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Green Building Certification in Russia

Trends, Problems, Perspectives

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| <p>The purpose of this bachelor's thesis was to study the current technological, political, social and economic aspects of green building certification in Russia. It aimed to provide an overview of green building assessment methodologies and market tendencies in order to identify the current state and future prospects of the industry.</p> <p>Significant portion of this work was based on literature research. The information has been obtained from legislative documents, governmental reports, assessment guidelines, company databases as well as journals and articles in the web. Additionally, press interviews with key people in the construction industry were used as sources of information.</p> <p>Results of this research have shown the dynamics of the development of green building certification in Russia. A number of obstacles to this development, as well as opportunities it brings to stakeholders, arising from current technological, economic and political aspects of Russian construction industry, have been identified.</p> <p>As the result of the work, an overall understanding of Russian Green Building Certification market has been achieved. This information can be used to justify venturing into the market, as well as to prepare for possible market turbulences.</p> | |
| Keywords | Green Building Certification, Russian Federation, LEED, BREEAM, Green Zoom |

Contents

| | | |
|-------|---|----|
| 1 | Introduction | 1 |
| 2 | Green Building Certification Systems in Russia | 3 |
| 2.1 | BREEAM | 4 |
| 2.1.1 | Assessment and Weighting | 4 |
| 2.1.2 | Credit Categories and Weights | 6 |
| 2.1.3 | Example of a BREEAM building: Greendale office centre, Moscow | 7 |
| 2.2 | LEED | 8 |
| 2.2.1 | Assessment and Weighting | 9 |
| 2.2.2 | Example of a LEED building: Saint-Gobain Weber R&D Centre | 11 |
| 2.3 | GOST R 54954-2012 | 12 |
| 2.4 | “Green Standards” Certification System | 12 |
| 2.4.1 | Assessment and Weighting | 13 |
| 2.4.2 | Example of a Green Standard building: Kuntsevo Plaza Mall | 14 |
| 2.5 | STO NOSTROY Green Building Certificate | 14 |
| 2.6 | Green Zoom | 15 |
| 2.6.1 | Assessment and Weighting | 16 |
| 2.6.2 | Example of a Green Zoom building: Eightedges Office Centre | 17 |
| 2.6.3 | Comparison of Green Zoom with LEED v4 | 18 |
| 3 | Russian Green Building | 25 |
| 3.1 | Russian Policies on Sustainability | 25 |
| 3.2 | Public Awareness and Involvement | 27 |
| 4 | Russian Construction Industry | 28 |
| 4.1 | Building Stock | 28 |
| 4.2 | Economics of Construction | 30 |
| 5 | Trends, Problems, Perspectives | 33 |
| 6 | Conclusions | 38 |
| | References | 40 |

1 Introduction

Green (or Sustainable) Building is a set of techniques implemented throughout the life cycle of a building with an intent to minimize the disturbance caused to the environment by the construction project, as well as to use the natural, economical and human resources efficiently and to improve the quality of the built environment. The aim of green building is to achieve a balance between the economic, social, and ecological systems. Green building relies greatly on efficient use of resources, waste treatment, and the utilization of alternative energy sources, and thus provides benefits to both the economy and environment, as well as to the health and wellbeing of the society. [1.] The concept of green building has emerged in the late 20th century. Nowadays the practices of sustainability in construction, architecture and urban planning have become mainstream in the US and Western Europe, while the rest of the world is actively catching up. [1,2.] Due to its broad nature, the concept of green building may be interpreted in various ways. Partially the uncertainty of the concept arises from the fact that the technologies and principles of green building undergo constant development, and many of them constitute the cutting edge of contemporary building industry. However, at the moment, there is a set of principles that is agreed to be uniform between all approaches to define the essence of sustainable building:

1. An efficient use of natural, social and economic resources.
2. Protecting occupants' health and improving employee productivity.
3. Reducing waste, pollution and environmental impact. [3,4.]

The introduction of green building on a national scale is made possible by the collaboration of governmental policy makers, educational bodies, R&D institutions, building design and construction enterprises, financial institutions and public organizations. Such integrative cooperation is a prerequisite for the successful implementation of policies to improve sustainability, as can be seen on the example of such countries as the USA and the EU member states. [2.]

Green building certification systems are tools to assess the conformity of a building project with the principles of green building. The assessment is based on the framework of standards, requirements and criteria that a building project must meet in order to be recognized as "green". Although this framework may vary between different systems in its scope and content, the core set of principles of green building remains the basis for

every certification system. The assessment framework contains specific qualitative and quantitative requirements on building components and the environmental performance of the building during its life cycle. [5.]

During the assessment, a certain number of points is awarded for the compliance with each requirement. The requirements are then divided into groups, according to the topic they deal with. In order to underline the importance of some assessment issues, a maximum amount of points is assigned to each requirement by the certification system. This discrimination between more or less important issues of assessment is known as “weighting”. Weighting can be done on the basis of score of each requirement separately, or of the total score of a group. Weighted scores are added together in order to produce the final score. This final score is compared with the thresholds for certification levels defined by the system. If the final score is higher, the building is awarded a certificate stating its level of performance. [6,7,8.]

The requirements of the certification system are usually stricter than those of national building codes. Thus, green building certification systems can be used to distinguish more advanced and sustainable buildings on the market and to promote the development of buildings that perform better than average. [2,6.]

The history of attempts to create a uniform tool for assessing the sustainability of a building project goes back to 1990s, when the certification systems LEED, BREEAM, and HQE were developed in the USA, Britain and France, respectively. The process continued with the development of second generation systems, such as DGNB, GreenStar and Casbee certification systems in Germany, Australia and Japan, respectively, in the 2000s. [8.] However, LEED and BREEAM still remain the two most commonly used certification systems worldwide, and serve as benchmarks for the development of new systems. Many national assessment instruments have been developed on the same principles that are implemented in LEED and BREEAM. At the same time, the constant development of the concept of sustainability itself also causes the assessment and certification methodologies to adopt to these changes by varying the scope and methods of assessment. [3,8.]

The introduction of the concept of sustainable building to the construction industry is essential for the green building certification market to emerge. Thus, in order to fully understand this market, one also needs to analyze the progress of sustainable building

itself. The top-down process in introducing sustainability to a country can be evaluated by observing the changes in the legislation concerning environmental policies, in the codes and standards of the industry. At the same time, the popularity of such tools as voluntary certification systems can be expected to correlate with the customer interest in sustainable buildings, presenting values for a quantitative assessment of a bottom-up introduction of sustainability.

This paper aims to investigate the current state of green building certification in Russian Federation by analyzing the green building certification market, as well as by assessing the general political, social and economic trends in the Russian construction industry. In order to do this, I will look at the certification systems that are present in Russia and analyze their general features, as well as the statistical data from the market of green building certification. Several examples of certified building projects from Russian Federation is analyzed, in order to present the local tendencies in the field. Finally, I present the most important economic, social and political trends and features of the Russian construction and real estate environments. In the Discussion, I will aim at giving a general overview of the present and future of green building certification in Russia. The findings of the study can be practically helpful for companies or individuals interested in the possibilities present on the Russian market for sustainable construction and green building certification.

The research is mainly based on information collected from various sources, such as scientific studies, work reports from the industry, legislation and technical standards, official documentation of enterprises and governmental organizations, as well as from press publications of interviews with key people in the industry.

2 Green Building Certification Systems in Russia

There are several certification systems on the Russian market nowadays, both international and domestically developed. [9.] This chapter presents a summary of each of the systems, containing general facts on the certification system and its assessment methodology, its role on the Russian market and examples of buildings certified according to it. The section is concluded by a comparative analysis of LEED, an internationally leading green building certification system, and Green Zoom, a Russian national certification system that has been derived from LEED.

2.1 BREEAM

BREEAM (Building Research Establishment's Environmental Assessment Method) is historically the first green building assessment scheme, and is regarded as a benchmarking tool for green building certification. [8.] Since its creation in 1990 by British Building Research Establishment, BREEAM has been developed a lot further and nowadays it is adapted for use outside the UK. Local assessment schemes have been developed in accordance to the local codes of several, mainly European, countries. For buildings in the rest of the world, a uniform international scheme applies. Also it is possible to use the Bespoke scheme, the requirements of which are specially developed by BREEAM Accredited Professionals, taking into account the specific features of the building during assessment. In June 2016, around 260,000 projects have been assessed according to BREEAM in more than 70 countries. [10.]

2.1.1 Assessment and Weighting

The assessment according to New Construction international scheme can be done in either or both of the two steps- at the stage of design ("interim") and post-construction ('final') stage. Both the assessment and the consulting in BREEAM is done by accredited specialists of a third-party organization. Only the verification and final approval of the certification is centralized and carried out in Building Research Establishment. [11.]

The 57 requirements, or issues, of assessment, are divided into ten categories. The weights vary between the issues according to the impact each issue has on the environmental performance of the building. [11.]

The evaluation is done in four steps:

- 1st step: The proportion of the score earned for all issues of the category to the maximum score of the category is calculated for each of ten categories.
- 2nd Step: The values from step 1 are weighted according to the pre-defined weight of each category, and summed up to produce final score.
- 3rd step: The compliance with the mandatory issues is checked
- 4th step: The value from the 2nd step and the compliance with the mandatory issues is checked against the requirements of the 5 certification levels, and a certificate of the achieved level is granted to the project. [11.]

The level of a BREEAM ranked building is assigned according to the ranking system presented in table 1. The minimum amount of points needed for passing the certification is 30, and the maximum amount of points that can be awarded is 100.

