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# Central European Regional Policy and Human Geography

University of Debrecen
Department of Social Geography and Regional Development Planning

# Central European Regional Policy and Human Geography

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# C O N T E N T S

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# COMPETITIVENESS VS. SECURITY POLICY. QUESTIONS OF IMMIGRATION POLICY REGARDING THE MOBILITY OF HIGH QUALIFIED EMPLOYEES

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**Abstract:** The flow of human capital is one of the most important aspects of globalization. The different global economic players tend either to emphasize its advantages and drawbacks or benefit from it according to their interests. Today, not only does the nation state face increased immigration, but also more and more players are appearing in this market as interested parties –like transnational corporations, universities, research institutes, multinational organization. Because of these factors, the question presents itself: how are the competitiveness and security of national states and multinational companies related? Each national state tries to act according to the lobby pressure of multinational companies, which want to fill their labour needs from the global labour market but have to confine with different immigration laws, and they tend to facilitate the immigration processes and laws. This facilitation of laws evidently leads to taking serious security risks. Is it worth it for a nation state to take the risk just to be more competitive?

**Keywords**: student mobility, immigration policy, high qualified labour force, economic competitiveness, shortage of labour force

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## INTRODUCTION

There is no standard view on how to evaluate the migration of the modern era that is rooted in the processes of globalization. It can not be said that its effects are exclusively positive or negative. Most of its critics either from the media, society or politicians worry about the masses of badly or unqualified immigrants. These people, who arrive into the lower social strata, cause everyday problems that the whole society has to cope with. Mainly, they are employed in those jobs and positions that the local residents would never do (DDD) and there is no chance of social advancement for them. Their hopeless situation often draws them into criminal activity or pushes them to the edge of society, and that is why they gain more and more repugnance from their host society, and a global economic recession is making matters worse. Their reception is risky in several areas as it means taking political, economic, social, cultural, national security and criminal risks (Póczik, 2011).

However, there is a small group of immigrants who are competitive players in the labour market of their host country due to their qualifications and character attributes. The members of this exclusive club are highly qualified employees and university students who are considered to be the number one target group among qualified immigrants. They are the

group for which there is a desperate struggle in the international labour market. The aim is to get the best ones, the only reason being competitiveness. The developing Knowledge Economy needs the best professionals to gain a competitive edge over the other competitors. The aim of each national state is to effectively support the development of their Knowledge Economy.

Why are these immigrants favoured? Why are they fought for? Why is there a growing interest in university students? What risks do they entail? Can competitiveness override everything? How has the consideration of highly qualified employees changed during recent years?

## THE DEMAND FOR HUMAN CAPITAL

In this chapter I would like to list the most important influences upon the global and regional demand of human capital. How do Western –European demographic changes, visa policies of the USA or human resource policies of transnational companies affect the flow of highly qualified employees (Haug-Sauer, 2006)? These are the main factors influencing the flow, the cost and the risk assessment of human capital. The thorough analysis of these complex processes is absolutely vital if we want to understand and recognise all the factors involved when forming the immigration policy of a given country.

But first let us define the notion of human capital. If we do that, we can easily understand why this form of capital is so important in a globalized globalized world and for the Knowledge Economy. In general, we mean by that the set of skills and abilities that an employee acquires through his studies, trainings and job experiences or international scholarships which increase his value. The world of business has a narrower approach, and they mean by it all the skills, qualifications and abilities that directly contribute to the success of a company or a specific industry (OECD). Because of this narrower approach, we will be referring only to highly qualified employees who are indispensable for those companies, research institutes and laboratories which wish to increase their efficiency and competitiveness.

### Demographic transition

The working age population in the labour market continues to decrease due to Western-European demographic changes. On the other hand, as life expectancy rates increase, less active workers have to support more retired people.

This trend is causing serious problems and endangers the sustainability of the social security system. Also, it entails a serious risk for the economy of the country. In some fields of the economy, the effect of this demographic transition can be felt even nowadays as there is a growing shortage in the labour force. That is why there is a strong demand for highly qualified professionals (IT experts, doctors, researchers, engineers) and skilled workers. The solution for this problem is the effort to recruit employees from foreign countries to strengthen the labour market and ensure the competitiveness of the country and also finance the social security system for the citizens of the host country (Sachverstandigenrat deutscher Stiftungen für Integration und Migration, 2012). Despite these facts, in Germany it is estimated that there are hundreds of thousands of vacancies that cannot be filled because of the lack of qualified employees (Bevölkerung und Migration 2012/4).

To sum up, the countries seriously affected by this demographic transition are trying to attract the most suitable employees from other countries to save their position in the global markets and ensure the sustainability of their economic and social systems.

## Competitiveness

The notion of competitiveness has been used more and more often since the 1980s. What influence does it have on the international migration and Immigration Policy?

We can arguably say that all things are interdependent. The competitiveness of a company producing a product depends on the competitiveness of the given product (its price, quality and other market qualities). If a company wants to launch a new, innovative product or service, it needs the proper employees in addition to the financial background. This explains why those companies which want to sell their products in the global market fight for the best professionals. These professionals are able to gain a bigger market share by creating competitive products and enlarging productivity.

The definition of the economic competitiveness of a state is still controversial among economists as competitiveness emerges in different areas: economy, science, culture, social welfare, security, political system, prestige and power. It also influences the rate of economic growth or the position of a country in international trade, the flow of capital and labour force or in the international exchange of technologies and information (Szentes, 2012). Porter's approach to a nations' competitiveness can explain why transnational companies are so successful at lobbying in the field of immigration policy. According to Porter, a nation's competitiveness is equal to the competitiveness of its companies. This way, the need for proper human capital can easily be justified by both sides as neither the companies' nor the nation's competitiveness can do without the highly qualified and good-sized labour force. As a result of positive feedback, successful enterprises can attract new entrepreneurs, or talented, creative employees can end up create new competitive businesses in the global market – as in the Silicone valley in the USA. This is why international companies would like to influence the immigration policies of nations (Haug-Sauer, 2006).

## NATIONAL SECURITY. WHAT HAS CHANGED IN THE 21ST CENTURY?

In the following section, I would like to describe the immigration policies that are being changed mostly with regard to the security policies because of the above mentioned.

Forming the immigration policy is a touchy area as it affects other areas of politics and the economic, political and social interests often contradict. However, politics, society and economy have very different views on the migration of highly qualified employees. In order not to get into competitive disadvantage in the market of highly qualified labour, the immigration policies had to be changed during the last few decades.

The example was set by the USA, Canada and Australia, which carry out an intentional recruitment and marketing agenda among highly qualified foreigners and university students and they try to control, by quotas, the flow of migrants according to their qualification and profession to select those who are not needed or too risky.

The above mentioned countries were the most important destinations for migrants from all over the world even before the turn of the century. Because of their successful marketing activities, lots of foreign university students, PhD students and postgraduate students completed their studies or carried out their research work here. This rising trend was broken by 09/11 and the following European terrorist attacks in Madrid and London.

The migrant suddenly became a terrorist with high national security risks. To make matters worse, the terrorist attack against the WTC was committed by elite theorists who graduated at European (mainly Hamburg) universities and colleges. These people had been living in Germany as equal members of the German society. This drew the attention to the terrorist cells, integrating into society pretending assimilation and waiting for the best moment to act, meaning real risks. This raised the question to national security: what if they

infiltrate the national strategic fields like military researches. What should a government do to gain the kind of labour force that is vital but lessen the security risks?

The answer for this question in the USA was to make the process of visa issuance harsher. In this way, the proportion of foreign students studying sciences in the USA decreased with 20 percent during the Bush era and it caused serious difficulties at the research institutes as the proportion of foreign PhD. students in these institutions were often times more than 50 percent. Also, it caused financial difficulties because the main profile of some institutes in the US were educating foreign students on a market basis realizing profits and with these acts, the government made it impossible for them to survive. What is more, the international companies which had recruited staff from these universities found themselves in competitive disadvantage over other companies in the global market.

9/11 started another unexpected chain reaction in the fields that influence the immigration policy of a given country. US citizens became even more mistrustful with migrants from other countries, especially with those coming from Arabic countries. Because of this, all the students, highly qualified employees and researchers who could not get a US visa despite the fact that they had wanted to work primarily in the USA went to find a job or university place in competitor countries. This process became so worrying that the new government had to take immediate measures to stop it otherwise it threatened to lose the formerly gained leading-edge in the Knowledge Economy. This change in approach can be seen in Barack Obama's new program for education and science policy. The main goals are to make it easier for foreign students to get into the USA and to encourage their settling down. The fast visa process aims to demonstrate to them the fact that they are welcome. (Illés, 2009; Polonyi, 2012). This immigration policy can be seen as a new trend and more and more countries view the foreign students as future employees (Rédei, 2009). They try to encourage their foreign students to stay in the host country after graduation and also make it easier to get work permit if they already have a student visa.

