

# Trends in the application of "green" standards on the life cycle of capital housing construction objects

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**Abstract.** The study aims to identify the problems of "green" housing in the concept of sustainable-ESG development of the life cycle of a capital facility. It was revealed that the priority area of sustainable management of the capital object life cycle is a responsible attitude towards the environment, and the main factor is energy efficiency. In this aspect, the analysis of actual data from the Unified Housing Information System was carried out using statistical methods, mathematical and graphic modeling. Trends in the distribution of houses by energy efficiency groups were identified, an economic assessment of the increase in the cost of "green" residential buildings was made, the impact on the marginality of developers, which reduces when using "green" technologies, was shown. The role of the banking sector in maintaining "green" projects is shown: their share in the portfolios of financial institutions has been assessed, leaders in the top 5 banks have been identified. The conclusions are formulated in the form of points of growth of "green" housing construction in the field of standardization of requirements and approaches to the assessment of "green" projects, the development of mechanisms for their regulation based on the balance of administrative and economic instruments, as well as the activation of banking structures for the introduction of preferential investment.

**Keywords:** object of capital housing construction, "green" standards, analysis of the green construction market, growth points.

## 1 Introduction

At present the methodological development of standards in the area of sustainable development and «green» building, as well as the elaboration of mechanisms of their implementation into the sphere of construction in Russia are more actively performed through financial institutions based on the sustainable development concept of ESG [1,2].

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ESG (or «sustainable development») means the development of commercial activities which is built on following principles:

- E or «environment» means the responsible attitude to the environment;
- S or «social» means the social responsibility;
- G or «governance» means the high quality of corporate management.

The sustainable development provides the satisfaction of present-day needs, but at that it does not put the ability of future generations to satisfy their own needs at hazard because of unfavorable and imbalanced decisions made today.

Within the framework of the ESG concept all three principles shall be harmonically and equally taken into consideration as applicable to the development strategy of the organization. Notwithstanding, the key role in the efficiency of ESG is determined on the basis of various components depending on the business specifics [3,4,5].

According to the information provided by the International Energy Agency (greenhouse Gas Emissions from Energy) the share of greenhouse gas emissions in the sphere of construction and utilities is equal to approximately 40% from the total volume of greenhouse gas emissions in the Russian Federation.

The principle of environmental compatibility plays the key role in the sphere of sustainable development of housing construction due to the high resource and energy intensity of manufacturing the real estate object and its further use. The task to reduce the carbon footprint is treated as the high priority for the sustainable development of the construction sector and the housing and communal sector [6,7,8].

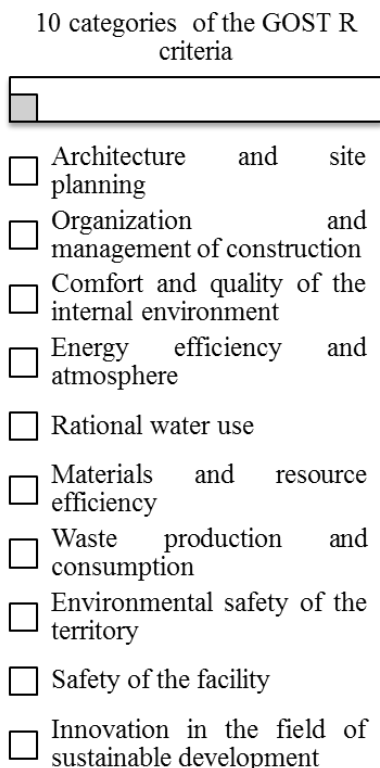
## **2 Regulatory legal acts**

The state development corporation ВЭБ.РФ approved its ESG strategy to be implemented till 2024 and in a future perspective till 2030 represented by the tools which specify high level objectives and tasks of the company.

The document determines instruments for the support of ESG initiatives, tasks and the role of ВЭБ.РФ in the creation of financial market infrastructure for sustainable projects and the promotion of the agenda of sustainable development for purposes of the involvement of the business community in its implementation at the national level, as well as lines of support of ВЭБ.РФ against criteria of ESG projects and their integration into the credit and investment process [9].

Methodological best practices in the sphere of sustainable development from ВЭБ.РФ became the foundation of the national standard of the Russian Federation GOST R «Green» apartment residential buildings. Assessment methodology and criteria for design, construction and operation» [10].

