

Ing. Kristián Szekeres<sup>1</sup>

## Roof Top Extensions for Multifamily Houses in Slovakia

### *Abstract*

In countries of European Union excluding Malta are situated approximately 100,1 million multifamily dwelling units. These dwellings count for an average of 47.5% of the total housing stock in the European Union countries. At present in Slovakia, and also other countries of Central and Eastern Europe, there is a vast housing area which was built after the World War II. This multifamily housing stock was during the 90's mainly privatized. Considering that the economy of Slovakia is not capable of replacing the existing housing fund which is located in the multifamily houses that were built after the World War II, it is necessary to dedicate an increased focus on renovation of this housing fund. The expenditures on multifamily housing stock refurbishment in last decades were comparing with the demand on a very low level. The main problems of the current multifamily housing stock in Slovakia are: need for modernization, low level of energy efficiency and insufficient building maintenance level. One of the options how to create sufficient sources for renovation of apartment buildings is to utilize the roof of the apartment building as a construction area and build it up. Means acquired from the sale of built-up after deducting the costs can be used for renovation. It is a matter of a one-time possibility which is limited by many factors that depend on localization and constructive technical solution of the apartment building.

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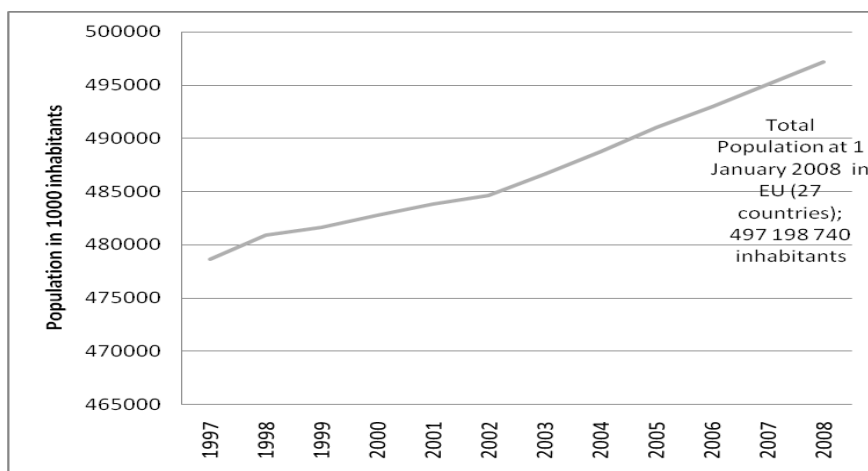
### *Introduction*

Constant growth of human population lays increased demands on the development of urbanized area and on safeguarding sufficient number of housing units. The population is growing differently over the World. The amount of yearly growth in European union is approximately 0,4% in the last 5 years. This percentage is low compare with the population growth in some Asian countries like China and India. To the contrary the size of the area of European Union is relatively small compare with the population. It means relatively high population densities in EU and pressure to effective land use. Built up area covered by multifamily houses is one of the possible solutions how to save land. This style of development was preferred in CEE countries in the second half of last century.

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<sup>1</sup> Ing. Kristián Szekeres, Department of Economy and Building Industry Management, Institute of Management, Slovak University of Technology in Bratislava, [kristian.szekeres@stuba.sk](mailto:kristian.szekeres@stuba.sk), +421(0)905792637