The immigration policy of the European Union is more complex as it has to combine the interests of each member state with the interests of a supranational organisation. To sum it up, we can say that the EU tends to create a single European immigration policy which simplifies the processes for university students and highly qualified employees. According to the Tampere Program, researchers and students coming from a third country can get the 'Blue Card' after a simplified issuance procedure. This program aims to create a competitive Knowledge Economy within the borders of the EU to strengthen the global market competitiveness of the EU. However, each member state is still quite free in making their own decisions and that is why Germany can exploit the potential in the foreign students and tries to encourage them stay in the country after graduation (Sachverstandigenrat deutscher Stiftungen für Integration und Migration, 2012).

All in all, different nations and states tend to form their immigration policy according to two basic ideas: on one hand they try to attract the required, competitive labour force and keep out the rest with the help of quotas, on the other hand they make efforts to encourage the more or less integrated foreign students to stay in the country.

## CONCLUSIONS

In conclusion, we can say that the states forming the new Knowledge Society try to cope with the threats and risks of terrorism. The short-term, strict regulations in immigration policy were turned into encouraging measurements as far as the foreign university students and highly qualified employees are concerned. So governments tend to choose the bigger risks in favour of retaining their countries' market positions and competitiveness in the global labour market.

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# TENDENCIES OF CHANGE CONCERNING BUSINESS ORGANISATIONS IN THE CONSTRUCTION INDUSTRY IN HUNGARY BETWEEN 2000 AND 2013

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**Abstract:** The distribution of business organisations according to the number of employees has long been an important area of research in economic geography. What is in the background of the above is that the economic position of individual geographical areas, as well as the strength of the local economy, are fundamentally influenced by the size of the companies operating there. In the light of the above, the purpose of this paper is to examine the changes concerning the size categories of registered business organisations in the construction industry, which is considered as an important base of the economy, in the period between 2000 and 2013, as well as to address the differences between the counties.

**Keywords**: construction industry, Hungary, counties

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## INTRODUCTION

The distribution of business organisations according to the number of employees has long been an important area of research in economic geography. What is in the background of the above is that the economic position of individual geographical areas, as well as the strength of the local economy, are fundamentally influenced by the size of the companies operating there: larger companies, as a result of higher levels of employment and larger amounts of capital at their disposal, provide a more secure basis for development (Baráth et al., 2011; Péter et al., 2011; Rőfi et al., 2011).

In the light of the above, the purpose of this paper is to examine the changes concerning the size categories of registered business organisations in the construction industry, which is considered as an important base of the economy (Coe et al., 2007; Comber et al., 2008), in the period between 2000 and 2013, as well as to address the differences between the counties. In the course of our analysis, we also wish to point out some of the most important tendencies of change that occurred in the new millennium.

## GENERAL TENDENCIES OF CHANGE

Examining the changes in the number of registered business organisations (Figure 1, Table 1), we can observe a very significant change between data pertaining to the construction industry and the economy as a whole. The first half of the period examined was characterised by significant growth in the construction industry, the rate of which exceeded the rate of growth in the economy as a whole. In the second half of the decade (mainly after 2008), however, in contrast with the processes in the larger economy, there was already stagnation, and then after 2011, a major decrease could be observed. In the background of this process, we can primarily identify the drop in the level of investments, which is attributable to the effects of the economic crisis.

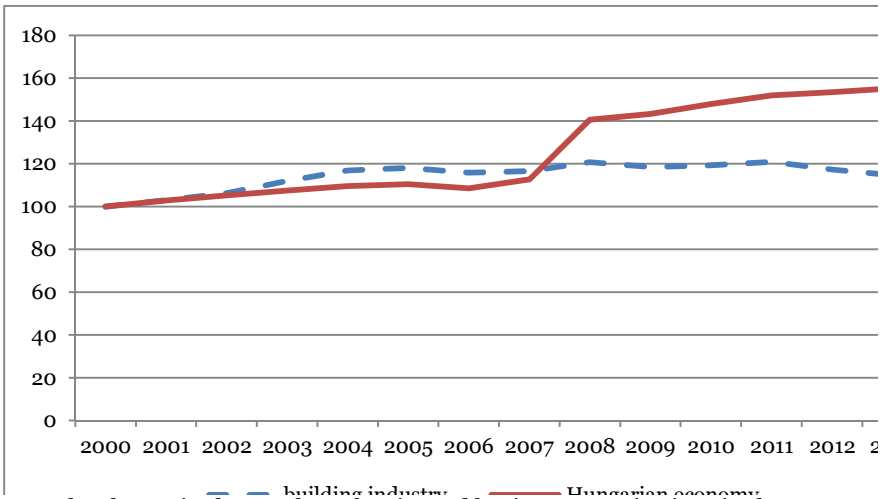


**Figure 1** The change in the number of registered business organisations in the construction industry and the economy as a whole, relative to the levels in 2000 (2000 = 100%)

Source: Central Statistical Office

**Table 1** The change in the number of registered business organisations in the construction industry and the economy as a whole, between 2000 and 2013 (number of companies)

| | construction industry | Hungarian economy |
|---|---|---|
| 2000 | 81,503 | 1,174,881 |
| 2001 | 83,906 | 1,207,137 |
| 2002 | 86,635 | 1,236,140 |
| 2003 | 91,158 | 1,263,138 |
| 2004 | 95,218 | 1,285,987 |
| 2005 | 96,243 | 1,297,687 |
| 2006 | 94,436 | 1,274,348 |
| 2007 | 94,956 | 1,323,409 |
| 2008 | 98,410 | 1,651,415 |
| 2009 | 96,552 | 1,682,791 |
| 2010 | 97,222 | 1,737,729 |
| 2011 | 98,521 | 1,785,298 |
| 2012 | 95,536 | 1,801,707 |
| 2013 | 93,368 | 1,823,134 |

Source: Central Statistical Office

Concerning the distribution of registered business organisations according to the number of employees (Table 2a and 2b), two questions deserve special attention: first, what differences can be observed between the data pertaining to the construction industry and the entire economy; and second, what changes over time occurred in the case of the construction industry. In the framework of a comparison between the data concerning the construction industry and the economy as a whole, we can clearly conclude that the proportion of smaller companies is higher in the construction industry than in the economy as a whole, while in case of larger companies (having more than 50 employees), the situation is the opposite. There are primarily two factors in the background of this phenomenon: on the one hand, a significant part of the market demand in the construction industry (e.g. the construction of family residences, interior decoration and home improvement, repairs) are smaller projects, and smaller businesses are more suitable for implementing these. On the other hand, in the construction industry, even in the case of larger projects, the use of a system of subcontractors is quite widespread, meaning that several smaller enterprises, each having a specialized expertise, would typically work on the implementation of larger projects also.

Examining the change over time of the size of registered business organisations reveals two larger groups (for reasons provided in the caption of the table, the categories of companies with 0 or unknown, as well as those having 1 to 4 employees were not analysed). In case of business organisations having 5 to 9 and those having 10 to 19 employees, we can still observe a growth until the middle of the first decade of the 21st century, while the decrease was continuous in case of business organisations having 50 employees or more. (There was some fluctuation in case of those with 20 to 49 employees, but the decrease became marked by the end of the period examined.)

