



Construction Project Level-based Environmental, Social, and Governance (C-ESG): A Review

Sungjin Kim, Ph.D.
Hanbat National University
Daejeon, South Korea

Soowon Chang, Ph.D.
Purdue University
West Lafayette, IN, USA

Sustainable business has been shed light on as a new way of business success by emphasizing global and local responsibility of environment, community, society, and economy in the industry and company levels. Environmental, social, and governance (ESG) factors of construction companies have often been evaluated by aggregating sustainability performance of their projects. However, the ESG is still underperforming in the project level. Therefore, the objective of this research is to propose the concept of the construction project level ESG (C-ESG) for facilitating sustainability practices in the construction industry. C-ESG intends to guide the valuation of non-financial performance in ESG and to achieve a higher level of sustainable development goals (SDG) for the construction project. A comprehensive literature review was conducted to consolidate evaluation metrics and key concepts in ESG, and adapt the ESG framework to the construction project context. In the project levels, three conceptual applications of the ESG framework can be considered: identifying priority public investment projects, supporting the bid/no-bid decisions, and monitoring and evaluating project progress. This research identified the needs and opportunities of C-ESG. In the future, further studies will be conducted to define key performance indicators (KPIs), metrics, and quantification methods in the three C-ESG types.

Key Words: Environment, Social, and Governance (ESG), Construction Project-level ESG (C-ESG), Sustainable Development Goals (SDG), Construction Management

Introduction

The United Nations (UN) established sustainable development goals (SDG) for promoting the wealth of each country while they pursue to protect the earth. The SDG is a high-level of goals for achieving a sustainable future for all countries, communities, and individuals on the planet (United Nations, 2020). A total of 17 SDGs addresses the significant challenges (e.g., climate change, energy, and industry innovations) for a sustainable future. In 2020, about 72% of the G250, the world's largest 250 companies, connected their business activities to the SDG in their corporate reporting system (KPMG, 2020). By referring to the SDGs, the companies have been trying to develop sustainability programs that can help to communicate their stakeholders including investors and shareholders in a transparent manner (Huber, Comstock, & Smith, 2018; KPMG, 2020). The developed programs consider both financial and non-financial elements for managing the companies and support the achievement of the SDG for the companies. Particularly, institutional investors such as pension and

sovereign wealth foundations are interested in the non-financial aspects in their business, such as sustainability and ethical goals of their investment (Huber et al., 2018). They also include environmental, social, and governance (ESG) factors considered as the sustainable financing for maintaining the sustainability of companies' business. To promote sustainable financing, the UN Environment Program Finance Initiative (UNEP-FI) presented three investment principles for responsible investment (PRI); sustainable insurance (PSI); responsible banking (PRB). Based on these principles, Sustainable Accounting Standards Board (SASB) provides a standard guideline for assessing the ESG framework of companies and consequently achieving sustainable financing (SASB, 2018a). The SASB standard helps to identify which non-financial elements that can influence the performance of financial conditions of the companies, regardless of the industry domains (SASB, 2017). Particularly, there is no exception for the construction industry. This domain has been considering ESG for sustainable development of companies as well as the industry itself, for example, they have established the program for leadership in energy and environmental design (LEED) for certifying the green building systems.

In particular of workforce health and safety, the construction industry has been focusing on the defect and safety-related work costs by managing their jobsites and laborers. Likewise, the contractors recently have been trying to incorporate the ESG values into their business for pursuing the SDG. Since the construction sectors usually have a negative social footprint, such as generating heavy construction wastes, high carbon emission levels, and losing the lives of laborers, the ESG indicators should be specially considered as core elements for enhancing their industry images as well as maintaining the sustainability of each company in the construction sector.

However, the level of SDG in this industry is still low because assessing the ESG is still underperforming in the construction project level as well as company level for their financial and non-financial performance (Kreander, Gray, Power, & Sinclair, 2005). Therefore, the main goal of this study is to review the literature related to the ESG adoption to the construction section and to propose the concept of the construction project level ESG (C-ESG) for achieving a higher level of SDG for the construction project as well as the company's better financial and non-financial performance. There were only a few scientific studies in the field of ESG in construction. However, this paper tried to collect the related information, find the departure of the problem, and propose the concept of C-ESG for further studies in this domain.