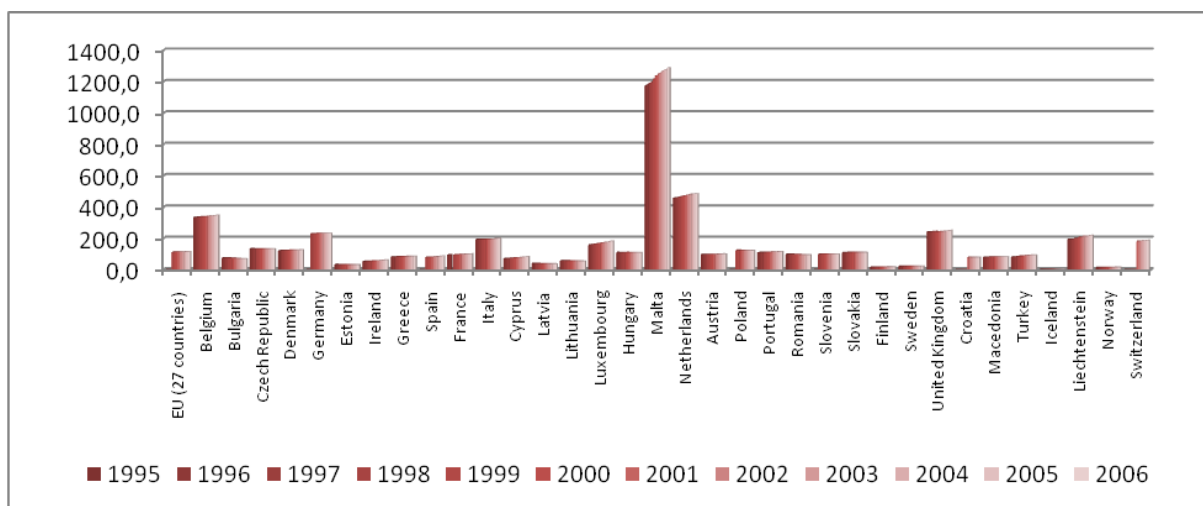
Figure 1 Total population in EU 27 countries in last decade (source EUROSTAT web site)



Note : The inhabitants of a given area on 1 January of the year in question (or, in some cases, on 31 December of the previous year).

In the surroundings of the central towns vast agglomerations are rising whose functioning lays increased demands on transportation and development and operation of public transportation and technical infrastructure. Within the areas of agglomeration on the contrary often as a consequence of negative effects of agglomeration effects (noise, exhausts, problems with parking) a decrease of attraction of housing function happens which influences the pricing of real estate and the social economic structure of population.

Figure 2 Population density in European countries (source EUROSTAT web site)



Note : The ratio of the mid-year population of a territory on a given date to the size of the territory.

This phenomenon can lead to a change of a housing area with a favorable geographical location on mixed-used areas which can then lead to an increase of its attractiveness on the

real estate market, however it can also cause gradual degradation of the physical condition of buildings in the consequence of neglecting regular maintenance and followed by another decrease of its attraction on the real estate market.

In countries of European Union (EU 27 excluding Malta) were situated approximately 100,1 million multifamily dwelling units according to the Report for European Housing Ministers Conference held in Prague, 03. 03. 2005<sup>2</sup>. These dwellings count for an average of 47.5% of the total housing stock in the European Union countries. Over one-third of the multifamily dwellings are situated in high-rise buildings with more than 4 floors. Roughly calculated there are 36 million high-rise dwellings. Dwellings situated in high-rise buildings count for an average of 17% of the total housing stock in the EU countries. The percentage of high-rise dwellings in new members of EU (joined after 1.1. 2004) is higher (34.1%) compared to the old member countries (14,3%). The share of multifamily dwellings from the total housing stock is in the new member states in average 55,8% and in old member states in average 47,0%.<sup>3</sup> The difference between the share of multifamily dwellings from total housing stock in old and new EU member countries is not that high like the difference in case of high-rise dwellings. The number of storeys in multifamily houses has an influence on economy of roof top extension project. In generally there is a rule than fewer storey mean less additional costs (elevator, fire safety, additional foundation etc.) and bigger development potential.

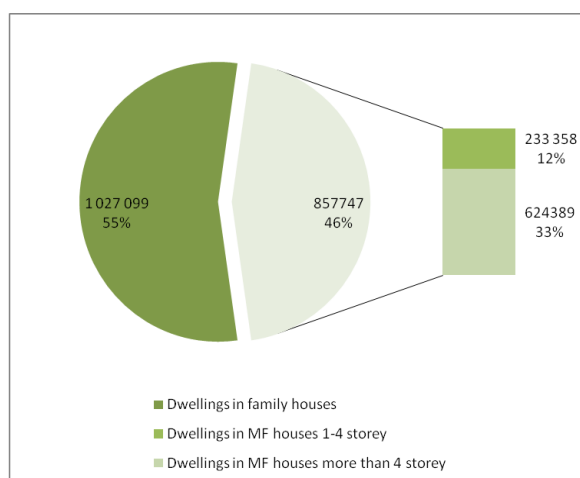
### ***Multifamily housing stock in Slovakia***

