Journal of Contemporary Issues in Business and Government Vol. 27, No. 2, 2021
https://cibg.org.au/

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2021.27.02.444

Efficiency Improving Methodology for Corporate Social Responsibility Indicators in Order to Ensure the Energy Transition Using Information Modeling Tools

SVETLANA I. KODANEVA[1]*

[1]Institute for Scientific Information on Social Sciences, Russian Academy of Sciences, Russia
*Corresponding Author
Email ID: kodanevas@gmail.com

Abstract: The current state of the environment and the emerging economic trends, especially in the energy sector, have created serious preconditions for an accelerated energy transition. This requires extractive companies to restructure their business models by increasingly introducing criteria for assessing corporate social responsibility. However, this is hindered by the lack of uniform standards for their calculation, which can lead to manipulation in investment markets. This study is devoted to an urgent problem, i.e. the methodology development for increasing the efficiency of the indicators of corporate social responsibility based on the information modeling. The technology, traditionally used in technological industries, in construction, in particular, has not yet been considered as a comprehensive methodology for organizing investment processes and making investment decisions. In the study course, a hypothesis about the effectiveness of information modeling as a methodological and instrumental basis for assessing corporate social responsibility was put forward and tested. The author has developed their model for creating a unified information platform for making investment decisions in the fuel and energy complex.

Keywords: Sustainable development, corporate social responsibility, energy transition, information modeling, green investments, fuel and energy industry.

INTRODUCTION

The world today faces an extremely serious challenge since several negative trends coincided in the same period. This is an unprecedented pace and depth of innovations that not only transform our lives but also shake political and economic systems, causing global crises in all spheres of society. Thus, the 2008 crisis marked the beginning of an instability period of rapid and radical changes and low predictability.

Moreover, ecological problems caused by extremely aggressive anthropogenic impacts on the environment are becoming more and more urgent. Among the many factors of such negative impact, one of the most significant is the impact of the energy sector. Thus, the World Energy Outlook 2018 and 2019 magazine contains an assessment according to which the most significant of all the Sustainable Development Goals is Goal 7 that is energy since its solution will allow all other goals to be achieved (IEA, 2018; 2019).

This makes experts around the world talk about the importance and inevitability of the energy transition. Over the past decade, renewable energy has strengthened its position as a source of energy worldwide, thanks to cost savings and political support. In 2019, a new record was achieved for this increase in the generation of 200 gigawatts, which is more than three times the level of growth in generation from fossil fuels and nuclear power. Currently, more than 27% of the world's electricity comes from renewable sources (like in 2010 it was 19%). The share of solar and wind energy has grown more than fivefold compared to 2009. Denmark, Uruguay, Ireland, and Germany in 2019 crossed the threshold of 30% of all electricity generated from these sources. By the end of 2019, 32 countries had a generation of over 10 GW (19 countries in 2009), and 47 countries, including several emerging economies, receive at least 1 GW from renewable sources, which covers the electricity needs of almost 150,000 European households (18 countries in 2009). A social revolution is underway, i.e. people around the world are calling for more action to tackle climate change, and 1,480 jurisdictions in 28 countries have declared a 'climate emergency'. This is pushing large investors to invest in renewable energy sources. So, in 2019, green investment reached record levels, increasing by more than 40%, with agreements signed in 23 countries, and the number of RE100 members grew by 27% during the year to 229 global corporations (REN21: Renewables Now, 2020).

The current period associated with the COVID-19 pandemic has reduced the relevance of the energy transition problem and even questioned it. At the same time, experts note that this is a short-term trend. Decarbonization aimed at reducing anthropogenic greenhouse gas emissions and low-carbon development is the main long-term trend in the development of world energy, associated with the desire of the world community to combat climate change, one of the main global threats (Makarov e al., 2019). Decarbonization is especially pronounced in the electric power industry. Almost 75% of the increase in generating capacity in the world in 2019 was provided by renewable energy sources, primarily solar and wind power plants, which in many regions of the world are already competing with a thermal and nuclear generation (Mitrova et al., 2020).

It can be argued that the current instability in the oil markets and its root causes could make the oil and gas sector less attractive to investors and intensify calls for an even faster phase-out of hydrocarbons (Blazquez et al., 2020, p. 1).

According to experts, it is possible to predict two scenarios for the development of events named ‘The traditional trajectory’ and ‘The accelerated transition’. In the first case, after the coronavirus crisis, the market will return to normal, but the oil and gas sector will face a crisis of underinvestment and a decline in production, which will lead to an increase in energy prices (Mitrova et al., 2020). As noted by Jorge Blazquez et al. (2020) raising hydrocarbon prices is the most effective way to stimulate the acceleration of the energy transition. Thus, the world will gradually return to this idea, but the fuel and energy complex will not be ready for this, and the current difficult situation may repeat itself in the future as the global demand for oil decreases.

