

The overview of green building sector in Slovakia

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Abstract

Green buildings have become a global trend in recent years, reflecting a social order for sustainable development from the sides of all stakeholders. This is confirmed by the fact that the global construction of green buildings comprises for almost a quarter of the total production of all buildings. Buildings generally represent a huge sector of energy consumers, so it is now necessary to reduce this consumption through smart design solutions and an appropriate building management system that will ensure efforts to achieve sustainable and smart urban requirements for the use of intelligent technologies. Regarding to the development of green buildings, Slovakia belongs to developing countries. The term "green building" is slowly becoming familiar in Slovakia, although it should be noted that the green building certification systems are only at the beginning. Also, the legislative and other financial support instruments for green buildings in Slovakia are under the phase of consideration and do not exist in practice. In the following paper, the authors explore green building sector in Slovakia. They present their development and overview, rating systems and analyses the most important investors and key local companies related to green buildings in Slovakia.

Keywords: green building, Slovakia, rating systems, LEED, BREEAM.

Received on 12 February 2019, accepted on 07 May 2019, published on 13 May 2019

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doi: 10.4108/eai.13-7-2018.158874

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1. Introduction for green building concepts

The most important global drivers for green concepts according to several studies including the World Green Building Trends SmartMarket Report 2016 [1] are: client demands, which demonstrates how critical it is to create greater public awareness of the benefits of green and the importance of establishing the business benefits of green building; market demands, which shows the state of saturation of the market with green buildings; environmental regulations, which can be carry vary strongly by market, depending on the degree of present regulation; awareness of conduct through human activities towards environmental protection and current environmental requirements; lower operating cost; and higher building values. [1]

While in Western Europe and the US with advanced market of green buildings featuring on the first places drivers as client demands and environmental regulations, developing markets of green buildings in Central and Eastern Europe - CEE (including Slovakia) gives more prominence to focus on lower operating cost and market demands.

On the other hand, the most commonly perceived barriers for green buildings are: increased the initial cost – at present the trend is perceived, especially with developed markets, much less than in the past, what may suggest a global trend toward greater experience with green building techniques and wider availability of green building products and service providers, which may be reducing the premium for building green. According to this global Study [1], new green building projects cost more than non-green building projects. That additional cost has a median value of 8%.

Other obstacles are perceived in terms of market differentiation quite similar: poor public awareness; lack

of political support and incentives; and idea about green buildings as unreachable, lucrative projects.

Among the largest benefits of green building investments include: the reduction of operating costs (according to the World Green Building Trends SmartMarket Report 2016 - a median decrease is 9% in 2015 in new green constructions and in green retrofits over the next 12 months; and 14% reduction in next 5 years in new green buildings and 13% expected decrease from green retrofits or renovations); increased building value for green versus non-green projects (increase a median 8% in 2015 in new green constructions and 7% in green retrofits or renovation projects according architects and contractors); increased asset value for green versus non-green projects (increase a median 7% asset value in 2015 in new green constructions and in green retrofits according to owners); documentation and certification providing quality assurance; education of occupants about sustainability; higher value at point of sale; higher occupancy rates; increased productivity for tenants; and higher rental rates. [1]

When we compare the average performance of green buildings to non-green buildings the following savings can be achieved:

- 13% lower maintenance costs;
- 24-50% lower energy consumption;
- 33-39% lower CO₂ emissions;
- 40% less water consumption;
- 70% less solid waste in landfills;
- 27% higher user satisfaction.

Another very important from the economical point of view is the payback period for the investment in green buildings. This issue is crucial for many investors. Payback period is particularly essential for certain commercial markets such as office, multi-residential housing or hotels, in which properties regularly change ownership. According to several studies focus on problematics of green buildings, e.g. [2], the median payback period is **8 years**. Payback period for cost of a green retrofit or renovation projects is a median **6 years**.