At present in Slovakia, and also other countries of Central and Eastern Europe, there is a vast housing area which was built after the World War II. This is the matter of a complex of residential buildings that were built in the form of mass housing construction. Until the year 1990 the construction but also the renovation of residential buildings and housing developments was planned. There were many middle and big construction companies which were able to cover the demands for new construction and renovation. After the year 1990 there was a change of socio-economical model of functioning of states of Middle and Eastern Europe.

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<sup>2</sup> Source : PRC Bouwcentrum International, The Netherlands, Sustainable Refurbishment of High-Rise Residential Buildings and Restructuring of Surrounding Areas in Europe, Report for European Housing Ministers Conference held in Prague, 03. 03. 2005

<sup>3</sup> Source : PRC Bouwcentrum International, The Netherlands, Sustainable Refurbishment of High-Rise Residential Buildings and Restructuring of Surrounding Areas in Europe, Report for European Housing Ministers Conference held in Prague, 03. 03. 2005

**Figure 3 Share of multi-family residential dwellings in housing stock**

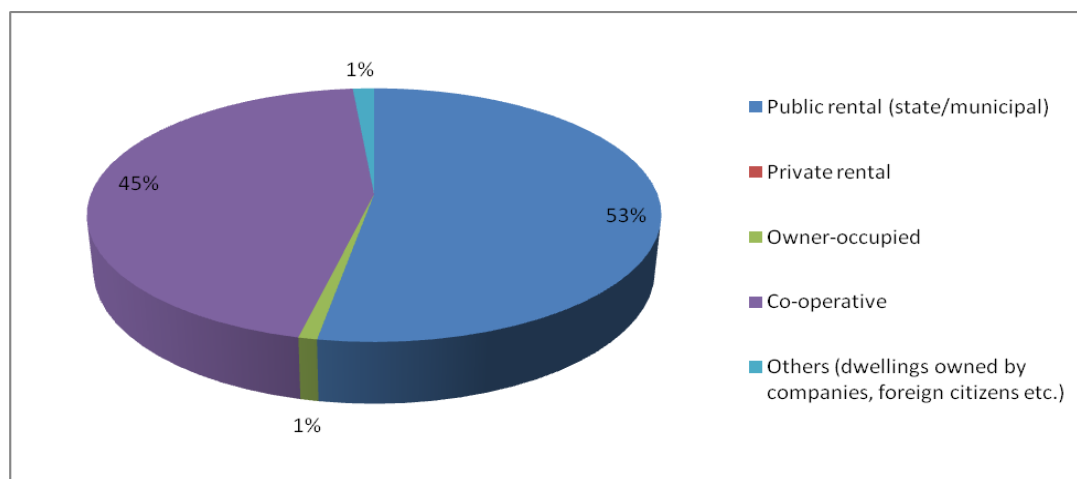
Source Statistical Office of the Slovak Republic Census 2001, Ministry of Construction and Regional Development of the Slovak Republic, [www.build.gov.sk](http://www.build.gov.sk)

Changes were manifested in every area of life and in the area of housing policy they led to massive privatization of the housing fund localized in residential buildings in Slovakia for the prices which mostly did not correspond with the market value of sale of real estate. Changes negatively affected the construction companies which were used to the supply of regular orders and regular salaries. In the 90's development of construction was characterized by the transformation of construction companies and their adaptation to the new conditions and gradual decrease of manufacturing capacity in the area of housing construction and renovation. Part of the redundant capacity was used during the realization of big infrastructural projects ordered by the state.