In the second scenario, the interest and confidence of investors in the companies of the complex will continue to decline, companies from other sectors of the economy will prefer to invest in ‘clean’ and ‘digital’ technologies. According to an EY survey, after the normalization of the economic situation, 71% of top management of international companies is going to prioritize investments in digital and technology, and 36% of companies have already increased investments in business automation (Krouskos, 2020).

Government policies will also stimulate the development of ‘green’ energy. This point of view is shared, in particular, by the European Commission, as evidenced by several statements by officials made in April 2020 (von der Leyen, 2020). The European Center for Policy Studies (CEPS) (2020) emphasizes that the coronavirus crisis creates an opportunity to develop a new agenda for an accelerated European transition to a low-carbon future under the EU Green Deal by the time the economy ‘restart’.

The energy transition is surely a complex phenomenon, associated with many risks and high uncertainty. However, a company in the oil and gas sector, subject to the introduction of new technologies and business models aimed at decarbonization, will be able to maintain a leading position in the economy, while at the same time providing a solution to environmental problems. The energy industry is forced to consider the social and environmental impact of new energy projects.

The incentive for this will be a whole range of factors that are gradually gaining strength. First of all, these are the requirements of international acts, especially the Paris Agreement, to reduce greenhouse gas emissions. To implement these requirements, many governments are pursuing a policy of decarbonization and stimulating the development of alternative energy. More serious attention has begun to be paid to assessing the impact of investment projects on the environment. This assessment has been around since the 1980s, but it is only now that it has begun to contribute to the development of a low-carbon economy. Decision-making procedures for the implementation of energy projects are becoming more stringent and include detailed environmental and social impact assessments. Internationally, the equator principles have also come to include similar requirements. Moreover, the volume of the evaluated data is increasing every year. As a result, two coal projects were halted in Australia and Kenya in 2019 after their environmental and social impact assessments were deemed unsatisfactory.

However, attracting investment in green projects today remains a challenge. Although at the international and state level, and in society, and increasingly in the investment sphere, the importance of introducing sustainable development practices is recognized, and many investors include ‘green’ investments in their portfolios, however, when making investment decisions, they avoid strict consideration of social indicators. responsibility, since this can lead to underfunding of the portfolio, which entails significant financial risks, the main of which is low profitability (Hill, 2020).

Today, there are no unified standards for recognizing companies and their projects as environmentally and socially responsible. One of the most effective tools for this is the ESG concept. It is an investment strategy that considers environmental (E), social (S), and governance (G) issues when valuing a company’s stock. This approach is especially significant for the extractive industry, since in the previously used negative screening, companies in the extractive industries, especially in the field of production and processing of hydrocarbons, automatically received negative ratings as ‘bad’.

Traditionally, analysts work with financial and economic indicators such as a company’s profit, cash flow, interest rates, or estimates of the prospects for economic growth. However, they have also always been interested in other sources of data that could ultimately influence the market. Accordingly, the ESG concept, based on the assessment of non-financial data, aims to provide investors with an understanding of the company's social and environmental obligations. It has institutionalized this screening of what analysts call non-financial data (Leins, 2018).

At the same time, the main disadvantages of the ESG are that the indicators used for the assessment are fairly general; unified criteria and standards have not yet been developed in the world. Accordingly, consulting companies collect information from various sources and interpret it in different ways. At the same time, ESG securities portfolios that financial analysts offer their clients are largely a marketing ploy, and the inclusion of non-financial estimates in analytical reports on common stocks, as evidenced by the empirical research of S. Leins, also often has purely speculative purposes (Leins, 2020).

The main reason for this is that the framework adopted for ESG indicators (Table 1) is fairly general. As a result, depending on the measurement and evaluation weights used by different agencies, the ESG indicators of the same company can vary significantly, which can be used to manipulate the market. The result is a complex ecosystem of ESG metrics, data sources, and ratings that need to be contextualized correctly to interpret and successfully use in analysis and investment decision making (Eccles et al., 2019).

Table 1: Criteria for assessing corporate social responsibility in accordance with the ESG concept (Leins, 2020)

Environmental	Social	Governance
Carbon emissions	Health and safety	Board composition
Energy efficiency	Labor conditions (operational)	Corruption scandals
Climate change risk	Labor conditions (supply chain)	Compensation schemes
Water stress	Product quality	Diversity management
Raw material sourcing	Privacy and data security	
Waste	Impact on communities	
Opportunities in environmental technologies	Opportunities in health	
Opportunities in renewable energy	Improvement of access to communication, healthcare and finance	

The solution of creating a universal tool that allows you to collect and process information necessary to determine ESG indicators and based on uniform standards is becoming especially relevant.