The document includes the system of criteria which characterizes the construction object at all stages of life cycle through a prism of ecological safety, comfortability of the human living environment and rational use of natural resources in the process of construction and use. At that ESG factors are assessed based on 10 categories of criteria (fig.1).



**Figure 1.** 10 categories of the GOST R criteria  
*Source:* compiled by the authors

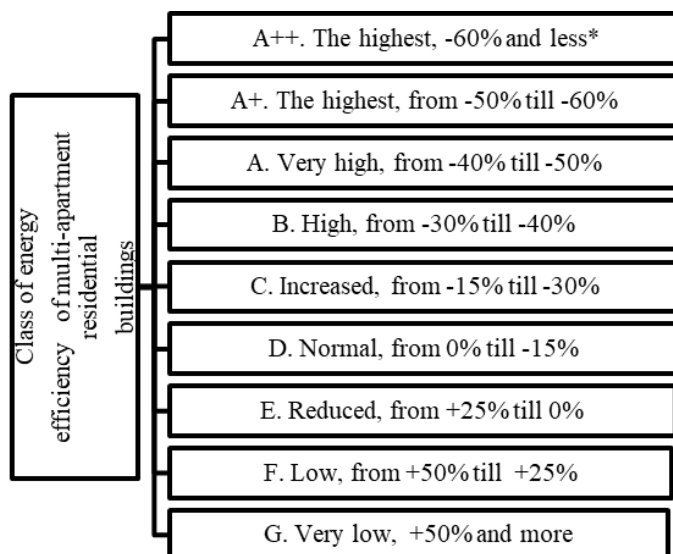
### 3 Methods for determining the energy efficiency classes of residential buildings

One of important criteria for assigning of a residential building to the «green» building class is the energy efficiency class. Determining the energy efficiency class happens in accordance with the Decree of the Ministry of Construction and Housing and Communal Services of the Russian Federation dated June 6, 2016 No. 399 «On Approval of the Rules for Determining the Energy Efficiency Class of Apartment Buildings». The energy efficiency class of the apartment residential building is determined following on from results of:

- assessment of architectural, functional and technical, constructional and engineering and technical solutions implemented in a building;
- establishing indicators which characterize annual specific values of energy resource consumption, including the same with the use of instrumental and computational methods;
- value of deviation of the calculated (actual) value of the specific consumption of energy resources from the rated level, established by energy efficiency requirements of buildings, constructions and structures [11].

The energy efficiency class of used apartment buildings is determined on the basis of actual values of the specific annual heat energy consumption for heating, ventilation and hot water supply, as well as the electrical energy consumption.

The energy efficiency class is determined after the comparison of the obtained value of deviation with values specified in the table of energy efficiency classes of residential buildings. Following classes are assigned (fig.2)



**Figure 2.** Class of energy efficiency of multi-apartment residential buildings  
 Source: compiled by the authors

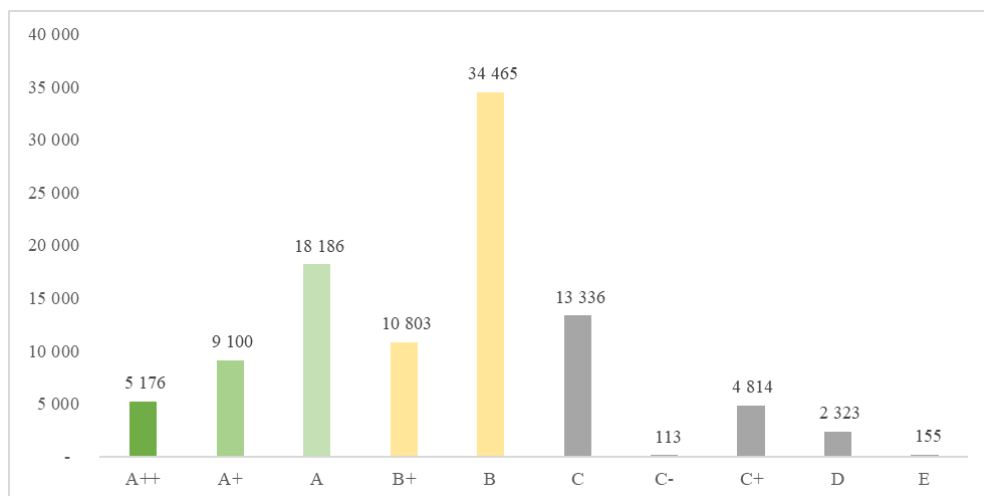
## 4 Discussion. Analysis of the «green» housing market

The study of trends in the implementation of "green" standards in housing construction was based on the data of the Unified Information System for Housing Construction, which includes information on the developer and the construction project.