**Table 2a** The change in the proportions of business organisations in different categories according to the number of employees relative to all registered business organisations in the construction industry (A) and in the entire economy (B) between 2000 and 2013 (the significant rearrangement between organisations with zero/unknown and 1 to 4 employees was fundamentally due to administrative reasons)

| | 0 person employed and unknown | | 1-4 persons employed | | 5-9 persons employed | | 10-19 persons employed | |
|---|---|---|---|---|---|---|---|---|
| | A | B | A | B | A | B | A | B |
| 2000 | 64.32 | 72.42 | 25.56 | 20.97 | 4.90 | 2.77 | 3.11 | 1.87 |
| 2001 | 61.99 | 71.78 | 27.92 | 21.60 | 5.01 | 2.86 | 3.06 | 1.81 |
| 2002 | 60.03 | 70.88 | 29.50 | 22.43 | 5.44 | 2.99 | 3.07 | 1.79 |
| 2003 | 59.01 | 70.59 | 30.50 | 22.73 | 5.48 | 3.01 | 3.05 | 1.77 |
| 2004 | 24.91 | 46.74 | 64.37 | 46.41 | 5.79 | 3.21 | 3.04 | 1.78 |
| 2005 | 15.90 | 33.84 | 73.06 | 59.21 | 6.00 | 3.29 | 3.15 | 1.79 |
| 2006 | 15.32 | 32.46 | 72.71 | 60.25 | 6.61 | 3.53 | 3.48 | 1.85 |
| 2007 | 17.01 | 32.11 | 70.96 | 60.91 | 6.92 | 3.44 | 3.32 | 1.81 |
| 2008 | 19.13 | 26.46 | 68.44 | 67.77 | 7.05 | 2.83 | 3.50 | 1.50 |
| 2009 | 19.82 | 29.72 | 67.85 | 64.65 | 7.14 | 2.79 | 3.35 | 1.40 |
| 2010 | 19.66 | 31.01 | 68.41 | 63.55 | 7.04 | 2.71 | 3.18 | 1.36 |
| 2011 | 20.00 | 31.99 | 68.95 | 62.86 | 6.50 | 2.58 | 2.96 | 1.28 |
| 2012 | 19.73 | 32.93 | 68.90 | 61.93 | 6.68 | 2.60 | 3.12 | 1.30 |
| 2013 | 19.64 | 33.59 | 69.50 | 61.45 | 6.43 | 2.53 | 2.91 | 1.28 |

Source: Central Statistical Office

**Table 2b** The change in the proportions of business organisations in different categories according to the number of employees relative to all registered business organisations in the construction industry (A) and in the entire economy (B) between 2000 and 2013 (the significant rearrangement between organisations with zero/unknown and 1 to 4 employees was fundamentally due to administrative reasons)

| | 20-49 persons employed | | 50-249 persons employed | | 250 and more | |
|---|---|---|---|---|---|---|
| | A | B | A | B | A | B |
| 2000 | 1.59 | 1.17 | 0.47 | 0.69 | 0.04 | 0.13 |
| 2001 | 1.51 | 1.16 | 0.47 | 0.68 | 0.04 | 0.12 |
| 2002 | 1.48 | 1.15 | 0.44 | 0.65 | 0.04 | 0.11 |
| 2003 | 1.48 | 1.14 | 0.44 | 0.65 | 0.04 | 0.11 |
| 2004 | 1.44 | 1.11 | 0.43 | 0.65 | 0.03 | 0.11 |
| 2005 | 1.47 | 1.13 | 0.38 | 0.64 | 0.03 | 0.10 |
| 2006 | 1.49 | 1.17 | 0.36 | 0.64 | 0.03 | 0.10 |
| 2007 | 1.39 | 1.03 | 0.37 | 0.59 | 0.03 | 0.10 |
| 2008 | 1.48 | 0.87 | 0.37 | 0.49 | 0.03 | 0.08 |
| 2009 | 1.45 | 0.86 | 0.37 | 0.49 | 0.03 | 0.08 |
| 2010 | 1.35 | 0.83 | 0.33 | 0.47 | 0.03 | 0.08 |
| 2011 | 1.25 | 0.77 | 0.32 | 0.45 | 0.02 | 0.08 |
| 2012 | 1.21 | 0.74 | 0.33 | 0.43 | 0.02 | 0.08 |
| 2013 | 1.21 | 0.71 | 0.29 | 0.38 | 0.02 | 0.07 |

Source: Central Statistical Office

As far as the rates of change are concerned (Table 3), we can clearly observe that in case of smaller companies (those with 5 to 9 and 10 to 19 employees), the figures of the construction industry are better, while in case of larger companies the rate of the decrease was much higher.

**Table 3** The rates of change of registered business organisations of different sizes between 2000 and 2013 in the construction industry and in the entire economy (%)

| | 2013 (2010=100) | |
|---|---|---|
| | building industry | Hungarian economy |
| 0 person employed and unknown | 34.98 | 71.97 |
| 1-4 person employed | 311.47 | 454.75 |
| 5-9 persons employed | 150.36 | 141.81 |
| 10-19 persons employed | 107.25 | 106.29 |
| 20-49 persons employed | 87.26 | 93.61 |
| 50-249 persons employed | 69.87 | 85.50 |
| 250 and more | 51.43 | 91.58 |

Source: Central Statistical Office

Major differences can also be observed with respect to the distribution of business organisations operating in the construction industry on the basis of their specialized sub-sectors (Table 4). Nearly two-thirds of all organisations were operating in the sub-sector of specialized construction work (which includes, among other things, the category of "other building installation" and "building completion and finishing"); the second place belonged to the construction of buildings, with the rest of the sub-sectors having only a minimal share. At the same time, it can be clearly seen from the data that the individual sub-sectors have different weights among the registered business organisations.

**Table 4** The distribution of registered business organisations of different size categories in a breakdown according to sub-sectors of the construction industry in 2013

| | A | B | C | D | D | total |
|---|---|---|---|---|---|---|
| 0 person employed and unknown | 43.4 | 4.1 | 4.1 | 2.0 | 46.3 | 100.0 |
| 1-4 persons employed | 21.7 | 1.9 | 2.4 | 1.1 | 72.9 | 100.0 |
| 5-9 persons employed | 33.6 | 5.4 | 3.9 | 1.7 | 55.4 | 100.0 |
| 10-19 persons employed | 34.8 | 7.5 | 6.5 | 2.8 | 48.4 | 100.0 |
| 20-49 persons employed | 37.6 | 9.4 | 9.8 | 3.7 | 39.5 | 100.0 |
| 50-249 persons employed | 34.6 | 8.6 | 14.5 | 8.6 | 33.8 | 100.0 |
| 250 and more | 11.1 | 44.4 | 33.3 | 5.6 | 5.6 | 100.0 |
| total | 27.4 | 2.8 | 3.1 | 1.4 | 65.3 | 100.0 |

A – construction of buildings, B – construction of roads and railways, C – construction of public utilities, D – other construction activities, E – specialized construction activities

Source: Central Statistical Office

Among smaller companies, it was mainly the sub-sectors of construction of buildings and specialized construct work that were overrepresented, while in case of larger companies, this was mainly characteristic in case of the construction of roads, railways and public utility

works, as well as the erection of other structures sub-sectors. What we can assume is primarily in the background of this process is that the successful operation of companies active in the latter sub-sectors requires a significant stock of capital and inventory of assets, which can decisively be provided by larger companies.

## THE TERRITORIAL CHARACTERISTICS OF THE TENDENCIES OF CHANGE

In the course of the examination of the distribution of registered business organisations active in the construction industry, it is expedient to analyse relative (i.e. per 1000 population), figures. As far as the average of the period between 2000 and 2013 (Table 5) is concerned, the city of Budapest and Pest county are in the best position, with the values of four counties exceeding the national average. An examination of the geographical location of the territorial units concerned, the dominant role of Central Hungary and North-Western Hungary can be observed, which is primarily related to the more frequent building construction activities resulting from the economically more developed status of these regions.

**Table 5** The average number of registered business organisations per 1000 persons in the period between 2000 and 2013 in the construction industry (A) and the total economy (B) in Hungarian counties (%)

| | A | B |
|---|---|---|
| Budapest | 134.0 | 156.6 |
| Pest county | 130.4 | 91.4 |
| Fejér county | 110.0 | 84.6 |
| Komárom-Esztergom county | 117.5 | 83.8 |
| Veszprém county | 107.6 | 96.1 |
| Győr-Moson-Sopron county | 111.3 | 96.1 |
| Vas county | 96.1 | 90.9 |
| Zala county | 95.2 | 106.3 |
| Baranya county | 95.9 | 94.2 |
| Somogy county | 83.4 | 105.7 |
| Tolna county | 92.7 | 88.2 |
| Borsod-Abaúj-Zemplén county | 66.2 | 65.9 |
| Heves county | 85.1 | 83.9 |
| Nógrád county | 79.7 | 67.8 |
| Hajdú-Bihar county | 77.3 | 87.1 |
| Szabolcs-Szatmár-Bereg county | 71.5 | 89.3 |
| Jász-Nagykun-Szolnok county | 76.8 | 72.4 |
| Bács-Kiskun county | 84.7 | 94.6 |
| Békés county | 63.1 | 87.2 |
| Csongrád county | 84.3 | 100.6 |
| total | 100.0 | 100.0 |

Source: Central Statistical Office

If we compare the values characterising the economy as a whole with the situation of the construction industry, a higher value for the latter is found outside of Budapest in territorial units performing well in the construction industry, while the opposite situation can be observed in the capital city, on the one hand, and in Somogy, Szabolcs-Szatmár-Bereg, Békés and Csongrád counties, on the other hand.