This study is aimed at solving this extremely urgent problem since we offer such a tool and practical recommendations for its implementation in the practice of the Fuel and energy complex (FEC) companies.

METHODS

This work is predominantly of a positivist nature using the method of a systems approach. The methodological approaches used (figure 1) are determined by the goals set by the author, which consist of answering the following questions:

1. Which of the currently existing tools for collecting, organizing, analyzing, and visualizing information allows to ensure the standardization of approaches to evaluating investment decisions within the ESG concept the most?
2. What are the main technical advantages of the chosen tool, allowing it to be implemented in practice in the companies of the fuel and energy complex?

The research methodology is mostly inductive. The main conclusions were formulated based on the analyzed sources and the discussions held. The results obtained were summarized concerning their possible practical application.

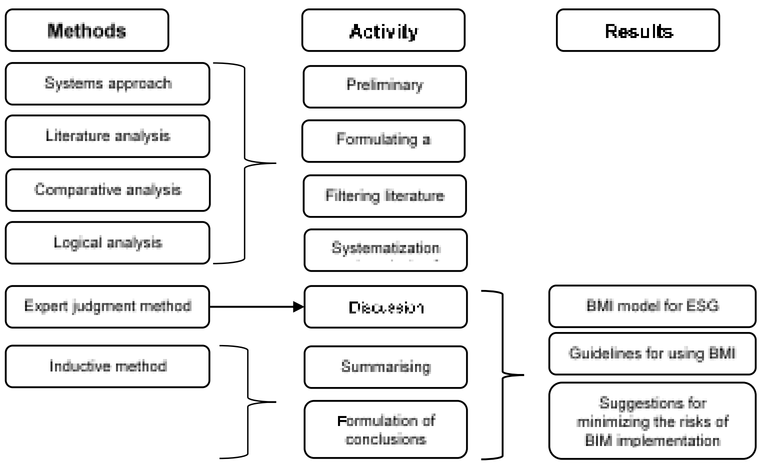

Fig.1: Research Methodology (compiled by the author)

The systemic approach method (Pawson et al., 2005) was implemented in five stages (Figure 2.). At the first stage, a background study was carried out of existing approaches to the formation and assessment of ESG indicators, data sources, and ratings used for this, as well as methods of collection and processing various categories of information (both financial and non-financial) existing in various fields of technology. This made it possible to formulate the main research questions and the hypothesis that Building information modeling (BIM) technology fully meets the goals of all the currently existing technologies.

The second stage is the evidence search, which included the collection and analysis of scientific and business literature. To search the literature, the databases Google Scholar, Web of Science, and Scopus were used with a time interval of publications from 2010 to 2020. The search included articles, reviews, and conference proceedings. All the works obtained as a result of the selection were tabulated for subsequent systematization and analysis. It should be noted that the largest peak of publications was in 2015 and 2016, followed by a decline in publication activity on the issues of BIM implementation. At the same time, more studies began to appear on the use of BIM not only in building construction but also in other areas.

In the third stage, all the data obtained were analyzed to determine the key characteristics of the BIM technology, these characteristics were systematized and evaluated for the advantages and obstacles of using BIM tools for the formation of criteria, and ESG indicators.

Then the obtained data were discussed and at the final stage conclusions were formulated and recommendations were proposed for the implementation of BIM technology in the investment decision-making process using the ESG concept.

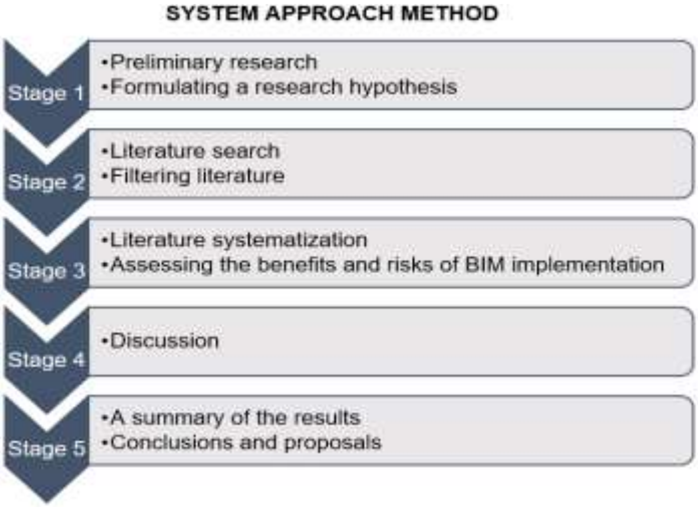

Fig.2: Methodological block diagram of the system approach method implementation (compiled by the author)

Main characteristics and technical capabilities of BIM

Today BIM technology is becoming more widespread, gradually turning into a buzzword and marketing tool (Matějka and Tomek, 2017). However, it not only provides a certain set of tools and methods for design and construction (as it was originally believed) but in itself is a new project management methodology.

