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Research paper

IMPLEMENTING AN ESG STRATEGY IN A CONSTRUCTION COMPANY

Eva Vitkova[1], Gabriela Kocourkova[2]

Abstract

Implementing an ESG strategy in business is one of the important steps on the path to sustainable development. In the construction sector, which is one of the largest consumers of natural resources and producers of emissions, the implementation of ESG principles is becoming a necessity.

The aim of the article is to describe the issue of implementing a sustainability strategy and setting specific ESG (environmental, social, governance) goals in the construction industry and a case study, including a description of the implementation of an ESG system in a selected construction company and the design of possible adjustments leading to improved functionality of this system.

ESG is a systematic framework that evaluates the non-financial performance of companies in three main ESG areas: E – environmental, S - social, G - governance.

This article focuses primarily on the environmental component of the ESG model, which in the context of the construction industry includes efficient resource management, waste minimization, recycling of building materials and emission reduction. The case study analyzes a specific contract that consists of the demolition of old industrial buildings. This project is unique in that it uses crushed concrete recyclate to create the fill body under the floors. The work focuses on a detailed analysis of the process, from initial plans and preparation, through the implementation of the work, to the evaluation of the results and the identification of recommendations for future projects. The work seeks to highlight the possibilities of improving environmental efficiency through a responsible approach to waste and recycling. At the same time, it emphasizes the need to introduce innovative technologies and strategies that contribute to the sustainable development of the construction industry.

Key words: ESG strategy, construction industry, recycling, circular economy

[1] Ph.D. Eng., Associate professor, Brno University of Technology, Czech republic, eva.vitkova1@vut.cz, ORCID 0000-0002-2028-953X

[2] Ph.D., Eng., Assistant professor, Brno University of Technology, Czech republic, gabriela.kocourkova@vut.cz, ORCID 0000-0002-7710-767X

1. INTRODUCTION

Global challenges such as climate change, increasing waste production and depletion of natural resources are creating increasing pressure for the implementation of sustainable solutions in construction companies. The ESG strategy provides a framework for achieving this goal while taking into account the impact of all its activities on the environment. Special emphasis is placed on the issue of waste management, which is one of the most pressing areas of environmental sustainability in the construction industry. Recycling and reuse of materials represent promising solutions that reduce the burden on landfills, save natural resources and support the circular economy [1,2].

Implementing an ESG strategy in business is one of the important steps on the path to sustainable development. In the construction sector, which is one of the largest consumers of natural resources and producers of emissions, the implementation of ESG principles is becoming a necessity. The aim of this strategy is to support sustainable development and improve the environmental, social and governance aspects of business processes [3,4].

The ESG framework provides a comprehensive view of the sustainability of organizations, combining environmental, social and governance aspects. Its multidimensional structure allows for the identification and management of various changes and opportunities, from climate change to social inequalities. ESG analysis thus offers a valuable tool for strategic decision-making, enabling not only financial decisions but also an understanding of broader societal contexts [5].

In the context of European policy, the position of the ESG framework has been significantly strengthened in recent years. This framework is closely linked to EU goals, such as the 2019 European Green Deal, which commits all Member States to achieve climate neutrality by 2050, or the 2030 Agenda, of which 17 Sustainable Development Goals are a key part. In response to the growing importance of ESG, the introduction of binding documents that Member States must incorporate into their national legislation. The key document in this area is the Directive of the European Parliament and of the Council (EU) 2022/2464, entitled Corporate Sustainability Reporting Directive (CSRD), which introduces requirements for reporting non-financial sustainability information, thereby increasing transparency, reliability and comparability of data that will facilitate decision-making for all stakeholders [6,7].

From the beginning of 2024, companies to which this obligation applies must regularly publish sustainability reports. Obligatory entities are organizations that meet at least two of the following three conditions, namely that the company has more than 250 employees, has a net turnover of at least 1 billion CZK (40 million EUR), and balance sheet assets are higher than 500 million CZK (20 million EUR). [8] It is clear from these conditions that these are mainly large companies.

Since the article focuses only on the Environmental part of the ESG strategy, namely on waste management, this issue will be discussed only briefly. Waste management is a key area of environmental policy, focused on effective waste management in accordance with the principles of sustainable development. Modern waste management plays an important role in protecting the environment and public health. At the same time, it contributes to the circular economy, thereby supporting the reduction of the consumption of primary raw materials. An important tool in this area is legislation, which sets out rules and obligations for individuals, businesses and public administration [9].