Table 1. Grading in BREEAM [11.]

| | |
|--------------|-----------|
| Outstanding | ≥ 85 |
| Excellent | ≥ 70 |
| Very Good | ≥ 55 |
| Good | ≥ 45 |
| Pass | ≥ 30 |
| Unclassified | < 30 |

In BREEAM, each level of certification has certain minimal performance requirements. The grading is made so that each consequent level either adds to the required criteria or imposes stricter requirements for the same criteria. Most Russian BREEAM-certified buildings have received Good or Very Good certificates. These levels require

- Compliance with the national regulations for safety and healthiness of the construction site.
- Use of high frequency ballast for lamps.
- Eliminating use of asbestos-containing products and materials.
- Compliance with national regulation on minimizing microbial contamination risk.
- 12, 5% reduction in water consumption over baseline building, calculated with BREEAM tool.
- Water consumption metering on mains supply.
- Timber products must be made of legally produced and harvested timber. [11.]

The only additional mandatory requirement for the Very Good level is one of measuring primary energy consumption by each of the end-use system. Hence, the difference between these two levels of certification is mainly based on the score in the voluntary criteria. [11.]

In July 2016, 85 buildings have been certified according to BREEAM in Russia. Figure 1 represents the trends in the location of the certified buildings. The majority (70%) of the buildings are located in the Moscow region, 14% in St. Petersburg. Seven buildings are located in Sochi, mainly those built for the Winter Olympics of 2014. The remaining eight buildings (9%) are located in other regions. Looking at the types of projects, office spaces are most frequently certified with BREEAM (47 buildings, 54%). There are also 16 industrial, three residential and six retail projects. From the remaining 15 projects for other uses, most are sports buildings for the 2014 Winter Olympiad and 2018 FIFA World Cup. [12.]

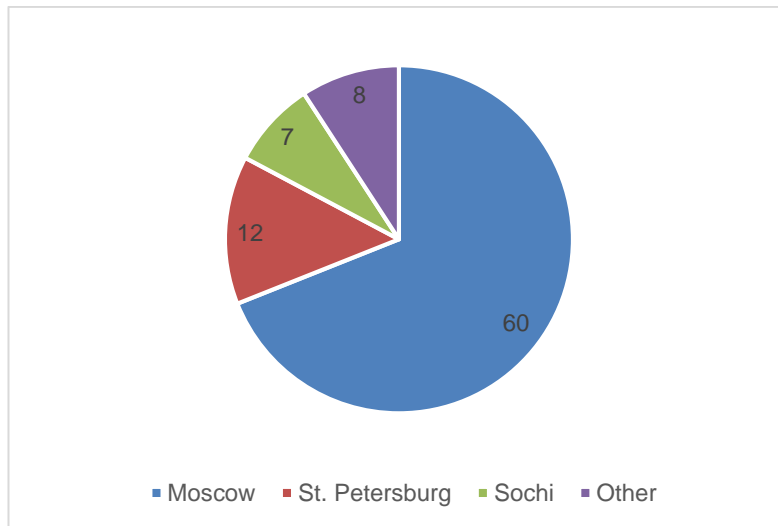


Figure 1. Trends in concentration of BREEAM certified buildings. Data gathered from GreenBook-Live [12.]

Two of the 87 projects registered in the BREEAM database Green Book Live have not passed the certification threshold. Of the 85 that passed, 32 project achieved the Good level, 31 the Very Good level, 3 the Excellent level and one project was awarded with an Outstanding certificate. [12.]

2.1.2 Credit Categories and Weights

In BREEAM, the weighting is done on the basis of the total score in each of the ten assessment categories, discriminating between the aspects of environmental impact of the building. In particular, 1/5th of the maximum score is dedicated to the energy performance of the building. The second largest weight is given to the category Health and Wellbeing. Materials and Management receive an almost equal attention with 12,5% and 12% of the maximum total score, respectively. The least credit is given to the two categories “Hazards” and “Surface Water Run-off”. The total breakdown of the weighting is given in table 2.

Table 2. Credit categories in BREEAM and their weight in total score [11.]

| Category | % |
|-----------------------|------|
| Management | 12 |
| Health and wellbeing | 14 |
| Hazards | 1 |
| Energy | 19 |
| Transport | 8 |
| Water | 6 |
| Materials | 12,5 |
| Waste | 7,5 |
| Land use and ecology | 10 |
| Pollution | 6,5 |
| Surface water run-off | 3,5 |

Apart from this, an extra 10% of score can be given for the performance on several issues that are recognized as “outstanding”, and thus dedicated to the Innovation category. The total possible score, however, is capped at 100%. [11.]

2.1.3 Example BREEAM: Greendale office centre, Moscow

The Greendale Office Center project is situated in Moscow. The building consists of two connected blocks, seven and 23 stories high. The architectural concept of Greendale is presented in figure 2.



Figure 2. Architectural concept of Greendale, Moscow [13.]

The total area of the building comprises 43,662 m², the majority of which are occupied by office spaces, a café and a restaurant. There is an underground parking in the building, also. In 2015 the project passed a BREEAM New Construction Interim assessment,

and received an Outstanding certificate with an 88,5% score. The client, O1 Properties, reported commitment to sustainable practices as its business strategy. The commissioning of the building is planned for the second half of 2016. [13,14,15.]

The Greendale building consumes 36,5% less energy than a baseline building modelled according to BREEAM and the ASHRAE 90.1–2010 standard. 65% of water consumption is reduced by the use of efficient utilities. The site for Greendale was previously occupied by an aluminum factory, and a plan for the redevelopment of the area has been developed. The transportation plan includes underground parking, electrical car charging station and bicycle parking. A metro station and other public transport stops are situated near the site. [13.]

Other green features of the building include

- Energy-efficient elevators by KONE.
- Double Argon-filled glazing, U-value 0,77 W/m²K.
- Own heat station.
- Fully mechanical ventilation with user control, fan coils.
- Energy efficient lighting system with LED and automated control.
- 70 plant species to be planted on the site.
- Green roof. [13.]

The project costs have been increased by 16% due to green innovations, 10% for the consulting and measurements and 6% for technologies. According to calculations, 75% of building life cycle costs emerge in the use and maintenance stage, but only 10% of these 75% come from energy expenditures. Data on the amount of projected cost reduction due to the innovations is not available. [13.]

2.2 LEED

Since its introduction by US Green Building Council in 1998, LEED has been a very popular certification system both in and outside of the USA. In July 2016, more than 94,340 buildings have been registered in LEED either as certified or undergoing certification in more than 150 countries. [16,17.] 80 Russian projects are registered in USGBC, 19 of them have received certificates. In 2013, LEED launched its newest version, LEED v4, to replace the previously used LEED v2009, according to which most of Russian LEED-assessed buildings have previously been certified. [17,18.]

2.2.1 Assessment and Weighting

Contrary to BREEAM, in LEED the assessment is carried out by the US Green Building Council in the United States, and the role of the accredited third-party representatives is limited to consultation and data collection.

LEED has a point allocation system similar to that of BREEAM. The assessment is done by reviewing the performance of the building against the requirements, or credits. For each credit, a number of points is assigned. Credits assessing similar aspects of the building are grouped into credit categories. However, contrary to BREEAM, the weighting is done based on the score of each credit. [16.]

A number of changes were introduced in the new LEED which affected both the content and weighting of categories. One of the major changes is that a new category of Location and Transportation was derived from the Sustainable Sites of LEED 2009, leading to a 16-point reduction of the weight of the latter. [16,18.] Other changes in credit categories of both systems and their weights are presented in table 2.

Table 3. Categories and their weights in LEED 2009 and v4. Modified from [18.]

| Category name | Points v4 | Points 2009 | % v4 | % 2009 | + - in v4 |
|-----------------------------|-----------|-------------|------|--------|-----------|
| Energy and atmosphere | 33 | 35 | 30 | 32 | -2 |
| Integrative process | 1 | 0 | 1 | 0 | +1 |
| Location and Transportation | 16 | 0 | 14,5 | 0 | 0 |
| Sustainable Sites | 10 | 26 | 9 | 23,5 | 0 |
| Water Efficiency | 11 | 10 | 10 | 9 | +1 |
| Materials and Resources | 13 | 14 | 12 | 13 | -1 |
| Indoor Environment Quality | 16 | 15 | 14,5 | 13,5 | +1 |
| Innovation | 6 | 6 | 5,5 | 5,5 | 0 |
| Regional Priority | 4 | 4 | 3,5 | 3,5 | 0 |
| Total | 110 | 110 | 100 | 100 | 0 |

As can be seen in the table, the new LEED v4 concentrates most on the issues of energy performance and the ecology of energy systems. High value is also put on the categories of Location and Transportation, and Indoor Environment Quality.

LEED certificates are granted according to the ranking presented in table 4:

Table 4. Grading in LEED [16.]

| | |
|--------------|-----------|
| 40-49 Points | Certified |
| 50-59 Points | Silver |
| 60-79 Points | Gold |
| 80+ Points | Platinum |

There is a set of mandatory criteria a building is required to meet in order to be certified in LEED, regardless of the level of the certificate. Apart from several variations between the project types, the prerequisites generally consist of the following measures [16.]

- Controlling site pollution during construction
- Measuring and reducing both indoor and irrigation water use
- Improving energy performance and monitoring energy use
- Preparing a plan for treating recyclable, construction and demolition waste
- Maintaining the quality of indoor environment and restricting smoking to special zones
- Managing the refrigerant use
- Arranging commissioning and verifying the performance of the building according to the Guidelines of ASHRAE.

Most certified Russian buildings have been certified according to LEED v2009. The number of certificated buildings have been rather low compared to the number of buildings certified with BREEAM, with four buildings a year certified in 2011-2015, and three buildings certified in 2016, in July (see figure 3).