The current construction volume of the apartment residential building is equal to 98.5 million sq. m. of April 2023. 325 sq. m. or 33% account for classes A++, A+ and A energy-efficient buildings which belong to «green» building objects within the framework of the approved methodology of simplified classification [12]. Energy efficiency class B buildings are the most popular among constructed buildings. More than 34 million sq. m. of housing account for the total.

**Table 1.** Distribution of buildings by energy efficiency groups

Energy Efficiency Groups	Residential area of the current construction, thousand sq. m.	Share, %
Groups A++, A+ and A	32 462	33%
Groups B+ and B	45 268	46%
Groups C, C-, C+, D, E	20 740	21%



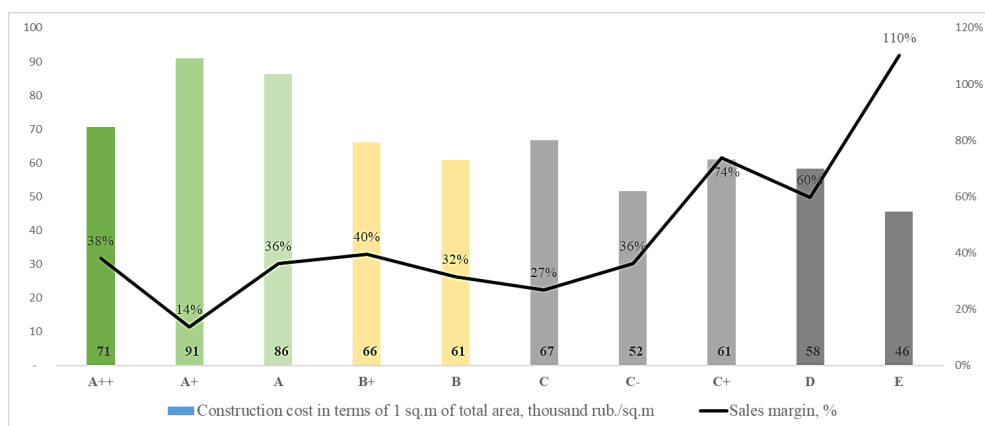
**Figure 3.** Residential area of the current construction, thousand sq. m.  
 Source: compiled by the authors

The construction volume of high energy efficiency class buildings (A++, A+ and A) is limited on the market due to the economics of housing construction projects itself. The construction cost of such class buildings amounts to 85 thousand roubles per sq. m. of the total area according to particulars specified in project declarations what is more expensive by 37% than classes B and B+ buildings and more expensive by 32% than energy efficiency group C buildings and lower. To the contrary, the volume of accumulated monetary funds received from the realization of apartments on the primary market for energy efficient classes A++, A+ and A buildings in escrow accounts is equal to 176 thousand roubles per sq. m. in equivalent of the rentable living space what is more than the volume of accumulated monetary funds received from the realization of apartments on the primary market for energy efficient classes B+ and B buildings by 29% and the volume of accumulated monetary funds received from the realization of apartments on the primary market for energy efficient class C buildings and lower.

Thus, it is possible to draw conclusion that the realization of energy efficient buildings requires additional capital expenditures upon the project implementation and is performed by developer upon the availability of the sufficient effective demand at the location area of a designed building which is being constructed.

The sales margin means the ratio of the average sales price per 1 sq. m. of the living space in the form of monetary funds accumulated in escrow accounts to the construction cost per 1 sq. m. of the rentable space of a residential building. In general, this value characterizes the efficiency of the realization of goods on the market and the profitability of its production for the company.