Initially, BIM technology appeared in design as a set of tools for visualization in the 3D format of various functional attributes of a building, as well as ensuring cross-functional cooperation in the construction industry (Matejka and Vitasek, 2018). It is generally believed that this technology appeared in the 1970s, based on the CAD technology (Computer-aided design system), created at the Massachusetts Institute of Technology in the 1960s (McGraw-Hill Construction, 2012). With the development of information technology and the increase in the productivity of computers, it began to develop quite rapidly and in the early 2000s grew into the concept of BIM (Eastman et al., 2018), which became widespread after Jerry Lyserin (analyst of the construction industry) in 2002 declared that it was a standard industry term (Heralová, 2017).

The fundamental difference between BIM and CAD was the ability not only to create volumetric designs of buildings but to saturate them with additional non-geometric information, which significantly expanded the functionality, allowing to include in the design calculations the financial component, requirements for the quantity and quality of materials (Kim et al., 2015), as well as control of all life cycle of the future object. These capabilities attracted the attention of Autodesk, which began to actively promote it along with its products (Hromada, 2016). Today there are several companies offering software products to implement the BIM concept. Their platforms offer various specialized functions such as structural analysis, energy efficiency monitoring and analysis, planning and compliance control of all stages of construction, and even labor safety monitoring. Bosché et al. (2015) developed a system to identify discrepancies between how individual elements were designed and implemented in practice.

The second feature of BIM is that it provides the creation of an information exchange platform for all interested parties, which allows for continuous assessment and control of the reliability of the information, as a result, its quality increases. It helps to make informed decisions (Lee et al., 2015).
To fully ensure information interaction, buildingSMART has developed a data format with open specifications (Industry Foundation Classes - IFC), which is not controlled by any company or group of companies (Ghaffarianhoseini et al., 2017). The development of IFCs was an important step (Kang and Hong, 2015). It contributed to ensuring and organizing interactions between BIM users by providing standard models covering rich semantic and geometric information about building components.
However, BIM should not be limited to a technological design tool. This concept not only brings technical advantages in the development process but, most importantly, creates an innovative and integrated working platform on which all project participants can interact, which significantly increases the productivity and quality of not only the design but also the implementation of the project throughout its life cycle (Elmualim and Gilder, 2014). This is achieved by constantly expanding the functionality of the BIM platforms. Firstly, this is since the developers themselves add all the new features, which are currently presented in the 7G format (Table 2). Secondly, most platforms use APIs, which allows their users to add new modules on their own, depending on their specific needs.

Table 2: Main characteristics of different types of BIM models (compiled by the author)

BIM model type	Main characteristics
3D BIM Model	This is a Computer-aided design system model, augmented by the ability to represent a project or object in 3D, and also includes additional information about the materials used in construction.
4D BIM Model	This is a 3D BIM model, complemented by the ability to schedule the implementation of the project and monitor its compliance.
5D BIM Model	This is a 4D BIM model supplemented with financial information. Summarizes all the components of the model that can be measured and evaluated to determine the cost of the project.
6D BIM Model	This is a 5D BIM model, supplemented with functionality that allows you to simulate the operation and maintenance of an object during its entire service life. This allows you to achieve the goals of sustainable development.
7D BIM Model	It is a 6D BIM model, supplemented with the data needed to manage the investment project, making it easier to make strategic decisions while managing.

Thus, BIM technology is a much broader concept, and it should be considered as a project management process that covers not only all of its stages, but also various business processes, and provides uniform information standards for the interaction of all project participants. Moreover, this process does not necessarily have to be reduced to construction. There is a fairly extensive scientific literature suggesting the use of BIM in various fields: in the field of waste management (Akinade et al., 2018; Cheng and Ma, 2013), in infrastructure projects (Becerik-Gerber et al., 2012; McGraw-Hill Construction, 2012), in railway transport (Bocchetto et al., 2019), high-speed urban transport (Saldanha, 2019), in shipbuilding (Jabłonka et al., 2018), in public procurement (Ciribini et al., 2015; Costa and Grilo, 2015), etc.
The possibilities of using BIM are of greatest interest to us. To solve the problems of sustainable development, including its three main elements: social, economic, and environmental. Today, there is a small layer of scientific literature on this topic. However, the authors of the relevant studies concentrate their attention on this issue within the framework of the implementation of exclusively construction projects. Thus, a recent study by Chong et al. indicated such advantages of BIM as increased comfort of life due to better design (Chong et al., 2017). At the same time, the BIM functionality for improving worker safety (the program detects critical and dangerous conditions at the facility (Shen and Marks, 2016)) and improving collaboration (due to constant information exchange) can be implemented in any area, not just in construction. The ecological component is reflected in the reduction of greenhouse gas emissions, the generation of waste during construction, as well as in the improvement of energy efficiency (Chong et al., 2017). Concerning the economic component, the introduction of BIM contributes to better financial control over the implementation of the project, helps to reduce costs, and provides greater flexibility without the need to rework the work already completed (Chong et al., 2017). An example of achieving both environmental and economic goals is the development by Adeyemi et al. (2014), which included resource conservation, zero emissions, and green building to reduce maintenance costs, rather than demolition and renovation of properties.
However, in addition to the effects during the construction of a specific building, the use of BIM is possible when designing the development of territories, for example, when calculating the need for various social facilities and designing their placement. Thus, a study by Kim et al. showed that it is possible to calculate traffic flows and pedestrian routes and, taking this into account, place, for example, a school so that children can get to

