SUSTAINABLE CONSTRUCTION INDUSTRY DEVELOPMENT AND GREEN BUILDINGS: A CASE OF LATVIA

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Nowadays, more and more attention is being paid to the country's economy, construction industry and real estate market's sustainable development and to the studies related to these issues. The aim of the research is to analyse significant aspects of sustainable development of construction activities and real estate market, with particular focus on environmental aspects of construction or the role of green buildings. The research includes an integrated approach of construction industry analysis and analysis of real estate operations area. Scientific and practical solutions and recommendations will enable the industry participants to be introduced to the main sustainable aspects of construction industry development, which, in their turn, can improve the overall performance of the industry in the long term.

Keywords: *construction, energy efficiency, environment, sustainable real estate market development.*

1. INTRODUCTION

The research is continuation of previous studies, such as Kauškale et al. (2017) [4], Kauškale et al. (2016) [3] and Kauškale, Riemenschneider (2017) [5]. The aim of the research is to analyse significant aspects of sustainable development of construction activities and real estate market, with particular focus on environmental aspects of construction and a role of green buildings.

Research methods include a combination of quantitative and qualitative research methods, such as analysis, synthesis, statistical data processing, logical assess, comparison method, qualitative data collection, questionnaire and other methods. The survey is focused on Construction and Real Estate Operations of the national economy sectors – such as managers and employees of enterprises who are working in development of building projects, construction of residential and non-residential buildings, civil engineering, real estate agencies, management of real estate on a fee

or contract basis, renting and operating of own or leased real estate, buying and selling of own real estate. The research includes an integrated approach of construction industry analysis and analysis of real estate operations area.

Scientific and practical solutions and recommendations will enable the industry participants to be introduced to the main sustainable aspects of real estate market and construction activities, which, in their turn, can improve the overall performance of the industry in the long term.

2. OVERVIEW OF THEORETICAL ASPECTS AND RESEARCH METHODOLOGY

Sustainable development of construction industry and real estate market requires a complex approach. Houses, which are constructed in accordance with the principles of sustainable construction, have the following characteristics [7, pp. 139–140]:

- high energy efficiency (low-energy buildings) with the annual heat energy consumption of less than 50 kWh/m2, for normal projects with 150–200 kWh/m2;
- passive houses, geographical location, high thermal heat insulation materials, green energy acquisition sources are used in the construction process. Annual energy consumption for these projects amounts to 15 kWh/m2;
- particularly energy-efficient (zero-energy) buildings are using only alternative energy resources and are divided as follows:
    - Zero-net buildings – the amount of the delivered energy is equal to the amount of the used energy;
    - Zero carbon buildings – do not use energy, which results in CO_2 (carbon dioxide) emissions;
    - Zero stand-alone buildings – no need to be connected to the network, are accumulating energy for the night and winter;
    - Plus energy buildings – are producing more energy per year than it is consumed.

For the implementation of the housing energy efficiency programme, a contractionary factor can be the attraction of financing. Fundraising for the implementation of the housing energy efficiency programme without any obstacles/ barriers is currently hindered by the following factors [10, p. 210]:

- consent of 51 % housing owners is required;
- utility debt;
- lack of motivation of low-income housing owners for the implementation of the object;
- uncertainty, both in terms of loan repayment and in terms of building energy efficiency benefits.

The interconnection between contractionary and motivating factors of sustainable development of real estate market and construction industry, which influence also the sustainable development of cities, is shown in Fig. 1.
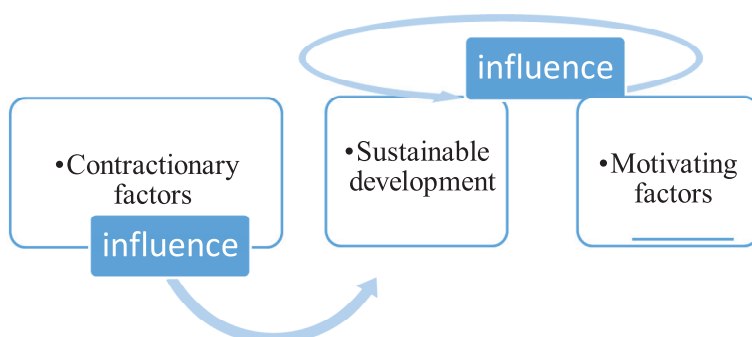
Fig. 1. Contractionary and motivating factors of sustainable development
of real estate market and construction industry
[made by the authors].