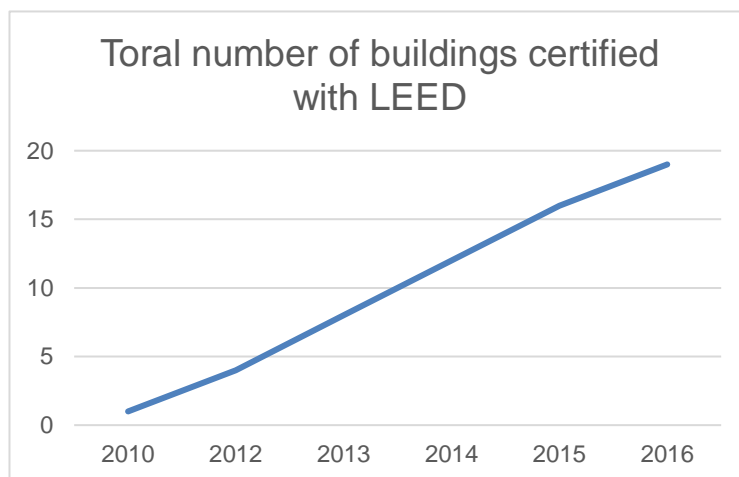


Figure 3. The trend in the number of LEED-certified buildings. Data from USGBC.

From all of the certified projects, 63% received a Gold certificate and 37% reached the Silver level. More than half of the projects are situated in the Moscow region, 26% in Saint Petersburg and only four projects were situated in other regions. Of the certified

buildings, the majority serves as industrial or office spaces (47% and 31% respectively), from the remaining four buildings, three are commercial and only one is residential. [17.]

2.2.2 Example LEED: Saint-Gobain Weber R&D Centre

The research and development center of Saint-Gobain Weber has been assessed according to LEED 2009 New Construction, and received the Gold level in 2016. The assessment was carried out as a part of corporate strategy of sustainability pursued by the Saint-Gobain Weber group. The building is situated in the town of Yegorievsk, the Moscow Region. The building was commissioned in October 2015. [17,19.]

According to the client, the total energy consumption of the building is 27 kW/m²a. The building achieved 63 points out of 110. The breakdown of the score is presented in table 5.

Table 5. Score of Saint-Gobain Weber Centre. Data from USGBC

| Category | Points awarded / Maximum |
|------------------------------|--------------------------|
| Sustainable sites | 17/26 |
| Water efficiency | 10/10 |
| Energy & atmosphere | 14/35 |
| Material & resources | 3/14 |
| Indoor environmental quality | 11/15 |
| Innovation | 4/6 |
| Regional priority credits | 4/4 |
| Integrative process credits | 0/3 |

The building achieved full points in all criteria related water management and control. Remarkably, the criteria related to indoor pollutant control received a zero score, despite its importance for an object of this kind. In the category of regional priority (with credits related to energy efficiency and water management), the building received full points. The certificate was issued in February 2016. [17,19.]

2.3 GOST R 54954-2012 Standard

GOST R (Russian ГОСТ Р) 54954-2012 is a Russian standard on sustainability of buildings and construction practices created in 2012 with an active participation of the Russian HVAC Engineering Society AVOK (Russian ABOK). [20.] Although it is a voluntary national quality standard for construction, it has several features of a certification system. It contains a set of requirements for environmental performance of buildings based on Russian legislation and codes for construction. The structure of the document repeats the logic of a certification system with all the requirements presented as a list. The process of applying the standard is similar to that of a certification methodology. GOST R serves as a check-list for compliance with existing building codes, but at the same time presents recommendations for performance beyond those. These recommendations are partially based on a number of ISO standards, including ISO 15392:2008 Sustainability in building construction-General Principles and ISO 2930-2007 Sustainability in building construction-Environmental declaration of building products. However, GOST R does not contain a ranking or award system, nor does it introduce any requirements beyond those set in the Russian building code, which makes it a hybrid of a building code and an assessment system without the possibility of certification. [20.]

2.4 Green Standards Certification System

The Green Standards (Russian Зеленые Стандарты) certification system was introduced in 2011 to become a national alternative to LEED and BREEAM. The work on developing the system started in 2009, when a working group was created by the Ministry of Natural Resources and Ecology with the target to adopt the benefits of international certification practices to Russian conditions. A year later the first draft of the certification standard was created, and then tested during the following year in order to collect feedback from builders, architects and engineers. The final version of the system was announced on April 8, 2011. In 2016, 15 companies around Russia have been accredited to perform certification according to Green Standards. However, the exact amount of buildings certified with the system is unknown. [21, 22.]

There are several bodies that form the system. They are

- Non-profit organization “Green Standards”, responsible for the management of the certification processes and accrediting the Certification Agents.
- The Board of the System, with representatives from ministries, federal agencies and other parties interested in promoting the system. The Board decides on the future development of the system and makes other strategic decisions.
- The Certification Agents which undertake the certification procedures and issue the certificates. The Agents must have appropriate resources, and be accredited by the NGO “Green Standards”.
- Training Center which is responsible for educating the specialists of the Certification Agencies on the use of the system. [23.]

2.4.1 Assessment and Weighting

The assessment criteria are divided into subgroups mostly in the same way as in the systems introduced above. However, the allocation of points is done in a slightly different way. For each criterion the building can receive 0-10 points. These points are multiplied with the weight of the criterion to produce a final score for the criterion. The final scores of all criteria comprise 100. The final ranking is determined as in the table 6 [22.]

Table 6. Grading in Green Standard. [22.]

| | |
|-----------|---------|
| certified | 40-49% |
| silver | 50-59% |
| gold | 60-79% |
| platinum | 80-100% |

The assessment table of Green Standard includes eight categories. Several criteria dealing with the design of spaces and structures, have been united under a category of “Architecture and Structural Engineering”. Most of the criteria under this category are also present in LEED and BREEAM as parts of other relevant categories. The most important categories in Green Standards are the Ecological Management, Site and Landscape and Energy Efficiency (table 3)

Table 7. Categories and weights in Green Standard. [22.]

| | |
|--|------|
| Ecological Management | 17,9 |
| Site and Landscape | 17,5 |
| Water Efficiency, Surface Water Management | 6,3 |
| Architecture and Structural Engineering | 14,8 |
| Energy Efficiency | 17,2 |
| Materials and Waste | 11,3 |
| Indoor Environment Quality | 10,5 |
| Safety | 4,5 |

There is a uniform set of requirements each building must achieve in order to be certified, similarly to LEED. The requirements cover the topics of site location and ecology (site choice, ecological management during construction works, environmental impact of the building on the landscape) and the quality of materials (eliminating use of products that contain asbestos, and only using certified products). However, the scope of the assessment is limited, compared to that of LEED and BREEAM, respectively. The system uses the existing Russian building code and legislation as reference for assessment. [22.]

Remarkably, the available documentation of Green Standard does not contain information on the methodology of assessment. Some criteria relate the requirements to the national standards and codes, while others impose requirements without providing the actual instructions for assessment. [22.]

2.4.2 Example Green Standard: Kuntsevo Plaza Mall

At least in July 2016, the website of the Green Standard does not contain any information about any projects that have been certified with Green Standard. Only limited information is available on the web about one building, a mall in the Kuntsevo district of Moscow. The mall was built in 2015, and has achieved the Gold level certificate. Several technologies used in the project include

- Heat pumps for air conditioning.
- Heat recovery in ventilation.
- Automated lighting control.
- Waste segregation.
- Utilization of the natural sunlight. [23.]

Unfortunately, detailed information about the specifics of this project has not been available.

2.5 STO NOSTROY Green Building Certificate

The STO NOSTROY (Russian СТО НОСТРОЙ) building certification system was introduced in 2011 by a non-governmental organization “NOSTROY”, which unites professionals of construction, reconstruction and renovation of built environment. Before this, the organization had issued a number of voluntary standards for certifying the quality of construction works and materials. [24.]

The system has only one scheme for design, construction, operation, renovation and demolition phases of the building life cycle. However, the standard discriminates between buildings by their use, and considers the type in consideration during the point allocation process.[25]

The scope and structure of the requirements are similar to those of Green Standards. Russian building codes and legislation are used as a reference for the performance assessment. In contrast to Green Standards, the exact assessment methodology is open to public. Energy efficiency and the quality of indoor environment are the two categories with the most weight, 19% and 13,5%, respectively. Other categories receive an almost equal weight.

The ranking is done on the basis of points achieved in each category (See figure 4).

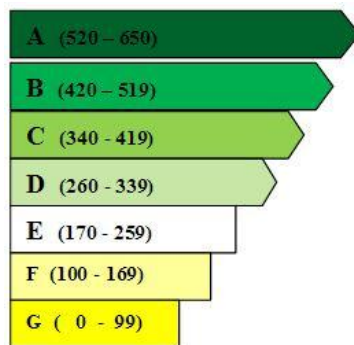


Figure 4. Ranking system of NOSTROY. [24.]

Unfortunately, no information about projects certified by NOSTROY was available by July 2016.

2.6 Green Zoom

Green Zoom is the newest Russian certification system created by a group of specialists in construction and real estate development, supported by Russian Green Building Council and launched in 2015. The system addresses the issues of energy and water efficiency, as well as the environmental impact of the building. It was developed on the basis of LEED v.4 2014, and at the moment (July 2016) consists of only one scheme,

which can be used for any civil building project of more than two stories. The main document of the system is organized to serve as an assessment scheme and a set of instructions for the project stakeholders to improve the performance of the project. At the moment (July 2016), 15 certified projects are listed on the website of the system. [25.]