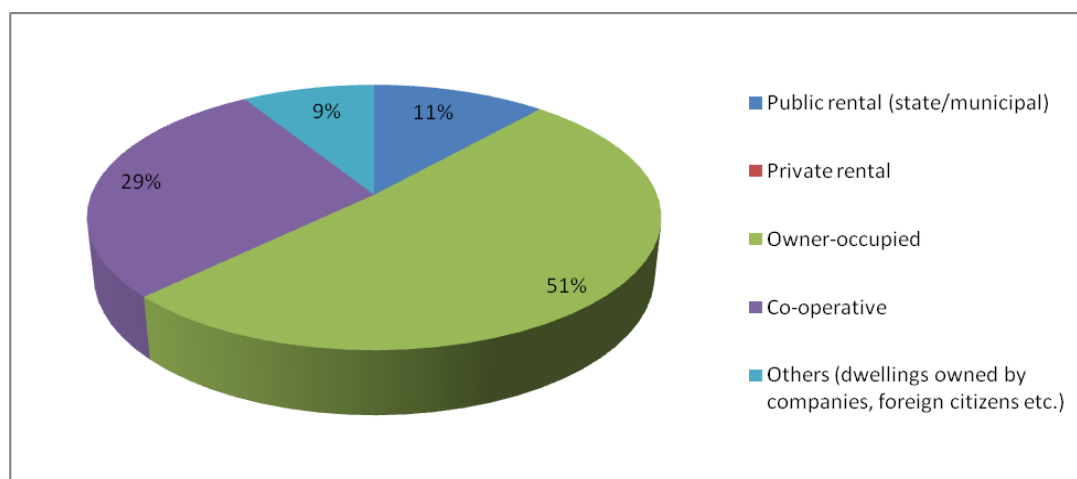
Privatization of the housing fund negatively affected its technical condition. Regular renovations ceased or were performed in the non-systematic ways depending on the financial situation and on "the level of awareness" of the new owners. The law on condominiums in Slovakia is in place, which prescribe the establishment of a condominium in case of multi ownership. Issue of housing condominiums is governed by the Act No. 182/1993 Coll. on ownership of dwellings and non-occupational spaces as amended by subsequent regulations. Owners can choose whether they establish a condominium in a multi-family residential building or close a management agreement with another natural person or legal person. Condominiums are until now important players in management of multifamily housing stock despite than in last few years started to increase the number of professional facility management companies. In former Czechoslovakia played an important role in construction and management of multifamily houses cooperatives. Their share on market was decrease in

second half of 90's. The market share of cooperative before 1991 was 45% and in 2001 was 28.5%.<sup>4</sup>

**Figure 4 Tenure structure of multifamily dwellings in 1991**



**Figure 5 Tenure structure of multifamily dwellings in 2001**



Source : CENSUS 1991, 2001

### ***Multifamily dwellings on the real estate market***

State gradually accepted various measures to support the renovation of the housing fund which in regards of amount at disposal and necessary amount of finances could not resolve accumulating problems. Eighteen years passed from 1990 and during this time the real estate market in Slovakia was transitioning a fast development which represents itself by mostly a form of a fast development of the real estate prices in the attractive areas of Slovakia. It is a peculiarity of the situation on the real estate market in Slovakia, that the prices of old and new apartments are comparable in attractive regions. The increase of prices

<sup>4</sup> Source : Census 1991 and 2001

of the real estate characterizes the whole area of Slovakia in dependence of the demand level for real estate. In the future, in the opinions of real estate experts we can expect another increase of the prices of real estate. However, estimated increase will gradually lose its dynamics and gradually will lead to differentiation of increase (decrease) of prices of apartments in family houses and in apartment buildings and of prices of construction lands. In the future we expect that the increase of prices of apartments in apartment buildings will slow down or stagnate and the rich portion of population will find attractive living in family houses situated in suburban areas of central towns. This development will have an unfavorable effect on the environment which will be represented in the form of decrease of green scenery and agricultural soil, in the form of increase of volume of transportation, in the form of overpricing of functioning of cities – increase of energy consumption. In the inner cities a segregation of socially weaker classes have a negative influence on the redevelopment of apartment buildings in the less attractive areas of the city and with bad technical condition. Other states of Western Europe were confronted with similar development and problems. These states after acquiring negative experience are at the present trying to perform active policies focused on the decrease of social segregation. Part of this politics is also the support of rerefurbishment of decayed neighborhoods as well as the support of refurbishment of apartment buildings built in the form of mass construction.