All mentioned aspects led to a necessity to develop sustainable industry regulation. To conduct the practical research on environmental aspects of sustainable real estate market and construction industry development in the Latvian context of sustainable development of industry and cities, the survey was developed on the basis of the previously conducted research.

The aim of the survey was to define the incentives and disincentives affecting green building development, its socio-economic importance and other issues related to the analysis.

Research methodology: quantitative research, online survey method (WAPI – web assisted personal interviews at Web panel). Research included 100 targeted largest companies in Latvia as was also in related methodology [9]. The areas of respondents' activity included real estate agencies, management of real estate on a fee or contract basis, development of building projects, construction of residential and non-residential buildings, civil engineering, renting and operating of own or leased real estate, buying and selling of own real estate. Structure of respondents was performed according to NACE 2.rev. classification [1]. Questionnaires were anonymous.

Sampling: The survey was focused on managers and employees of enterprises who were working in the real estate market (operating in the economic sector "Real Estate Operations" (L68) and "Construction" (F41)) such as managers and employee of real estate agencies, management of real estate on a fee or contract basis, development of building projects, construction of residential and non-residential buildings, civil engineering, renting and operating of own or leased real estate, buying and selling of own real estate. On 12 September 2017, the field of construction (F41) included 14639 enterprises, of which 5317 were related to construction of buildings (F41.1), and 13299 were enterprises dealing with real estate operations (L68) [1]. 100 respondents were selected, and only 18 respondents gave the responses. On average 78 % or 1 259 000 of the population of Latvia in the surveyed target group use the Internet on a regular basis [2]. The summarised information about the survey is shown in Table 1.

Table 1

Information about the Survey [made by the authors]

Indicator	Description
Type of survey	Questionnaire
Description of experts	Experts operating in such areas as Real Estate Operations and Construction
The level of competence of respondents	Owner, top level manager, middle level manager, supervisory level manager
Responses	18
Period of questionnaire	From 1 August 2016 to 1 November 2016 (2016M8,M9,M10)

Response rate was calculated as follows [13]:

$$\text{Response rate} = \frac{\text{Number of completed surveys}}{\text{Number of respondents contacted}} \qquad (1)$$

"Internal surveys will generally receive a 30 %–40 % response rate (or more) on average, compared to an average 10 %–15 % response rate for external surveys" [11]. The same source shows that General Client Satisfaction Surveys are as follows: medium length – 15 %–30 % (with 1 follow-up) up to 25 questions" [11]. CustomInsight a US company that designs and administers surveys offered the following comments regarding the link between response rates and survey types: "Response rates vary widely for different types of surveys. Customer satisfaction surveys and market research surveys often have response rates in the 10 %–30 % range. Employee surveys typically have a response rate of 25 %–60 %. Regardless of the type of survey you are conducting, you can have a major effect on the number of respondents who complete your survey." [8]. *Not always lower replies are less valid,* there may be a relationship between whether a data point is missing and any values in the data set are missing or observed [12]; [6]. Environmental aspects of construction industry development are analysed in the subsequent section.