ESG Integration for Sustainable Financing

ESG framework should begin with defining the scope of evaluating an organization's ESG responsibility in the context of environmental, society, and governance, then understand material sustainability issues. Every business is intertwined with environmental, social, and governance (ESG) concerns (Henisz, Koller, & Nuttal, 2019). Three elements of ESG can be defined as environmental criteria including energy used, waste discharges, and resources needed by business operations, and impacts of living beings (Henisz et al., 2019); social responsibility of the organization's transparent and ethical activities and behaviors for people, institutions, and communities (Henisz et al., 2019; ISO, 2010); and internal systems to govern a business, to make decisions in ethics and compliance with the law, and to satisfy external stakeholders (Henisz et al., 2019). ESG Materiality can be defined as sustainability issues that have material impacts on the companies' financial condition and operating performance (SASB, 2017). Three metrics: revenue/costs, assets/liabilities, cost of capital/risk profile (SASB, 2017), were defined to evaluate the financial impacts. Materiality Map shows material sustainability issues by industry based on investors' interest and impacts on companies (SASB, 2021). Based on the material sustainability issues of a company, the company will be able to create a valuation model to forecast financial impacts by transforming its actions and practices. The

financial value of non-financial-driven activities will be quantified so that it improves returns to stakeholders and business operations while contributing to sustainable development. Figure 1 describes the process of integrating ESG and assesses the impacts on the company values.

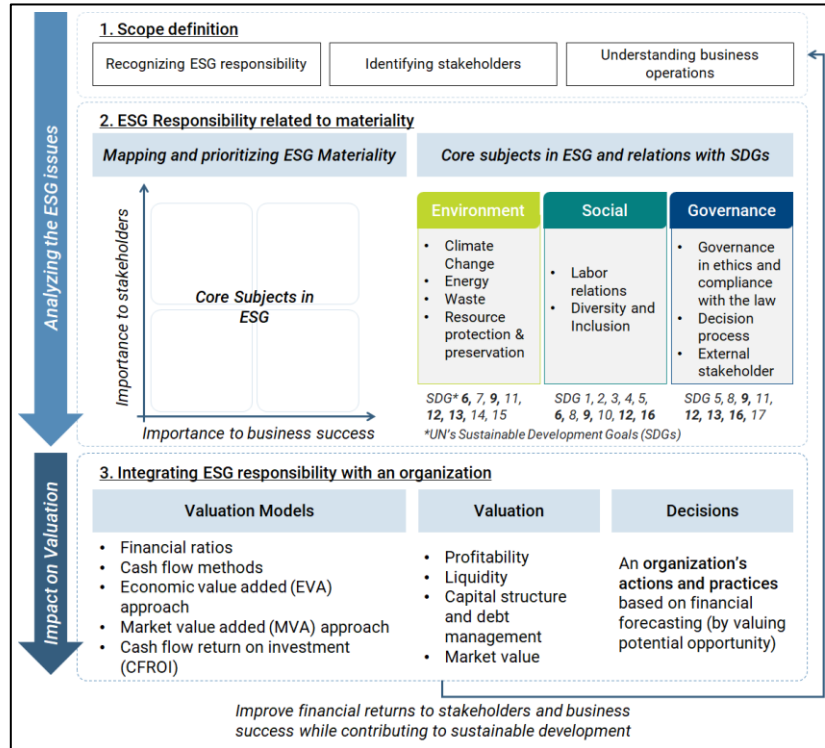


Figure 1. ESG integration framework (Referred to Berenberg, 2018; Hennisz et al., 2019; ISO, 2010; Skaug Saetra, Wynsberghe, Bolte, & Nachid, 2021; Stankeviciene, 2012; United Nations Global Compact, 2016)