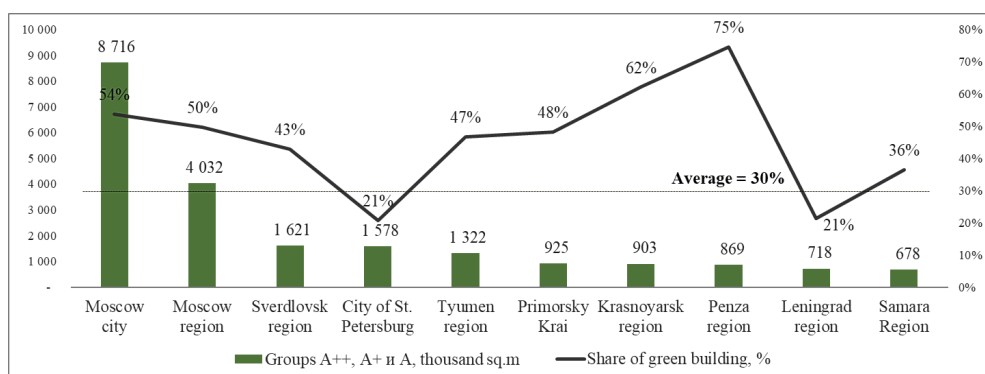
The average level of all designed buildings which are being constructed is equal to 34%. The margin distribution by energy efficiency groups of buildings demonstrates that the construction of «green» buildings does not produce the significant increased margin in relation to the average value, but the construction of low energy efficiency class housing is more favorable in economic terms because of the best combination in primary cost saving and the decrease in the market sale price per square meter.



**Figure 4.** Sales margin and Construction cost per sq. m. by Energy Efficiency Class  
 Source: compiled by the authors

Such margin distribution by energy efficiency classes of residential buildings demonstrates the necessity of the additional regulatory stimulation of developers who use «green» technologies. At that stringent prohibitions of the construction of low energy efficient buildings without mechanisms of the decrease in the prime cost of «green» technologies may lead to the reduction of activities of developers at location areas marked by the low effective demand.

The penetration analysis for the construction of «green» housing in regions demonstrates that the construction of «green» housing is most popular in cities with relatively large growing housing markets and the sufficient effective demand, such as Moscow (54% from the current construction percentage), Moscow Region (50%), Sverdlovsk Region (43%) and Saint Petersburg (21%). Not only areas with the cold climate (Tyumen, 47% and the Krasnoyarsk Territory, 62%), but also areas with the relatively mild climate (Samara and the Primorye Territory) reached the top 10 of regions with the area of «green» residential buildings which are being constructed. At that the average area of «green» housing from the total volume of constructed housing is equal to 30%.

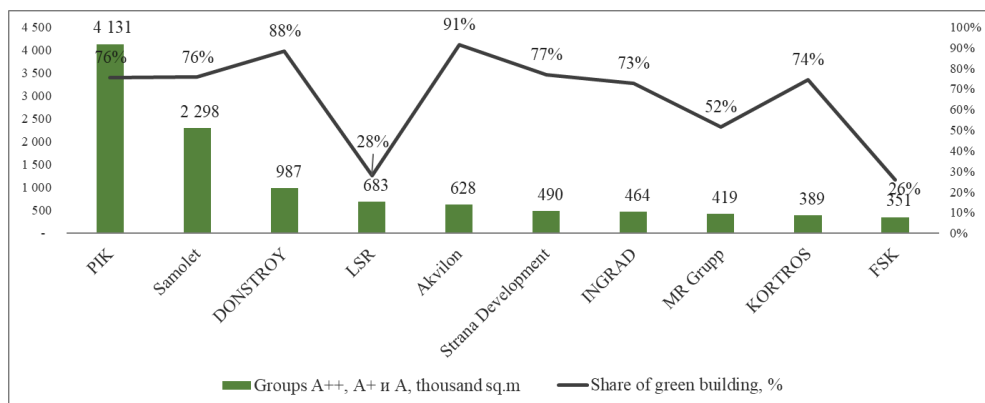


**Figure 5.** Top 10 regions of the Russian Federation with the largest area of current construction of «green» housing with a share of «green» building in the total construction in the region  
 Source: compiled by the authors

Saint Petersburg and the Leningrad Region are among all constituents of the Russian Federation are thrown into sharp relief among constituents of the Russian Federation with

