FUTURE OF SUSTAINABILITY IN CONSTRUCTION SECTOR IN RUSSIA AND FINLAND

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ABSTRACT

The goal of this thesis project is to research how advanced sustainable construction sectors in Russia and Finland are, and provide the reader with useful information related to the ongoing state of climate change-friendly buildings' sector in both countries. This is done by first providing some insight into sustainable construction in general, and the most advanced international buildings and practices in particular, so that the reader has a certain baseline to which to compare the Russian and Finnish sectors to. As one of the indicators of progress in sustainable construction, the number of environmentally certified buildings is provided in both countries.

The results of this thesis point to the fact, that Russia is largely behind Finland in terms of how well 'green' construction is integrated into the market and community. Sustainable construction sector in Russia is severely held back by the cost factor of sustainable technologies and the purchasing ability of population. The lack of governmental programs and legislations supporting 'green' buildings is also inhibiting the possible progress in this sphere. Finland, on the other hand, is complying with the strictest EU regulation, has an entire branch of government that is controlling and enforcing green building standards, and is constantly developing and supplying new energy-efficient building solutions to the market. The share of sustainable construction in Finland is projected to continue growing as it is, whereas in Russia it would require multiple factors to come into play for 'green' construction to become as popular and advanced as it is in Finland.

Keywords Sustainability, construction, overview

Pages 33 pages, of which attachments 0 pages

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1 PROJECT BACKGROUND

The aim of this thesis is to collect information about sustainability developments in construction sectors in Russia and Finland, make comparisons based on the information gathered.

The author of this thesis is employed in the construction sector in Finland. He has worked in various positions domestically and in Russia over the course of the last 4 years, and is therefore acquainted with the practices used in construction projects and sector differences in Russia and in Finland.

1.1 Research methodology

This project is research-based, and will utilize mostly articles and material from the Internet, as well as the author's personal experience as source material. Also, existing construction projects relevant to the topic of this work will be overviewed, in order to allow the reader to acquaint themselves with real-life examples of sustainable building developments and provide insight into the state of technological advancement in the sector.

1.2 Research questions

This thesis aims to collect information on and answer the following questions:

-How advanced sustainability construction sector is in Finland and in Russia? What are the standards used? What is the situation compared to the best environmental examples over the world?

-What kinds of organizations promote sustainability in these two countries? What is the governmental basis laid down for ensuring sustainable standards?

-Is there any obstacles to improving environmental standards? If so, how could they possibly be resolved?

1.3 Importance of the topic

Sustainability in construction is an important environmental topic in view of the ever-increasing population and housing demands.

The construction of any structure requires a large amount of resources - wood, crushed stone, clay, sand, metal, etc. Resource extraction actively pollutes the environment, as well as their processing. According to the British Green Building Council, the share of the construction industry in the total pollution of the planet is as follows: - 23% of air pollution, - 40% of drinking water pollution, - generates 50% of waste that goes to landfill. (Willmott Dixon, 2010)

Apart from that, buildings are among the main consumers of energy worldwide. At the same time, the issue of excessive energy consumption can be successfully solved by applying energy efficient technologies and sustainable solutions. Energy costs are also present at every stage of the production chain - from mining, production and processing to the construction work itself an. The harm from overconsumption of energy is not only in economic costs, but also in increased emissions of pollutants in the atmosphere.

Thus, it is important to promote sustainability in construction, and monitor the state of this sector. Furthermore, Russia, as a country of known environmental problems, could benefit from adopting practices of other countries such as Finland, where environmental standards and practices are known to be high. In order to promote the issue, it has to be openly discussed and scientifically covered, which is yet another thing this thesis project strives to achieve.

2 INTRODUCTION

The aim of this thesis is to collect information about sustainability developments in construction sectors in Russia and Finland, make comparisons based on the information gathered and predict possible future development trajectories. This project is research-based, and will utilize mostly articles and statistics from the Internet, as well as the author's personal experience as source material.

The author of this thesis is employed in the construction sector in Finland. He has worked in various positions domestically and in Russia over the last 4 years and is therefore acquainted with the practices used in construction projects and sector differences in Russia and in Finland.

2.1 Introduction to sustainability

Over the last couple of decades, both scientists from different fields and politicians have been actively discussing the need for the development of global strategies for sustainable development. We as

a society have come to the realization that mindless consumption of the Earth's resources upsets the natural balance and leads to catastrophic consequences for us as a species. In order to ensure prosperous future of upcoming generations, it is extremely important to solve ongoing environmental problems. Developed industrialized countries consume such vast quantities of natural non-renewable resources, both mineral and organic, that keeping extractions at current level for a continuous period of time is improbable as it will lead to their depletion. This, in turn, would further increase the technological, economical and scientific gap between the developed and developing countries, and hack deeper into the existing socio-economic stratification between the rich and the poor demographic groups.

According to John Dernbach, a professor of law at Widener University and a leading scholar in the area, sustainability means "freedom, opportunity, and quality of life; more efficiency; more effective and responsive governance; a desire to make a better world for those who follow us; a willingness to find and exploit opportunities; a quest for a safer world; and a sense of calling to play a constructive role in international affairs" (Jarzombek, 2003).

The essence of the concept of sustainable development is to strive to maintain a balance between economic development and environmental protection. This concept is based on the fact that if three quarters of the world's population, now living in underdeveloped countries, follow the same path of development of their economic systems as the inhabitants of developed countries, then the planet will clearly not withstand such a powerful consumption of its resources and an imminent ecological disaster will break out. However, developing countries cannot be blamed for their efforts to improve the living standards of rapidly growing populations.

Within the framework of the concept of sustainable development, there are three possible ways to ensure environmental safety on Earth.

Firstly, this would mean the preservation of trees and other vegetation on Earth. They form the environment and the ecosystem around us, and are vital for natural balance.

Secondly, this would mean lowering the load we put on the nature, in the form of pollution, resource consumption, etc. Wisely managing ecosystems is key to achieving sustainability and ensuring long-term ecological well-being of our planet.

Thirdly, this would mean the introduction of environmentally friendly technologies that eliminate the consequences of economic activities, unfavourable for human life.

2.2 **Introduction to sustainability in buildings**

The goal of sustainable “green” architecture is the creation of functional buildings that are designed in a way that allows to solve a number of problems related to heating, cooling, water and electricity consumption, as well as the impact on its immediate environment. The ecological aspect of the building has to be considered along with its aesthetic aspect and cost, and not prevent it from fulfilling its original purpose.