2.6.1 Assessment and Weighting

Green Zoom has been designed as a lightweight and easily comprehensible assessment system. There are 48 criteria, each of them with its own score. The system assures a minimal performance with a uniform set of required criteria, developed on the basis of the Russian building code. The criteria are divided into nine categories, with eight of them dealing with general performance of the building and the ninth concentrating on the local issues of one of the four different climatic regions of Russia: Southern regions, Northern regions, Draughty regions and Regions with high geothermal activity. The maximum score in Green Zoom is 90 points. The project can be assessed twice, at the design and commissioning stages, with separate certificates issued on each stage. [26.]

Green Zoom concentrates mostly on the issues of indoor environment and energy performance (See table 8). The rest of the attention is divided almost equally between the rest of the categories. In contrast to LEED, no bonus points are available in Green Zoom. [26.]

Table 8. Categories and their weights in Green Zoom (Based on data from [26.]

| Category name | points | % |
|--|--------|------|
| Collaborative analysis of the project on design stage, working group formation | 1 | 1 |
| Site Location and Transportation | 8 | 9 |
| Site Ecology | 10 | 11 |
| Water efficiency | 12 | 13 |
| Energy efficiency and emission control | 17 | 19 |
| Materials and waste | 8 | 9 |
| Indoor Environment Ecology | 23 | 25,5 |
| Innovation | 7 | 8 |
| Local issues | 4 | 4,5 |

Similarly to LEED, basic criteria of assessment must be met in order to pass the certification. The requirements include

- Designing a facility manager's office in the building.
- Creating a plan to minimize the ecological impact on soil and air from construction works.
- Assessing the features of the site before the design and taking these features into account during the design.
- Use local species of vegetation and minimize irrigation needs.
- Use water-efficient technologies and meter water consumption.
- Third-party commissioning.
- Reduce energy consumption (over a basic model done in compliance with national standards from 2007), introduce energy metering.
- Eliminating ozone-depleting refrigerants use.
- Waste segregation measures, using materials certified nationally.
- Indoor air quality as required by in Russian codes.
- Restricting smoking to isolated zones. [26.]

In July 2016, 15 projects were listed on the website of the system. Of these projects, 13 have been certified after construction, the other two are currently in the design and planning stage. All 13 constructed buildings were certified in 2015, six of them serve for residential purposes, the others are office (four) and retail buildings (three). Of all the 15 projects, eight are located in Saint Petersburg, the others were built in different non-capital regions of the Russian Federation. [25.]

2.6.2 Example of a Green Zoom building: Eightedges Office Centre

The business center "Eightedges" was built in Saint Petersburg in 2014, and has since 2015 been occupied by the Russian national energy company "Gazprom". In 2015, this fully glazed octagonal building (presented in figure 6) was considered to be one of the most expensive business centers in St. Petersburg. [28.] The project costs, by information from the development company Leorsa Group, comprised \$50 million. [28.] The most innovative solutions employed in Eightedges project include

- Automated HVAC system with heat recovery. The reported energy savings are around 60%, no heating is required during inter-season times, during winter cold outside air is utilized for cooling.
- Automated shading of the fully-glazed façade.
- Integrated control over the engineering and automation systems of the building. [27.]



Figure 5. The glazed façade of Eightedges. [27]

The rainwater and the snow from the roof are utilized in the building and on site. With the help of the building automation system, both electricity and heating energy consumption is monitored and controlled individually by every office and machinery type. [27.]

In 2015, Eightedges was certified according to LEED Core and Shell v2009, and Green Zoom v.1.1. As a result, it received the LEED Gold certificate with 60 points out of 110 (58%) and the Green Zoom Platinum certificate with 70 points out of 90 (78%). [25.]

2.6.3 Comparison of Green Zoom with LEED v4

Being developed on the basis of LEED v4, Green Zoom has inherited many features and principles from the international certification. At the same time, its developers have pursued the goal of creating a system that would correspond to the circumstances of the Russian construction industry. [26.] In the following section, the credit categories and ranking system of Green Zoom are compared to those of LEED v4. The categories are compared in terms of weight of the category in the total score, and the scope of assessment. The names of the categories of Green Zoom (GZ) are translated from Russian. Despite some differences in naming, the scope and intent of the categories are similar to LEED.

Category 1. Collaborative analysis of the project on design stage, working group formation.

Credits: 1 in both systems,

Weight: 1% in both systems.

The only mandatory credit in the category of Collaborative Analysis of the Project on Design Stage is given for establishing a working group with representatives from main design and building contractors, investors, clients and consultants. The intent of the group is to assess the features of the site and collaboratively work out a concept of sustainable solutions to be implemented in the project. Such collaboration on pre-design stage allows for higher efficiency in future implementation. The main difference from the analogous category of LEED (Integrative Process) is that a specific framework is set for the creation of the group and documenting its decisions. [16, 26.]

Category 2. Site Location and Transportation.

Credits: GZ 3; LEED 8,

Weight: GZ 9%; LEED 14.5%.

The eight categories of the Site Location and Transportation category of LEED were reduced to three. The selected credits include requirements on distance to public transport stops, amount of bicycle storage facilities and short distances to public infrastructure objects. Contrary to LEED, Green Zoom does not address issues of construction density of the district, green vehicle facilities, or bicycle networks, neither does Green Zoom require quantitative assessment of the amount of public transportation available. [16, 26.]

Category 3. Site Ecology.

Credits: GZ 7; LEED 7,

Weight: GZ 11%; LEED 9%.

Although the number and scope of the credit for Site Ecology are the same between systems, several differences can easily be seen. When assessing site ecology, Green Zoom concentrates on the impact of the planned building rather than the pre-existing site contamination profile. In the credit for Habitat Restoration, less measures are proposed. Also, the minimum green space area requirement is 10% lower in Green Zoom. The list

of measures to mitigate heat island effect is reduced from 8 to 5, excluded is, for example, the use of shading from solar energy devices. It is enough to confirm the use of two of the five measures in Green Zoom to get the credit, and unlike in LEED, quantitative requirements are not stated. Light pollution reduction measures in Green Zoom are limited to stating the use of downward-emitting luminaires, without a quantitative assessment. [16, 26.]

Category 4. Water efficiency.

Credits: GZ 6; LEED 7,
Weight GZ 13%; LEED 10%.

Most of the credits in the category of Water Efficiency are a direct translation of the credits of LEED v4. The two credits for water metering in LEED are combined into one in Green Zoom.

In Green Zoom, the requirements for indoor water consumption volumes are based on the requirements of Russian standards (GOSTs). With looser requirements than those of LEED, Green Zoom does not assess the water consumption of several fixture types that are mentioned in LEED. In fact, the GOST 19681-94, which Green Zoom refers to, sets the minimum, not maximum, values for water consumption of a fixture. [29.] For example, according to GOST 19681-94, a faucet must consume a minimum of 12 litres per minute when operating at 300 kPa, while in LEED similar fixture may consume a maximum of 2-9 litres per minute, depending on the type of faucet, at 450 kPa. [29.] Both Green Zoom and LEED require at least a 20% reduction from these critical values, but obviously the final water consumption in a building certified according to Green Zoom will be higher. Furthermore, no labelling of fixtures and products is required in Green Zoom or in GOST 19681-94, unlike in the guidelines of LEED. [16, 26.]

Category 5. Energy efficiency and emission control.

Credits: GZ 6; LEED 11,
Weight: GZ 19%; LEED 30%.

Both LEED and Green Zoom assess the energy performance of the building. In LEED, the first option to receive the credit for energy efficiency is to demonstrate a 5% reduction

in energy costs from a baseline model calculated according to ANSI/ASHRAE/IESNA Standard 90.1–2010, Appendix G. [16.]

The corresponding option in Green Zoom proposes the following formula for calculating the energy performance of the building

$$E = [(E_b - E_p) / E_b] \cdot 100\% \geq 10\%,$$

where $E=10\%$ is the minimum energy efficiency value, E_b is the total energy consumption of a building designed according to national standards from 2007, E_p is the total energy consumption of the designed building, with the effect of the measures to reduce energy consumption, excluding the energy supply from on-site renewable energy systems. In other words, Green Zoom requires the building to consume at least 10% less energy than it would if it had been built in accordance with the national standards from 2007. Similarly to LEED, further reduction of energy consumption is rewarded in a separate credit, with points assigned on a gradual scale with a set of percentages. The Green Zoom did not incorporate other options that are present in LEED, in particular, the compliance with ASHRAE Advanced Guidelines. [16, 26.]

Another common credit in the Energy Efficiency category is assessing the use of renewable energy. In LEED, the percentage of renewable energy is calculated based on the price of the energy supplied from renewable sources and the total price of the energy consumed by the building yearly. Green Zoom calculates the efficiency as the ratio between the annual amounts of energy supplied from renewables and the total consumed. [16, 26.]

Green Zoom does not give credit to further improvements of energy metering and refrigerant use, and it does not address the issues of energy demand response and the use of green power produced off-site. [16, 26.]

The issues of the “enhanced commissioning” credit of LEED are reduced in number and added to the prerequisite for general commissioning. Green Zoom allows commissioning to be done only by a third party specialists hired by the client, while in LEED it is possible to employ the specialists of the contractor if the project size is less than 1800 m². [16, 26.]

Category 6. Materials and waste.

Credits: GZ 6; LEED 7;

Weight: GZ 9%; LEED 12%.

The attitudes towards the quality of materials and waste management in LEED and Green Zoom are very different. The only common principle is the requirement for recyclable waste segregation and collection. The thorough assessment of waste management planning and implementation of LEED was replaced by a single credit of construction waste minimization, which only prescribes to measure the amount of waste and take some measures to minimize it, with one point available for 20% reduction, and two points for 40% less waste produced. However, the methods of quantitative assessment are absent in Green Zoom. [16, 26.]