If we examine the changes on the level of counties (Table 6), a decrease in the construction industry could be observed only in two counties, Zala and Nógrád, while in all the other territorial units, the number of business organisations active in the construction industry increased between 2000 and 2013, in line with the figures characteristic of the entire economy. As far as the rate of change relative to the national average of the industry is concerned, however, we can conclude that a significant increase only occurred in Pest, Győr-Moson-Sopron and Vas counties.

**Table 6** The change in the number of registered business organisations between 2000 and 2013 in the construction industry and in the Hungarian economy

| | 2013/2000 | | county value relative to national value | |
|---|---|---|---|---|
| | construction industry | total economy | construction industry | total economy |
| Budapest | 100.76 | 119.95 | 87.96 | 77.30 |
| Pest county | 138.90 | 178.77 | 121.25 | 115.20 |
| Fejér county | 110.14 | 142.20 | 96.14 | 91.64 |
| Komárom-Esztergom county | 103.68 | 139.34 | 90.50 | 89.79 |
| Veszprém county | 116.06 | 130.54 | 101.31 | 84.12 |
| Győr-Moson-Sopron county | 130.19 | 159.18 | 113.64 | 102.58 |
| Vas county | 142.39 | 155.61 | 124.29 | 100.28 |
| Zala county | 97.89 | 141.66 | 85.45 | 91.29 |
| Baranya county | 112.04 | 139.36 | 97.80 | 89.81 |
| Somogy county | 108.72 | 138.52 | 94.90 | 89.27 |
| Tolna county | 112.61 | 148.92 | 98.30 | 95.97 |
| Borsod-Abaúj-Zemplén county | 109.42 | 151.07 | 95.51 | 97.35 |
| Heves county | 119.36 | 185.31 | 104.19 | 119.41 |
| Nógrád county | 89.53 | 158.04 | 78.15 | 101.84 |
| Hajdú-Bihar county | 131.13 | 212.31 | 114.46 | 136.81 |
| Szabolcs-Szatmár-Bereg county | 121.35 | 272.30 | 105.93 | 175.47 |
| Jász-Nagykun-Szolnok county | 102.29 | 169.24 | 89.29 | 109.06 |
| Bács-Kiskun county | 123.64 | 196.20 | 107.93 | 126.44 |
| Békés county | 111.28 | 212.83 | 97.13 | 137.15 |
| Csongrád county | 115.61 | 176.96 | 100.91 | 114.04 |
| Hungary | 114.56 | 155.18 | 100.00 | 100.00 |

Source: Central Statistical Office

The comparison of the data pertaining to the construction industry and the entire economy reveals that there is a significant – more than 20% – positive difference for the construction industry in one county only (Vas county), while the opposite (the value for the

entire economy being 20% higher than the value for the construction industry) was the case in 4 counties (Nógrád, Hajdú-Bihar, Szabolcs-Szatmár-Bereg and Békés counties), with Jász-Nagykun-Szolnok and Bács-Kiskun counties also being very close to that.

As far as the average number of employees of business organisations is concerned (Figure 2), in the first half of the first decade of the century, that value was around 8-9, but a decrease started around 2006/2007 – probably due to the economic crisis just then setting in – and today that value is hardly above 6 employees/company.

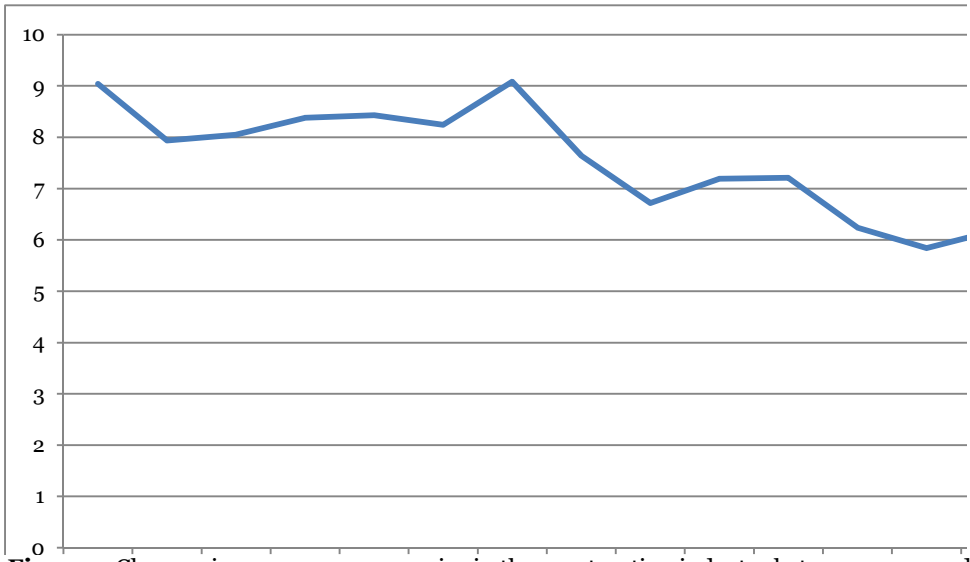


**Figure 2** Changes in average company size in the construction industry between 2000 and 2013 (taking into consideration registered business organisations having more than 4 employees)

Source: Central Statistical Office

If we examine county data (Table 7), we can find very low values for Nógrád, Pest and Komárom-Esztergom counties, with Somogy, Vas, Győr-Moson-Sopron and Csongrád counties representing the opposite extreme (values significantly above the national average). With a view to changes over time, a clear tendency can be established in very few counties, as current investment projects of large budgets, often realized with the financial support of the European Union, generally improved the situation of counties for one or two years, which was then followed by a setback. The spread indicator showing the extent of changes, however, reflects that larger fluctuations could primarily be observed in case of counties with larger-than-average-size business organisations in the region (e.g. Somogy and Vas counties).

**Table 7** The values indicating average company size and the changes in the same in the counties of Hungary between 2000 and 2013

| | A | B | C |
|---|---|---|---|
| Budapest | 6.80 | 89.7 | 1.18 |
| Pest county | 5.77 | 76.1 | 0.83 |
| Fejér county | 7.21 | 95.2 | 1.23 |
| Komárom-Esztergom county | 6.06 | 79.9 | 1.01 |
| Veszprém county | 9.05 | 119.3 | 1.46 |
| Győr-Moson-Sopron county | 9.57 | 126.3 | 1.51 |
| Vas county | 9.92 | 130.8 | 2.35 |
| Zala county | 9.57 | 126.3 | 1.69 |
| Baranya county | 8.62 | 113.7 | 1.51 |
| Somogy county | 10.63 | 140.3 | 2.35 |
| Tolna county | 8.52 | 112.4 | 1.40 |
| Borsod-Abaúj-Zemplén county | 9.27 | 122.3 | 1.55 |
| Heves county | 7.27 | 95.9 | 1.67 |
| Nógrád county | 5.31 | 70.1 | 1.07 |
| Hajdú-Bihar county | 7.73 | 101.9 | 1.72 |
| Szabolcs-Szatmár-Bereg county | 7.61 | 100.4 | 1.91 |
| Jász-Nagykun-Szolnok county | 7.40 | 97.7 | 0.71 |
| Bács-Kiskun county | 7.28 | 96.0 | 1.56 |
| Békés county | 9.12 | 120.3 | 1.76 |
| Csongrád county | 9.66 | 127.5 | 2.69 |
| Hungary | 7.58 | 100.0 | 1.05 |

A – the mean value of average company sizes in the construction industry in the years between 2000 and 2013 (taking into consideration registered business organisations having more than 4 employees), B – the relationship between the county-level mean value of average company sizes between 2000 and 2013 relative to the national value (%), C – the spread of average company sizes in the construction industry between 2000 and 2013

Source: Central Statistical Office

If we examine the distribution of registered business organisations operating in the construction industry according to size categories in 2013 (Table 8), we can conclude that larger companies (having more than 50 employees) can be found in Budapest, as well as in Borsod-Abaúj-Zemplén and Csongrád counties. (If we also consider companies with 20 to 49 employees, we can add Tolna, Szabolcs-Szatmár-Bereg and Békés counties). The opposite extreme (where the proportion of larger companies is very low) primarily consists of Pest, Veszprém, Vas and Nógrád counties.