Some examples of how a building can be more sustainable are as follows:

- Taps and water systems in the building can be designed in a way that reduces water consumption (Govt.nz, 2021)

- The building can utilize smart lighting technologies, that turn off the light when people are not in the room (Govt.nz, 2021)

- If the building is to be located in the Northern Hemisphere, it could face the south, so as to maximize the uptake of heat from the Sun, and to subsequently decrease the heating costs (Govt.nz, 2021)

- Renewable energy generating units can be installed, such as solar panels. This would allow to generate green electricity for the purposes of the building. (Govt.nz, 2021)

- Rainwater collection systems can allow to collect water, that may further be used to flush toilets or water green areas of landscape. Doing so allows to cut energy costs required to pump the water up the building, as well as reduce district water use (Govt.nz, 2021)

- Utilizing a reflective roof principle. Reflective roofs are roofs that reflect most of the sunlight energy hitting them and efficiently remove heat from their surface. Such roofs are most often white and reflect the entire spectrum of solar radiation. Their benefits include significant (up to 15%!) reduction in air conditioning costs during the hot season, improvement of the indoor microclimate, reducing the local air temperature in the city, which improves air quality and prevents smog formation among other benefits. Figure 1 compares the impact of reflective roofs versus non-reflective roofs in numbers. (Vseokrovle.ru, 2020)

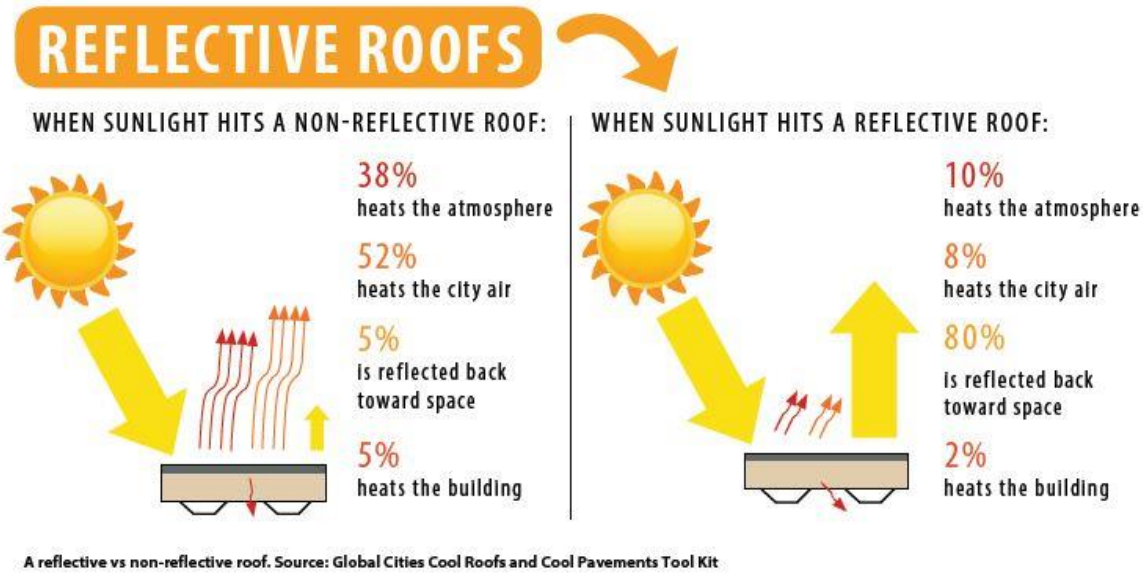

Figure 1 Reflective roof impact (Global cities cool roofs and cool pavements kit)

Sustainability as a concept is deeply rooted in interdependence of complex systems and long-term solutions. Therefore, during the planning stage of the project it is necessary to think in advance and pre-plan the efficient execution, operation and maintenance of the building. The idea is to try to mitigate its possible negative effects on its environment (nature, wildlife) and users, minimize monetary, water and energy expenditure by optimizing the utilization of resources. Building's decommissioning also plays a crucial part in a building's sustainability level, as construction waste accounts for 50% of the total waste output of the planet, as was mentioned before (Willmott Dixon, 2010). Therefore, it is necessary to integrate building reuse practices into the project, or other ways or recycling the material. It is also important to find balance between different sustainability aspects, as favouring one excessively can lead to an overall poor sustainable solution. As an example, a preference for only locally produced materials can be made, with disregard of whether the materials are actually more energy-efficient themselves. Then the transportation impact and costs could be less, but the overall environmental impact of the project can rise.

At the design stage it is possible to minimize pollution of the environment with harmful substances and CO2 emissions, during the stage of raw materials procurement. Improving building planning and design elements such as layout, artificial lighting, natural ventilation, open and green spaces can also minimize negative environmental impacts and increase resilience to the predicted impacts of climate change. Throughout the lifecycle of a building, measures to improve functional efficiency may include improved insulation, natural ventilation, energy-efficient lighting, or the installation of combined

heat and power systems. The elimination of hazardous substances is an important aspect of building renovation. (WHO, 2017)

The most notable organizations that are involved in the study of environmental issues in building construction are the following:

- Sustainable Energy Ireland (SEI)

  Ireland is not a member of the World Council for Green Buildings. The country is taking a different approach through the established government agency SEI. Its work is funded by the Irish Government under the National Development Plan 2007-2013, with partial funding from the European Union. SEI has reviewed various existing methodologies applied in other EU Member States and plans to adopt as a national calculation method the simplified SBEM building energy model, as in the UK.

- Haute Qualite Environnementale (HQE, France), which is a part of the French Environment and Energy Management Agency (ADEME)

  HQE's goal is to advise contractors and building owners on environmental issues. This fully voluntary advice is provided to ensure that all construction and operations stakeholders understand the importance of environmental considerations, which should not be a constraint in design. HQE oversees four areas: green building, eco-management, comfort, and health (for building users).

- The UK Green Building Council (UK-GBC)

  The role of the UK Green Building Council (UK-GBC) is to set a goal and coordinate a green and sustainable building strategy. The national assessment system has not yet been developed, but the decision on its creation has already been made. Work is underway to revise national building codes to determine carbon dioxide emissions using the Simplified Building Energy Model (SBEM).

- The German Sustainable Building Council (DGNB)

  The German Council for Environmentally Friendly and Sustainable Buildings has developed a new clearly structured tool for their design and quality assessment. The German certification of such buildings was developed by this Council (DGNB) in cooperation with the Federal Ministry of Transport, Building and Urban Development (BMVBS) as a tool for comprehensive planning and quality assessment of buildings. A well-organized and easy-to-understand certification system covers all the essential aspects of sustainable and sustainable construction and gives buildings bronze, silver or gold status. The assessment is

influenced by six criteria: environmental, economic, sociocultural and functional, technological, operational and location.

- Rakennusten ympäristöluokitus, The Environmental Assesment of Builidngs - Promise (Finland)

  Promise - The Environmental Assessment of Buildings is a voluntary scheme adopted in Finland, which is not a standard per se, but contains specific information about the “industry’s best practices”. “Promise” covers four areas: environmental pressure, use of natural resources, user health and environmental risks.