The material quality is also addressed rather poorly in Green Zoom: of the two credits dedicated to this topic, one checks the compliance with the national standard SanPin (Russian СанПиН) 2.1.2.2645-10, which in turn requires only to comply with national standards on material quality and emissions control. [30.] The other credit can be achieved by using materials that have an environmental certificate, with no requirement on the share of certified materials or any exact definition of such a certificate being mentioned. The issues of Environmental product Declarations and Life Cycle Impact Analysis of the building, addressed exhaustively by LEED, are not included in the scope of Green Zoom. [16, 26]

Category 7. Indoor Environment.

Credits: GZ 12; LEED 11;

Weight: GZ 25,5%; LEED 14,5%.

Both systems require compliance with local or international standards for indoor air quality, with LEED referring to ASHRAE or ISO standards and Green Zoom referring to the building codes of the Russian Federation. Both systems include credits for further indoor air quality enhancement. Although the measures for achieving this are quite similar between the systems, Green Zoom requires several of the measures to be implemented in order to achieve the minimum score for this credit, while in LEED it is sufficient to select one of them. The requirement for the amount of VOC emitted by the materials is also stricter in Green Zoom, where 80% or less VOC emissivity allowed by national codes must be reached, whereas LEED sets the limit at 100%. However, the codes that are

used for determining baseline, differ in the scope and methods of assessing the concentrations of the VOC and other pollutants, which makes it difficult to compare the quality of indoor air assured by accomplishing this credit in Green Zoom and LEED. [16, 26]

Further differences can be noted in the assessment of the indoor air quality after construction. Green Zoom requires a measurement of the actual VOC concentration before occupancy, and proposes a flush-out during 100 hours if the concentration is above allowed limits. LEED has a more flexible approach and allows a flush-out without carrying out the measurements. [16, 26]

In terms of individual control over the microclimate, the requirements for the amount of spaces with the possibility for control by the occupants are lower in Green Zoom, 30% versus 50% in LEED. [16, 26]

The number of options for demonstrating quality of indoor lighting has been sufficiently reduced in Green Zoom. The only options incorporated include individual lighting fixtures installation, using fixtures with CRI over 80 and rated life span of 24000 hours. Only one of the three options presented in LEED for asserting daylight utilization quality has been adopted in Green Zoom. [16, 26]

Category 8. Innovation.

Credits: GZ 3; LEED 2;

Weight GZ 8%; LEED 5,5%.

Both systems promote innovation by granting points for the implementation of measures to improve the performance of the building not mentioned in other credits. In LEED, it is also possible to demonstrate exemplary performance on one of the credits, while Green Zoom lacks this option. Consulting a green building expert is rewarded in both systems. However, in LEED only the service of a LEED specialist satisfies the criteria, while in Green Zoom it is sufficient to consult a specialist of LEED, BREEAM or Green Zoom itself. [16, 26]

Category 9. Regional Priority

Credits: GZ 4; LEED 4,

Weight GZ 4,5%; LEED 3,5%

The Regional Priority category was developed in both systems in order to provide an incentive for building projects to address issues that are classified as important for the specific location of the project. In LEED, the credits of energy performance optimization, thermal comfort, land and site habitat protection, rainwater management and light pollution are considered important throughout the Russian Federation. A building project can achieve a maximum of four points by implementing any four of these six credits, with one point being awarded per credit. On each of these credits, the building must score higher than certain thresholds in order to get the regional priority points. In Green Zoom, there are four credits devoted to local priority issues, each worth one score point. Each credit is devoted to issues of a specific location type, namely the Southern, Northern, Draughty Regions and Regions with high geothermal activity. However, in Green Zoom a building can never score full 4 points for regionally important issues, as in such case it should be considered located both in Southern and Northern regions. Another difference is that instead of requiring completion of specific credits, Green Zoom requires “addressing” the problems relevant to each location. For example, a project located in Northern regions of RF can get one point for implementing measures to reduce heat consumption. [16, 26]

Ranking

The requirements for the score to achieve a certain level are slightly stricter in Green Zoom (See table 9).

Table 9. Score required for achieving certain level of certification [16, 26.]

| Level | LEED | Green Zoom |
|------------------|------|------------|
| Certified/Bronze | 36% | 39% |
| Silver | 45% | 50% |
| Gold | 55% | 61% |
| Platinum | 73% | 78% |

In general, Green Zoom can be considered a valid tool for the assessment of the environmental performance of the building and to assert its level to be higher than required by Russian building codes. However, compared to LEED v4, its methodology and scope are simplified. In many credits of Green Zoom, project teams have less choice of options

to demonstrate the level of performance. A large part of the credits do not assess quantitative values, and they provide rather vague definitions and instructions. Several mainstream international green building practices, such as Environmental Product Declarations, have been left outside the scope of Green Zoom. Very little attention, compared to LEED, is paid to the issues of site location and transportation. Taking Russian national standards as a reference makes it easier for Russian specialists to deal with the requirements of the system, but at the same time reduces the possibility to follow the best international practice. The previously mentioned business center Eightedges provides an example of the difference between the two approaches, achieving a 23% lower score in LEED than in Green Zoom during a parallel assessment.

Being the only national certification system to be used on the Russian market, Green Zoom has the potential to evolve into a full-scale certification system from the state of a pilot project, which it can be considered to be at the moment. In order to achieve that, Green Zoom must employ a deeper, more thorough and defined assessment methodology. So far, it may appeal to the Russian customers with its simplicity, but this simplicity may be decreasing the value of the certification.

3 Russian Green Building

Russian involvement in international operations between 2000-2014 promoted the presence of Western companies on the national market and the exchange of knowledge and technologies between professionals. This progress facilitated the introduction of the concepts of sustainability to the operation of Russian companies and to the policies of governmental bodies. [30,31] This chapter summarizes the most important milestones in the development of Russian green building.

3.1 Russian Policies on Sustainability

The history of political action for improving the energy efficiency in Russia dates back to 2009, when then-president Medvedev launched several major reforms. The main result of these actions were the Federal Law No. 261-FZ “On Energy Conservation and Increasing Energy Efficiency”, adopted in 2009, and the governmental program for measures on energy savings and energy efficiency to be implemented until 2020. It is specially mentioned that Russia’s energy intensity was 2.5 times higher than the world’s average and up to 3.5 higher than that of developed countries, the main reasons for this

being the climate conditions, as well as inefficient infrastructure and technologies. [33,34] As a result of these top-down measures, several standards and measures to regulate the energy consumption of buildings were introduced. For instance, a goal of reducing the energy consumption of new buildings by 15% by 2011, 30% by 2016 and 40% by 2020 has been set. In addition, a number of changes has been introduced into the requirements on the contents of project documentation, in particular, a new section on solutions for energy efficiency has been added. [34,35]

However, only a 6,5% reduction in the energy consumption of all of the buildings was achieved by 2013. The results were better in the municipal building sector, where a 10-15% reduction in the total energy consumption was achieved during the same period. Still, in 2013, buildings constituted 37,5% of the total energy consumption profile of Russian Federation. [36.]

Despite the attempts to develop the framework for energy efficiency, the progress since 2013 has been rather limited, as the requirement of the laws and decrees did not result in changes in the building code and construction practices. The implementation of the new requirements on project documentation was also inefficient. [33.] Moreover, other aspects of sustainable building like waste management, indoor environment quality or quality of materials, were not addressed by the reforms specifically, and at the moment are regulated by the existing building code. The requirements contained in Russian legislation are inherited from the Soviet times or were developed in the early 2000s. When compared with the analogs of the EU and the US, Russian standards are found to be up to 25-30 years outdated. [33,37,38.]

A few new standards representing more strict criteria on building performance have been developed, but have not been made statutory. One example is the building code “СП «Энергетическая эффективность зданий» [Set of Rules for Energy Efficiency of Buildings], which was developed on basis of EN ISO 13790:2008, and adopted to Russian conditions and practices. [39.] Another example is the voluntary standard GOST R (*Russian* ГОСТ Р) 54954-2012, which was described in more detail in Section 2.3.

The strictness and rigidity of existing Russian codes imply obstacles to the diffusion of alternative practices and innovation in general. The sustainable technologies proposed by architects and engineers are often rejected by the construction expertise, as

they are not supported by the existing standards. [40.] In general, the efforts of the government to develop the legal framework of construction to incorporate sustainability principles are considered ineffective by professionals in the field. [41,42.]

3.2 Public Awareness and Involvement

Another important and necessary measure to take to promote changes in the industry towards more sustainable practices is the promotion of sustainability principles to the general public and introducing financial incentives for investing in sustainable projects. These actions have been undertaken in all of the countries that have succeeded in green innovations. [2.]

In a questionnaire arranged by Delovaja Rossiya in 2016, a vast majority of the representatives of 250 Russian construction and real estate enterprises evaluated the measures on promoting sustainability as ineffective. Remarkably, in the same questionnaire, three quarters of the respondents considered a three year period as the maximum acceptable for return of investments in green innovations. [43.]

In interviews by the newspapers “Gazeta” and ‘Kommersant’, construction professionals reported a serious lack of socio-economic measures to promote values of sustainability to the people and introduce the practices of green building into the industry. In addition, there is a lack of specialists having appropriate education for dealing with these practices in construction and architecture companies. [40,41.]