it on foot by the safest route (Kim et al., 2016). It promotes health and safety and reduces energy consumption and harmful emissions.
The technology makes it possible to develop the most efficient public transport routes. Niu et al. (2015) developed a model for visualization of the urban energy landscape design. Moreover, in modern conditions, using BIM, not physical objects are modeled, but various situations such as fire or traffic, passengers, etc.
Most of the examples given are related to the ability of BIM to simulate real objects and processes in a virtual environment, which will make it possible to predict the change in these objects, taking into account certain specified factors. The model can automatically adapt to changes through parametric relationships between objects. This allows you to predict the need for schools or traffic flows, taking into account the given parameters of new housing construction.
The next important step in improving the efficiency of using BIM is to create a semantic service that allows it to receive the necessary information from the Internet. As a result, today BIM has the necessary interoperability (Miettinen and Paavola, 2014), which allows it to both interact with various systems and receive the necessary information from external sources, and the analytical tools embedded in it allow analyzing all this information, transforming it into virtual models, which, in turn, provides the necessary level of predictive analytics.

RESULTS

The analysis showed that BIM allows the management of various processes, ensures the prompt collection of information, its processing, and visualization. An important advantage of BIM that can solve the key problem of using ESG in investment practice is the availability of open information standards. Therefore, BIM is already being used in complex and long-term investment projects.
Thus, it seems that BIM is the most effective tool for introducing the ESG concept into investment practice in the energy sector.
It is necessary to ensure the constant collection of information from internal and external sources. BIM relies on digital technologies, integrating them into the facility management process. The synthesis of new technologies such as IoT, GPS, big data, laser scanning, and RFID helps to monitor, for example, emissions of pollutants or the level of gas flaring (Figure 3). This data will be automatically fed into BIM, captured in ESG metrics, and analyzed in real-time. Constantly updated information will automatically record situations when ESG indicators reach critical levels.
At the same time, BIM allows you to take into account the features of a specific area. Accordingly, companies developing oil fields in the taiga or the Arctic will be able to make more informed decisions, taking into account the geographical and climatic characteristics that will be reflected in the model.
Further, the obtained data will be automatically integrated into a single information space, which makes it possible to assess the current level of the enterprise's impact on the environment and simulate various options for the development of events, which will allow choosing the most optimal solutions. In other words, BIM can be used as a visualization tool for the enterprise of the future, with the calculation of the economic and environmental consequences of decisions made.
Finally, BIM allows all interested parties to access the model. The solutions, in this case, are distributed databases and open access standards, as well as tools with an open API that allow you to create a decentralized blockchain-like environment (Turk and Klinc, 2017).

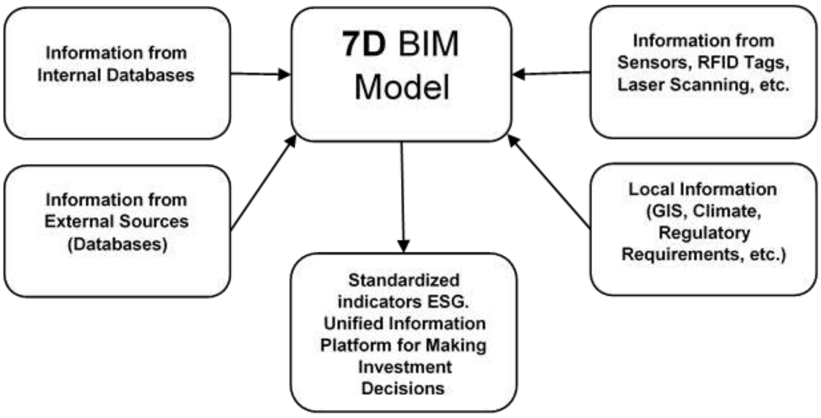

Fig.3: BIM model for use in investment valuation according to ESG criteria (compiled by the author)

DISCUSSION

The study allows us to say that the BIM methodology is an effective tool that provides the necessary level of standardization of data collection and processing used in ESG, and provides effective mechanisms for their analysis, visualization and, which is especially important for 'green' investments, forecasting and modeling various options for the development of events.