2.3 **Sustainability assessment of construction projects and its criteria:**

Construction sustainability is assessed by 3 groups of factors:

-social
-economic
-environmental. (LafargeHolcim Foundation , 2019)

Sustainability in social context means ethicality, friendly environments for human occupation, safety and health. (LafargeHolcim Foundation , 2019)

Sustainability in environmental context means renewable energy sources and no emissions, as well as the use of climate friendly technologies and high material performance. (LafargeHolcim Foundation , 2019)

Sustainability in economic context means a shift from a linear to a circular economy, and therefore energy preservation, waste re-utilization, more efficient resources and their allocation, etc. A lean system with maximum output for any given input. (LafargeHolcim Foundation , 2019)

The most common of these factors are economic. Economic efficiency is one of the most important aspects in the decision-making process regarding the energy-efficiency of a building. From the standpoint of sustainable development, energy-saving measures used in housing construction should not only solve the problem of saving resources, but also increase the level of comfort of buildings, the quality of life of people, and contribute to the preservation of the environment and human health. Thus, they must ensure the economic, social and environmental efficiency of the building's life cycle. (Enshassi, Kochendoerfer, & Ghoul, 2016)

Construction sustainability criteria include the entirety of a

construction project, e.g. material procurement, construction process, operation and maintenance of a building, as well as its decommissioning. Therefore, when planning a building project, it is also important to take into consideration the following factors:

- the reduction of the energy and material consumption of the construction processes;
- the reduction of the cost of transporting building materials;
- the reuse of building structures and the use of materials suitable for further processing;
- the extension of the life span of structural elements;
- the involvement of environmentally friendly materials in the production cycle;
- the reduction of the impact on the environment by reducing building areas and occupying new territories. (Nurizan Ab Rahmana, Majida, Ismail, & Rooshdi, 2014)

2.3.1 Indicators

As mentioned above, 3 factors are taken into consideration in sustainability assessment: economic, social and environmental. For each factor, certain indicators can be used to determine the level of compliance and overall efficiency.

To conduct an environmental assessment, those environmental criteria are considered, that characterize the consumption of energy and material resources and the emissions' impact on the environment throughout the entire life cycle of a building. Indicators of environmental sustainability are:

- the primary energy consumption per year and throughout the entire life cycle of a building
- the share of regenerative types of energy
- material flow per year and throughout the entire cycle
- the weight of recyclable materials
- the emission of harmful substances. (Keller, 2006)

To conduct an economic assessment, the following indicators are taken into consideration:

- construction costs
- the impact of construction costs on operating costs
- costs associated with carrying out repairs
- energy needs for operating needs
- general operating costs

- costs associated with decommissioning and waste disposal. (Keller, 2006)

To conduct a social assessment, qualitative indicators are considered that sufficiently fully reflect the social appearance of an industrial building. Among these indicators the following social aspects are present:

- noise exposure
- climatic conditions
- natural light
- visual perception
- aesthetic design of industrial buildings. (Keller, 2006)

Many sustainability assessments are also based on a multi-criteria analysis, life cycle assessment, material flow analysis, environmental extended input-output, life cycle costing and other analysis.

2.4 **Sustainability assessment tools**

Sustainability assessment tools for construction projects include a variety of options, from self-assessment plans to commercial labeling methods and standards. As the requirements for these tools have become stricter, so the tools evolved to include not just one particular building or its component, but entire communities and units of public infrastructure. In this chapter, the most prominent of these tools will be discussed, e.g BREEAM and LEED environmental certification methods.

2.4.1 BRE Environmental Assessment Method – BREEAM

The first system of international “green” certification was the method for assessing the environmental performance of buildings called BREEAM (BRE Environmental Assessment Method) developed in 1990 by the British organization BRE Global. The BREEAM system (Fig. 2) is an example of a successful concept that effectively implements the

Figure 2 BREEAM badge (BREEAM, 2021)

protection of the environment from human activity by meeting the interests of all market participants without involving international or local law as a punitive tool. (BREEAM, 2021)

BREEAM covers nine areas: management, health and social welfare, pollution control, energy, eeffective management of built-up areas and ecology, transport, water supply, materials and waste. (BREEAM, 2021)

BREEAM criteria for the 9 areas mentioned above are as follows:

Management:

- Commissioning and further management of the building, ensuring the optimal efficiency of all its systems.
- Management of the construction process in terms of resource efficiency, energy consumption, environmental pollution.
- Providing guidance to non-technical building users so that they can understand and effectively operate building systems. (BREEAM, 2021)

Health and Social Welfare:

- Availability of sufficient daylight in the premises.
- Providing a pleasant view from the window to rest the eyes.
- Comfortable room temperature.
- Required sound insulation.
- Quality of indoor air and water.
- Natural ventilation.
- Lighting quality. (BREEAM, 2021)

Pollution control:

- Monitoring the use of refrigerants and their leakage.
- Control of rain flows.
- Control over how much CO2 and other gases are generated
- Control of pollution of natural watercourses from building drains.
- Limiting exposure to external light and noise. (BREEAM, 2021)

Energy:

- Reducing energy consumption related CO2 emissions.
- Reducing CO2 emissions and air pollution through the use of renewable energy sources.
- Use of energy metering devices.
- Use of natural light.
- Measures to improve energy efficiency:
  - water heating by solar panels;
  - minimization of heat losses;
  - energy efficient transport systems: elevators, escalators;
  - recuperation during air exchange. (BREEAM, 2021)

Effective management of built-up areas and ecology:

- Re-use of land and non-use of previously undeveloped land is encouraged.
- Use of previously contaminated lands, their rehabilitation.
- Combination of the building with the surrounding buildings.
- Mitigating or improving environmental impact.
- Minimization of the long-term impact of the development on the environment, biodiversity of the area.
- Minimization of artificial lighting.
- Reducing the noise level at the construction site. (BREEAM, 2021)

Transport:

- Availability of public transport.
- Favourable and safe conditions for walking and cycling.
- Proximity to social infrastructure facilities (schools, gardens, recreation areas).
- Maximizing the capacity of parking lots.
- Smart layout that reduces the need for car trips.
- Providing opportunities to work from home.
- Maps and information. (BREEAM, 2021)

Water supply:

- Minimization of drinking water consumption for hygienic purposes.
- Water flow meters.
- Tracking water leakage.
- Reuse of water.
- Collection and use of rainwater. (BREEAM, 2021)

Materials:

- The use of building materials with low environmental impact throughout the entire life cycle of the building.
- Reuse of building materials.
- Certified manufacturers of basic materials.
- Sufficient protection of the building and landscape. (BREEAM, 2021)

Waste:

- Reuse of materials.