The creation of the Russian Green Building Council in November 2009 was expected to become a major step in promoting sustainability in Russia. RuGBC is a member of the World Green Building Council, and is considered an “emerging” member. The Russian Green Building Council is a non-commercial organization and states its aims as “to develop and promote green building certification systems, provide education and training on green building, as well as to represent the interests of its members”. However, the productivity and effectiveness of the council’s work is questionable. In fact, some experts have reported, that there is very limited action supporting the stated intentions of the RuGBC. [31,44.]

In general, the awareness of the essence and benefits of sustainable building is rather low among both construction and real estate professionals, as well as in general public. There is a lack of professionals with appropriate education to implement sustainable

technologies in projects. The readiness of stakeholders for long-term investments in green technologies is also rather low. [40,41.]

4 Russian Construction Industry

Russian construction industry has been undergoing great changes during the last two decades. In 1990s the volume of large state-financed projects dropped due to the changes in the political environment. A reduced demand from the state, together with an absence of market and private investments had a negative effect on the industry. The decline lasted until the mid-2000s, thereafter the Russian construction started growing again. The main factors for the recovery were the reorganization of the industry and the establishment of market economy. In 2000s, several new sectors of private real estate like commercial and business spaces emerged, which also had a positive effect on the industry. The new market of private residential construction has also been growing after 1990s, largely due to the start of private investments in real estate development. [45.]

4.1 Building Stock

In 2014, after a decade of growth in the construction industry, Russia was the fourth country in the world by the total area of buildings, which comprised 5,5 billion sq. m. The majority of the area was used for residential purposes, followed by the commercial spaces (See figure 6) [46.]

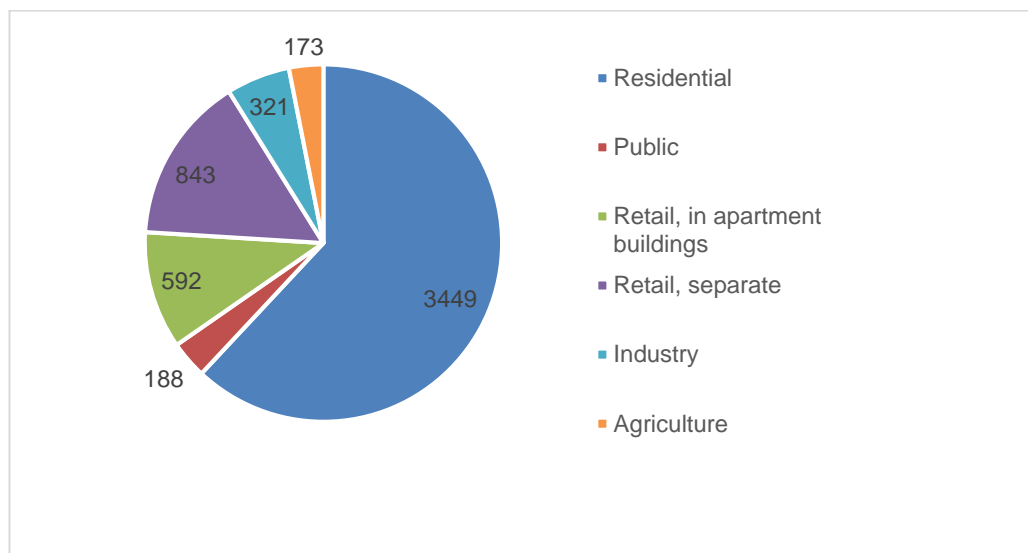


Figure 6. Building stock according to its purpose, in m². [46.]

However, the majority of buildings in Russia have been built before the 1990s. The small amount of new buildings in proportion to the older ones leads to low effectiveness of the measures to promote energy efficiency of the building stock. It has been estimated, that even if the energy consumption of new buildings were reduced by 50%, the total improvement in energy efficiency of the whole building stock would comprise around 1% yearly. The average age of a Russian building is 45 years (37 years in the residential sector), projected to be growing up to 65 years by 2050, as can be seen in figure 7. [46.]

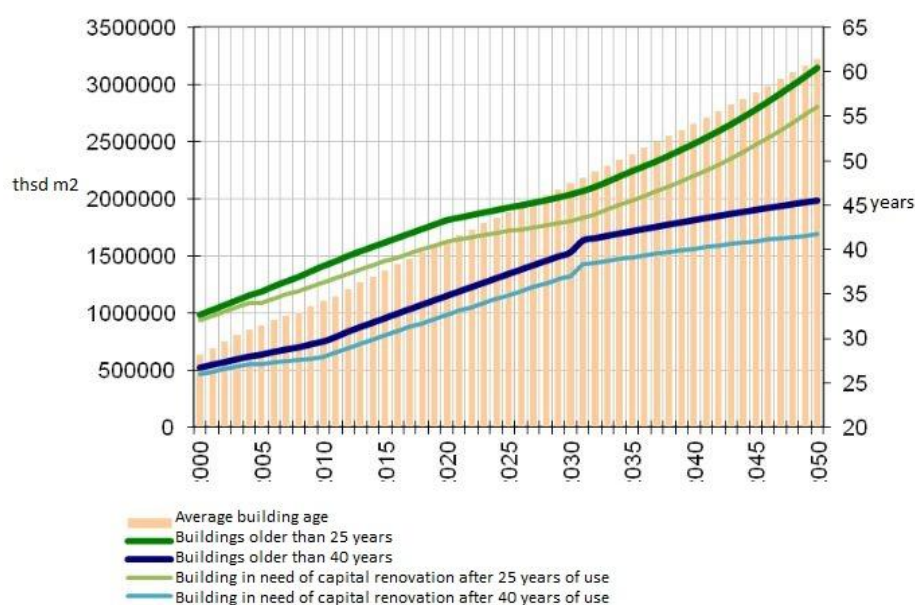


Figure 7. Projections on the number of buildings of different age by 2050. Adopted from [46.]

The amount of buildings that demand major renovation is unknown, as no official statistics is available. According to unofficial approximations, by 2014 around 4% of all buildings have run 66% of their projected life span. At the same time, the volume of major renovations has reached its peak in 2009, and since then has been descending (See figure 8).

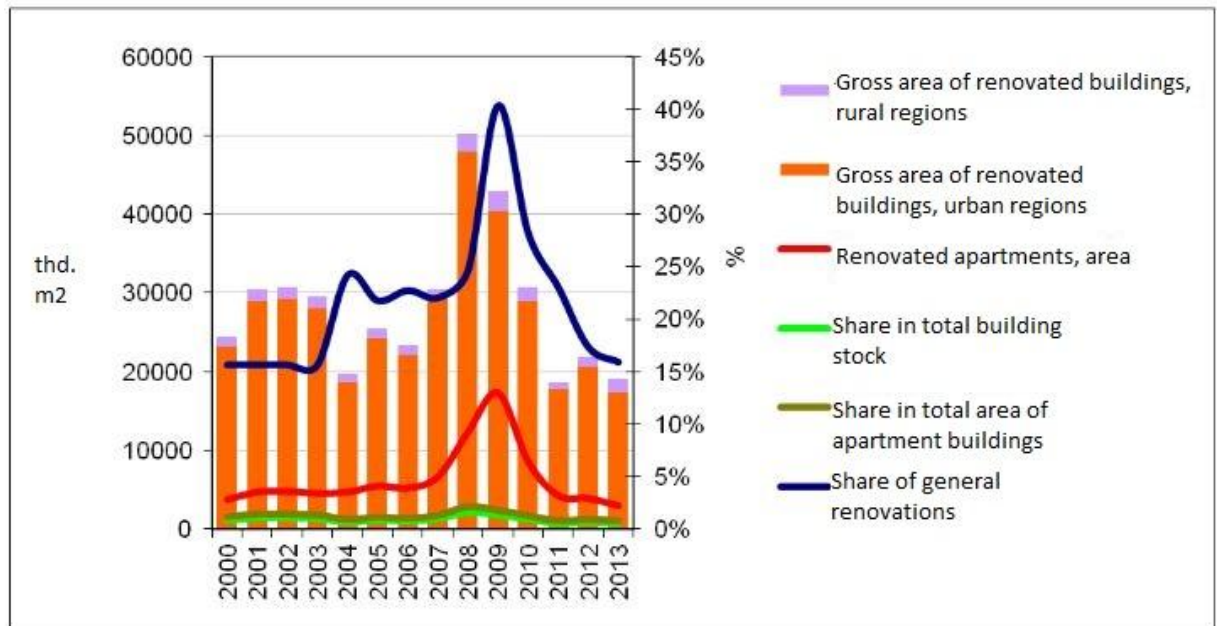


Figure 8. Trends in major renovation works. Adopted from [46.]

Due to the large proportion of old buildings, major renovations provide good opportunities to improve the overall energy performance of the Russian building stock. However, given that the rate of renovating old blocks of flats is around 0,2% yearly, the overall energy performance of the building stock is expected to be decreasing due to the constant aging. At the moment, the building sector is responsible for 38% of all primary energy consumed in Russia, with 23% percent consumed by the residential buildings. Up to 67% of the energy in residential buildings is used for heating and ventilation. In order to achieve improvements in energy efficiency, around 2% of all residential buildings should undergo a major renovation. [46.]

Overall, the main trends in the Russian building stock are the constant aging and inefficient energy consumption patterns. Given the current rates of energy renovations and energy efficiency improvements in new buildings, these trends can be expected to persist in the future.

4.2 Economics of Construction

Before the economic crisis of 2008, the share of construction in the Russian GDP comprised some 1,5-2%, five times less than it was in the EU (9%). During the crisis, the growth of the sector slowed down, but started accelerating again after 2010. Of all sectors, residential construction has been developing at the highest pace in the post-crisis

years. The most prominent progress could be seen in the economically active regions of Moscow, Saint Petersburg, as well as other large cities and the Southwestern region. Generally, in 2011-2015, the volume of new commissioned buildings grew by approximately 2% in a year. Non-residential construction, which comprises around 10% of the volume of the sector, has mostly been present in Saint Petersburg and Moscow. [47.]