Green Building Products and Services

An overall global focus on energy conservation is evident in the popularity of **electrical products**, which can yield a high degree of energy savings for relatively small investment. However, mechanical systems, such as **heating** and **air conditioning systems** that are critical to energy savings, have a much lower use due to their importance in buildings, possibly due to the investment required and the fact that they are less likely than lighting to be included in renovation/retrofit projects. Growing interest in how green buildings impact the health of their occupants may be evident in the relatively strong performance of **thermal and moisture protection**. Another growing interest in smart cities may be driving

the expected growth in the use of **building automation systems**.

Even greater savings could be achieved; however, the implementation of intelligent networks of sensors which would bring together smart homes with smart cities. Subjects which are being tested are processors, sensors, and network connectivity built into articles of daily activities which may perform in the future management the role of technology in building and contributing to optimal utilization of urban resources. [3]

Next important area of interest about the green building is related to **waste management**. Recycling and recycling technologies are closely related to human activities in buildings. Other areas that are quite important in the new green buildings are **finishes** and **flooring**. Finally, it is **furnishing** that is contributing to the proper functioning of buildings.

In general, the most important criteria for green products are: high energy efficiency; products made of recycled materials; lifecycle data; nontoxic building materials; durability of materials and products; and environmental product declarations.

2. Green Building Rating Systems

Buildings are a global scale mainly measured on the basis of certification systems. Certification of green buildings is an indicator of quality and also a guarantee of comprehensive embodiment of buildings. They demonstrate that buildings are made from quality materials, they are environmentally friendly and users have created a suitable environment for their daily activities. At present widespread use of certification systems is in the construction industry all around the world. [4]

The main benefits of using rating systems are competitive advantage; marketing; provides ability to create better design and realization of buildings; buildings are more environmentally friendly; opportunity to obtain financial support from government or municipality.

The main disadvantages associated with rating systems are related to additional costs and time during the planning and realization of building; difficulties to understand requirements of rating systems and documentation processes.

International green standard certification

The world's best known green building certification systems are LEED and BREEAM. For both the priority is the minimum load of the environment with respect to maximizing the use of renewable energy. Other certification systems are DGNB (Deutsche Gesellschaft für Nachhaltiges Bauen) and SBToolCz Sustainable Building Tool.

Rating system LEED

LEED system was developed by the US Green Building Council (USGBC). LEED (Leadership in Energy & Environmental Design) is an internationally recognized independent evaluation system of Green Buildings. LEED is a voluntary certification system, by which is certified more than 180,000 projects worldwide. It provides third-party verification that a building or more buildings was designed and built by using strategies aimed and targeted to improve performance through pertaining parameters. LEED promotes and reflects the overall approach to building long-term sustainability through detection performance in key areas. [4] The basic set of parameters (i.e. credit categories) include: site selection, water management, energy saving and CO₂ reduction, material selection and quality of indoor environment. While consideration is taken not only to the materials, resources or building equipment (HVAC), as well as the impact of the building and its operation on the environment and, finally, on the health and comfort of the user. The certification provides an independent three-part assessment that the building has been designed and built according to criteria that meet the requirements of

sustainability, energy efficiency, material selection and indoor environment.

Rating system BREEAM

The BREEAM certification system was established in the United Kingdom in 1990. It is designed to assist architects and designers in designing and mitigate the impact of their projects on the environment. Currently are available versions of certificate for residential buildings, office buildings, industry, schools, state administration and judiciary, prisons, multifunctional buildings, hospitals.