- Disposal of household waste.
- Removal of construction waste. (BREEAM, 2021)

At the time of writing, BREEAM has issued 594,011 certificates and registered 2,313,475 buildings in 89 countries. (BREEAM, 2021)

2.4.2 Leadership in Energy and Environmental Design - LEED

LEED (Fig. 3) is an ecological rating system for buildings. LEED was developed by the United States Green Building Council as a measurement standard for energy efficient, ecological and sustainable buildings to nudge the construction industry towards designing, constructing and operating such buildings.

Figure 3 LEED certification badge (LEED, 2021)

Since its introduction in 1998, LEED has expanded and is now being applied to new buildings, renovation of existing buildings, design of building infrastructure and stylobate, interior decoration, and more. (LEED, 2021)

The system is categorized into 9 basic areas:

- Integrative Process
- Location and Transportation
- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environmental Quality
- Innovation in Design
- Regional Priority (LEED, 2021)

To obtain the lowest LEED certificate, you must score 40-49 points. The next step is “Silver” (50-59 points), then “Gold” (60-79 points). The highest step is the "Platinum" level (80+ points). (LEED, 2021)

Projects with a minimum certification or LEED Silver level do not add to the project cost. Gold and Platinum certification increases the cost of the project during construction. Early integration of the LEED certification process can help reduce these additional costs. The costs

associated with project commissioning and improved system energy efficiency usually pay off in a short time by reducing energy costs, increasing operating cost efficiency and improving consumer comfort. LEED training is provided through various seminars, as well as through specialized programs. Initial LEED project registration costs $ 450 for USGBC members and $ 600 for all other organizations. LEED certification costs vary by project, but the average is $ 2,000 per project. (LEED, 2021)

2.5 **Examples of the most sustainable structures in the world**

2.5.1 Pearl River tower, China

The headquarters of the China National Tobacco Company (CNTC) in Guangzhou is housed in one of the greenest skyscrapers in the world. Quite surprisingly, the 310-meter 71-storey Pearl River Tower (Fig. 4) is designed as a zero-energy building, meaning it does not consume electricity from the external grid. Its southern facade is equipped with double glazing with ventilation between the panes, which significantly reduces building heating and air conditioning costs. The skyscraper also has smart shutters that open and close depending on the weather, and the roof houses rain tanks with a water purification and recirculation system. (Newswire, 2017)

Figure 4 Pearl River tower (Placetech, 2021)

Pearl River Tower is also equipped with photovoltaic panels and solar thermal collectors that heat the water in the skyscraper. And inside the building, on two technical floors, are giant wind turbines that deliver 15 times more energy than conventional blades. Such efficiency is achieved by installing the windmills vertically in special channels. Strong winds blow at a height of one hundred meters. In addition, the wind speed will increase 2.5 times due to the structural features of the building. The facade of the skyscraper, in the form of a giant vertical wave, smoothly curves in front of each channel with wind turbines. Air currents will be directed into the resulting giant gap with greater force, contributing to the increase in the rotation of huge turbine blades and potentiating the generation of megawatts of energy. Another positive feature of skyscraper openings is the reduction of the wind load on the building, which all skyscrapers inevitably experience. The location of the building was also not chosen by chance, the facade of the house is oriented towards the winds blowing from the south of China. According to the project's lead architect, Gordon Gill, this is not just a building, but "a highly efficient tool shaped by the sun and the wind." (Architizer, 2013)

The building was awarded a Platinum LEED certificate, making it China’s most ecological building as of the year 2016.

2.5.2 The Hearst tower

The Hearst Tower (Fig. 5) in New York has been certified LEED Gold. The spectacular 182-meter skyscraper was designed by maestro Norman Foster. The unusual shape of the frame is not just an architectural concept, but also a way to reduce up to 20% of materials compared to a classic steel frame. In addition, the creators pride themselves on the fact that about 90% of the building's metal structures contain recycled materials. (HEARST, 2021)

The air surrounding the tower is successfully used for cooling and ventilation of the tower building. The tower's atrium is cooled in summer and humidified in winter by rainwater collected in a reservoir on the tower's roof. This water is also used in the building's internal system to irrigate indoor plants and surrounding outdoor trees. (HEARST, 2021)

Figure 5 The Hearst tower (E-Arhitect, 2021)

The building also saves electricity. Firstly, due to the enhanced daylight from the huge windows that literally pierce the tower. And secondly, thanks to special sensors that regulate the switching on and off of artificial light, natural light is used to the maximum in the tower. Saving electricity is doubly beneficial: the cost of building maintenance is reduced and environmental damage is reduced by lowering the amount of carbon dioxide emissions into the atmosphere. (Foster&P, 2021)

During the construction of the building, no toxic substances were used, and only environmentally friendly materials were used for interior decoration, which do not emit organic volatile substances into the air. (Foster&P, 2021)

2.5.3 The Bahrain World Trade Center Towers

The Bahrain World Trade Center (Fig. 6, known as Bahrain WTC or BWTC) structurally consists of two 240-meter towers, connected by three bridges, each of which has wind turbines. The skyscraper project was developed by the architect Sean Keele. (BahrainWTC, 2021)

Figure 6 The Bahrain towers (Favorit-TK, n.d.)

The skyscraper is located in the capital of the Kingdom of Bahrain, Manama. The skyscraper construction lasted from 2004 to 2008. There is a total of 50 floors in the building. The skyscraper has received several sustainability awards, some of which are:

- PALME Middle East Awards 2010 for Best Use of Exterior Lighting
- Inovation Nova Award 2009 for innovations that have significantly helped improve quality and reduce costs with respect to aspects of construction.

- Council of Tall Buildings and Urban Habitats 2008 for extraordinary contributions to the advancement of tall buildings and the urban environment.
- EDIE Award for Environmental Excellence 2007 for achieving the highest environmental standards within the design and construction industry (BahrainWTC, 2021)

The shape of the skyscraper allows for the creation of accelerated air currents for the giant turbine blades. Three 30-meter wind turbines provide about 15% of the towers' total consumption, or 1.1 to 1.3 MW per year. The approximate cost of the skyscraper is USD 150 million. The BWTC is the first skyscraper in the world to integrate wind turbines into a skyscraper design. (BahrainWTC, 2021)

3 ORGANIZATIONAL FRAMEWORK IN RUSSIA

As of this very moment, no city in Russia meets the “green” criteria for sustainable development. The practice of green urban planning and construction in Russian cities is extremely fragmentary and low in number. At the same time, the cities of Russia have great potential in this respect, especially Moscow and St. Petersburg. (Karasevich, 2017, p. 151)