Based on the framework, investors have been asking the ESG integrations for sustainable financing of the companies, and they have been using the ESG portfolios for screening their investment projects (Melas, Nagy, & Kulkarni, 2017). Also, ESG criteria have been integrated into investment decision processes (Kaiser, 2020). Hence, the companies accepted their requests by expanding the diversity of their business into ESG domains. For example, Netflix has decided to raise a creative development fund of about 20 million USD for the next 5 years, to strengthen their business diversity (Netflix, 2020). Clorox has also established a strategy of reducing virgin plastic usage by about 50% by 2030, to respond to the requests from their investors (Clorox Company, 2021). One of the largest global petroleum companies, ExxonMobil Inc. has utilized the ESG framework to develop a new business. This company has partnered with the U.S. government to develop the technology to capture and store carbon, and they invested in biomass technology to reduce greenhouse gases (ExxonMobil, 2020).

Also, the ESG framework includes climate changes, natural resources and energy, human resources, social responsibility, and organizational changes throughout the three components. Many companies have integrated those non-financial components to enhance their sustainability and their financial profits. ESG indicators can be measured as sustainable development of economic entities (Zhao et al., 2018). Companies need to assess materiality issues in the context of ESG which affects the financial significance and performance of their business (Steinbarth & Bennett, 2018). According to research

analyzing relationships between investment factors and ESG scores of the stock market, stocks with high ESG scores have shown stable earnings, lower accruals, and higher profitability (Melas et al., 2017). Therefore, companies have been opening their non-financial as well as financial data to the public by complying with international standards and the ESG framework (Buchholz et al., 2020; Lee, 2020).

However, the integration and application of ESG investment criteria are difficult to be universally accepted across countries and industries (Kaiser, 2020). The construction industry has unique and intrinsic features. Since different types of business, such as transportation, mechanics, and finance are connected in a single construction project, ESG in the construction industry should be adapted by considering its organization and management mechanism during the construction project life cycle.

ESG in the Construction Industry and Its Limitations

The construction industry often serves as an economic driver by hiring a workforce (Kim, Chang, & Castro-Lacouture, 2020) and activating multiple economic sectors such as the primary sector for extracting natural resources, secondary sector for manufacturing building materials and components, and tertiary sector for providing consultant services (e.g., design, engineering, and management) (Pheng & Hou, 2019). Many different parties, owners, contractors, and designers should be involved in the construction works (Ofori, 1990) and provide different professional practices which lead to a complicated organizational structure in the industry (Pheng & Hou, 2019). Although the team organization is temporary for a particular product (Pheng & Hou, 2019), collective efforts across organizations are required to reduce management costs and increase its profit during their collaboration (Kim, Han, Yi, & Chang, 2016).

With the emphasis on ESG integration, the construction industry has been focusing on establishing the future strategy for increasing their ESG scores. For example, Samsung Construction and Engineering Corporation declared that they will not invest the coal-related projects, such as thermal power plant construction or mining coal projects anymore after completing all the related projects currently ongoing. At the same time, they are planning to expand their business into eco-friendly or renewable projects (Park, 2021). Hyundai Construction Company is focusing on the development of smart safety technologies by adopting various information and communication technologies (ICT), and they aggressively invest the new renewable energy-related projects, such as hydrogen fuel-related facility construction, bio-gas-related, and tidal power generation projects for enhancing their business sustainability (Hyundai Engineering & Construction, 2020).

However, there is still a huge argument that the adoption of ESG components or sustainable financing into the construction has significant effects on the performance of the organization or their profits (Hoepner, Rezac, & Siegl, 2011; Siew, 2017). Kreander et al. (2005) found that there is no significant difference in the performance or investment when the construction companies returned the social and environmental responsibility to the society and community (Kreander et al., 2005). In addition, the adoption of ESG would lead to underperformance of the construction project as well as companies' financial performance in the construction industry (Siew, 2017). Poelloe (2010) surprisingly investigated that the construction companies' social responsibilities, such as reducing carbon, greenhouse gases, and construction waste or sharing the profits with the communities have a negative correlation with companies' financial and market performance (Poelloe, 2010). Another limitation is that the project managers are against emphasizing the construction companies' ESG-related activities and their responsibilities for society. They do not think of them as beneficial components to increase the financial performance of the business (Butković, Tomšić, & Kaselj, 2021).