The process of evaluation criteria focuses on building design from the conceptual phase to the full completion of the building. This requires records to support decision making in the process of design and construction of building, approved during the project development and ensure their full implementation. [4]

Table 1. Comparison of categories and weights of certification systems LEED vs BREEAM

LEED	BREEAM		
Local sustainability	26%	Project management	12%
Water management	10%	Health and comfort	15%
Energy efficiency and renewable resources	35%	Energy	19%
Protection of materials and resources	14%	Transportation	8%
Quality of the indoor environment	15%	Water	6%
Innovation and design	6%	Material	12,5%
		Waste	7,5%
		Pollution	12%
		Land acquisition	10%

3. Slovak green building sector

The process of certification of sustainable buildings in Slovakia is just starting. There is known only energy certification, what is entirely something else. The concept of energy efficiency is applied in the context of efficient use of energy materials and media in various stages of

production, transmission, distribution and energy consumption. This is only one small part of the whole called sustainable construction.

In Slovakia, the concept of green buildings is currently not conceptually supported from political circles nor is enshrined in legislation. Also, there are no financial support or tax incentives that would encourage investors to increase their activities towards sustainable construction. In countries, such as Canada, Germany, the

USA, the Netherlands or the Scandinavian countries, legislation has been adapted to sustainable vision and if the developer wants to have successful projects it is necessary to meet the highest levels of certification of buildings.

The detailed information on individual buildings certified in the systems BREEAM and LEED in Slovakia are set out in the Table 2 and 3 below.

Table 2. BREEAM Certification (New Construction) in Slovakia [5], [6]

BREEAM Certification (New Construction)				
#	Name of Building	year of issue	Certification system	Certification level
1	CBC 3	2013	International 2009 Europe Commercial: Offices	Very Good (56.82%)
2	CBC 4	2013	International 2009 Europe Commercial: Offices	Very Good (56.82%)
3	CBC 5	2013	International 2009 Europe Commercial: Offices	Very Good (56.82%)
4	Schindler Dunajská Streda	2013	International 2009 Europe Commercial: Industrial	Excellent (73,87%)
5	Prologis Hall DC7, phase I	2014	International 2009 Europe Commercial: Industrial	Good (50,09%)
6	Forum Business Center	2014	International 2009 Europe Commercial: Offices	Excellent (73%)
7	Hall Bratislava DC8 - Tomra	2014	International 2013 New Construction: Industrial	Very Good (60,40%)
8	Hall Bratislava DC8 - Tomra	2015	International 2013 New Construction: Industrial	Very Good (60,90%)
9	PROLOGIS SENECA - Hall DC7.2	2015	International 2013 New Construction: Industrial	Pass (41,4%)
10	PROLOGIS SENECA - Hall DC7.2	2015	International 2013 New Construction: Industrial	Good (46,2%)
11	DC12 PROLOGIS SENECA	2015	International 2013 New Construction: Industrial	Good (51.4%)
12	DC13 PROLOGIS SENECA	2015	International 2013 New Construction: Industrial	Good (47.59%)
13	Logistic centrum Lidl Sered'	2016	International 2013 New Construction: Industrial	Outstanding (88.69%)
14	Logisticke centrum Lidl Sered'	2016	International 2013 New Construction: Industrial	Outstanding (88.19%)
15	DC10 PROLOGIS SENECA	2016	International 2013 New Construction: Industrial	Good (46.20%)
16	DC09 PROLOGIS SENECA	2016	International 2013 New Construction: Industrial	Good (52.00%)
17	Twin City A2, Slovak republic	2017	2013 New construction: Offices	Excellent (80.19%)
18	Bory Mall (Retail)	2016		Very Good 60.20%
19	Decathlon (Retail)	2016	International 2009 Europe Commercial: Retail	Very Good (60.29%)

20	Decathlon (Retail)	2014	International Commercial: Retail	2009 Europe	Very Good (62.40%)
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Certification of existing buildings, valid for 12 months - BREEAM In-Use, includes other 23 projects. [5], [6]

Table 3. LEED Certification in Slovakia [5], [6]