3.1 Introduction to sustainability in construction sector in Russia

Observations and analysis show that in many Russian cities, the urban planning and design solutions that are being developed should be aimed at improving the environment through large-scale landscaping, improving the quality characteristics of the pedestrian and transport infrastructure, overcoming the imbalance between pedestrian and car traffic types of movement, creating a more comfortable and safer environment for road users and improving the visual appearance of streets. (Karasevich, 2017, p. 155)

In the Russian Federation, green urban planning concepts should be built around the following key aspects:

- Defining the concept of criteria for a green city
- Supporting the planning and development of green cities
- Attraction of financial resources for the development
- Implementation of plans for green urban planning

- Improvement of the spatial organization of urban, rural settlements and construction projects, considering the new principles of urban planning

- Analysis of existing regulatory legal acts in the context of criteria for green urban planning

- Implementation of “green” standards in urban planning and transport activities

- Assessment of the social and environmental impact of any “green” initiatives and design solutions

- Organization of training in principles and technologies of green urban planning

- Development and support of pilot initiatives in the field of green urban planning, as well as the replication of experience to other cities. (Karasevich, 2017, pp. 155-156)

In terms of sustainability, Russia is 20 years behind Europe. There is a national certification of "green standards", however, in many ways the requirements are more lenient than international standards.

Preparations for the Winter Olympic Games in Sochi were a major starting point for the development of green building in Russia. In 2014, with the world’s media focusing its attention on Russia, the image of Russia had to be improved. To do so, the government went to great extents and ensured the successful construction of the Olympic facilities, so that their quality would receive recognition all over the world. The same happened again, when new stadiums for the 2018 FIFA World Cup were being built. (Vestnik, 2019, p. 113)

Upon the completion of construction of all the stadiums in Sochi and other adjacent infrastructure, 10 objects received BREEAM certification, including the Olympic village and a hotel with 157 rooms. Each of them has a unified communications management system that allows to save energy and maintain the optimal room temperature. At the train station in Adler energy-saving lamps, glass and solar modules on the roof were installed. All of that allows to save about 5 million rubles on building maintenance yearly.
To better understand the impact of constructing energy efficient buildings, let us turn to statistics: a third of all energy consumed on the planet is spent on maintaining the required temperature inside buildings and on lighting. (Vestnik, 2019, p. 113)

In the opinion of Alexey Shepel, a member of the board of directors of the construction corporation S. Holding, Russia has not yet switched to the construction houses or infrastructure facilities compliant with sustainable life cycle principals due to poor mentality. Shepel says, that “Buildings are built to be sold the next day utilizing an ‘out-of-sight out-of-mind’ principle. We should be building structures for hundreds of years to come, and plan in advance for how the building will be maintained, operated, reconstructed and even decommissioned”. (ProNovostroy, 2018)

Another problem is that only a handful of companies produces environmentally friendly building materials for ecological building projects, some of which are Tarkett, GreenBuildTrade, EcoTrade and SoTechS. Otherwise, the vast majority of all popular building materials are produced using components harmful to humans and the environment. These include phenol-formaldehyde adhesives, polystyrene, polyurethane foams, and more. All these materials, over the course of their entire service life, emit molecules of phenol, styrene, methanol, etc., and are extremely poisonous when burned.

In Russia, many cities are suffering from problems with environmental systems such as landfills, waste processing, water purification, emissions, as they often operate below the EU standards, therefore endangering the well-being of inhabitants and surrounding ecosystems. Although building “green” is a key to resolve all of these problems, it takes a lot of time and some serious investments. However, it is worth noting, that the first step towards that has already been made. In Russia, the principles of green building have already been adopted in some places. As of right now, mostly rich states or cities can invest in the reconstruction of ordinary houses according to the principle of green building. Therefore, Moscow can be called “the greenest” city in Russia, although there is still a colossal lack of green spaces, parks and other infrastructure facilities of the natural complex present.

According to Olga Barabanova, the commercial director of Sezar Group, sustainable construction in Russia is impractical, and is not in demand. According to her “The creation of such projects requires significant investments, not only at the stage of creating solutions and construction, but also at operation. The consumer benefits are not always obvious. Correctly operating and maintenance of a rainwater collection and reuse system requires significant resources. And this is just one of the systems. Even in the luxury real estate segment, the buyer is not ready to bear such costs” (ProNovostroy, 2018)

3.2 **Environmental authorities in Russia related to construction sector**

In Russia there are two main governmental establishments that deal with ecology and environment-related issues. One is the Ministry of Natural Resources and Environment of the Russian Federation, and the other is the Federal Service of Russia for Hydrometeorology and Environmental Monitoring (ROSHYDROMET).

3.2.1 The Ministry of Natural Resources and Environment of the Russian Federation

The Ministry of Natural Resources and Ecology of the Russian Federation independently carries out legal regulation, as well as develops and submits to the Government of Russia drafts of constitutional and federal laws on the following issues:

- geological exploration, rational use and protection of subsoil
- use, protection of the forest funds and reproduction of forests
- use and protection of water bodies
- operation of reservoirs and water management systems
- protection, use and reproduction of objects of the animal world and their habitat
- protected natural areas
- environmental protection and environmental safety
- protection of atmospheric air
- production and consumption waste management
- improvement of the economic mechanism for regulating nature management and environmental protection

3.2.2 The Federal Service of Russia for Hydrometeorology and Environmental Monitoring (ROSHYDROMET)

The executive federal body under the jurisdiction of the Ministry of Natural Resources and Environment of the Russian Federation, which carries out the functions of managing state property and providing state services in the field of hydrometeorology and related areas, monitoring the environment, its pollution, state supervision over the implementation of work on active impact on meteorological and other geophysical processes.

Main tasks assigned to this agency include:

- state supervision of work on active impact on meteorological and other geophysical processes in the territory of the Russian Federation
- state registration of surface waters and maintenance of the state water cadaster in terms of surface water bodies
- maintaining the Unified State Data Fund on the state of the environment and levels of pollution
- state monitoring of atmospheric air

3.2.3 Environmental legislations related to sustainable construction

There is one main piece of legislation in Russia that regulates sustainability of buildings. It is called “Conformity assessment. Ecological requirements for estate properties”, and it was developed using several international building sustainability standards as its basis:

- ISO 15392:2008 "Sustainability in building construction - General principles"

- ISO/TS 21929-1:2006 "Sustainability in building construction - Sustainability indicators - Part 1: Framework for development of indicators for buildings"

- ISO 21930:2007 "Sustainability in building construction - Environmental declaration of building products"

- ISO/TS 21931-1:2010 "Sustainability in building construction - Framework for methods of assessment for environmental performance of construction works - Part 1: Buildings" (GOST, 2013)

This standard establishes environmental requirements for real estate buildings and structures, including their adjacent territory, and applies to all categories of designed, built, reconstructed and operational real estate. It is applied when conducting voluntary certification of real estate objects and their project documentation, subject to the safety requirements established by technical regulations in the field of construction. (GOST, 2013)

