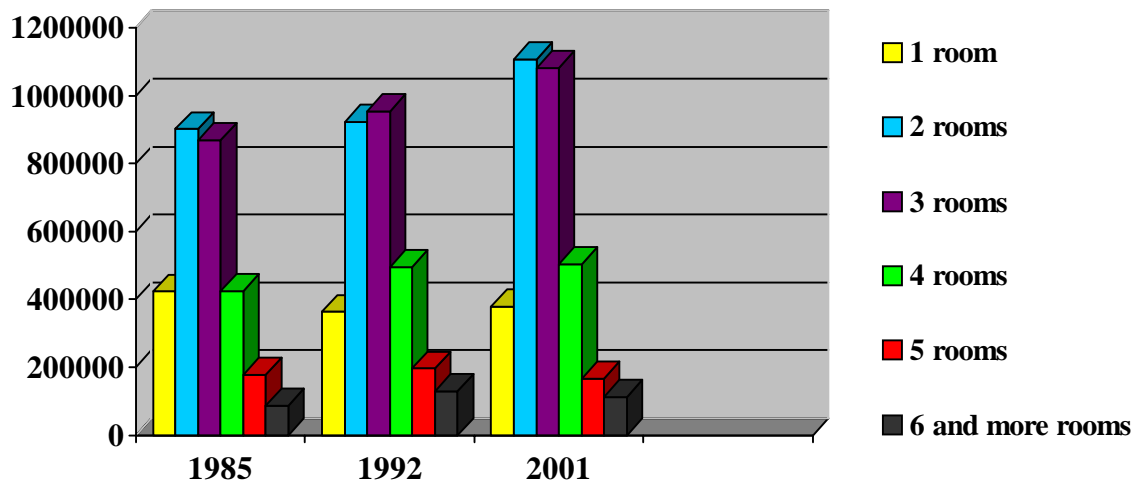
According to the statistic data, the average useful area per inhabited dwelling in the country is 66m² and the average living area per inhabited dwelling is 42m². As it can be seen in the following chart, there are no big changes in these figures for the period 1992-2001.

In comparison with 1985, the percentage of dwellings with useful area of up to 59m² decreased from 52% in 1985 to 45% in 2001, while this of the dwellings with useful area over 60m² increased from 48% to 55%. These figures show that the trend of erection of very small dwellings in Bulgaria is in a process of overcoming and more medium size dwellings are erected.



Dwellings by useful area by census years

Examining the dwelling stock according to the number of rooms, it can be found that **65% of the dwellings are with 2 or 3 rooms**. Comparing the data from the year 1992 and this from the year 2001, it can be said that the percentage of dwellings with one room is the same, this of the dwellings with two rooms has increased with 3% and this of the dwellings with three rooms has increased with 1%. There is a decrease in the percentage of the dwellings with four, five and more rooms with 1%.



Dwellings by number of rooms

	2000			2001		
	Total	New	Enlarged	Total	New	Enlarged
Number of dwellings	8795	8720	75	5937	5875	62
1 room	899	884	15	656	648	8
2 rooms	3170	3146	24	2283	2259	24
3 rooms	3690	3667	23	2277	2258	19
4 rooms	836	828	8	561	554	7
5 rooms	151	147	4	116	114	2
6 rooms and more	49	48	1	44	42	2

Completed dwellings by number of rooms

2.2.6 Occupancy of dwellings

The average occupancy of the dwellings in the country is one household per dwelling. The occupancy rate by number of inhabitants in one dwelling for the period 1985-2001 shows a positive trend, the figure for 1985 is 3.3 inhabitants per dwelling and for 2001 this figure is 2.8.

There is a great increase of the number of dwellings occupied by one single person. In 1985 the percentage of these dwellings was less than 13%, but in 2001 the figure increased to 20%.

NUMBER OF INHABITANTS	1985	1992	2001
1	12.8 %	16.6 %	20.1 %
2	25.4 %	27.2 %	28.9 %
3	20.2 %	20.3 %	22.1 %
4	22.6 %	20.9 %	18.4 %
5	9.5 %	7.9 %	6.3 %
6	6.3 %	4.6 %	2.7 %
7	1.8 %	1.5 %	0.8 %
8 and more	1.4 %	1.0 %	0.7 %
Average number of inhabitants per 1 dwelling	3.3	3.0	2.8

Structure of the inhabited dwellings by number of occupants and census years

There is a decrease in the number of dwellings with a high rate of occupancy. In 1965 the percentage of dwellings with a high rate of occupancy was 33.8%, this figure decreased to 19% in 1985 to reach 10.5% in 2001.

The average living area per capita is 15 m². This average index hides the real situation. In fact, most of the population still live in very small dwellings. This can be seen, if we examine the index "average number of occupants per dwelling by number of rooms". The average rate of occupancy is 2.8 inhabitants per dwelling, but for the dwellings with one room this rate is 2.1 and respectively 2.6 for dwellings with 2 rooms. The amount of one and two-room dwellings represents 42.7% of the whole dwelling stock.

2.2.7 Structure of the dwelling stock by type of ownership

97% of the dwellings in the country are privately owned. From these dwellings 94% are inhabited by the owners, 5% are rented and 1% are occupied jointly by the owners and the roomers.