In the field of waste management, the Czech Republic is governed not only by national legislation, but also by European directives. The European Union has adopted several framework directives aimed at regulating waste flows and reducing negative impacts on the environment. Directive (EU) 2018/851 of the European Parliament and of the Council constitutes the legal basis for modern recycling and waste management. It clearly defines what can be considered waste and sets criteria according to which materials can be classified as either by-products, products that are created as a by-product of the production process, or lose their waste status when certain conditions are met. An important aspect of this directive is the definition of the use and recognition of the potential benefit of waste [10].

In Czech legislation, waste management is primarily regulated by the aforementioned Act on Waste No. 541/2020 Coll., which divides waste into only two basic categories – other and hazardous. Together with Act No. 545/2020 Coll., on packaging and other related legal regulations regulate all aspects of waste management, from its generation to final disposal. They set strict requirements for waste sorting, collection, recycling and disposal, thus their aim is to minimize the negative impacts of waste on the environment, promote recycling and reuse, and at the same time set clear rules for waste management [11,12]. According to the Waste Act, waste generators and persons authorized to conduct waste business are obliged to send reports on annual waste production and management to the relevant municipal office of the municipality with extended obligations. This data is entered into the national ISOH2 database and is subsequently sent to the European Commission [12].

Waste classification is necessary for the purposes of their correct recovery and management. Waste is divided according to several criteria, such as origin, composition and hazard. An important document for waste classification is the Decree on the Catalogue of Waste and Assessment of Waste Properties No. 8/2021 Coll., which contains a detailed list of all types of waste and their classification into individual categories [13].

Many authors from different countries of the world deal with the management of the circular economy, or rather the circular economy. For example, Tomič and Shneider published an article in 2020 in terms of the socio-economic impacts of changing the system structure of the circular economy [14]. Waste management in the sense of energy recovery was addressed by the authors Brunner and Rechberger, who identified this as key for sustainable waste management [15]. E-waste in an international context, where they presented primarily an overview of trade flows, regulations, hazards, waste management strategies and technologies for value recovery, was addressed by the authors Ilankoon, Ghorbani, Chong, Herath, Moyo and Petersen [16]. An overview of waste management decision-making methods in the construction industry was described in an article by Palafox-Alcantar, Hunt, and Rogers [17]. The possibility of using fresh concrete waste in concrete for non-structural engineering works as a waste management strategy was already discussed in 2017 by Rughooputh, Rana, and Joorawon [18]. The application of smart waste management was discussed in 2021 by Petriwi, Kristinayanti, Andayani, Aryawan, Indrayanti, and Sudiarta at the Department of Civil Engineering, Bali State Polytechnic [19]. The redefining of construction and demolition waste management systems and best practices for construction works was discussed by Sáez, Báez, and Navarro in 2020 [20]. A case study on the dynamic analysis of the construction and demolition waste management system in Tehran, Iran was compiled by Ghanbari in 2022 [21]. Last but not least, the authors Drochytka, Dufek, Michalčíková and Hodul studied the possibility of using special types of construction and demolition waste in the construction industry in their article in 2020 [22].

2. METHODOLOGY

The case study deals with the identification, sorting, and analysis of individual types of waste. In order to carry out these, the individual types of waste were identified in two phases of the construction contract, namely:

- design phase,
- implementation phase.

In the design phase, waste was identified from the project documentation, where the expected types of waste to be produced were considered.

In the implementation phase, waste was identified from the implemented construction budget and from the construction company's accounting, where invoices for waste disposal were identified from specialized companies dealing with this issue.

The following phases were used within the methodology:

- identification,
- description,
- analysis,
- comparison,
- evaluation.

3. CASE STUDY

The case study is based on a construction contract that includes the demolition of 9 buildings intended for various types of activities. The construction company that implemented this large contract is medium-sized. This means that it is not currently subject to the ESG framework obligation, but within the framework of waste management (i.e. the Environmental area), this company must report the amount of construction and demolition waste produced. The case study focuses on identifying construction and demolition waste in some phases of the construction contract.