At the same time, objective limitations should also be taken into account the lack of reliable practical approbation and high costs. In construction, they are offset by the benefits received. However, in other areas, in particular, in the field of sustainable development and 'green' investment, there is still not enough practice to draw such unambiguous conclusions.

The most significant problem is the regulation's lack of BIM use. Therefore, at the first stage, it is necessary to establish regulatory requirements for the use of BIM in determining ESG indicators and include ESG criteria in BIM standards. That is, to link these two models normatively. This is especially important since standardization is of great importance for the financial sector (Matejka and Vitasek, 2018). Besides, one should take into account the decisive role of the state, which is confirmed by the experience of countries such as the United States and Great Britain. This is how BIM technology was most widely used in the USA. This phenomenon was largely driven by the US government's requirement that all major infrastructure contracts use BIM (McGraw Hill Construction, 2014). The level of BIM implementation in the UK is 39%, and the public sector here accounts for 40% of investments in construction, and here, as in the USA, government contracts prescribe the mandatory use of BIM (Ghaffarianhoseini et al., 2017).

The risks of using BIM must be carefully considered. First of all, it is the protection of confidential information and cybersecurity (Solihin and Eastman, 2015). Since the exchange of information makes data available to many platform participants, there are risks of unauthorized access and information leakage (Chien et al., 2014). Also, problems may arise associated with the acquisition of access rights to external information belonging to third parties.

Another significant risk is associated with ensuring the accuracy and relevance of the data, therefore, additional costs will be required for equipping the enterprise with the technical means indicated above, and for special employees whose task will be to maintain the relevance of the system.

CONCLUSION

The current environmental situation, as well as emerging economic trends, especially in the energy sector, increase the commercial risk of investment decisions and influence the formation of public policy, which, will be aimed at stimulating the acceleration of the energy transition in most developed and many developing countries of the world. This means that the fuel and energy complex can no longer afford to focus solely on profit, but must take into account the environmental and social risks of the investment project's implementation. Moreover, investors around the world are using non-financial criteria for assessing the acceptability of investments. One of the most common concepts used when making investment decisions is ESG. However, one of its significant disadvantages is the lack of uniform standardized approaches to the definition of criteria, sources of information, and assessment methods, which creates a complex system that is subject to manipulation.

The solution is the use of BIM technology, which originally appeared in the construction industry. However, in recent years, the application areas of BIM have been constantly expanding. This technique is increasingly used in the implementation of complex and large investment projects, since it ensures cross-functionality and interoperability, which allows coordinating the work of all project participants, solving various problems of modeling complex situations and processes not directly related to construction, including the problem of achieving sustainable development goals. This document examines the currently created BIM technologies, the functions they possess, and proposes a model for using BIM in ESG.

REFERENCES

1. Adeyemi, A., Martin, D., Kazim, R. (2014). Elimination of Waste and Inefficient Facilities in Existing Buildings for Sustainability in Developing Nations. *International Journal of Architecture and Urban Development, 4*(1), 5-16.
2. Akinade, O. O., Oyedele, L. O., Ajayi, S. O., Bilal, M., Alaka, H. A., Owolabi, H. A., & Arawomo, O. O. (2018). Designing out construction waste using BIM technology: Stakeholders' expectations for industry deployment. *Journal of Cleaner Production*, *180*, 375–385. doi: https://doi.org/10.1016/j.jclepro.2018.01.022
3. Becerik-Gerber, B., Jazizadeh, F., Li, N., Calis, G. (2012). Application areas and data requirements for BIM-enabled facilities management. *Journal of Construction Engineering and Management, 138*(3), 431–442.
4. Blazquez, J., Dale, S., Dunlop, J., Fattouh, B., Heffron, R., Hegland, J., et al. (2020). Decarbonization pathways for oil and gas. *Forum. A Quarterly Journal for Debating Energy Issues and Polices, 121*, 1–4.
5. Blazquez, J., Dale, S., Jefferiss, P. (2020). The role of carbon prices in the energy transition. *A Quarterly Journal for Debating Energy Issues and Polices*, *121*, 3–5.