**Table 8** The distribution of construction industry companies in various size categories in each of the counties of Hungary in 2013 (%)

| | A | B | C | D | E | F | total |
|---|---|---|---|---|---|---|---|
| Budapest | 33.34 | 55.12 | 6.18 | 3.35 | 1.57 | 0.43 | 100.0 |
| Pest county | 22.48 | 68.51 | 5.68 | 2.35 | 0.74 | 0.24 | 100.0 |
| Fejér county | 15.96 | 74.01 | 6.36 | 2.55 | 1.00 | 0.12 | 100.0 |
| Komárom-Esztergom county | 16.57 | 73.07 | 6.37 | 2.70 | 1.22 | 0.06 | 100.0 |
| Veszprém county | 10.53 | 80.88 | 5.54 | 2.12 | 0.73 | 0.20 | 100.0 |
| Győr-Moson-Sopron county | 12.41 | 78.01 | 6.11 | 2.23 | 1.01 | 0.23 | 100.0 |
| Vas county | 11.50 | 80.54 | 4.46 | 2.65 | 0.73 | 0.12 | 100.0 |
| Zala county | 12.15 | 77.06 | 5.88 | 3.22 | 1.35 | 0.34 | 100.0 |
| Baranya county | 14.05 | 74.85 | 6.58 | 3.01 | 1.30 | 0.21 | 100.0 |
| Somogy county | 10.75 | 78.98 | 6.28 | 2.88 | 0.83 | 0.28 | 100.0 |
| Tolna county | 11.96 | 75.06 | 8.04 | 2.90 | 1.68 | 0.36 | 100.0 |
| Borsod-Abaúj-Zemplén county | 18.19 | 68.56 | 7.34 | 3.96 | 1.36 | 0.58 | 100.0 |
| Heves county | 15.24 | 73.90 | 6.86 | 2.45 | 1.27 | 0.29 | 100.0 |
| Nógrád county | 12.89 | 77.21 | 7.35 | 2.02 | 0.52 | 0.00 | 100.0 |
| Hajdú-Bihar county | 11.75 | 75.01 | 7.73 | 3.77 | 1.42 | 0.32 | 100.0 |
| Szabolcs-Szatmár-Bereg county | 18.47 | 68.40 | 7.98 | 3.17 | 1.64 | 0.34 | 100.0 |
| Jász-Nagykun-Szolnok county | 13.72 | 74.42 | 7.90 | 2.91 | 0.82 | 0.22 | 100.0 |
| Bács-Kiskun county | 13.17 | 75.75 | 6.80 | 2.84 | 1.14 | 0.30 | 100.0 |
| Békés county | 10.55 | 77.98 | 6.13 | 3.09 | 1.89 | 0.37 | 100.0 |
| Csongrád county | 12.84 | 74.70 | 7.26 | 3.17 | 1.52 | 0.51 | 100.0 |
| Hungary | 19.64 | 69.50 | 6.43 | 2.91 | 1.21 | 0.31 | 100.0 |

A – 0 person employed and unknown, B – 1-4 persons employed, C – 5-9 persons employed, D – 10-19 persons employed, E – 20-49 persons employed, F – 50 and more

Source: Central Statistical Office

The analysis of the distribution of registered business organisations in the construction industry in a breakdown according to sub-sectors and counties (Table 9) reveals several peculiar features. In the case of the construction of buildings sub-sector, the share of larger companies was particularly high in Szabolcs-Szatmár-Bereg, Békés and Csongrád counties, while in case of the erection of other structures sub-sector, the same can be observed in Zala and Somogy Counties, and in case of the specialized construction work sub-sector, in Budapest and in Borsod-Abaúj-Zemplén county.

**Table 9** The distribution of registered business organisations active in the construction industry in a breakdown according to number of employees in the counties of Hungary, in the various sub-sectors of the construction industry, in 2013 (%)

| | construction of buildings | | | civil engineering works | | | specialized construction activities | | |
|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | A | B | C | A | B | C |
| Budapest | 88.7 | 9.5 | 1.8 | 80.4 | 13.3 | 6.2 | 89.4 | 9.0 | 1.5 |
| Pest county | 89.6 | 9.2 | 1.2 | 80.5 | 15.5 | 4.1 | 92.7 | 6.7 | 0.6 |
| Fejér county | 87.3 | 11.5 | 1.2 | 76.9 | 18.6 | 4.5 | 92.1 | 7.1 | 0.8 |
| Komárom-Esztergom county | 85.5 | 12.1 | 2.4 | 77.8 | 18.2 | 4.0 | 92.1 | 7.2 | 0.7 |
| Veszprém county | 87.4 | 10.7 | 2.0 | 81.9 | 13.5 | 4.7 | 93.5 | 6.2 | 0.3 |
| Győr-Moson-Sopron county | 85.8 | 12.1 | 2.1 | 74.7 | 19.6 | 5.7 | 92.6 | 6.6 | 0.7 |
| Vas county | 87.0 | 11.4 | 1.6 | 79.2 | 16.7 | 4.2 | 94.5 | 5.1 | 0.4 |
| Zala county | 83.9 | 13.4 | 2.7 | 66.9 | 24.4 | 8.7 | 93.1 | 6.2 | 0.7 |
| Baranya county | 84.5 | 13.2 | 2.3 | 77.9 | 16.3 | 5.8 | 91.4 | 7.7 | 0.9 |
| Somogy county | 85.5 | 13.1 | 1.4 | 68.1 | 24.1 | 7.8 | 93.7 | 6.0 | 0.3 |
| Tolna county | 78.9 | 17.9 | 3.1 | 80.6 | 15.0 | 4.4 | 90.2 | 8.4 | 1.4 |
| Borsod-Abaúj-Zemplén county | 83.3 | 14.1 | 2.6 | 75.6 | 20.1 | 4.3 | 89.7 | 8.9 | 1.4 |
| Heves county | 84.2 | 13.4 | 2.4 | 82.1 | 14.6 | 3.3 | 92.2 | 6.8 | 1.0 |
| Nógrád county | 85.6 | 12.4 | 2.1 | 83.1 | 16.9 | 0.0 | 92.4 | 7.6 | 0.0 |
| Hajdú-Bihar county | 81.4 | 16.2 | 2.4 | 71.6 | 21.6 | 6.8 | 90.5 | 8.6 | 0.9 |
| Szabolcs-Szatmár-Bereg county | 81.8 | 15.2 | 2.9 | 79.5 | 15.9 | 4.6 | 90.4 | 8.5 | 1.1 |
| Jász-Nagykun-Szolnok county | 82.8 | 15.5 | 1.7 | 82.1 | 14.5 | 3.4 | 91.4 | 8.3 | 0.4 |
| Bács-Kiskun county | 84.3 | 13.0 | 2.8 | 77.8 | 17.0 | 5.2 | 91.6 | 7.8 | 0.6 |
| Békés county | 82.8 | 12.4 | 4.8 | 78.9 | 14.3 | 6.9 | 91.3 | 7.7 | 1.0 |
| Csongrád county | 81.2 | 14.6 | 4.1 | 75.7 | 17.6 | 6.7 | 91.3 | 8.0 | 0.7 |
| Hungary | 86.4 | 11.6 | 2.0 | 78.4 | 16.3 | 5.2 | 91.5 | 7.6 | 0.9 |

Source: Central Statistical Office

## CONCLUSION

The most important findings of this paper could be summarised as follows:
- business organisations active in the construction industry were more affected by the economic crisis, and the boom that could be observed in the first half of the first decade of the 21st century was followed by a significant decrease, a slump in the 2010s;
- in the construction industry there is a higher proportion of companies with a lower number of employees than the average of the entire economy, and the decrease was especially large in case of larger companies;
- on the basis of an analysis of the relative figures of the registered business organisations, the outstanding role of Budapest and of Pest county could be highlighted.

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# SPATIAL DIFFUSION OF ENERGY EFFICIENT BUILDINGS: A WESTERN EUROPEAN CASE STUDY

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**Abstract:** Among the various environmental problems arising today, special attention must be paid to the issues related to energy; in particular one of the most important tasks to address environmental issues is the decreasing of the energy consumption of buildings. As a result, much attention has been given recently to research projects aiming to analyze the technological, economical and environmental features of energy efficient buildings.
The goal of our paper is to examine the spatial diffusion of energy efficient buildings built in Germany which country plays a very important role in this field. Within the framework of our research we will highlights the differences between the German "Länder" (federal states) and the settlements of different sizes, as well as, the observable peculiarities with regard to the individual building types.