Hence, to resolve the problems, Lovrenčić Butković et al (2021) emphasized that the construction firm should pay attention to collaborative ESG activities (e.g., reducing Carbon dioxide emissions, managing safety and health, reducing construction waste, increasing the return to the public and community, during the construction management and operations for obtaining the favorable business reputations from the public. Therefore, the construction project management should consider both non-financial and financial components including various trades, work processes, work processes, waste management, and workforce safety that can impact the sustainability of contractors’ business. Figure 2 shows the relationships of the ESG adoption in construction management and the success of the business of the construction companies in terms of their sustainability.

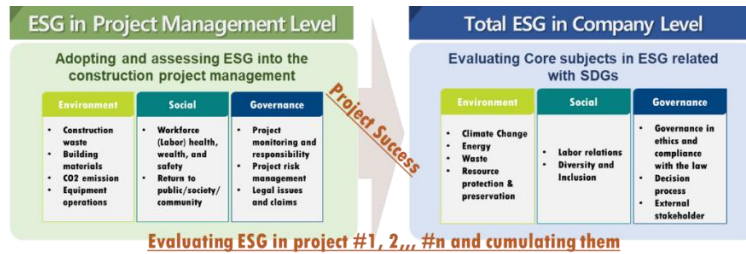


Figure 2. Relationship between ESG adoption to project and company levels

According to SASB, companies in engineering and construction services have significant materiality issues on ecological impacts in the environment dimension, product quality & safety in the social capital dimension, employee health & safety in the human capital dimension, product design & lifecycle management in the business model & innovation dimension, and business ethics in leadership & governance dimension (SASB, 2018b). The companies should measure six (6) sustainability topics: environmental impacts of project development, structural integrity & safety, workforce health & safety, life cycle impacts of buildings & infrastructure, climate impacts of business mix, and business ethics for their active projects, commissioned projects and total backlog (SASB, 2018a).

Proposing a Construction project level-based ESG (C-ESG)

The systematic and effective management during the project should aim to complete and deliver the product to the customer successfully by utilizing the knowledge, skills, and well-structured organization. It will contribute to providing an acceptable level of project safety, quality, and profits, hence sustainability is a very critical part of construction project management (Erdogan, Šaparauskas, & Turskis, 2019) and consequently the companies’ success. Therefore, this study defines the C-ESG as the decision-making process leading to the success of construction management as well as the entire business by considering ESG criteria. Considering both stakeholders and business success, example of materiality subjects in C-ESG is shown in Figure 3 for valuation.



Figure 3. Example of Materiality Subjects in C-ESG for Valuation (ARUP, 2018; Stanitsas, Kirytopoulos, & Leopoulos, 2021)

Strategies to implement C-ESG

To implement the C-ESG, three main components should be elaborated: (1) government owners should identify the priorities for their public investment projects as well as establish the ESG criteria for the project before advertising the bid; (2) general contractors should identify and consider the ESG framework that the government provided for supporting their decision-making to participate the bid or not; and (3) both subjects should manage and monitor how the project management runs for achieving the ESG goals. Figure 3 illustrates the concept of C-ESG between the public and private sectors.

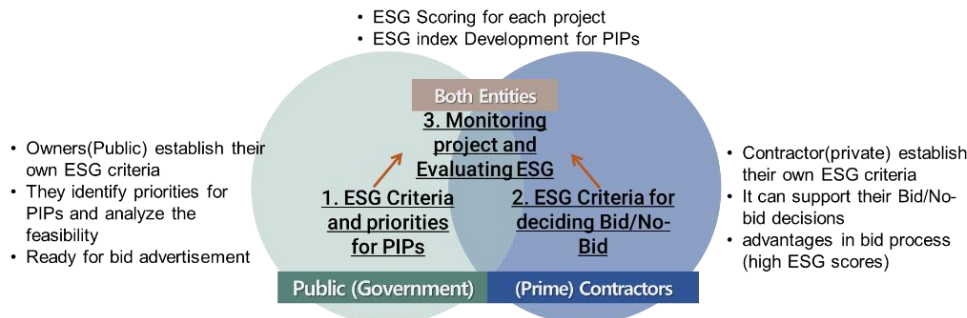


Figure 4. Concept of C-ESG

Government: Identifying Priority for Public Investment Projects Through Well-Defined the ESG criteria