6. Bocchetto, F. P., Gaggero, M., Malleni, F., Manferlotti, P., Marongiu, L., Momoni, F., Sangiovanni, O. (2019). Building Information Modelling for a “linear” railway infrastructure: an experience of implementation in a complex organization such as the High Speed Rail System. *Ingegneria Ferroviaria*, *12*, 991-1014.
7. Bosché, F., Ahmed, M., Turkan, Y., Haas, C. T., & Haas, R. (2015). The value of integrating Scan-to-BIM and Scan-vs-BIM techniques for construction monitoring using laser scanning and BIM: The case of cylindrical MEP components. *Automation in Construction*, *49*, 201–213. doi: https://doi.org/10.1016/j.autcon.2014.05.014
8. Cheng, J. C. P., Ma, L. Y. H. (2013). A BIM-based system for demolition and renovation waste estimation and planning. *Waste Management*, *33*, 1539-1551. doi: https://doi.org/10.1016/j.wasman.2013.01.001
9. Chien, K.-F., Wu, Z.-H., Huang, S.-C. (2014). Identifying and assessing critical risk factors for BIM projects: empirical study. *Automation in Construction*, *45*, 1–15. doi: https://doi.org/10.1016/j.autcon.2014.04.012
10. Chong, H.-Y., Lee, C.-Y., Wang, X. (2017). A Mixed Review of the Adoption of Building Information Modelling (BIM) for Sustainability. *Journal of Cleaner Production*, *142*(4), 4114-4126. doi: https://doi.org/10.1016/j.jclepro.2016.09.222
11. Ciribini, A. L. C., Bolpagni, M., Oliveri, E. (2015). An Innovative Approach to e-public Tendering Based on Model Checking. *Procedia Economics and Finance*, *21*, 32-39. doi: https://doi.org/10.1016/S2212-5671(15)00147-1
12. Costa, A. A., Grilo, A. (2015). BIM-Based E-Procurement: An Innovative Approach to Construction E-Procurement. *The Scientific World Journal*. doi: https://doi.org/10.1155/2015/905390
13. Eastman, C., Teicholz, P., Sacks, R., Liston, K. (2018). *BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors*. *3nd Edition*. John Wiley & Sons, Inc.
14. Eccles, R. G., Lee, L.-E., Stroehle, J. C. (2019). The Social Origins of ESG: An Analysis of Innovest and KLD. *Organization & Environment*, 1–22. doi: https://doi.org/10.1177/1086026619888994
15. Elmualim, A., Gilder, J. (2014). BIM: innovation in design management, influence and challenges of implementation. *Architectural Engineering and Design Management*, *10*(3-4), 183-199. doi: https://doi.org/10.1080/17452007.2013.821399
16. Ghaffarianhoseini, A., Tookey, J., Ghaffarianhoseini, A., Naismith, N., Azhar, S., Efimova, O., Raahemifar, K. (2017). Building Information Modelling (BIM) uptake: Clear benefits, understanding its implementation, risks and challenges. *Renewable and Sustainable Energy Reviews, 75*, 1046-1053. doi: https://doi.org/10.1016/j.rser.2016.11.083
17. Heralová, R. S. (2017). Life Cycle Costing as an Important Contribution to Feasibility Study in Construction Projects. *Procedia Engineering*, *196*, 565–570.
18. Hill, J. (2020). *Environmental, Social, and Governance (ESG) Investing: A Balanced Review of Theoretical Backgrounds and Practical Implications*. Elsevier.
19. Hromada, E. (2016). Life cycle costing from the investor’s and facility manager’s point of view. Central Europe towards Sustainable Building 2016. *Innovations for Sustainable Future*, *2*, 1374-1380.
20. Jabłonka, T., Ornat, M., Żółkiewski, S. (2018). Building Information Modelling recognition in ship’s machinery designing and construction. *Scientific Journals of the Maritime University of Szczecin*, *56*(123), 23-29. doi: https://doi.org/10.17402/309
21. Kang, T. W., Hong, C. H. (2015). A study on software architecture for effective BIM/GIS-based facility management data integration. *Automation in Construction*, *54*, 25-38. doi: https://doi.org/10.1016/j.autcon.2015.03.019
22. Kim, J. I., Koo, B. S., Suh, S. D., Suh, W. H. (2016). Integration of BIM and GIS for Formal Representation of Walkability for Safe Routes to School Programs. *Journal of Civil Engineering*, *20*, 1669-1675. doi: https://doi.org/10.1007/s12205-015-0791-4
23. Kim, M. K., Cheng, J. C., Sohn, H., Chang, C. C. (2015). A framework for dimensional and surface quality assessment of precast concrete elements using BIM and 3D laser scanning. *Automation in Construction*, 49(B), 225-238. doi: https://doi.org/10.1016/j.autcon.2014.07.010
24. Krouskos, S. (2020). How do you find clarity in the midst of the COVID-19 crisis? *Global Capital Confidence Barometer EY*. Recovered from https://www.ey.com/en_ru/ccb/how-do-you-find-clarity-in-the-midst-of-covid-19-crisis
25. Lee, H. W., Oh, H., Kim, Y., Choi, K. (2015). Quantitative analysis of warnings in building information modeling (BIM). *Automation in Construction*, *51*, 23-31. doi: https://doi.org/10.1016/j.autcon.2014.12.007
26. Leins, S. (2018). *Stories of Capitalism: Inside the Role of Financial Analysts*. University of Chicago Press.
27. Leins, S. (2020). ‘Responsible investment’: ESG and the post-crisis ethical order. *Economy and Society*, *49*(1), 71–91. doi: https://doi.org/10.1080/03085147.2020.1702414