This standard is aimed at reducing the utilization rate of non-renewable energy resources, rationalizing water use, minimizing harmful effects on the environment during the construction and operation of the building, including the adjacent territory, while ensuring a comfortable human environment and adequate economic profitability of architectural , constructive and engineering solutions. This piece of legislation defines principles, categories, assessment criteria, indicators, recommended indicators and minimal environmental requirements for real estate objects. The design and construction of real estate objects should be carried out according to the recommended indicators given in this standard, with mandatory compliance with minimum environmental requirements. (GOST, 2013)

A number of other national standards have been developed also, such as

- STO NOSTROY 2.35.4–2011 “Green Building”. Residential and public buildings. Rating system for assessing the sustainability of the environment "

- GOST R 54964–2012" Conformity assessment. Environmental requirements for real estate ”
- STO NOSTROY 2.35.68–2012“ Green construction ”. Residential and public buildings. Taking into account regional peculiarities in the rating system for assessing the sustainability of the habitat ”.

However, as can be seen from the dates when these legislations were released, they are all almost a decade old. In order to ensure that they remain relevant and effective, they need to be continuously updated and supported by the government. As sustainability criteria and levels of “greenness” rise constantly, it is important that ecological developments in Russia are maintained on the same level as in Europe. Besides, it is important that sustainability in construction sector does not remain “voluntary” as it is under current legislations.

3.3 **Popularity of environmental labeling for buildings in Russia**

As of the year 2019, there are 130 facilities in Russia that are certified according to "green" standards. Only around 30 of them are residential complexes that have received the international BREEAM or LEED certification. On the Russian market, most of the buildings that have any of the environmental certificates belong to the office segment - 39% of the total number of "green" buildings. The second place is occupied by retail property - 24%. The third place in Russia is occupied by warehouse and industrial facilities - 19%. A similar structure is observed in Moscow, where offices hold absolute leadership with a share of 80%. It should be noted that all office buildings that have one of the certificates under consideration are located in Moscow (83%) or St. Petersburg (17%). There are no such objects in the regions. (CRE, 2019)

There are currently three green certification schemes on the Russian market – BREEAM RUS, LEED and DGNB. At the same time, a large number of objects are certified under the BREEAM scheme, which accounts for more than 70% of "green" buildings. This is primarily due to the fact that this particular environmental certification standard was the first to appear in Russia and already has a fairly extensive network of independent auditors offering certification services in the country. (CRE, 2019)

The BREEAM RUS certificate is the Russian version of the British standard, adapted to Russian conditions, climate, building codes and legislation. The Russian version of the British standard is in many ways stricter and more demanding than the original, since it is based on Russian norms and design rules.

Despite the fact that Russia has its own ecological development standards, the BREEAM or LEED certifications remain the most prestigious awards for sustainable buildings. The very first building to receive one was the "hypercube" at the Skolkovo Research Center (Fig. 7). (Vestnik, 2019, p. 112)

Many innovations have been implemented into it, such as geothermal pumps for heating and cooling, solar light panels and much more. Then “The Japanese House” business center, “Siemens” office, “Lahta Center” and several other business centers in Saint-Petersburg have received either of the environmental accreditations. Rental expenses in structure with ecological certificates rise by about 15%, while the price for sale rises to 35%. Together with this, the cost of maintaining the building is reduced by 25-30%. Having a ‘green’ accreditation is an excellent advertisement for a piece of architecture, and it helps attract long-term tenants who care about their image and reputation in the corporate circles and are willing to pay for it. (Vestnik, 2019, p. 112)

Figure 7 The Skolkovo Hypercube (Skolkovo, 2012)

On the other hand, the ecological residential estate market in Russia is extremely small. The first residential complex to receive BREEAM certification was “The Triumph Park” in St. Petersburg. During its construction, ventilated facades made of energy-saving materials were used. In hot weather, they keep the building cool, and keep the warmth in winter. Special lamps, elevators, motion sensors, plumbing controllers and temperature control sensors allow the residents to save 40% on electricity costs and 30% on heating. However the prices for that property were higher than the market average for similar, non-ecological projects. (Vestnik, 2019, p. 112)

According to Konstantin Losyukov, the director of the office real estate department at Knight Frank, given the global trend and increased attention towards sustainable development, in particular to the development of green construction, we expect an increase in the number of certified buildings on the Russian market in the future. Moreover, it can be predicted that an increase in the supply of commercial real estate in all segments will be accompanied by the active involvement of auditors for "green" certification at the design stage of the building, which will avoid inconsistencies that often arise if the owner decides to go through this procedure with already constructed object. Moreover, it is possible that in the future for tenants, the availability of "green" certification will also be another significant factor in favour of a particular facility. (CRE, 2019)

4 ORGANIZATIONAL FRAMEWORK IN FINLAND

Since 2008, Finland has been fulfilling the directive of the Council of the European Union on the energy performance of buildings, which is binding for all EU members. This has given a big boost to ‘green’ construction in Finland.

4.1 Introduction to the construction sector in Finland

Sustainability in the construction sector in Finland has been a trend that is becoming more and more popular. And that is not surprising, as per the later European directives, from December 31, 2020, all new residential buildings must be “zero energy” buildings, whereas public buildings should “go zero” starting January 1, 2019. (Ministry of Environment, 2016) This gave rise to a number of developments, such as the ones described below.

LEMMINKAINEN is implementing a pilot project of an eco-office in Helsinki for the University and the Environmental Center of Helsinki - “Viiki House”. Reducing energy consumption will be achieved due to the insulation of facades, low heat transfer coefficient in structural elements and automatic reduction of the air exchange rate when there is no one in the building. The house itself will provide 25-30% of the energy. 4 wind turbines and solar panels will be installed on the roof. Plus, there is central heating. In addition, 25 geothermal wells were drilled with a depth of 250 meters, which are covered with a stone ramp. In summer, the ramp is heated by the sun, warm water is pumped into the ground under the building, and in winter it is pumped into the building's heating system. (FIGBC, 2011)

Another example is the Luukku project (Fig. 8), developed at the Aalto

University of Helsinki, which won a number of awards at international exhibitions. The building project uses only solar energy and generates more than it consumes. In the summer, extra energy is supplied to the grid. The sensors located in the walls keep the indoor temperature at 20-23 degrees. In addition to solar panels, energy efficiency is improved by wood panels, a special wall profile, cellulose-based insulation inside the panels. The estimated lifespan of the house is 30 years. (Aalto, 2009)

Figure 8 Luukku house prototype (Aalto, 2009)

Another, more massive project, is Eco-Viikki (Fig. 9). This eco-district was one of the first of such scale in the world: before that, only individual eco-buildings had been built. The concept of construction of the district was based on utilizing energy-saving technologies. The residential part of the district consists of 14 original quarters with their own types of buildings.