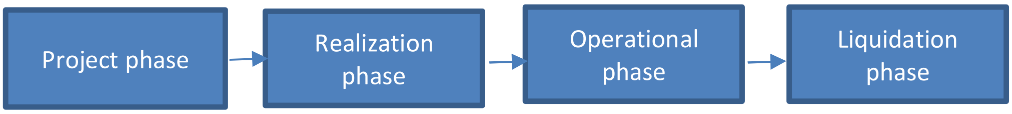

Figure 1. View construction contract phases [source own]

The aim of the study is to identify the differences between planned and actual waste volumes and to analyse the factors that influenced these differences. Attention is paid to technological processes, planning quality, work efficiency and possibilities of separation and recycling on the construction site. An important part of the analysis is the examination of the use of the waste generated, assessing whether the principles of the circular economy have been observed and the amount of waste disposed of in landfills has been minimised.

The results of this analysis can provide valuable insights into the possibilities of streamlining waste management in the construction industry and linking the individual phases of the construction contract from the perspective of the generated construction and demolition waste.

3.1. Description of construction order

The construction contract concerns the demolition of a site that was previously a manufacturing plant. This site consists of several buildings that form a single functional unit. These are buildings built around the third quarter of the 20th century, which are technologically outdated, energy inefficient and no longer meet current requirements for industrial production. They are built from materials that corresponded to the time of their construction and do not show any major static defects that threaten stability. However, there are signs of degradation and wear, especially in materials with a shorter lifespan, such as wooden structures, hole fillings, metalwork and plumbing elements or external surface finishes. The perimeter structures do not meet current thermal and energy standards. There are a total of 9 different buildings - these are mainly former production halls and storage areas, and the site also includes a former administration building, a bicycle shed, a stonemason's workshop and a sauna.

The demolition was preceded by emptying the buildings, dismantling the technologies and thoroughly cleaning all areas. The scope of the demolition included the removal of above-ground and underground parts of the buildings, including infrastructure and paved areas with a total area of approximately 7,000 m2. The infrastructure of the area includes gas, electricity and water distribution, but their exact condition and routes were not known. According to available information, there was no sewage network in the area. During the removal of the buildings, a significant amount of demolition materials of various types were created, which are related to the scope and nature of the structures and materials used. The demolition work was carried out using procedures that maximize the reuse or recycling of the resulting materials. suitable for recycling in the construction industry. The waste generated by the buildings was divided into several basic groups according to their nature based on the Waste Catalogue. The estimate of their quantity is only indicative and is based on the scope of the planned work. The approximate amount of waste produced during the implementation of the construction contract is created in the project part, when the construction contract budget is created based on the project documentation. The amount of waste is shown in Table 1.

The demolition of the buildings was carried out with an emphasis on sorting and recycling the resulting construction waste. Extensive landscaping was also carried out simultaneously with the demolition. An embankment was constructed on the compacted plain using demolition recyclate. The biggest problem during the demolition was the large differences in the obtained recyclate. This was due to the non-existent project documentation of the original buildings. Although the quality of the materials seemed to be in line with the assumptions, the higher volume required additional modifications and increased demands on logistics and separation, which resulted in increased financial costs.

3.2. Utilization of individual waste generated for recycling

Before the demolition work began, it was assumed that part of the concrete raw material would be used in the construction and the remaining amount would be left on the investor's land. Despite the higher amount of **concrete waste material** produced, it was found that this volume was not sufficient to cover all the material requirements of the new project. All available concrete raw material was subsequently used in the construction work as a fill body under the floor of the new industrial building, and due to the increased demands on the project, it was also necessary to purchase additional aggregate.

In the case of **waste from brick structures**, the amount of waste increased compared to the original assumptions. The investor did not consider using this type of waste in the implementation of the new building (after the demolition of the existing building, and therefore it was taken to a landfill, where it was subsequently materially evaluated. This procedure takes into account the principles of the circular economy and contributes to increasing recycling and reuse of construction and demolition materials.

Before the demolition itself, **all glass elements** (windows, doors) were carefully dismantled, which were then stored in a designated place in marked containers. This glass waste was then transported to facilities specializing in its recycling.

The separated **plastic was** stored in marked containers, from where it was transported to recycling facilities. Recycling of glass and plastic waste not only reduces the amount of waste deposited in landfills, but also supports the principles of the circular economy and the fulfillment of legislative goals of reducing the environmental burden.

Asphalt mixtures, tar and products from it were mechanically removed and collected in designated places to prevent contamination with other waste. They were then transported to a recycling facility where they were crushed, cleaned and processed. This process supports the reuse of asphalt waste, minimizing the need for new raw materials and maximizing the use of existing construction materials.