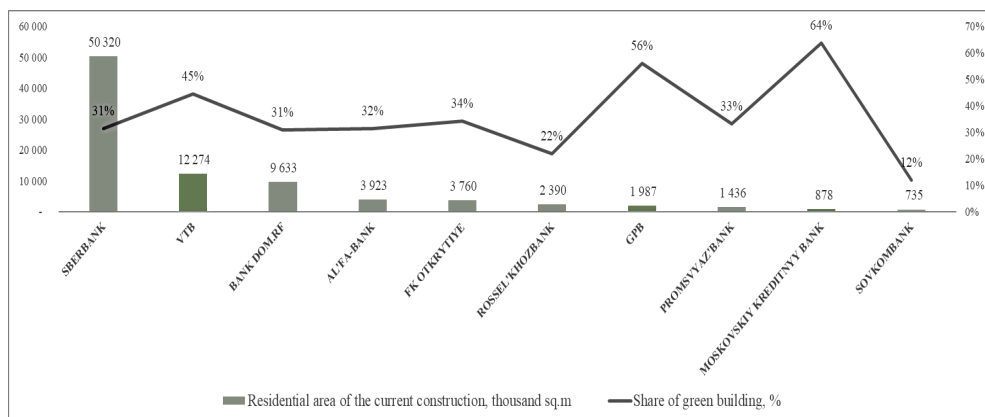
the largest area of the construction of «green» buildings, but a low share of «green» building from the total share of «green» building on the regional market. Only 21% from housing construction objects belong to the high energy efficient class (A++, A+ and A).

Following companies are key developers on the «green» building market in Russia: «PIK» (a share of «green» building construction: 76%), «Samolet» (76%) and «Donstroy» (88%). For a total they build 7.4 million sq. m. of class A energy efficient buildings and more, what is equal to 23% from the total construction of «green» housing.



**Figure 6.** Top 10 developers of the Russian Federation with the largest area of current construction of «green» housing with a share of «green» building in the total construction of the company  
 Source: compiled by the authors

The banking sector is one of key elements of stimulation of the construction of «green» housing through the issue of «green» bonds for purposes of financing of sustainable projects and through the reduction of rates on credits granted to «green» developers [13,14,15,16,17,18,19]. In average, a share of «green» building in portfolios of banks is at the level of 27%. Sberbank provides financing towards 15.8 million sq. m. (31% from the «green» building portfolio) of «green» housing or 49% of the total «green» building market in the Russian Federation. At that a market share is equal to 51% for this financial institution. Thanks to the active cooperation in the sphere of finance financing by companies «PIK» and «Samolet» the Bank VTB reaches 45% as its share of «green» housing in its portfolio, which is the highest value in the top 5 banks.



**Figure 7.** Top 10 banks of the Russian Federation with the largest area of current financed construction with a share of «green» building

*Source:* compiled by the authors

## 5 Conclusion. Analysis results. Problem areas and growth points

The analysis demonstrated that the first point of growth of «green» building has consisted of the systematization of approaches to the energy efficiency evaluation of residential buildings and the standardization of approaches by all market participants. In present-day conditions regulatory measures are out of business processes of the developer which is directly engaged in the design and the construction of the real housing construction object.

For this reason, each developer implements projects due to its own competences and often does not realize its economic benefits from the «green» project implementations at the initial stage of a project life cycle. The development of the collected volume of cases in technologies of energy efficient cladding structures and the modern equipment which contribute the choice of the optimal combinations of the workability and the energy usage reduction of a building in principle with consideration to the economic feasibility of a project may be of prime importance for the development of the «green» building market.

The second point of growth consists of getting the balance between stimulating and limiting mechanisms of financial and economic nature. The «green» building needs additional capital expenditures, but the additional value from «green» solutions is relatively low, that's why the complete shift to the «green» building only forms risks for regions with the low housing construction margin. At areas with the low market sale cost of housing activities of developers begin to be reduced because of the insufficient effective demand on more expensive «green» projects.

The third point of growth means the activation of work of financial institutes and authorized banks which credit «green» building projects. The current statistics demonstrated that the majority of credit institutions provide financing for «green» projects in accordance with average market values not depending on declared preferences in the sphere of ESG. Unfortunately, it speaks for the absence of preferences in the development of stable housing development.