Western European states compared to the countries of Middle and Eastern Europe have an advantage in the fact that the apartment houses mostly have one owner who rents out the apartments. One owner compared to several tens of owners (present state in Slovakia) can more easily prepare and realize complex refurbishment of the apartment house. Owners in Western Europe in most cases own apartment buildings long-term and for that reason they have a better understanding of construction modifications on objects built in the past, of their technical condition and also have the accumulated means for a necessary renovation. Opposite to this, the owners in Slovakia are not often aware of what physical condition is the object they own and what type of works are necessary to be performed in order to maintain its satisfactory technical condition. There is also the problem to agree on a schedule and form of renovation and on an increase of allocations paid into the fund of repairs, which cover the renovation costs. The law on condominiums define the minimal amount of paid into the fund of repairs on level approximately 25 cents/m<sup>2</sup>, month. It means in case of flat with 60 m<sup>2</sup> and 10 m<sup>2</sup> share on public spaces inside the house monthly paid 17,5 Euro. This amount compared with the real needs of refurbishment is too low. The required level of payments according to the estimation of facility managers has to be close to 1 Euro/ m<sup>2</sup>, month (source own investigation). This amount is in many cases not acceptable to the socially weaker groups like retired people, who live alone.

Recently the situation has improved as more lucrative loans from banks are available on renovation of the housing fund for which the owners do not have to use their apartments as a guarantee in favor of the banks. After the owners decide to take a loan they have to pay for them from the account which contains the payments to the fund of repairs.

***Possible sources of finance MF houses refurbishment***

Human constructions built in different time periods react by their architectural, technical and functional solutions to the demands laid by society of a certain period. Since we can follow the growth of standard of life quality in the long-term and also the growing science-technology development in the recent period, buildings built half a century ago cannot fully meet the current demands. That is the reason why their gradual reconstruction, conversion or replacement by new buildings is necessary.

Considering that the economy of Slovakia is not capable of replacing the existing housing fund which is located in the multifamily houses that were built after the World War II, it is necessary to dedicate an increased focus on renovation of this housing fund. To support renovation of apartment buildings various grant schemes can be created and financed by national and European sources (even though the question of utilization of European means is complicated in regards of the proprietary condition of real estate) and from the loan sources granted by financial institutions etc.. In 2003 the state expenditures on housing in Slovakia represented 2.8% of total annual budget. The housing budget was divided into 5 main areas: subsidies for new construction 18.3%, loans 30.1%, interest subsidies 5.9%, premiums building saving contracts 32.3%.<sup>5</sup>

State subsidies are oriented on the provision of funds in the following fields:

- provision of rental housing for socially underdeveloped population groups,
- preparation of land and development of technical infrastructure (public drinking water, savage and gas pipe network, electricity and public road) being a precondition of construction and utilization of new housing,
- removal of systems failures of residential buildings.

Systems failures are defects grounded on the wrong design and technical solution of multifamily houses created according to the standardized project using prefabricated technology. The subsidy for removal of system failures is set by two parameters, by the proportion of procurement cost (up to 50%) and by cost per square meter of apartment floor area.

State-supported loans are based on three systems of funding, especially:

- contractual pavings for housing,
- mortgage loans,
- State Housing Development Fund.

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<sup>5</sup> Source : Ministry of Construction and Regional Development of the Slovak Republic, [www.build.gov.sk](http://www.build.gov.sk)

The expenditures on multifamily housing stock refurbishment subsidies are comparing with the demand on a very low level. The main problems of the current multifamily housing stock in Slovakia are: need for modernization, low level of energy efficiency and insufficient building maintenance level.

One of the options how to create sufficient sources for renovation of apartment buildings is to utilize the roof of the apartment building as a construction area and build it up. Means acquired from the sale of built-up after deducting the costs can be used for renovation. It is a matter of a one-time possibility which is limited by many factors that depend on localization and constructive technical solution of the apartment building. The aim of this thesis is to investigate these factors and suggest a model of financing and the process of realization of renovation of apartment building in the form of its built-up. The paper aims to contribute to the development of theoretical knowledge of energetically passive prefabricated construction schemes available for mass built-ups of apartment buildings in Slovakia.