CENSUS YEARS	TOTAL			IN TOWNS			IN VILLAGES		
	Total	Public	Private	Total	Public	Private	Total	Public	Private

Number									
1975	2342819	269555	2073264	1290558	242744	1047814	1052261	26811	1025450
1985	2724989	441493	2283496	1729983	409692	1320291	995006	31801	963205
1992	2788908	176936	2611972	1840802	157028	1683774	948106	19908	928198
2001	2819107	93252	2725855	1905579	83803	1821776	913528	9449	904077
Percentage									
1975	100.0	11.5	88.5	100.0	18.8	81.2	100.0	2.5	97.5
1985	100.0	16.2	83.8	100.0	23.7	76.3	100.0	3.2	96.8
1992	100.0	6.3	93.7	100.0	8.5	91.5	100.0	2.1	97.9
2001	100.0	3.3	96.7	100.0	4.4	95.6	100.0	1.0	99.0

Inhabited dwellings by type of ownership and by census years

The size of the privately owned dwellings increases constantly, while this of the state or municipal sector decreases. This is a specific aspect of the dwelling sector in Bulgaria.

The total amount of municipality and state dwellings is 109068. 95802 of these dwellings are in the towns. 82563 of them are permanently occupied and most of them are in blocks of flats erected with prefabricated concrete panels. In these dwellings live 201042 people. 13266 dwellings are located in villages. The number of dwellings owned by the municipalities decreases constantly. This is due to the lack of funds for the erection of new dwellings and the trend to sale the dwellings to the tenants.

12773 dwellings are owned by corporations (companies, institutes, etc.) which rent them to their staff.

	Total	Type of dwelling				
		Inhabited of common type	Uninhabited of common type	In hostel (for students, workers)	In no dwelling building	Collective
Dwellings	109068	66747	15816	24060	1620	825
Useful area	5445661	3461115	722979	664308	60129	537130
Living area	3380481	2060205	456075	469895	39215	355091
Households	120807	69835	0	48426	1721	825
Inhabitants	318280	201042	0	57187	4364	55687

Types of state and municipality owned dwellings

The private rental sector includes 127353 dwellings that represent about 5% of the whole dwelling stock. These dwellings are located in different types of buildings. In the country there is a trend people with higher income to invest in new dwellings in order to rent them. In this case the rental rate is usually very high. This is one of the

reasons for the huge number of uninhabited dwellings.

Number of dwellings	127353
Useful area	7145913
Living area	4331657
Households	138621
Inhabitants	336824

Characteristic of the private rental sector

2.3 Energy consumption in the dwelling sector

The energy consumption in the building sector in Bulgaria is rather high, due to the low energy efficiency of the heating installations and the low thermophysical parameters of the heated buildings.

The total energy consumption for space heating in the household and communal (public buildings, shops) sector was reported to be 120 PJ for a heated area of 200 million m² in 1998, in a joint Danish/Bulgarian study (Birch and Krogboe and the Ministry of construction, Sept. 1998). Assuming that the degree days for the heating season are 2520 (the actual figure for Sofia), this corresponds to 237kJ per m² per degree day. Available modern technology gives around 35kJ per m² per degree day. Thus, the potential for the energy saving in the area of space heating is quite large, but households will conserve energy with a slow rate because:

- Households are not aware of energy saving options.
- Materials for undertaking energy conservation measures (insulation, windows, sealant, thermostatic radiator valves) are expensive.

On the other hand, Bulgaria does have the major advantage that 97% of its housing stock is a private property and mostly owner-occupied, so that the occupants of a dwelling who have to pay for an investment also benefit it.

The following tables give useful data for the energy consumption in buildings.

Energy source	1995	2000	2005	2010
Coal	6 690	30 101	29 164	27 816
Other solid fuels	23 821	24 821	24 111	23 445
Diesel furnace oil	477	708	777	828
Natural gas	841	4 117	7 274	10 774
Heat energy	32 121	29 062	30 739	32 348
Electricity	54 657	54 640	53 105	56 245
Renewable energy sources	0	17	35	56

Final energy demand by type of energy sources in the household and services sector, TJ

Process	1995	2000	2005	2010
Heating	47 943	56 534	59 883	62 584
Hot water	31 267	40 371	41 745	43 077
Cooking	19 366	23 960	22 533	21 183

Final energy demand by process type in households and services sector, TJ

Three main types of heating systems are used: district heating, local heating and individual heating.

At the end of 2001 about 450000 flats were supplied with district heating (DH), that is equivalent to 16% of the existing residential stock. The highest percentage of DH supplied flats is in Sofia (64%), while in Plovdiv the figure is 13% and in Burgas – 12%. The heating installations in buildings are of the convective type, with induced circulation and heat carrier temperature 95/70 °C. The connection is either through heat exchangers or directly by injection pumps.

Local heating is used mainly for public and administrative buildings, only 79000 dwellings are heated with local heating. Light fuel oil, heavy fuel oil, gas, wood and more rarely coal are used. There are also a few installations providing geothermal energy as a mean of heating. Buildings normally use low temperature pipe heating.

For those buildings not connected with the district heating, the most popular way of heating is individual heating by electric heaters. About 25% of the population use it. The low price in the past for electrical energy has stimulated its use for heating and 5-6 million kWh are used. The high increase in the prices of the electricity, however, is the main reason that forces the inhabitants of these buildings to use less energy for heating. Unfortunately, less energy consumption is not obtained by means of energy conservation techniques, but it is a result of the decrease of the living standard of the inhabitants by satisfying only part of their heating needs.