Figure 9 Eco-Viikki campus (CSBR, 2015)

Most of the houses in the area are multi-storey, but there are also 1-2-storey cottages, some of them are entirely built of wood. Since the project is associated with the scientific and technical center for environmental technologies, then near each house there are plots of 5-10 acres for gardens and vegetable gardens. The area is also equipped with several are drinking wells and compost pits, which are available to the inhabitants. The houses in Eco-Viikki provide energy for themselves. Solar collectors are installed in the roofs of buildings; solar energy provides both hot water and heating. Photovoltaic panels are installed on the balcony railings, which also participate in energy production. The photo panels of each apartment are connected to a single control system, with an individual account of the required heat. Although the houses are connected to a heating plant, this is only a safety precaution in case of extreme frosts. On average, this eco-district saves about a third of electricity and water compared to conventional urban districts. (Helsingin kaupunki, 2020)

4.2 **Environmental authorities in Finland related to construction sector**

Unlike in Russia, in Finland there are governmental bodies whose sole purpose is to develop sustainable building practices and implement them. They are mentioned below.

4.2.1 The Ministry of the Environment

The Finnish Ministry of the Environment is developing green building regulations already today. These standards will include indicators of

energy consumption - from the stage of production of building materials to the period of operation. A system that takes into account the environmental impact of the release of building materials (raw materials, energy consumption in the production process, emissions, environmental impact of the final product) is already in use in Finland. A vital task is to reduce energy consumption during the operation of the building. (Ministry of Environment, 2020)

A branch of the Ministry that is directly related to sustainable construction is The Housing Finance and Development Centre of Finland. This agency is charged with the duty of promoting ecologically sustainable and affordable housing, among other things. (Ministry of Environment, 2020)

4.2.2 The Green Building council

The Green Building Council was established in Finland in spring 2010. The purpose of the association is to co-operate in promoting awareness and competence related to the sustainable development of the built environment and to integrate sustainable development practices into the operations of the real estate and construction cluster. Otherwise, the council's duties include:

- communicating the best practices and current developments in the field of sustainable construction through newsletters, websites, events and other means

- developing policies, tools and indicators through expert collaboration, research and development projects

- ensuring the comprehensive use of environmental performance assessment tools in Finland through communication and interaction

- generating dialogue and cooperation in the real estate and construction sectors

- representing its members operating in the Finnish real estate and construction industry internationally (FIGBC, 2020)

4.2.3 Environmental legislation in Finland

The Ministry of the Environment has a whole branch of legislations regulating energy efficiency and building sustainability. The minimal requirements comply with the European requirements and respective agreements and are also continuously updated. The full list of laws

regulating energy efficiency in buildings can be found from the website of Ympäristöministerio.

4.3 **Popularity of environmental labeling for buildings in Finland**

In Finland, 4 main types of environmental certificates are used:

- BREEAM
- LEED
- The Nordic Joutsenmerkki (Swanmark)
- The domestic RTS eco-rating

Unlike in Russia, BREEAM and LEED in Finland use the same international standards that are applied in other countries. As of the moment when this thesis is being written, there are 738 BREEAM building certification and 253 LEED certified objects in Finland (GBIG, 2020).

4.3.1 RTS certification

The environmental classification system RTS has been developed for Finnish conditions and considers Finnish realia, legislation and the diversity of the real estate portfolio. The RTS environmental classification is based on European standards. (RTS, 2020)

As of November 2020, more than 130 construction projects were certified by RTS standards. Buildings range from schools and hospitals to apartment and office buildings. (Rakennustieto, 2020)

4.3.2 Joutsenmerkki

Joutsenmerkki, The Swan ecolabel, is developed as a way for products and services to prove their ‘greenness” to the consumer. It can be carried by different product groups, from detergents to buildings. As of November 2019, the Swan label covers 60 product groups, which include about 9’000 products. It is also Finland’s best-known ecolabel. About 8’000 dwellings projects are constructed under the Swan label, and 18’000 more are under construction. (Nordic Swan, 2019)

As an example of a construction project under the Swan Label can be considered the first such apartment complex in Finland, which is located in Helsinki. It was built by JM, a Finnish construction company, and the complex meets all of the necessary Swan Label requirements in regard to its levels of household appliance ecology level, waste sorting the origin of raw materials and emissions from them. Moreover, the energy class of the apartments is A, which exceeds the required minimum for construction in Finland. (JM, 2020)

5 RESEARCH FINDINGS

Environmental planning is a factor influencing legislation in both countries. At the moment, the main mechanisms of environmental protection mechanisms are not spelled out in Russia, there is no clearly defined structure of how and in what sequence it is necessary to carry out certain assessments at the pre-project and project levels. In Finland, everything is regulated, which helps to reduce the number of conflicts occurring during the construction and operation of various types of projects. Unlike the Russian law, the Finnish law on environmental protection is intended to promote the use of the principles of minimizing harm and damage to the environment, minimal use of resources, as well as the use of advanced methods to prevent environmental pollution. The environmental protection law is based on an integrated environmental permitting system. However, the Russian law primarily strives for the preservation of the still undisturbed territories, creating reserves. In general, Russian legislation is largely descriptive. Such a system can lead to confusion and less coordination.

The ultimate goal of preventing negative environmental impacts is common in both countries. But in Russia, much of it is dedicated to fixing possible faults, which is a good in case of a real emergency. However in general, the concept is imperfect, due to the lack of clear criteria for avoiding risks. If in Finland there is a reason to suspect that an economic activity may harm the environment and the population, then a risk assessment is carried out by a specialized institution, which will contribute to more accurate assessments. In Russia, environmental risks are often calculated without the involvement of additional competent organizations, only in cases of large-scale projects. (Gogoberidze&Co, n.d.)

Based on the analysis of the existing environmental legislation of Russia and Finland, it should be noted that there are several fundamental differences between the existing legislative systems. The current environmental legislation of Finland is fully subordinate to the rules of the European Community, where often the development of national acts is, in essence, a reworking of existing sets of rules. Most of the current environmental legislative acts in Russia were adopted in the around 2000s, which calls into question their degree of relevance. Many normative and methodological acts were adopted when a significant number of modern ecological technologies for maintaining the state of the environment did not yet exist. (Gogoberidze&Co, n.d.)

5.1 Some statistical findings

According to statistical data received from Knoema.com, Russia is clearly behind Finland in terms of CO2 emissions per capita (Figure 10) and CO2 emissions intensity.