The government as the owner of the public investment projects (PIP) generally provides the systematic process and scope for the project contractors in the public-private partnership (PPP). Typical public investment planning requires identifying the priorities for the PIP to decide a go or no-go based on its feasibility evaluation. Even the prime contractor participating in the PIP is assessed in terms of ESG in recent, they do not have any systematic ESG framework provided by the government. The project owner should establish the ESG framework for their construction project and their contractors, especially in the case of the PPP. The public entity can set up their ESG-focused strategies, establish ESG-connected project goals, conduct ESG-driven feasibility and cost-benefit analysis, and provide well-planned bid advertisements for the contractor candidates. Since all context should be under the legal framework, it might result in promoting the implementation of ESG into the construction projects in a practical way.

General Contractor: Identifying ESG Criteria for deciding the Bid/No-bid Decisions

One of the important components in the C-ESG concept is how the contractor can decide to participate in the PIP bid or not based on reviewing and identifying the ESG criteria that the owner provided. Based on the review, the contractor can establish their ESG strategy that can be implemented into their construction project management. This might provide a more objective decision-making tool for contractors can complete the project or not by referring to the ESG criteria that they should follow within the legal framework. This tool can be utilized as another feasibility analysis methodology in non-financial components for the contractor.

Both: Monitoring and Evaluating of Construction Project

Generally, contractors have their project monitoring process and plans for their project management; however, it is very difficult to assess the non-financial components during the project. Based on the ESG framework, both entities in PPP must have their ESG criteria to evaluate the values of sustainable finance aspects. The owner can monitor the construction process as well as assess the potential market values of the product (e.g., road, airport, or bridge) and profits. Also, they can establish their asset visions and management plans for the product. The private contractors can evaluate their non-financial performance, convert it into financial performance, and identify their final profits from this project. Thus, the contractor can stack their historical sustainable financial information for their construction project, and it can be utilized as their decision-making tool for future projects. Finally, the C-ESG can contribute to developing the systematic company ESG index as well as gaining higher ESG scores.

Discussion and Conclusion

This study provided the concept of C-ESG to promote a higher level of sustainability for the public project owners as well as the private contractors within the PPP. The main challenge in integrating the ESG framework is considering it from the companies' business management perspectives in the construction industry since this domain should have different characteristics regards the business structure as well as intrinsic features of construction projects. Therefore, the ESG framework must be designed by project level-based rather than the companies' entire business. First, the owner should have their ESG criteria for evaluating the feasibility and priorities of their public investment project. Second, the contractors (usually prime contractors) should also have their ESG criteria for considering both financial and non-financial feasibilities for deciding the participation of project bids or not. Third, both entities must assess their project and management process by utilizing their ESG framework. Then, the C-ESG index or framework will be developed for systematically evaluating the sustainable finance of construction projects, and the companies can obtain cumulative ESG scores for their business operations in the construction industry. This study still documents significant challenges. First, the number of literature used for review was very small. So, this study reviewed various types of literature including magazines, reports, and scientific papers, then the departure of the problem was established. The results should be further formalized and analyzed scientifically by expanding the knowledge about construction project-level ESG in the future. The suggested C-ESG concept is still required a scientifically formalized process through utilizing defining key performance indicators (KPI) and their importance based on the questionnaire responses and established C-ESG index referring to the general ESG framework. Further studies can also identify the critical factors influencing the performance of ESG in the construction project and analyze how they are taking actions under different scenarios through system dynamics simulation. Then, it is possible to promote establishing the C-ESG for enhancing the sustainability level of entities in the construction industry.

Acknowledge

This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (2021R1F1A1064109).