### ***Characteristics of technical and qualitative level of MF houses build before 1991***

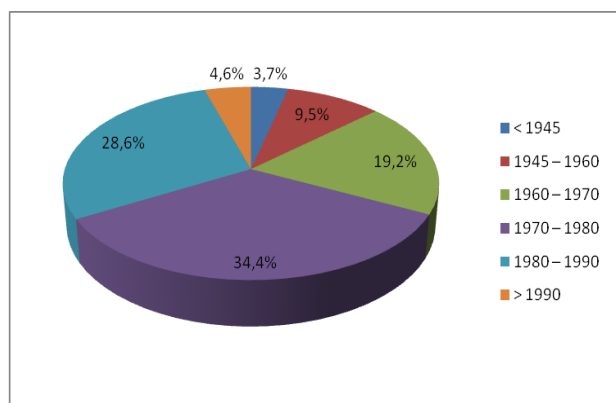
#### *MF houses built before 1945*

In Slovakia the construction of multifamily houses started after World War One. In this period mainly 2 and 3 storey buildings were built with traditional construction system: concrete foundation, solid brick walls, wooden ceilings and sloping roofs. In this period 1-4 room flats with size 50-125 m<sup>2</sup> were constructed. In this period there was no typification and those houses are nowadays situated on attractive places inside the city. According to own estimation from this period there are around 100 houses which can be extended by one or two floors.

#### *MF houses built between 1945-1960*

Between the years 1945 and 1960 in Slovakia continued the multifamily houses production. The height of the new houses increased to up to 6 floors. From 1950 projects typification started. The new built houses have mainly sloping roof, but at the end of the 50's some new modular systems with a flat roof were designed. In this period 1-3 room flats and studios with size 25-75 m<sup>2</sup> were constructed. According to own estimation from this period there are around 1000 houses which can be extended by one or two floors.

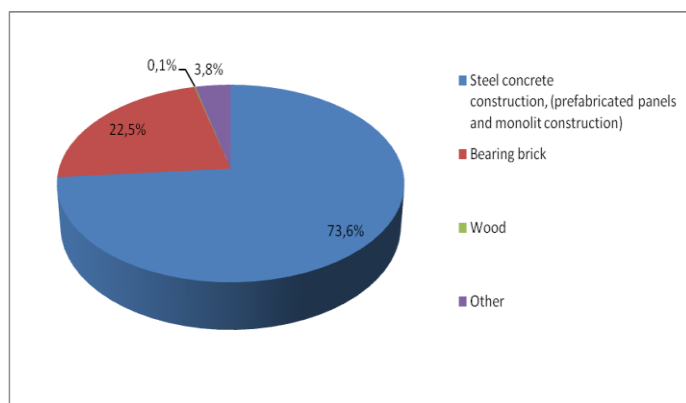


**Figure 6 Age of the multifamily housing stock in Slovakia**

Source : Ministry of Construction and Regional Development of the Slovak Republic, 2005

### *MF houses built between 1960-1991*

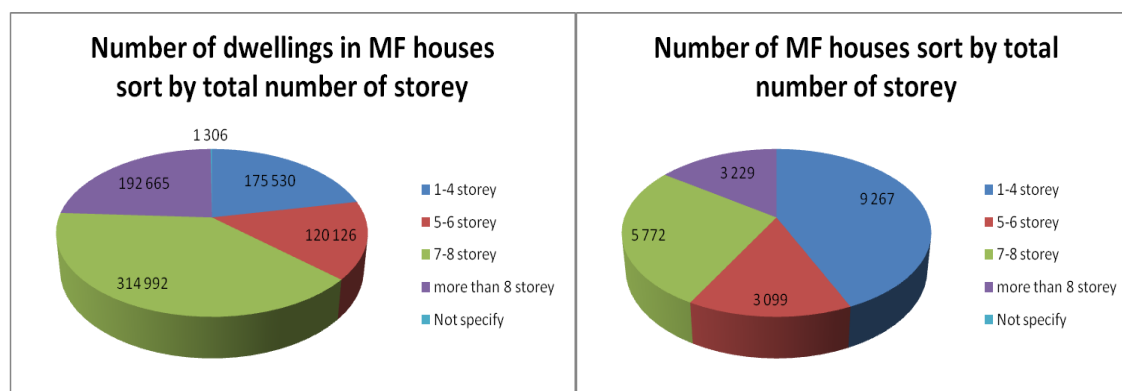
In the 60's new modular systems designed mainly from prefabricated panels were introduced. The height of new houses was increased to up to 13 floors. The productions of new high rise buildings rise. The main part of flats in multifamily houses in Slovakia was built in the 60's and the 70's. The size of new flats from this period ranges from 25 to 84 m<sup>2</sup>. According to own estimation from this period there are around 3500-5500 multifamily houses which can be extended by one or two floors.