**Key words**: energy efficient buildings, sizes of settlements, Germany, functions of buildings

* * * * * * *

## INTRODUCTION

In our days, energy issues belong to the most important problems facing the Earth, the solution of which may be expected partly from decreasing the amount of the energy used and partly from the increased utilisation of renewable energy resources. In the light of this, it is not surprising that the European Union in its Europe2020 Strategy (European Commission, 2010) drafted rather ambitious concepts in these two areas: by 2020 the European Commission considers it necessary to increase the share of renewable energy sources in the

final energy consumption to 20%, and to reach a 20% increase in energy efficiency. A substantial part of energy consumption is related to buildings and includes, inter alia, the use for cooling/heating, lighting, and cooking purposes.

In the view of the above, since the late 1980s, special attention has been paid to minimising the energy consumption of buildings and the idea of energy efficient building (in more popular term: passive houses) was born within the framework of this. The a passive house is a building for which thermal comfort can be achieved solely by postheating or postcooling of the fresh air mass without a need for recirculated air.

The international literature dealing with passive houses so far analysed mainly the technological and financial conditions, and included, inter alia, research concentrating on the operation (Badescu, 2007a; Feist et al., 2005; Wall, 2006), economy (Audenaert et al., 2008; Badescu, 2007b; Chel – Tiwari, 2009; Dodoo et al., 2010; Kozma, 2008) and environmental aspects (Mahdavi – Doppelbaue, 2010; Thiers – Peuportier, 2008) of passive houses.

In recent years, however, only very little attention has been paid to the number and geographic range of the passive houses in the course of the researches – which may be mostly explained by the lack or absence of information and the uncertainties in the data concerning the number of passive houses built in the World.

Publications in this category (Kozma et al., 2014; Lang, 2010) indicated that that Germany is one of the most important areas where passive houses are widespread, for which reason we consider a more detailed examination of this country necessary. In the course of this, on the one hand, we will discuss the place of Germany within the world, and on the other hand, we will examine the situation within the country. The aim of the paper is to study the changes in the construction of passive houses over time; in addition, the differences between German "Länder" (federal states), as well as the observable peculiarities with regard to the individual building types are also presented.

## MATERIALS AND METHODS

The study relied partly on the database of the Passive House Institute, and partly on the database of the International Passive House Association, which have provided the most important information by years, countries and regions (for example, the geographic location, size or function of a given building). The source of the data concerning the population and the income situation of the individual federal states was the German Statistical Office. All the obtained results were statistically evaluated by the method of descriptive statistics (%).

## RESULTS AND DISCUSSION

In recent decades, the number of passive houses and their size increased worldwide: while only 268 such buildings were reported in 2000 (their size was 103,960 m$^2$), by 2012, this number has approached 3,000 (their size was 1,623,870 m$^2$). The analysis of the data from Germany reveals an outstanding role played by the country: regarding the total number of passive houses: in 2012 their share in the total stock of buildings was 59,5%, while in terms of ground area it is 45,3%. This very high percentage is fundamentally due to the fact that the idea of the passive house itself was born in Germany, and a natural consequence of this was that such buildings first appeared in Germany. At the same time, examining the changes over time, a decreasing significance of the country can also be observed: while in 2000, the country's share in the total stock of buildings was 80.2%, by 2012 this decreased to 59,5%. In the background of this decreased was primarily the success of such buildings, as well as the

fact that increasing efficiency and decreasing price of the technology used was also very attractive to builders in other countries, as a result of which significant investments were made in this area.

If we examine the situation within Germany (Table 1), the outstanding role of two federal states (Baden-Württemberg and Bavaria) can be highlighted (nearly 50% of all passive houses are built here); the second large group consists of North Rhine-Westphalia, Hesse, Rhineland-Palatinate, and Lower Saxony, while the share of the other federal states combined is less than 5%. Concerning the changes over time, several market processes can be observed (due to the low number of elements, no convincing conclusions can be drawn yet on the basis of the figures from 1997/98):

- As a general tendency, the federal states other than the six outstanding ones have gradually increased their shares over time: their combined share in 1999/2000 was only 9.4%, which increased to 17.9% by 2011/2012. There are fundamentally two factors behind this process. On the one hand, the first passive house was built in Darmstadt in the state of Hesse in 1991, and in the initial period passive houses mainly spread in the areas neighbouring with this state. On the other hand, the technology became less expensive over time, and as a consequence, its application became more cost-efficient in states with lower income levels.
- The two federal states in the top positions went opposite ways: in case of Baden-Württemberg there was a significant setback, while Bavaria forged ahead.

**Table 1** Changes in the distribution of passive houses in Germany federal states between 1997 and 2012 (%)

| | A | B | C | D | E | F | G | H | Σ |
|---|---|---|---|---|---|---|---|---|---|
| Baden-Württemberg | 31.8 | 39.3 | 23.6 | 27.2 | 21.6 | 15.9 | 18.8 | 15.9 | 22.2 |
| Bavaria | 15.8 | 18.7 | 25.3 | 24.2 | 23.5 | 24.2 | 30.6 | 32.6 | 26.1 |
| Berlin | 0.0 | 0.0 | 0.6 | 0.0 | 0.7 | 0.3 | 1.2 | 1.0 | 0.6 |
| Brandenburg | 0.0 | 2.4 | 2.8 | 1.9 | 1.8 | 0.7 | 3.0 | 2.0 | 2.0 |
| Bremen | 0.0 | 0.0 | 1.1 | 0.0 | 0.0 | 1.0 | 0.3 | 0.0 | 0.3 |
| Hamburg | 2.3 | 0.0 | 1.7 | 1.6 | 1.5 | 2.1 | 2.7 | 4.7 | 2.2 |
| Hesse | 18.2 | 12.4 | 9.0 | 8.6 | 9.9 | 10.7 | 6.5 | 10.2 | 9.6 |
| Mecklenburg-Vorpommern | 0.0 | 0.6 | 0.0 | 0.4 | 0.4 | 0.3 | 0.6 | 0.0 | 0.3 |
| Lower Saxony | 15.9 | 5.9 | 6.2 | 5.4 | 8.8 | 10.0 | 7.1 | 6.8 | 7.5 |
| North Rhine-Westphalia | 11.4 | 6.5 | 11.2 | 11.3 | 17.2 | 14.5 | 12.5 | 12.2 | 12.6 |
| Rhineland-Palatinate | 2.3 | 7.6 | 10.1 | 10.1 | 6.2 | 10.7 | 8.0 | 5.1 | 8.0 |
| Saarland | 0.0 | 0.6 | 0.0 | 0.4 | 0.4 | 0.3 | 0.6 | 0.3 | 0.4 |
| Saxony | 2.3 | 1.2 | 1.7 | 2.3 | 3.3 | 5.5 | 3.9 | 5.8 | 3.6 |
| Saxony-Anhalt | 0.0 | 1.8 | 0.6 | 0.4 | 0.0 | 0.0 | 0.6 | 0.0 | 0.4 |
| Schleswig-Holstein | 0.0 | 1.8 | 3.9 | 5.8 | 2.9 | 2.4 | 2.1 | 2.7 | 3.0 |
| Thuringia | 0.0 | 1.2 | 2.2 | 0.4 | 1.8 | 1.4 | 1.5 | 0.7 | 1.2 |

A – 1997/1998, B- 1999/2000, C – 2001/2002, D – 2003/2004, E – 2005/2006, F – 2007/2008, G – 2009/2010, H – 2011/2012

Source: databases of the Passive House Institute and the International Passive House Association

At the same time, the actual processes are better reflected by the relative data (also taking into consideration population size) pertaining to passive houses (Table 2). If we consider the top six states, there are only two new states that enter the picture relative to the proportion expressed by the percentage: Hamburg and Schleswig-Holstein. The analysis of the reasons behind why passive houses are widespread, an important factor is the income level of the population, which can be explained by the fact that the construction of these buildings involves significant additional costs.

According to the available data, the top give states in the ranking according to 100,000 population are also the top 5 states in terms of income. If we examine the opposite

extreme, i.e. the end of the ranking, the situation is not so clear. From the point of view of how widespread passive houses are, only two of the five states (Mecklenburg-Vorpommern and Saxony-Anhalt) at the bottom of the list are among those that also have the lowest income figures. The strong link between the two factors is shown by the very high value of the correlation coefficient, +0.787, which suggests a significant connection.