References

ARUP. (2018). *Sustainable Development Report 2017/18*. Retrieved from <https://www.arup.com/perspectives/publications/promotional-materials/section/sustainability-report>

- Berenberg. (2018). *Understanding the SDGs in Sustainable Investing*. KG: Hamburg, Germany. Retrieved from https://www.berenberg.de/files/ESG_News/SDG_understanding_SDGs_in_sustainable_investing.pdf
- Buchholz, H., Eberle, T., Klevesath, M., Jürgens, A., Beal, D., Baic, A., & Radeke, J. (2020). Forward Thinking for Sustainable Business Value: A New Method for Impact Valuation. *Sustainability* 2020, Vol. 12, Page 8420, 12(20), 8420. <https://doi.org/10.3390/SU12208420>
- Butković, L. L., Tomšić, D., & Kaselj, S. (2021). Collaborative Strategic View in Corporate Social Responsibility – Construction Industry Case. *Business Systems Research : International Journal of the Society for Advancing Innovation and Research in Economy*, 12(1), 144–163. <https://doi.org/10.2478/bsrj-2021-0010>
- Erdogan, S. A., Šaparauskas, J., & Turskis, Z. (2019). A Multi-Criteria Decision-Making Model to Choose the Best Option for Sustainable Construction Management. *Sustainability* 2019, Vol. 11, Page 2239, 11(8), 2239. <https://doi.org/10.3390/SU11082239>
- Henisz, W., Koller, T., & Nuttal, R. (2019). *Five ways that ESG creates value*.
- Hoepner, A. G. F., Rezec, M., & Siegl, K. S. (2011). Does Pension Funds' Fiduciary Duty Prohibit the Integration of Environmental Responsibility Criteria in Investment Processes?: A Realistic Prudent Investment Test. *SSRN Electronic Journal*. <https://doi.org/10.2139/SSRN.1930189>
- Huber, B. M., Comstock, M., & Smith, H. (2018). UN Sustainable Development Goals—The Leading ESG Framework for Large Companies. In *The Harvard Law School Forum on Corporate Governance*. The Harvard Law School Forum on Corporate Governance. Retrieved from The Harvard Law School Forum on Corporate Governance website: <https://corpgov.law.harvard.edu/2018/10/04/un-sustainable-development-goals-the-leading-esg-framework-for-large-companies/>
- Hyundai Engineering & Construction. (2020). *2020 Hyundai Engineering & Construction Sustainability Report*. Retrieved from https://www.hdec.kr/kr/company/library_03.aspx?
- ISO. (2010). *ISO 26000 Social Responsibility*. Retrieved from <https://www.iso.org/iso-26000-social-responsibility.html>
- Kaiser, L. (2020). ESG integration: value, growth and momentum. *Journal of Asset Management*, 21(1), 32–51. <https://doi.org/10.1057/S41260-019-00148-Y>
- Kim, S., Chang, S., & Castro-Lacouture, D. (2020). Dynamic Modeling for Analyzing Impacts of Skilled Labor Shortage on Construction Project Management. *Journal of Management in Engineering*, 36(1). [https://doi.org/10.1061/\(ASCE\)ME.1943-5479.0000720](https://doi.org/10.1061/(ASCE)ME.1943-5479.0000720)
- Kim, Y.-W., Han, S.-H., Yi, J.-S., & Chang, S. W. (2016). Supply chain cost model for prefabricated building material based on time-driven activity-based costing. *Canadian Journal of Civil Engineering*, 43(4). <https://doi.org/10.1139/cjce-2015-0010>
- KPMG. (2020). *The KPMG Survey of Sustainability Reporting 2020*. Retrieved from home.kpmg/sustainabilityreporting
- Kreander, N., Gray, R. H., Power, D. M., & Sinclair, C. D. (2005). Evaluating the Performance of Ethical and Non-ethical Funds: A Matched Pair Analysis. *Journal of Business Finance & Accounting*, 32(7–8), 1465–1493. <https://doi.org/10.1111/J.0306-686X.2005.00636.X>
- Lee, J. (2020). *기업의 사회적 가치와 커뮤니케이션 (Corporates' social value and communications)*. Retrieved from https://www2.deloitte.com/content/dam/Deloitte/kr/Documents/insights/deloitte-korea-review/11/kr_insights_deloitte-korea-review-11_06.pdf
- Melas, D., Nagy, Z., & Kulkarni, P. (2017). Factor Investing and ESG Integration. *Factor Investing: From Traditional to Alternative Risk Premia*, 389–413. <https://doi.org/10.1016/B978-1-78548-201-4.50015-5>
- Ofori, G. (1990). *The Construction Industry: Aspects of Its Economics and Management*. Singapore University Press.
- Park, G. (박근홍). (2021). [ESG's 왓] 삼성물산, 친환경 행보 눈길...총수 이슈·안전 문제는 약점.