28. Makarov, A. A., Mitrova, T. A., Kulagin, B. A. (eds.). (2019). *Forecast of energy development in the world and Russia 2019*. INEI RAS, Moscow school of management SKOLKOVO.
29. Matějka, P., Tomek, A. (2017). Ontology of BIM in a Construction Project Life Cycle. *Procedia Engineering*, *196*, 1080-1087.
30. Matejka, P., Vitasek, S. (2018). *Comparison of different cost estimation methods with use of building information modelling (BIM)*. 17th International Scientific Conference Engineering for Rural Development, May 2018, pp. 843–849. doi: https://doi.org/10.22616/ERDev2018.17.N154
31. Miettinen, R, Paavola, S. (2014). Beyond the BIM utopia: approaches to the development and implementation of building information modeling. *Automation in Construction*, 43, 84–91. doi: https://doi.org/10.1016/j.autcon.2014.03.009
32. Mitrova, T., Grushevenko, E., Kapitov, C., Melnikov, U., Perdero, A., Dobroslavskiy, N. (2020). *Coronacrisis: the impact of COVID-19 on the fuel and energy sector in the world and in Russia*. Energy center of the Moscow school of management SKOLKOVO. 2020. Recovered from https://energy.skolkovo.ru/downloads/documents/SEneC/Research/SKOLKOVO_EneC_COVID19_and_Energy_sector_RU.pdf
33. Niu, S., Pan, W., Zhao, Y. (2015). A BIM-GIS Integrated Web-based Visualization System for Low Energy Building Design. *Procedia Engineering*, *121*, 2184-2192. doi: https://doi.org/10.1016/j.proeng.2015.09.091
34. Pawson, R., Greenhalgh, T., Harvey, G., Walshe, K. (2005). Realist review – a new method of systematic review designed for complex policy interventions. *Journal of Health Services Research & Policy*, *10*(1), 21–34. doi: https://doi.org/10.1258/1355819054308530
35. REN21: Renewables Now. (2020). Renewables 2020 Global status report. Recovered from https://www.ren21.net/reports/global-status-report/
36. Saldanha, A. G. (2019). Applications of building information modelling for planning and delivery of rapid transit. *Municipal Engineer*, *172*(2), 122–132. doi: https://doi.org/10.1680/jmuen.16.00045
37. Shen, X., Marks, E. (2016). Near-Miss Information Visualization Tool in BIM for Construction Safety. *Journal of Construction Engineering and Management*, *142*(4). doi: https://doi.org/10.1061/(ASCE)CO.1943-7862.0001100
38. McGraw Hill Construction. (2014). SmartMarket Report. The business value of BIM for construction in major global markets: how contractors around the world are driving innovation with Building Information Modeling. Recovered from https://www.icn-solutions.nl/pdf/bim_construction.pdf
39. Ms. Nora Zilam Runera. (2014). Performance Analysis On Knowledge Management System on Project Management. International Journal of New Practices in Management and Engineering, 3(02), 08 - 13
40. Solihin, W., Eastman, C. (2015). Classification of rules for automated BIM rule checking development. *Automation in Construction*, *53*, 69-82. doi: https://doi.org/10.1016/j.autcon.2015.03.003
41. von der Leyen. (2020, April 16). Speech by President von der Leyen at the European Parliament Plenary on the EU coordinated action to combat the coronavirus pandemic and its consequences. European Commission. Recovered from https://ec.europa.eu/commission/presscorner/detail/en/speech_20_675
42. CEPS. (2020, March 31). The European Green Deal after Corona: Implications for EU climate policy. Recovered from https://www.ceps.eu/ceps-publications/the-european-green-deal-after-corona/
43. Turk, Ž., Klinc, R. (2017). Potentials of Blockchain Technology for Construction Management. *Procedia Engineering*, *196*, 638-645. doi: https://doi.org/10.1016/j.proeng.2017.08.052
44. IEA. (2018). World Energy Outlook 2018. Recovered from https://www.iea.org/reports/world-energy-outlook-2018/energy-efficiency
45. IEA. (2019). World Energy Outlook 2019. Recovered from https://www.iea.org/reports/world-energy-outlook-2019/energy-efficiency