LEED Certification				
#	Name of Building	year of issue	Certification system	Certification level
1	AUSK ALPS Project-Assembly Hall	2012	LEED BD+C: New Construction v3 - LEED 2009	Gold
2	BBC1 plus	2013	LEED BD+C: Core and Shell v3 - LEED 2009	Gold
3	Central Tower	2013	LEED BD+C: Core and Shell v3 - LEED 2009	Silver
4	Central Administrativa (ProCare)	2014	LEED BD+C: Core and Shell v3 - LEED 2009	Silver
5	Central Shopping	2014	LEED BD+C: Core and Shell v3 - LEED 2009	Silver
6	Central Hotel Lindner	2014	LEED BD+C: Core and Shell v3 - LEED 2009	Silver
7	Eco Point	2014	LEED BD+C: Core and Shell v3 - LEED 2009	Gold
8	Digital Park I	2015	LEED O+M: Existing Buildings v3 - LEED 2009	Platinum
9	Digital Park II and III	2016	LEED O+M: Existing Buildings v3 - LEED 2009	Platinum
10	NFS Bratislava	2016	LEED ID+C: Retail v4 - LEED v4	Silver

There are another 21 projects registered for LEED certification. [5], [6]

Table 4 below shows the most significant projects, investors and key local companies in Slovakia related to green buildings.

Table 4. The most significant green building projects, architects and investors in Slovakia

Project	Architect	Investor
CBC III, IV, V	AUKETT - Ing. arch. Miroslav Frecer, Ing. arch. Juraj Hantabal, Ing. arch. Matúš Gondek, Ing. arch. Jana Lehotská	HB REAVIS Group
Schindler Dunajská Streda	ARCHITECTS BOBEK JÁVORKA, s.r.o.	Schindler eskalátorová a.s.

Forum Business Center	Ing. arch. Ladislav Nagy, Ing. arch. Martin Stohl, Ing. arch. Martin Tribus, Ing. arch. Matej Malina, Ing. arch. Peter Moravčík	HB REAVIS Group
Twin City A2	Ing. arch. Ladislav Nagy	HB REAVIS Group
Green Bay	Beňuška / Topinka	Riverside, a.s.
Čulenova	Zaha Hadid Architects	Penta Investments
Panorama Business III	GFI	J&T Real Estate, a.s.
Aupark Bratislava	Jančina architekti	HB Reavis
Aupark Tower	Jančina architekti	HB Reavis
Eurovea	Ing. arch. Marek Varga, Ing. arch. Miroslav Vrábel, Ing. arch. Branislav Kaliský, Bose International Planing & Architecture Michel Desvigne	Ballymore EUROVEA, a. s.
Apollo Business Center	Jančina architekti	HB Reavis
The Europeum	Dušan Krepop, Pavel Suchánek a Jozef Šoltés	IMMO CONSULT Bratislava s.r.o.
Bory Mall	Massimiliano Fuksas	Penta Investments
BBC1 plus	Bogár Králik Urban - Michal Bogár, Ľubomír Králik, Ľudovít Urban	CA Immo Group
Central	Ing. arch. Ivan Kubík	CA Immo Group
EcoPoint	Ing. arch. Andrea Klenovičová, Ing. arch. Roman Klenovič	Bischoff et Compagnons
Digital Park	Jakub Cigler Architekti	Penta Investments
NFS Bratislava	Karol Kállay ml.	Národný futbalový štadión, a. s.
Zelené átrium	Miroslav Marko	SMF Marko
Business Centrum T2	VITKO, KOBÁK et. al.	Penta Investments
ROSUM	Helika	Penta Investments
New Stein	Ivan Kubík	MiddleCap, YIT Reding
OS SKULTETYHO (Rezidencia pri Myte)	Architektúra Krušec	Penta Investments
Staromestska Offices	Bogle Architects	Cresco Group
Einpark	A1 ReSpect	Corwin Capital
Blumental Offices	A1 ReSpect	Corwin Capital

Among the most important Slovak realization companies includes: Strabag Pozemné a inžinierske staviteľstvo, s.r.o., Bratislava; Doprastav, a.s., Bratislava; Strabag, s.r.o., Bratislava; Skanska SK, a.s., Bratislava; HB Reavis Management, s.r.o., Bratislava; Chemkostav, a.s., Michalovce; In Vest, s.r.o., Šaľa; YIT Slovakia, a.s., Bratislava; ViOn, a.s., Zlaté Moravce; Metrostav Slovakia, a.s., Bratislava; Alpine Slovakia, s.r.o., Bratislava; Hornex, a.s., Bratislava.