3. ENVIRONMENTAL ASPECTS OF CONSTRUCTION INDUSTRY DEVELOPMENT: A CASE OF LATVIA

According to the developed methodology, the survey was conducted. In the survey, 39 % respondents were owners, 11 % were high level managers, 17 % were middle level managers and 33 % were other company members, including front line specialists. Structure of respondents was as follows, according to NACE 2.rev. classification (European Commission, 2017):

L – Real estate activities;
L68 – Real estate activities;
L68.1 – Buying and selling of own real estate;
L68.1.0 – Buying and selling of own real estate;
L68.2 – Renting and operating of own or leased real estate;
L68.2.0 – Renting and operating of own or leased real estate;
L68.3 – Real estate activities on a fee or contract basis;
L68.3.1 – Real estate agencies;
L68.3.2 – Management of real estate on a fee or contract basis;
F41 – Construction industry.

Education level of respondents is shown in Table 2.

Table 2

Education Level of Respondents, %

Education	%
Bachelor's degree/higher professional/higher	55.56
Master's degree	33.33
Secondary vocational	11.11

The first question was related to the significance of each environmental factor for the construction of the environmentally-friendly and sustainable real estate object and its further operation (see Fig. 2).
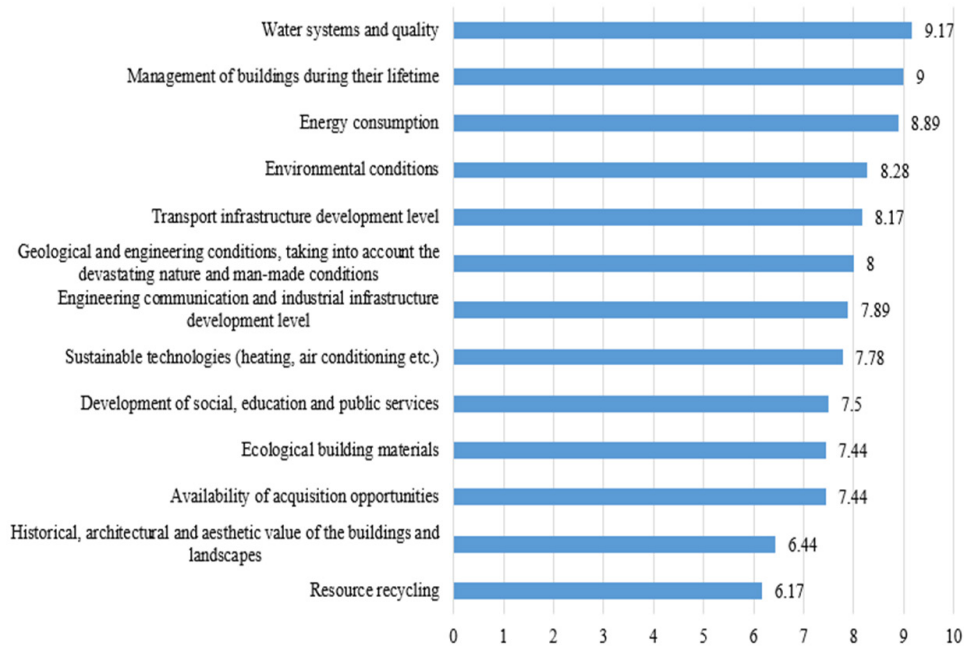

Fig. 2. What is the significance of each environmental factor for the construction of the environmentally-friendly and sustainable real estate object and its further operation? (1– not important, 10 – very important) [made and constructed by the authors].

Answers to the question "How do you evaluate the following factors influencing green building housing affordability" is shown in Table 3 (1 – not developed, negative evaluation, 10 – well-developed, positive evaluation).

Table 3

Green Building Affordability [Made and calculated by the authors]

Factor	Average	St.dev.	St.err.	Median
1. Price level of green building object	5.06	1.92	0.1132	5.5
2. Mortgage loan (financing) accessibility for green building object financing	6.00	2.38	0.1398	5
3. Per capita income	4.56	2.62	0.1540	4

The average evaluation on question "How important are ecological aspects of civil construction?" was 711 points from 10 (0 – not important, 10 – very important).