The growth of the construction industry started slowing down in 2014, due to the decrease in investment volume and the general decline of the economic situation. The situation was worsened by the sanctions the Western countries imposed on Russia after the events in Ukraine and Crimea in 2014. These sanctions vetoed a number of international financial and investment operations, and gave rise to an outward flow of investment from Russia. Being a major exporter of oil and gas, Russia was severely affected by the fall of fuel prices in 2015. Today, in 2016, Russia is in a structural economic crisis, which is projected to continue at least 6-8 years. The official statistics describes the reduction in the volume of construction projects as seen in figure 9. However, some developers report 20-50% decrease in production of buildings in July 2016. [47,48,49.]

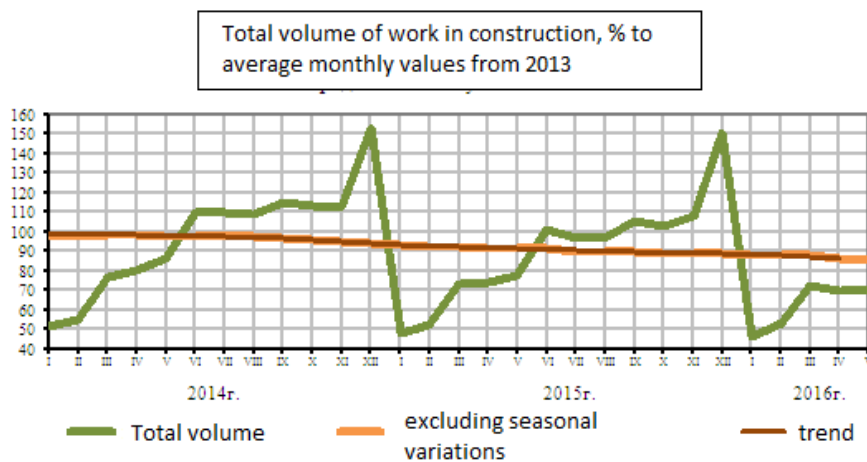


Figure 9. Trend in the volume of construction works. Adopted from [50.]

The volume of the production in construction grew in 2014-2015 due to the inertial supply of projects that had been started 2-3 years earlier. This supply was temporarily covered with demand, as in the vulnerable economic situation the population was using assets accumulated during previous years to invest in real estate. However, since 2015, the incomes of the population have decreased, which lead to a drastic decrease of demand

and a situation of overproduction in the residential sector. In the official reports of governmental bodies, the demand for housing was expected to decrease by almost double by 2020. The demand for commercial spaces decreased also, as the overall business environment suffered from the economic crisis. The tendencies of the amount of new buildings in relation to the GDP in Russia during 2007-2016 are presented in figure 10. [47,49.]

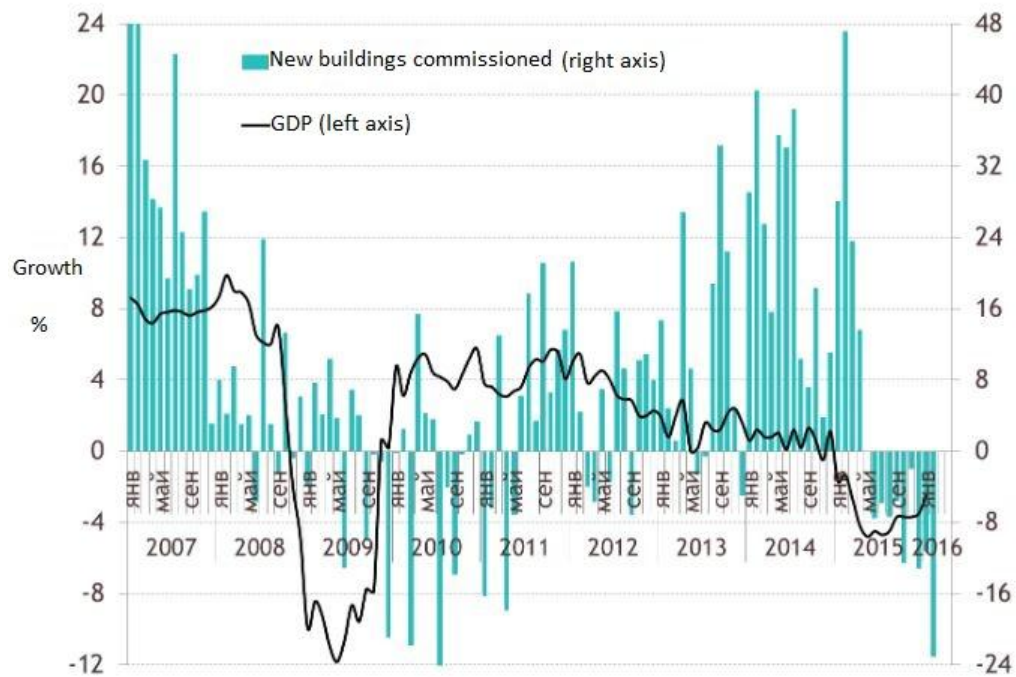


Figure 10. Trends in Russia's GDP and gross area of new buildings. Adopted from [47.]

Another contemporary economic problem of the Russian construction is the lack of investment tools for developers. In fact, no investment credit currently is available for construction companies from banks, and new projects have to be financed by clients. Despite the introduction of a state program for mortgages, the demand stays low, as the amount of money available to the population is very limited. [48.]

Generally, the future of the whole construction industry is greatly dependent on the strategic decisions of the government on future economic policies.

5 Trends, Problems, Perspectives

Basing on the information presented in Chapter 2, it can be concluded that the market for green building certification in Russia is rather young, and, since its emergence in 2010, Russian green building stock has been growing at a rather slow pace. Despite this, a whole variety of both international and locally created certification systems is present on the market. The international systems are represented by BREEAM and LEED, which have been used to certify 87% of the buildings. The recently created Russian national certification system Green Zoom has been used in 12% of the projects, sometimes parallel with either LEED or BREEAM (See figure 11). The other two Russian national certification systems, STO Nostroy and Green Standards, have little to no history of practical implementation.

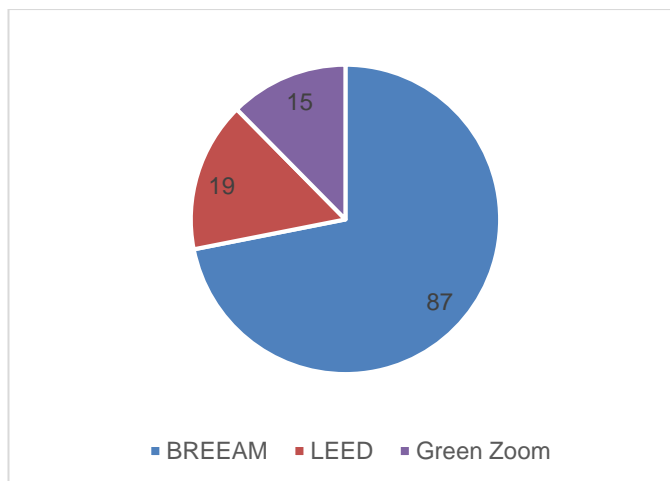


Figure 11. Shares of Green Zoom, LEED and BREEAM in total number of certified green buildings in Russia.

As can be concluded from the analysis of assessment methodologies presented in Chapter 2, all systems are designed to analyze similar aspects of the environmental performance of the buildings. In every system, the attention is focused on the issues of efficient use of energy and water resources, health of the indoor environment and the environmental impact of the construction process and the building itself. These values correspond to the main principles of sustainable building mentioned in Chapter 1, and their importance is recognized both in international and Russian certification systems. However, there are significant differences between the systems in the way the performance

of the building is actually measured. In particular, neither STO Nostroy nor Green Standards provide the thorough and complete analysis of the environmental performance of the building that can be found in BREEAM or LEED, and neither do they ensure a higher level of performance compared to existing standards. These issues led to the lack of success in implementing these systems in practice, as neither NOSTROY nor Green Standard have a history of practical use in Russia.

As can be seen from the statistics presented in Chapter 2, at the moment (July 2016), BREEAM is the most popular certification system in Russia, and has been used in 72% of certification cases. There are several factors that make BREEAM advantageous for Russian customers. One of them is the flexible and locally adaptable nature of BREEAM, in which local codes and standards are given much more consideration than in LEED. Secondly, the process of assessment is carried out by a local certified assessor, rather than by an organizational body located overseas, as is in the case with USGBC in LEED. Due to these factors, when choosing BREEAM, the project team does not have to be proficient in English in order to understand the requirements, as well as does not have to submit the documentation in English and convert metric units used in Russia into imperial units. Also, the presence of a representative of the certification body in the project, which is a feature of BREEAM process, ensures delivery of the requirements to the design and construction contractors. The fact that there is a high rate of projects that have been registered in the LEED database for certification, but have not received a certificate, provides evidence for the conclusion that BREEAM has achieved more successful adaptation to Russian market. As previously mentioned in Chapter 2, only 24% of Russian projects that are registered in the certification database of USGBC, have finally received their certificates, at least by July 2016. In BREEAM, only two of the 87 projects did not receive a final certificate.