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## References

1. Modernization of industry and the development of high-tech industries in the context of "green" growth/B. N. Porfiriev, V. N. Borisov, I. A. Budanov [and others]. - Moscow: Scientific Consultant Limited Liability Company, 2017. - 434 p. - ISBN 978-5-6040635-1-4. – EDN XPNTNJ.
2. Sustainable development planning and green construction for building resilient cities: Russian experiences within the international context / B. N. Porfiriev, A.



- Dmitriev, I. Vladimirova, A. Tsygankova // . – 2017. – Vol. 16, No. 2. – P. 165-179. – DOI 10.1080/17477891.2017.1280000. – EDN YUYWEZ.
3. M. P Afanasyev, N.N. Shash. ESG transformation in the corporate sector : Systematization of the global approach//Problems of forecasting. 2022. № 6(195). S. 185-197. DOI: 10.47711/0868-6351-195-185-197
  4. Boffo R., Patalano R. ESG Investing: Practices, Progress and Challenges. OECD Paris, 88.
    1. [www.oecd.org/finance/ESG-Investing-Practices-Progress-and-Challenges.pdf](http://www.oecd.org/finance/ESG-Investing-Practices-Progress-and-Challenges.pdf). (date of access 19.12.2022)
  5. Antoncic M, Bekaert G, Rothenberg R, Noguier M. Sustainable investment—exploring the linkage between alpha, ESG, and SDG’s. URL: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3623459](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3623459)
  6. Strategy for Socio-Economic Development of the Russian Federation with Low Greenhouse Gas Emissions until 2050, approved by order of the Government of the Russian Federation of October 29, 2021 No. 3052-r \\ <http://static.government.ru/media/files/ADKkCzp3fWO32e2yA0BhtIpyzWfHaiUa.pdf> (date of access 01.04.2023)
  7. Porfiriev B., Shirov A., Kolpakov A., Low-carbon Development Strategy: Prospects for the Russian Economy // World Economy and International Relations. 2020. Vol. 64. No. 9. Pp. 15-25. (In Russ.)] DOI: 10.20542/0131-2227-2020-64-9-15-25.
  8. Laitner J., Lugovoy O., Potashnikov V. Cost and benefits of deep decarbonization in Russia // Ekonomicheskaya Politika. 2020. Vol. 15. No. 2. Pp. 86-105. <https://doi.org/10.18288/1994-5124-2020-2-86-105>
  9. Decree of the Government of the Russian Federation of September 21, 2021 No. 1587 "On the approval of criteria for sustainable (including green) development projects in the Russian Federation and requirements for the system of verification of sustainable (including green) development projects in the Russian Federation
  10. GOST R 70346-2022 National standard of the Russian Federation "Green" standards residential apartment buildings "green". Assessment methodology and criteria for design, construction and operation [Online]. Available: <https://docs.cntd.ru/document/1200193111>
  11. Decree of the Ministry of Construction and Housing and Communal Services of the Russian Federation dated June 6, 2016 No. 399/pr "On Approval of the Rules for Determining the Energy Efficiency Class of Apartment Buildings" [Online]. Available: <http://publication.pravo.gov.ru/Document/View/0001201608100003>
  12. Unified Information System for Housing Construction [Online]. Available: <https://xn--80az8a.xn--d1aqf.xn--p1ai/>
  13. Schoenmarker D., Schramade W. Principles of Sustainable Finance. Oxford, OUP. 2018. 432 p.
  14. Böttcher J. Green Banking: Realizing Renewable Energy Projects. Oldenbourg: De Gruyter. 2020. 732 p
  15. Sachs J., Woo W.T., Yoshino N. & all (eds.) Handbook of green finance. Energy Security and Sustainable development. Singapore: Springer Verlag. 2019. 718 p

16. Bieliński T. M. Mosionek-Schweda M. Green Bonds as a Financial Instrument for Environmental Projects Funding// Unia Europejska. 2018. Pl. 248. No. 1. Pp. 13-21.
17. Ezroj A. Carbon risk and green finance. L.: Routledge. 2020. 138 p.
18. Grunow H.-W., Zender Ch. Green Finance: Erfolgreiche Schritte Zur Grünen Unternehmensfinanzierung. Bale. Springer Nature., 2020. 68 p.
19. MacNeil I., Esser Im. From a Financial to an Entity Model of ESG. Eur Bus Org Law Rev.