The respondents also mentioned the following ecological aspects of construction that are important: huge amount of documentation and its approval in the state institutions, laws that promote ecology, the quality of the construction site. Some respondents mentioned the construction material quality, noise, dust, soil and waste water pollution, construction waste sorting need, proper disposal, nearby a mobile station. As the important aspects, the respondents mentioned the efficient use of resources, environmental quality problems, environmental impacts on health and well-being and the need to ensure the ecological and economically sound use of resources.

According to the survey results, more favourable conditions are important, the material security is a key issue; there is a need of confidence by investing. Green building investment has promoting and restrictive factors as well. Promoting and restrictive factors of green building investments are shown in Table 4.

Table 4

Promoting and Restrictive Factors of Green Building Investments [table made by the authors] [Factor evaluation based on Riemenschneider, Kauškale (2016) [5]]

Promoting/motivating	Restrictive/obstructive
• Access to financing, regulations, mortgage rates (7.94)	• Lack of credit financing opportunities (7.78)
• Available purchase price of the resources (7.83)	• Limited financial opportunities, lack of free funds (7.78)
• Good overall economic situation in the country, economic upturn, contributing to an increase in demand (7.83)	• Lack of motivation (7.33)
• Good financial health opportunities, free assets (7.78)	• Lack of information (7.22)
• Favourable industry development trends (7.78)	• Lack of professional skills and professional employees (7.61)
• Successful investment attraction programmes (7.67)	• Lack of experience in green construction projects (7.5)
• Green construction promotion national development policy (7.39)	• Lack of management experience (7)
• Competition in the industry, and hence the need for the construction of the competitive real estate object (7.28)	• Increase in the prices of resources (8)
• Good Ease of Doing Business ranking* (7.11)	• Economic recession, crisis contributing to a reduction in demand (7.11)
• Change in thinking paradigm of the buyers, focus on sustainability (6.94)	• Underdeveloped business environment (6.67)
• Market pressure to find innovative opportunities (6)	• Increase in object selling price, which would reduce the potential number of buyers (7.67)
	• Lack of long-term policies in the field of green construction (8.17)
	• Competition in the industry (6.44)
	• Low Ease of Doing Business Index (6.56)
	• Difficulties to start operation (7.06)

* Ease of Doing Business Index is an index developed and calculated by World Bank that ranks 183 countries according to ease of doing business in a particular country

The evaluation of the adequacy of knowledge for the successful green construction and sustainable construction entrepreneurship in the following areas showed the following results (see Fig. 3) (1 – no adequate skills; 10 – a lot of knowledge).
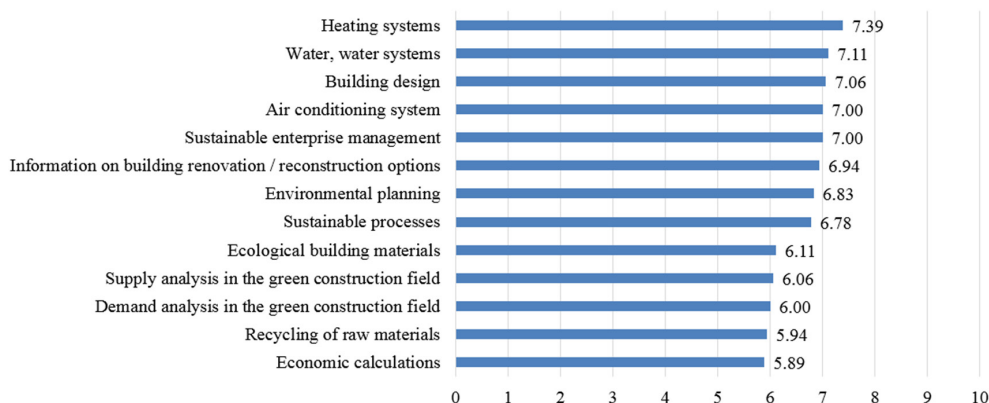
Category	Value
Heating systems	7.39
Water, water systems	7.11
Building design	7.06
Air conditioning system	7.00
Sustainable enterprise management	7.00
Information on building renovation / reconstruction options	6.94
Environmental planning	6.83
Sustainable processes	6.78
Ecological building materials	6.11
Supply analysis in the green construction field	6.06
Demand analysis in the green construction field	6.00
Recycling of raw materials	5.94
Economic calculations	5.89

Fig. 3. The evaluation of the adequacy of knowledge for successful green construction and sustainable construction entrepreneurship (1 – no adequate skills; 10 – a lot of knowledge) [made and calculated by the authors].