Among Russian systems, one has to be granted special attention. Based on the information discussed in Chapter 2, it seems that of all national systems, Green Zoom demonstrates the best performance both in terms of assessment methodology and practical implementation. Although still rather vague in its definitions and requirements, it provides a valid framework for asserting certain level of environmental performance of the building. This framework has been adopted from LEED v4 to reflect Russian legislation and codes, as well as the most common local practices of construction. Unfortunately, as can be seen in the comparative analysis of these systems presented in 2.6.3, this adaptation has led to some of the solutions representing the best practice in LEED

and BREEAM to be left outside of the scope of assessment in Green Zoom. The adaptation has also made the judgement of Green Zoom less strict, making it easier for a building to get certified. At the same time, the performance required by Green Zoom is still higher than that of the official national codes. Based on all these factors, it is safe to say that Green Zoom has an opportunity to become a transition from the outdated national codes to the best international practices of green building.

The amount of certified green buildings is at the largest in the two biggest cities of Russia, Moscow and Saint Petersburg (See figure 12). The region of Sochi has received several BREEAM-certificated projects due to the requirements of the Olympic committee for the environmental performance of sports facilities built for the Winter Olympic Games of 2014. However, several green building projects have been developed in other regions of the country, mainly large cities.

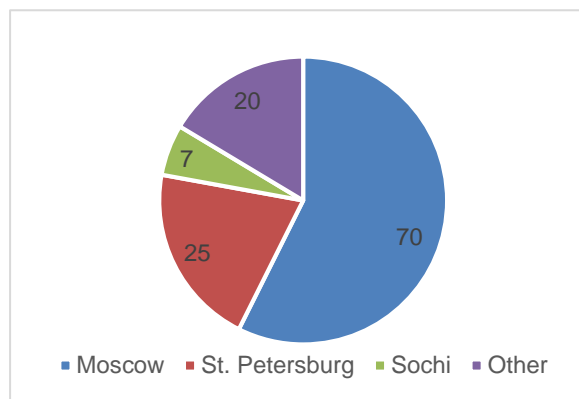


Figure 12. Trends in the location of certified green buildings

The concentration of certified green building stock, presented in figure 13, can be explained by the features of the Russian green building, in particular, the demand for it. As mentioned in Chapter 3, in the situation when the energy prices have been rather low, and no adequate promotion of sustainable development has been done, the interest in green buildings has been rather limited. It can also be concluded, that a large part of the demand has been created by the international companies that have the principle of sustainable development included in their corporate agenda. These companies create a demand for building and certification of retail, office and industrial buildings, which comprise 50% of the total number of certified green building stock in Russia.

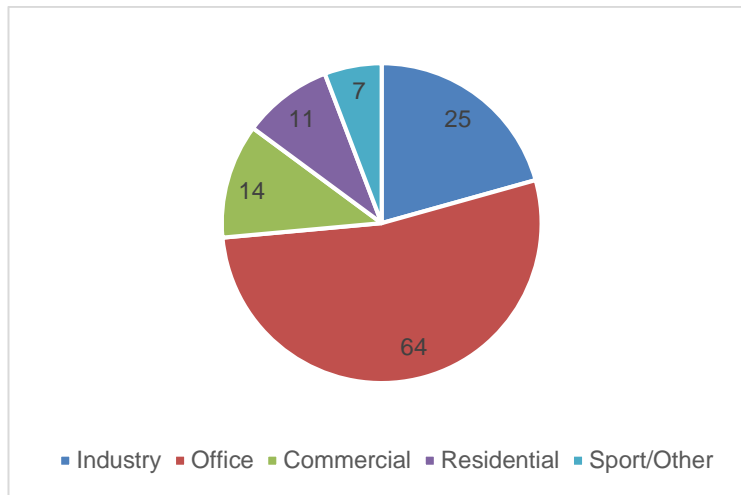


Figure 13. Trends in the intended purpose of certified green buildings.

As can be seen from the statistics presented in Chapter 2, in the residential sector the demand for greener housing has been mostly present in the Comfort and Premium-class properties. These projects are mostly situated in the regions of Saint Petersburg and Moscow. The main factors creating the demand there were the perception of green housing as in something more advanced and fashionable among the upper class of Russian society, as well as the higher awareness of the upper-class customer groups of the issues of ecology and sustainability. The regular class residential housing, which has been the main product of national construction during recent decades, did not implement the green building technologies. [42.]

The green building certification market is greatly dependant on the advancement of sustainable practices in the construction industry. [2.] As discussed in Chapter 4, since its emergence in the 1990s and until 2015, the Russian construction sector of economy has been growing steadily both in the volume of production and in the types of buildings available on the market, but the improvements in the technologies and practices of construction did not develop at the same pace. Several attempts for creating a legislative framework for introducing innovative principles of energy efficiency and sustainability into Russian Construction that were undertaken in 2008-2013 were rather inconsistent and did not result into serious changes in building codes or legislation. No measures of financial support to sustainable principles were introduced. The public promotion of sustainability principles was also absent in Russia. The lack of concentrated and planned governmental action has been diminishing both the demand for greener buildings from the customer side, and the need for improving the performance of building stock on the side of construction and real estate company side.

As mentioned in Chapter 3, Russian experts on green building and green building certification confirm that the idea of sustainable building and sustainable living is still in its earliest stages in Russia, and that current political and economic environment slow down the development. The lack of qualified and experienced designers, project managers, consultants and other staff in real estate and construction constrains many projects from accomplishing the certification goals. Secondly, inadequate and excessively complicated laws and building codes make it difficult to introduce innovative solutions and restrict the designers and builders in their choice of techniques. Thirdly, a lack of financial incentives and the general orientation towards the short-term benefit, which is very common among the local developers, inhibit the interest towards green building in Russia.

The current political and economic environments in Russia, discussed in detail in Chapter 4, also present a number of obstacles to the introduction of sustainable building. It seems that international relations have been one of the major boosters of demand for green buildings and, consequently, green building certification. With the modern image of Russia as a vulnerable and unpredictable country, the involvement of foreign players in Russian business and economy can be predicted to decrease, leading to a lower demand for green buildings. The general recession of construction industry is another barrier for innovation, as the developers tend to reduce the number of projects and the costs of construction. As most of the green building projects still tend to demand higher construction costs, it can be projected that the developers' interest in innovative technologies will reduce.

At the same time, it seems that the contemporary crisis can bring forth several opportunities for making green building more popular in Russia. First of all, in the situation of oversupply, the developers need to distinguish the building on the market. In the situation of an average Russian building designed according to outdated standards, and the general trend of aging of the building stock, buildings that meet the criteria of a green building certification system will more likely be considered outstanding. Thus, it seems that the "Green" status of the building can be a powerful measure to promote it to potential clients. Another potentially attractive side of green buildings is their energy efficiency. In the situation with growing inflation and projected increase in energy prices, energy efficient buildings might seem attractive to clients with long-term attitude to investment.

6 Conclusions

The purpose of this thesis work was to analyse the current state of green building certification in Russia. During the analysis, the methodologies of certification and the statistical information about the stock of certificated buildings were used in order to portrait the role of each of the systems on the Russian market, as well as to understand the general tendencies in Russian green building certification. In addition to the certification methodologies, the analysis covered the political, social and economic trends in Russian construction industry and the progress in introduction of green building innovation to it.

The development of the green building certification market is highly dependent on the introduction of the concept and practices of sustainable development and environmental responsibility to the society, economy and legislation. As the governmental policies for supporting and promoting the sustainable development in Russia lack practical action and do not result in real changes in construction and real estate, the sustainable innovation in Russia has been diffusing in the bottom-up direction. The demand for green buildings is created by companies and individuals that are concerned about the quality of the built environment and aware of the potential benefits of green building.

The study has shown that voluntary certification systems are the only tool for assessing and asserting the level of environmental performance of buildings available in Russia nowadays. These systems exclusively provide the necessary framework for implementing the best international practices of sustainable building in Russian construction.

A number of certification systems is available on the Russian market. The international systems LEED and BREEAM were introduced in Russia in early 2010's, and since then they dominated the certification market. BREEAM has been the most popular system due to its high credibility and a successful adaptation to the specifics of Russian construction. Two national certification systems, "Green Standards" and "STO Nostroy", have been developed with a goal to create an alternative to BREEAM and LEED that would better suit the Russian practices, but failed to assure competitiveness, and by now have almost no history of use. Another national certification system, Green Zoom, was developed in 2015 on the basis of LEED v4, and has since then demonstrated its validity during successful implementation in 15 building projects. While the level of environmental performance of the building assured in "Green Zoom" is lower than in BREEAM or

LEED, this system has the potential to become an intermediate step between the outdated Russian construction practices and advanced requirements of international certification systems.

Although it started in 2010, the green building certification is still in its early stages in Russia. The main obstacles to its bottom-up development arise from the low awareness of the benefits, practices and technologies of green building among the broad public and key stakeholders in construction and real estate. So far, the diffusion of sustainable innovation has been facilitated to large extent by the involvement of Russia in global operations, but in light of the recent political and economic confrontation between Russia and the Western countries, the presence of international investment and players in Russia is questioned.

The current state of the Russian construction is characterized by recession. The main reasons for it are the overproduction during previous years in residential and office property, the two most commonly certified types of buildings, the decrease of income of the population and the stagnation of the business environment in general. However, even with such an unfavorable background, there are several benefits developers can get from green building certification. Compared to those built according to national codes, certified green buildings demonstrate an outstanding performance and thus can easily be distinguished on the market, which in turn helps to promote them to the client. Also the predicted rise of energy prices may create a demand for sustainable and energy-efficient buildings. Finally, the future relationships between Russia and the international, mainly Western, countries, including economic relations and political environment, as well as the reforms and actions the Russian government is to implement during crisis times, will shape the future of the ideas of sustainable development in the Russian Federation.

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