ENVIRONMENT	RUSSIAN FEDERATION	FINLAND
CO2 emissions (million tonnes) in 2019	1,792.0 -0.76 %	43.4 -8.31 %
CO2 emissions per capita (tons of CO2 per capita) in 2019	12.45 -0.71 %	7.81 -8.62 %
CO2 emissions intensity (tonnes per 1000 dollar GDP) in 2019	0.45 -2.08 %	0.16 -9.20 %
Quantity of municipal waste collected (thousand tonnes) in 2017	10,071.00 -76.87 %	2,812.00 1.59 %

Figure 10 Environmental comparison of the two countries (Knoema.com, n.d.)

Besides, Russia's main energy sources are fossil fuels, with alternative energy sources accounting for only 8.2% of overall energy use, whereas in Finland the number is slightly over 25% (Figure 11). Also, the energy is used more efficiently, as Finland has a lower number of MJ per 1 dollar of GDP than Russia.

ENERGY	RUSSIAN FEDERATION	FINLAND
Primary energy production (quadrillion Btu) in 2018	63.46 3.44 %	0.53 0.89 %
Primary energy consumption (quadrillion Btu) in 2018	33.30 2.59 %	1.23 1.32 %
Energy intensity (MJ per dollar of GDP) in 2015	8 0.81 %	6 -5.01 %
Energy imports (%) in 2015	-83.7 -0.20 %	45.3 -1.87 %
Alternative and nuclear energy use (%) in 2015	8.2 5.57 %	25.4 9.41 %
Fossil fuel energy consumption (%) in 2015	92.1 2.94 %	40.2 -4.68 %
Diesel price (US dollars per liter) in 2016	0.55 -26.67 %	1.34 -24.72 %
Gasoline price (US dollars per liter) in 2016	0.59 -27.16 %	1.45 -23.28 %

Figure 11 Energy comparison of the two countries (Knoema.com, n.d.)

Overall, Finland suffers less from environmental problems, and takes part in more international environmental agreement than Russia (Figure 12).

Environment - current issues	air pollution from heavy industry, emissions of coal-fired electric plants, and transportation in major cities; industrial, municipal, and agricultural pollution of inland waterways and seacoasts; deforestation; soil erosion; soil contamination from improper application of agricultural chemicals; nuclear waste disposal; scattered areas of sometimes intense radioactive contamination; groundwater contamination from toxic waste; urban solid waste management; abandoned stocks of obsolete pesticides	limited air pollution in urban centers; some water pollution from industrial wastes, agricultural chemicals; habitat loss threatens wildlife populations
Environment - international agreements	party to: Air Pollution, Air Pollution-Nitrogen Oxides, Air Pollution-Sulfur 85, Antarctic-Environmental Protocol, Antarctic-Marine Living Resources, Antarctic Seals, Antarctic Treaty, Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Environmental Modification, Hazardous Wastes, Law of the Sea, Marine Dumping, Ozone Layer Protection, Ship Pollution, Tropical Timber 83, Wetlands, Whaling signed, but not ratified: Air Pollution-Sulfur 94	party to: Air Pollution, Air Pollution-Nitrogen Oxides, Air Pollution-Persistent Organic Pollutants, Air Pollution-Sulfur 85, Air Pollution-Sulfur 94, Air Pollution-Volatile Organic Compounds, Antarctic-Environmental Protocol, Antarctic-Marine Living Resources, Antarctic Treaty, Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Environmental Modification, Hazardous Wastes, Law of the Sea, Marine Dumping, Marine Life Conservation, Ozone Layer Protection, Ship Pollution, Tropical Timber 83, Tropical Timber 94, Wetlands, Whaling signed, but not ratified: none of the selected agreements

Figure 12 Comparison of the two countries (IndexMundi.com, n.d.)

All this data supports the assumption that Russia is behind Finland in terms of environmental sustainability, and requires further work in this direction.

5.2 **Study questions answered**

It is difficult to pass objective judgment on how well Russia has adapted to the sustainability movement due to the peculiarities of its socio-economic context. As has been previously discussed, the market is more shifted in favor the economical aspect of sustainability, so the first and foremost requirement is that sustainable solutions have to be cheap, which they rarely are. Also, the overall standards enforced by the government are rather not strict, and private sustainability assessment tools have to be relied upon to ensure international recognition and high standards. Whereas Finland is being guided by the latest European decrees on construction sustainability and is running at the forefront of the field by researching new solutions and implementing them widely. Finnish projects have earned international awards and recognition, which places them at the worldwide top.

Both countries have designated governmental bodies that promote sustainability and develop new legislation. In Russia it is The Federal Service of Russia for Hydrometeorology and Environmental Monitoring and The Ministry of Natural Resources and Environment of the Russian Federation. Sustainability in construction is regulated by a set of ISO standards related to “Conformity assessment. Ecological requirements for estate properties”. In Finland, construction sustainability is regulated by legislation that is based on European norms and is decreed by The Ministry of the environment. There is also a non-profit

organization called “The Green Building council” that helps promote sustainability and represents Finland internationally.

In Finland, environmental standards are restricted by the current level of technology and how fast the legislative basis will adapt to include any innovations. In Russia, on the other hand, high standards can make project costs unaffordable, which would go against the economic aspect of sustainability, and thus render the whole idea useless. It is necessary to make sustainable solutions more affordable in Russia, either by improving the technology further or by other means like direct financial support.

6 CONCLUSION

To conclude, it should be noted that the ecological construction market in Russia is just emerging and its development requires serious government support, improvement and updating of the regulatory framework in the field of energy conservation and environmental protection, all the while taking into account the current practices of the construction market in Europe. The development and promotion of national green standards significantly stimulates the market for building materials and technologies. If the development trends on the "green" technologies market in Russia maintain their current pace and rate, it is reasonable to expect that in a few years’ time a boom in the field of environmental housing and communal services will take place. However, this will require extensive governmental support, as it will be crucial to maintain that these technologies are affordable and available to the customer. So far, everything indicates that price is the only inhibitor to the growth of ecological construction in Russia.

On the other hand, in Finland climate-friendly construction is booming already. With a more ecology-conscious consumer, and a more stable economic situation, the Finnish “green” construction has enjoyed a steady growth due to high demand. However, the driving forces behind these changes are the strict European legislations in respect to the minimal energy efficiency of buildings.

Lastly, it is important to note that the term “green” construction includes not only reducing the consumption of energy resources and materials throughout the entire life cycle of a building, but also reducing the negative impact on the environment and human health. Green buildings have a number of advantages, including environmental benefits, benefits to society, economic, environmental benefits, marketing benefits of certification objects, as well as benefits for each of the participants in the green building process. The

development and implementation of green building standards stimulates the development of business, innovative technologies and the economy, improves the quality of life of society and the state of the environment. They are a tool for a smart economy - they save money, resources and contribute to the prospect of a sustainable future.

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