**Table 2** The relative data of passive houses and the income situation of the population in the different federal states of Germany

| | A | B |
|---|---|---|
| Bavaria | 3.87 | 109.8 |
| Baden-Württemberg | 3.84 | 108.3 |
| Rhineland-Palatinate | 3.67 | 102.5 |
| Hesse | 2.92 | 103.5 |
| Hamburg | 2.35 | 109.3 |
| Schleswig-Holstein | 1.96 | 100.9 |
| Lower Saxony | 1.75 | 95.1 |
| Saxony | 1.55 | 86.7 |
| Brandenburg | 1.45 | 86.9 |
| North Rhine-Westphalia | 1.29 | 101.2 |
| Thuringia | 0.97 | 84.4 |
| Bremen | 0.90 | 100.3 |
| Saarland | 0.66 | 94.2 |
| Mecklenburg-Vorpommern | 0.35 | 82.1 |
| Berlin | 0.32 | 90.1 |
| Saxony-Anhalt | 0.28 | 82.5 |

A – the number of passive houses per 100,000 population, B – the income situation of the individual states (the average of income per capita between 1997 and 2011 relative to the German figure – 100.0%)
Source: databases of the Passive House Institute and the International Passive House Association

Passive houses may have different functions, and examining Germany from this point of view reveals that there are differences from the general tendencies around the world in two areas (Table 3). Firstly, the proportion of residential-purpose passive houses is higher in Germany (this is particularly true in case of other residential functions), and secondly, the proportion of commercial-purpose passive houses (e.g. commercial office buildings, industrial halls, hotels) is significantly lower.

**Table 3** Functions of the passive houses in the World and Germany

| | World | Germany |
|---|---|---|
| detached single family house | 60.6 | 57.9 |
| other residential function* | 26.8 | 31.3 |
| residential function in total | 87.4 | 89.2 |
| administrative function | 3.7 | 3.8 |
| mixed (residential and market) function | 1.4 | 1.5 |
| market function (commercial purpose passive houses) | 1.9 | 0.6 |
| education function | 4.2 | 3.5 |
| sport function | 0.7 | 0.8 |
| social and healthcare function | 0.8 | 0.7 |
| total | 100.0 | 100.0 |

Source: databases of the Passive House Institute and the International Passive House Association

Analysing the changes of the functions in time (Table 4), however, a very substantial shift of emphasis may be observed. More than 90% of the buildings constructed during the early years (second half of the 1990s) belonged to the category of residential function, and the significance of the other functions gradually increased after the millennium. This essentially may be explained by the fact that as a result of the improvement of the technology and the increase in the number of positive experiences, the applied method became popular among the other actors as well (mostly from the public sector). The decrease of the residential function was particularly salient after 2007, which is due to the fact that the income of the population decreased as a result of the crisis, which also decreased activities of this type, while the public and the market sector still considered these investments important.

**Table** 4 Changes in the functions of passive houses in time in Germany between 1997 and 2012 (%)

| | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| detached single family house | 53.3 | 55.4 | 61.8 | 62.1 | 61.9 | 54.2 | 58.6 | 52.5 |
| other residential function* | 42.2 | 38.6 | 33.2 | 30.1 | 31.8 | 31.1 | 27.0 | 29.4 |
| residential function in total | 95.5 | 94.0 | 95.0 | 92.2 | 93.7 | 85.3 | 85.6 | 81.9 |
| administrative function | 4.5 | 3.6 | 2.2 | 1.6 | 1.8 | 7.2 | 3.0 | 6.5 |
| mixed (residential and market) function | 0.0 | 0.0 | 1.1 | 2.3 | 2.2 | 1.4 | 1.8 | 1.0 |
| market function (commercial purpose passive houses) | 0.0 | 0.6 | 0.0 | 0.0 | 0.4 | 0.7 | 1.2 | 0.3 |
| education function | 0.0 | 1.8 | 1.7 | 2.7 | 1.1 | 3.4 | 5.7 | 8.2 |
| sport function | 0.0 | 0.0 | 0.0 | 0.4 | 0.4 | 1.0 | 2.1 | 0.7 |
| social and healthcare function | 0.0 | 0.0 | 0.0 | 0.8 | 0.4 | 1.0 | 0.6 | 1.4 |
| total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

A – 1997/1998, B- 1999/2000, C – 2001/2002, D – 2003/2004, E – 2005/2006, F – 2007/2008, G – 2009/2010, H – 2011/2012
Source: databases of the Passive House Institute and the International Passive House Association

An examination of the distribution of passive houses of different functions across the federal states leads to several findings (Table 5). Firstly, in a large number of the states, the residential function accounts for more than 80%, with lower values only observed in case of Brandenburg and Saxony. This is fundamentally due to the fact that the above two states are overrepresented as far as passive houses built after 2008 are concerned, and in these years – as mentioned before – uses other than for residential purpose were of increasing importance.

Secondly, within the residential function, the dominance of detached houses is general, from which only the federal states of Hamburg and Hesse are exceptions. The first is fundamentally due to the fact that the free space for the construction of detached houses is limited in Hamburg, and therefore, other residential functions (e.g. rows of houses, condominium buildings) dominate. In the case of Hesse, the most important factor is that a larger-than-average proportion of residential-purpose buildings can be found in the five largest settlements (this number in this federal state is 24.2 while the average number of

Germany is 17.1%), where it is primarily buildings other than detached houses that are constructed due to the lack of space.

Thirdly, as far as non-residential functions are concerned, it is only in a few cases that overrepresentation of a higher extent can be observed: in Brandenburg it is sports, education and mixed functions, in Hesse it is education, in North Rhine-Westphalia the social and healthcare, in Saxony the administrative, education and sport, in Schleswig-Holstein the market, while in Thuringia it is the market, social and healthcare functions that significantly exceed the national average.

**Table 5** The distribution of passive houses completed in the German federal states between 1997 and 2012 (only states with at least 20 passive houses are included)

| | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| Baden-Württemberg | 54.2 | 36.5 | 90.7 | 3.4 | 1.7 | 0.2 | 3.2 | 0.5 | 0.2 |
| Bavaria | 62.8 | 26.8 | 89.6 | 3.3 | 1.9 | 1.3 | 3.5 | 0.4 | 0.0 |
| Brandenburg | 59.5 | 18.9 | 78.4 | 2.7 | 5.4 | 0.0 | 8.1 | 5.4 | 0.0 |
| Hamburg | 34.2 | 58.6 | 92.8 | 2.4 | 2.4 | 0.0 | 2.4 | 0.0 | 0.0 |
| Hesse | 41.2 | 42.9 | 84.1 | 5.1 | 0.6 | 0.6 | 7.3 | 1.7 | 0.6 |
| Lower Saxony | 69.8 | 18.8 | 88.6 | 4.3 | 0.7 | 0.0 | 5.0 | 0.7 | 0.7 |
| North Rhine-Westphalia | 57.4 | 32.4 | 89.8 | 4.3 | 0.4 | 0.0 | 1.7 | 0.4 | 3.4 |
| Rhineland-Palatinate | 64.1 | 27.7 | 91.8 | 4.1 | 2.0 | 0.0 | 1.4 | 0.7 | 0.0 |
| Saxony | 52.2 | 23.9 | 76.1 | 7.5 | 1.5 | 1.5 | 10.4 | 3.0 | 0.0 |
| Schleswig-Holstein | 54.5 | 32.8 | 87.3 | 5.5 | 0.0 | 3.6 | 0.0 | 1.8 | 1.8 |
| Thuringia | 69.6 | 17.5 | 87.1 | 0.0 | 0.0 | 4.3 | 4.3 | 0.0 | 4.3 |
| Germany | 57.9 | 31.3 | 89.2 | 3.8 | 1.5 | 0.6 | 3.5 | 0.8 | 0.7 |

A – detached single family house, B – other residential function, C – residential function in total, D – administrative function, E – mixed (residential and market) function, F – market function (commercial purpose passive houses), G – education function, H – sport function, I – social and healthcare function
Source: databases of the Passive House Institute and the International Passive House Association

Earlier it has already been mentioned that passive houses of different functions were built on settlements of different sizes. The detailed analysis of the data (Table 6) sheds light on several important facts. One the one had, we can observe that in the majority of the federal states, in case of larger settlements, relative to the share of passive houses, the proportion of residential buildings is lower while the proportion of buildings of other functions is higher. In the background of this lies the fact that settlements of larger population generally also play some central role and the buildings for such purposes are generally concentrated in these settlements, and so in the spirit of energy savings, the passive house technology is used in case of some of them. Further, the local governments and companies of larger settlements generally have bigger financial resources, and thus they are able to finance the higher investment costs.

Another important fact is that the proportion of detached single family passive houses is lower, while the proportion of buildings with other residential function (e.g. condominium buildings, rows of houses, apartment buildings) is higher than the average in case of larger settlements. This is fundamentally due to the fact that on smaller settlements, due to the available space, detached single family houses are built much more frequently, while on larger settlements, due to the constraints of space, buildings of other residential function are more important.