All types of **metal waste** were materially recovered, which is an effective and environmentally responsible solution. Metal elements were dismantled manually or mechanically, taking care to minimize their damage and contamination with other materials. Separated waste was stored in designated areas and transported to a waste processing facility.

Soil formed a significant part of the waste generated. Clean and uncontaminated soil was used for backfilling and landscaping. Before being used, the soil had to be screened, which means sieving it to remove unwanted particles such as construction material residues, stones, roots or other impurities. The screened soil has a homogeneous composition and better properties (compactionability, grain size) for further use.

The original estimates regarding the amount of **insulation waste material** turned out to be inaccurate, the actual amount was higher than expected. Due to the contamination of the material, it had to be deposited in a specialized construction waste landfill. This type of waste must be handled in accordance with strict environmental regulations.

Other mixed construction and demolition waste was deposited in a specialized construction waste landfill. Recycling is considered an unsuitable waste treatment option in this case, due to the demanding implementation directly on the site of the demolition work.

For **other municipal waste** – paper, plastic packaging, textiles, it was necessary to ensure proper separation. This waste was first sorted at the place of origin, where the individual materials were separated into different containers or bins. Waste that is suitable for recycling was transported to a facility for further processing. If the waste could not be separated, it was taken to a landfill, where it was subsequently deposited. This approach takes into account the need to minimize the environmental impact by choosing landfilling only as a last resort.

3.3 Result of Case Study

Table 1 shows a comparison of the expected and actual amounts of waste generated during demolition, including variations in volume and costs associated with disposal. As stated in the previous chapter, the expected amounts of waste were determined based on available data from the design phase, i.e. from the project documentation. The actual amount of waste in the implementation phase was determined from the construction contract implementation budget and based on the accounting output, where invoices for the removal and disposal of individual types of waste in specialized centers were identified. The actual amount of waste confirmed significant variations in the volume of individual types of waste, which was mainly caused by incomplete project documentation and failure to take into account the specifics of the demolished area, which was previously used as a facility for the production of small concrete elements. The exact amount of waste could not be determined, with the exception of categories 17 06 – Insulation material and 17 09 – Other construction and demolition waste, where data is available from cash receipts issued by the facility after receiving the waste at the landfill, i.e. from the construction company's accounting.

Table 1 therefore shows the individual types of waste that were generated within the construction contract, and the amounts were identified in two phases of the construction contract, namely:

- project phase – the amount is determined from the project documentation,
- implementation phase – the amount is determined from the implemented construction budget and from the construction company's accounting.

Table 1. Overview of types of demolition waste with expected and actual quantities and costs, [source own]

Catalog number	Waste name	Estimated quantity [t]]	Actual quantity [t]	Deviation [t]	Estimated costs [CZK]	Actual costs [CZK]]
17 01	**Concrete, bricks, tiles and ceramics**	**7 584.66**	**13 909.00**	**6 324.34**	-	-
17 01 01	Concrete	5 976.98	11 452.00	5 475.02	-	-
17 01 02	Bricks	1 523.02	2 457.00	933.98	-	for transportation
17 01 07	Mixtures or separate fractions of concrete, bricks, tiles and ceramic products not specified under heading 17 01 06	84.66	-	-	-	-
17 02	**Wood, glass and plastics**	**27.23**	-	-	-	-
17 02 01	Wood	12.41	-	-	-	-
17 02 02	Glass	12.29	-	-	-	-
17 02 03	Plastics	2.53	-	-	-	-
17 03	**Asphalt mixtures, tar and tar products**	**3.95**	-	-	-	-
17 03 02	Bituminous mixtures other than those mentioned in 17 03 01	3.95	-	-	-	-
17 04	**Metals**	**44.16**	-	-	-	-
17 04 01	Copper	0.42	-	-	-	-
17 04 02	Bronze	0.63	-	-	-	-
17 04 05	Brass	39.86	-	-	-	-
17 04 07	Aluminum	1	-	-	-	-
17 04 11	Iron and steel	2.25				