- [Http://www.sisaon.co.kr/](http://www.sisaon.co.kr/). Retrieved from <https://www.sisaon.co.kr/news/articleView.html?idxno=125309>
- Pheng, L. S., & Hou, L. S. (2019). The Economy and the Construction Industry. In *Construction Quality and the Economy* (pp. 21–54). Springer Nature Singapore Pte Ltd. https://doi.org/10.1007/978-981-13-5847-0_2
- Poeloe, A. (2010). *Is there a trade-off between social responsibility and financial performance?* (Master thesis in Erasmus University Rotterdam.). Master thesis in Erasmus University Rotterdam. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.866.197&rep=rep1&type=pdf>
- SASB. (2017). *SASB Conceptual Framework*. Retrieved from https://www.sasb.org/wp-content/uploads/2020/02/SASB_Conceptual-Framework_WATERMARK.pdf
- SASB. (2018a). *Engineering & Construction Services*. Retrieved from <https://www.sasb.org/standards/download/>
- SASB. (2018b). SASB Materiality Map. Retrieved from Sustainability Accounting Standards Board website: <https://materiality.sasb.org/materiality.html>
- SASB. (2021). Exploring Materiality. Retrieved from Sustainability Accounting Standards Board website: <https://www.sasb.org/standards/materiality-map/>
- Siew, R. Y. J. (2017). Critical evaluation of environmental, social and governance disclosures of Malaysian property and construction companies | *Construction Economics and Building*. *Construction Economics and Building*, 17(2), 81–91. Retrieved from <https://search.informit.org/doi/abs/10.3316/informit.947578197095696>
- Skaug Saetra, H., Wynsberghe, van, Bolte, L., & Nachid, J. (2021). A Framework for Evaluating and Disclosing the ESG Related Impacts of AI with the SDGs. *Sustainability 2021, Vol. 13, Page 8503, 13(15)*, 8503. <https://doi.org/10.3390/SU13158503>
- Stanitsas, M., Kirytopoulos, K., & Leopoulos, V. (2021). Integrating sustainability indicators into project management: The case of construction industry. *Journal of Cleaner Production*, 279, 123774. <https://doi.org/10.1016/J.JCLEPRO.2020.123774>
- Stankeviciene, J. (2012). Methods for valuation of restructuring impact on financial results of a company. *Economics and Management*, 17(4), 1289–1295. <https://doi.org/10.5755/J01.EM.17.4.2990>
- Steinbarth, E., & Bennett, S. (2018). Materiality Matters: Targeting the ESG Issues that Impact Performance. In <https://corpgov.law.harvard.edu/>. The Harvard Law School Forum on Corporate Governance. Retrieved from The Harvard Law School Forum on Corporate Governance website: <https://corpgov.law.harvard.edu/2018/05/10/materiality-matters-targeting-the-esg-issues-that-impact-performance/>
- United Nations Global Compact. (2016). *Practical Guide to ESG Integration*. Retrieved from <https://www.unglobalcompact.org/>
- United Nations. (2020). *The Sustainable Development Goals Report 2020*. New York. Retrieved from <https://unstats.un.org/sdgs/report/2020/>
- Zhao, C., Guo, Y., Yuan, J., Wu, M., Li, D., Zhou, Y., & Kang, J. (2018). ESG and Corporate Financial Performance: Empirical Evidence from China's Listed Power Generation Companies. *Sustainability 2018, Vol. 10, Page 2607, 10(8)*, 2607. <https://doi.org/10.3390/SU10082607>