4. Future development of green building sector in Slovakia and expectations for next years

In forthcoming period is expected mainly growth in new green commercial construction projects on greenfield. This sector will be far ahead from the second sector of green residential constructions. On the other side, will be green institutional projects and green retrofit of existing

buildings where we can see the top opportunities on the Slovak market with green buildings.

The necessity of family houses and apartment buildings renewal which need to be strong even in the previous political regime and achieves increasingly urgent status. More than 1,100,000 overall apartments should be renewed [7] (including flats in apartment buildings (40%) and family houses (60%)). [8] Another separate group in terms of direction of initiative for building renovation is the sector non-residential public buildings. There are more than 15,000 public buildings which require a top priority for their renewal, especially schools and hospitals. Their technical condition is alarming, as reflected in their energy consumption and closely related operating costs. Many of the buildings during its lifetime have not undergone any more substantial renewal. That's why the years of neglected maintenance were written off under to their emergency state, which often does not match to their physical age.

5. Conclusion

Although green buildings in global are mainly associated with the commercial sector, in recent years the green concept has been widely adopted in the entire construction industry, but only to a moderate extent. Slovakia is one of the developing countries and the concept of green buildings is not complexly established in its construction sector. When comparing Slovakia with other V4 countries, in terms of building certification for January 2017, according to LEED and BREEAM certification systems Slovakia is at the end with a total of 21 certified buildings. The most certified buildings are in Poland (127 buildings), followed by the Czech Republic (60) and Hungary (27). The authors see the greatest opportunity for Slovakia in applying a green concept to the renewal of existing buildings. The huge potential is mainly in the sector of existing residential buildings and the public buildings sector. Despite several objectives adopted at the supranational level, the current activity being pursued to meet these objectives is inadequate. The absence of any legislative, tax and financial support instruments for green buildings in Slovakia suggests that activity in the field of green renewal will continue at minimal level in the near future.

References

- [1] World Green Building Trends SmartMarket Report 2016. Online: <http://fidic.org/sites/default/files/World%20Green%20Building%20Trends%202016%20SmartMarket%20Report%20FINAL.pdf>
- [2] World Green Building Trends SmartMarket Report_2013. Online: https://www.green-buildings.com/wp-content/uploads/2015/06/World_Green_Building_Trends_SmartMarket_Report_2013.pdf
- [3] Spirkova, D., Caganova, D. (2014). Smart Housing in Sustainable Development. Edited by: Giaffreda, R; Caganova, D; Li, Y; et al., Conference: 1st International Summit on Internet of Things (IoT) Location: Rome, ITALY Date: OCT 27-28, 2014. INTERNET OF THINGS: IOT INFRASTRUCTURES, PT II, Book Series: Lecture Notes of the Institute for Computer Sciences Social Informatics and Telecommunications Engineering, Volume: 151, Pages: 52-59.
- [4] Adamuscin, A. (2017). Current state of green building market in Slovakia in comparison with neighboring countries. In: the 17th International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management, SGEM 2017, Conference proceedings Volume 17, Nano, Bio, Green and Space Technologies for a Sustainable Future, Issue 62. doi:10.5593/SGEM2017/62
- [5] www.usgbc.org
- [6] www.greenbooklive.com
- [7] Statistical Office of the Slovak Republic.
- [8] Renewal strategy of residential buildings fund in the Slovak Republic, Bratislava, July 2014. Ministry of Transport, Construction and Regional Development.