Catalog number	Waste name	Estimated quantity [t]]	Actual quantity [t]	Deviation [t]	Estimated costs [CZK]	Actual costs [CZK]]
	Mixed metals	-	-	-	-	-
17 05	**Soil (including excavated soil from contaminated sites), aggregates, excavated waste rock and tailings**	**1 502.82**	**-**	**-**	**-**	**-**
17 05 04	Soil and aggregates other than those mentioned in 17 05 03	1 502.82	-	-	-	-
17 06	**Insulation material and building materials containing asbestos**	**1.25**	**54.02**	**52.77**	**-**	**40 888.00**
17 06 04	Insulation materials other than those mentioned in 17 06 01 and 17 06 03	1.25	54.02	52.77	-	40 888.00
17 09	**Other construction and demolition waste**	**2.65**	**19.64**	**16.99**	**-**	**20 610.00**
17 09 04	Mixed construction and demolition wastes other than those mentioned in 17 09 01 and 17 09 03	2.65	19.64	16.99	-	20 610.00
20 03	**Other municipal waste**	**6.44**	**-**	**-**	**-**	**-**
20 03 01	Mixed municipal waste	4.44	-	-	-	-
20 03 99	Municipal waste not otherwise specified	2	-	-	-	-
Total		**9 173.16**	**-**	**-**	**4 000 000**	**5 231 453**

Note: 1 Euro = 25.50 CZK

To understand the data in Table 1, it is necessary to add several conditions:

- the estimated quantity was determined in the design phase, i.e. from the design documentation,
- the actual quantity was determined based on the implemented construction budget of the construction contract, or from accounting, i.e. from invoices from specialized companies that deal with waste management,
- if the values of the estimated quantity and the actual quantity differ, or are not determined in one, then they were not identified at this stage,
- the total price of the estimated quantity was determined in the design phase, i.e. as estimated and was determined as a whole,
- the total price of the actual quantity was determined based on the implemented construction budget or directly from the accounting of the construction company.

4. DISCUSSION

From the case study, which included a construction contract focused on the demolition of 9 buildings made of various types of material, it is clear that waste management, especially construction and demolition waste, needs to be further streamlined. From the description of the case study, it is clear that there is currently pressure not only on construction companies to approach the management of construction contracts in an ecological, i.e. environmentally friendly way. However, it is clear here, especially from Table 1, that not all tools for the management of effective waste management exist yet. Especially in the design phase, where in this part of the construction project, with inaccurate or completely missing input data, it is not possible to specify in detail the expected individual types of waste. For example, this fact can be caused, as in this case study, by the lack of original project documentation.

From Table 1, it is clear that large deviations in quantity were found for almost all individual types of waste, which is due to ignorance of the original project documentation and ignorance of the structures of the original 9 buildings. The total estimated price was also inaccurately estimated, with the difference between the actual and estimated price being a 30% increase over the estimated value. This increase is again due to unfamiliarity with the terrain, the construction of demolished buildings that are not visible (e.g. foundations that are underground) and the lack of original project documentation that would map the current state of the buildings.

5. CONCLUSION

The implementation of an ESG strategy in the construction industry is necessary not only as a response to growing environmental, social and legislative requirements, but also as a key step towards the sustainable development of the entire sector. This diploma thesis, focusing on the environmental component of ESG, analyzes the issues of waste management, recycling of construction materials and specific possibilities for the use of crushed concrete recyclate in the construction of a new industrial complex. The results point to the fact that responsible management of construction waste, its recycling and reuse represent effective solutions for reducing the ecological footprint of construction companies, while supporting the circular economy.

Although the environmental (E) component of ESG plays a key role in the analyzed construction company, its implementation should be only the first step. It is recommended to gradually expand the strategy to include social (S) and governance (G) aspects. Adopting these pillars can bring several significant benefits to the company. Emphasis on the social dimension can improve the working environment, increase employee satisfaction and loyalty, and at the same time strengthen the company's reputation in the market. The management pillar emphasizes transparency, ethical business and effective risk management, which leads to long-term stability of the company.

The example of a specifically addressed project demonstrates the effectiveness of the use of recycled materials, while also showing the challenges associated with their wider implementation. These challenges include insufficient legislative support, the simplicity of landfilling compared to other methods and the need for technological innovations. Changing this situation requires the introduction of higher landfill fees, support for recycling centers and the dissemination of awareness in the field of recycling.

In conclusion, it can be stated that the implementation of ESG principles in the construction sector is not only a challenge, but also a huge opportunity. This work points to the practical possibilities and benefits of a responsible approach to construction and demolition waste and provides opportunities for its further use. Sustainability in the construction industry should not be perceived only as an obligation, but as a strategic investment in the future, which brings innovation, increases efficiency and supports the long-term competitiveness of the entire sector.

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