**Table 6** The distribution of buildings of various functions on the basis of the population size of the settlements concerned (in %, with only those states included in the table that have 20 passive houses in both settlement categories; data for Germany aggregated from the data for the states; the table does not include the data for the three cities of state status, i.e. Berlin, Bremen and Hamburg)

| | | single family house | other residential function | residential function in total | other function | total |
|---|---|---|---|---|---|---|
| Baden-Württemberg | 1 | 26.3 | 63.2 | 89.5 | 10.5 | 100.0 |
| | 2 | 58.7 | 32.2 | 90.9 | 9.1 | 100.0 |
| Bavaria | 1 | 37.9 | 45.9 | 83.8 | 16.2 | 100.0 |
| | 2 | 64.9 | 25.1 | 90.0 | 10.0 | 100.0 |
| Hesse | 1 | 10.0 | 62.0 | 72.0 | 28.0 | 100.0 |
| | 2 | 53.5 | 35.6 | 89.0 | 11.0 | 100.0 |
| Lower Saxony | 1 | 60.5 | 26.3 | 86.8 | 13.2 | 100.0 |
| | 2 | 73.3 | 15.8 | 89.1 | 10.9 | 100.0 |
| North Rhine-Westphalia | 1 | 51.9 | 37.0 | 88.9 | 11.1 | 100.0 |
| | 2 | 58.1 | 31.7 | 89.8 | 10.2 | 100.0 |
| Rhineland-Palatinate | 1 | 48.5 | 48.5 | 97.0 | 3.0 | 100.0 |
| | 2 | 68.7 | 21.7 | 90.4 | 9.6 | 100.0 |
| Saxony | 1 | 51.4 | 28.6 | 80.0 | 20.0 | 100.0 |
| | 2 | 53.1 | 18.8 | 71.9 | 28.1 | 100.0 |
| Germany | 1 | 39.7 | 44.7 | 84.4 | 15.6 | 100.0 |
| | 2 | 62.2 | 27.4 | 89.6 | 10.4 | 100.0 |

1- the five largest cities of the given federal state, 2 - the settlements other than the five largest cities of the given federal state
Source: databases of the Passive House Institute and the International Passive House Association

The passive houses with different functions, of course, differ in their ground base (Figure 3). The largest ground areas belong to social and healthcare facilities, followed by educational buildings, while in case of administrative, sports-related and mixed use the ground areas are more or less the same. In case of the residential function, the average ground area is below 500 square metres, and is of course much smaller in case of detached single family houses than buildings incorporating several units.

The relationship between the ground area of the passive houses and the German federal states is primarily worth examining from the point of view of the number of passive houses (Table 7). The analysis of the data reveals that in several cases there are significant differences between the number of passive houses and their ground area relative to the total stock of buildings. The high number of passive houses relative to ground area is characteristic mainly in Bavaria, Lower Saxony and Thuringia, which can be explained by the fact that the proportion of the detached single family passive houses with the smallest ground area is the highest in these states. The opposite extreme (where the relative proportion of the ground area of the passive houses to the total for the country significantly exceeds the relative proportion of the number of passive houses) are represented by Brandenburg, Hamburg and Hesse: in the latter two states, the higher-than-average role of other residential functions is characteristic (Table 5), which is supplemented in the case of Hesse by a high share of the education function, which can be characterized by significant average ground areas. In the

case of Brandenburg, the outstanding role of other functions associated with larger average ground areas can be observed (Table 5), within which – similarly to Hesse – the educational function fulfils an important role.

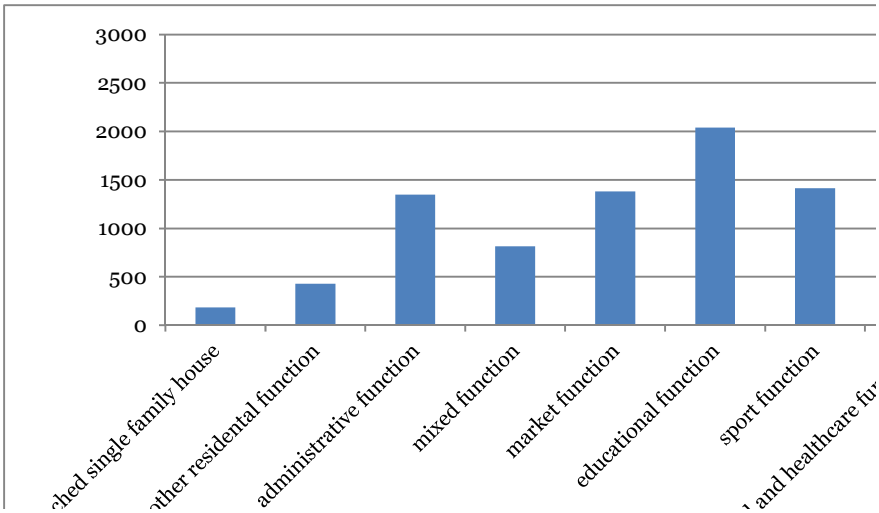


**Figure 1** Average ground area of the passive houses built in Germany between 1997 and 2012 with different functions (m²)

Source: databases of the Passive House Institute and the International Passive House Association

**Table 7** Distribution of ground area and number of passive houses by federal states of Germany (%)

| | ground area of passive houses | number of passive houses |
|---|---|---|
| Baden-Württemberg | 21.1 | 21.7 |
| Bavaria | 20.3 | 26.4 |
| Berlin | 1.0 | 0.6 |
| Brandenburg | 3.3 | 1.9 |
| Bremen | 0.3 | 0.3 |
| Hamburg | 3.6 | 2.3 |
| Hesse | 18.7 | 9.5 |
| Mecklenburg-Vorpommern | 0.1 | 0.3 |
| Lower Saxony | 5.7 | 7.5 |
| North Rhine-Westphalia | 11.2 | 12.7 |
| Rhineland-Palatinate | 6.5 | 8.0 |
| Saarland | 0.1 | 0.4 |
| Saxony | 4.7 | 3.7 |
| Saxony-Anhalt | 0.1 | 0.4 |
| Schleswig-Holstein | 2.6 | 3.0 |
| Thuringia | 0.7 | 1.3 |
| total | 100.0 | 100.0 |

Source: databases of the Passive House Institute and the International Passive House Association

Earlier it was mentioned that detached single family houses account for a significant share within the stock of passive houses, and therefore, a more detailed examination of these could contribute to the drawing of some useful conclusions. The data call attention to the importance of income conditions (Table 8): in the order according to the average ground area of detached single family houses, from the five states at the top four are also in the top five according to income, and the same tendency can also be observed in case of the five states at the bottom of the list.

**Table 8** The average ground area of detached single family passive houses and the income situation in the given federal state (only states with at least 20 detached houses are included in the table)

| | A | B |
|---|---|---|
| Rhineland-Palatinate | 194.6 | 102.5 |
| Bavaria | 194.0 | 109.8 |
| Hesse | 191.4 | 103.5 |
| Baden-Württemberg | 185.9 | 108.3 |
| Hamburg | 180.1 | 109.3 |
| Saxony | 178.0 | 86.7 |
| Lower Saxony | 177.0 | 95.1 |
| North Rhine-Westphalia | 176.0 | 101.2 |
| Brandenburg | 172.6 | 86.9 |
| Thuringia | 168.4 | 84.4 |
| Schleswig-Holstein | 154.0 | 100.9 |

A – the average ground area of detached houses ($m^2$), B – the income situation in the states (with the average amount of per capita income in Germany between 1997 and 2011 being 100.0%)
Source: databases of the Passive House Institute and the International Passive House Association

## CONCLUSIONS

The most important conclusions can be summarised as follows: In accordance with the international trends, the increase in the number of passive houses in Germany also accelerated in the first decade of the 21st century; however, as a result of the economic crisis, the rate of increase slowed down and at the same time the proportion of Germany's share from the stock of passive houses worldwide gradually decreased. An examination of the distribution of passive houses within Germany reveals that the initial geographical concentration gradually decreased with time, and that the significance of passive houses in each of the federal states is significantly influenced by the income situation in the given state. Considering the functions of the passive houses, in the first years the residential function was predominant; however, the significance of other – especially educational – functions gradually increased in the past few years. Within the residential function, the role of detached houses is of outstanding significance; different values can be primarily explained with the geographical characteristics of the given state. The size of a settlement plays an important role in determining the functions of passive houses there.

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