The replies to the question "What kind of information is lacking and would be desirable for the successful operation in the green construction field?" included a lack of information on tax relieves and other relieves the green construction provides, a lack of information on the ecological construction materials, ultimate economy, fundraising opportunities, a lack of general knowledge, advertising and striving for the purest life. However, a lack of information was observed in all areas.

4. RESULTS AND DISCUSSION

The respondents of the survey gave the following recommendations: the introduction of tax relief and simplifying the construction process of green construction, work for the public sector together with the investment companies, encouraging green construction by law, promoting the state policy in this area, and concluding intention agreements. It is also necessary to know advantages of green building, the costs, its necessity and grounds for advantages, as a lack of information can be observed. Respondents could not find structured information on costs and energy-efficient solutions; no information was available on the definition of the concept; there was a lack of aggregated information from one resource, and the need arose to know the long-term benefits and impact on health. Local government should communicate more with the society and businesses. Work on macroeconomic stability should be continued, predictable changes (the number of laws, tax policies, etc.) should be provided, there is a necessity to build qualitative and aesthetic objects, while minimising the costs both in the construction and in the further maintenance of the object, as well as there is a need of price reduction to increase affordability of real estate and green buildings, or to increase average wages. BIM implementation, stable policy implementation, planning process rationalisation, advertisements and information of society, including energy performance certificates, successful use of the European Fund, investors' attraction, energy efficiency and sustainability indicators for buildings were also mentioned by the experts as important aspects for sustainable industry regulation that could influence city planning and its sustainability as well.

5. CONCLUSIONS

1. The results of analysis on sustainable entrepreneurship in construction companies resulted in high importance of ecological aspects of construction. Sustainable implementation of construction projects influences sustainable industry development, and these aspects are interconnected.

2. The research results highlighted a role of environmental information systems within the country that can be necessary for all market participants. The important aspects of sustainable entrepreneurship in construction industry are the efficient use of resources, the construction material quality, water pollution, the necessity of noise and dust minimization, construction waste sorting need, impacts on health and well-being and ensuring the sound use of resources from the ecological, economic and social point of view. The future research directions have been defined and are related to economic estimation of green building projects and their management aspects.

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ILGTSPĒJĪGĀS BŪVNIECĪBAS NOZARES ATTĪSTĪBA UN ZAĻĀ BŪVNIECĪBA: LATVIJAS PIEREDZE

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K o p s a v i l k u m s

Mūsdienās arvien vairāk tiek pievērsta uzmanība valsts ekonomikai, būvniecības nozarei un nekustamā īpašuma tirgus ilgtspējīgai attīstībai, kā arī pētījumiem, kas saistīti ar šiem jautājumiem. Pētījuma mērķis ir analizēt būvniecības un nekustamā īpašuma tirgus ilgtspējīgas attīstības būtiskos aspektus, īpašu uzmanību pievēršot vides aspektiem būvniecībā un zaļo ēku nozīmei tajā. Pētījumā ir iekļauta būvniecības nozares integrētās pieejas analīze un nekustamo īpašumu tirgu ietekmējošo aspektu analīze. Zinātniskie un praktiskie risinājumi un ieteikumi ļaus nozares dalībniekus iepazīstināt ar galvenajiem būvniecības nozares un zaļās būvniecības ilgtspējīgās attīstības jautājumiem, kas savukārt var uzlabot nozares vispārējo darbību ilgtermiņā.

10.11.2017.