**Figure 7 Construction methods of multifamily houses**

Source : Ministry of Construction and Regional Development of the Slovak Republic, 2005

**Estimated roof top extension potential in Slovakia**

In Slovakia, in different parts of the country, there are around 4500-6500 multifamily houses which can be extended by one or two floors. Of course this is only a rough estimation which is based on the number of houses which are lower than 8 floors. The estimation is grounded on statistical dates presented on Figure number 8.

**Figure 8 Number of multifamily houses sort by total number of storey**

Source : <http://www.rozvojbyvania.sk>, 09/2007

**Advantages of roof extensions in Slovakia**

Advantages of roof extensions in Slovakia are mainly the same as in other countries. The main advantages are :

- Land saving especially in densely urbanized areas : for example Bratislava region,
- Creation of additional building sites in attractive areas of inner cities,
- Supporting the positive changes in tenure structure of high rise residential buildings by creating new high standard flats,
- Supporting the current housing stock replenishment by flats of bigger and smaller size than average,
- Improving the current appearance of building from architectural point of view and improving their technical condition
- Increasing the efficiency of use of current technical infrastructure, social infrastructure and public transport facilities
- Creation of additional sources to finance the refurbishment of multifamily houses.

**Disadvantages of roof extensions in Slovakia**

Disadvantages of roof extensions in Slovakia are mainly the same as in other countries. The main disadvantages are:

- The more efficient use of urban space, the more negative influence on its attractiveness,
- Design of individual roof extension projects without coordination may cause a degradation of the original architectural and urban concept of area. This is a serious problem in Slovakia today,
- With the construction of additional flats comes increased lack of parking facilities,
- Potential problems with bearing structure and foundation of objects after their roof extension,
- Problems occurring during the construction process. Damages caused by weather influences, for example leaking into the flats on the top floor.

#### ***Factors which have influence on roof top extension project economy***

In this chapter I will investigate what factors have influence on project economy. The most important factor is the price level at the real estate market in a specific region. This factor determine the level of expected incomes from the selling the additional created apartments.

Second important factor is the current physical condition of the multifamily building, on which can be created a new roof top extension. Important is the technical solution of the foundation and the type of soil under it. Important are the limitations joined with the number of storey of the multifamily house – for example regulation referred to the height determined by spatial plan of the area, regulations referred to the fire safety. There are some other regulations according to the law enacted by local municipality which are potential sources of additional expenditures for example the necessity to create new parking places.

There are some other costs which have smaller influence on project economy like: additional costs caused by necessity to rent public spaces to establish limited construction site and additional costs caused by carried out construction works in higher locations.

#### ***Conclusion***

Multifamily houses are situated in every European country. In the western and eastern part of Europe are problems joined with multifamily houses different scope. There is one element which is similar in every country and that is the energy saving potential after the refurbishment. To create additional apartments in existing living areas is a good possibility to make correction in existing structure of size of apartments and in their tenure structure. In

current multifamily housing stock in Slovakia is the share of the flats with size 100 or more square meters very low.

Roof extension for multifamily houses is a good possibility to create additional dwellings close to the central part of cities without build up existing green spaces. Profit from the selling of new dwelling units is an “extra source” to finance the reconstruction and modernization of multifamily houses. Their current technical condition (especially in CEE countries) and moral appearance is on low level. This situation is partly the result of the low level of investments to the maintenance in last decades. Roof top extension in existing residential areas is a very complex issue and has positive and negative influence to the living space and living standards.

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