

# Environmental protection in the reports of medium-sized manufacturing enterprises in Hungary - a regional perspective

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## Abstract

Nowadays, we are confronted with the importance of environmental protection everywhere, whether we browse the internet or walk down the street, we find news and advertisements about it everywhere. But it is not only an issue for individuals, but it is also increasingly important for companies, as they must comply with ever stricter legislation and international consumer expectations. Studies on environmental investment have been around since the end of the last century, but in this research, we focus on the SME sector, including the Hungarian manufacturing industry. The manufacturing industry was chosen because it is one of the largest industries in Hungary and is therefore likely to be more numerous in several regions for comparability in terms of regionality.

The aim of the research is to investigate whether there are regional differences or similarities between medium-sized enterprises in the domestic manufacturing sector in terms of environmental expenditure and the information reported on it. Research on environmental sustainability activities and ecological footprint calculations in the corporate sector is available, and there are several methods for regional sustainability efforts that form the basis of our analysis.

The research was carried out on a 239-item sample of medium-sized manufacturing enterprises in Hungary, using content analysis to examine the supplementary annexes and annual reports of selected enterprises. Results are presented in a regional context.

*Keywords:* SME sector, environment, regional spread, supplementary annexes

*JEL Classification:* Q56, R12

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## 1. Introduction

Nowadays, we are confronted with the importance of protecting the environment everywhere, whether we are walking down the street or browsing the internet, we can find advertisements and commercials about it. But this is not only an important issue for individuals, it is also becoming more and more important for businesses, as they have to comply with increasingly stringent legal requirements and international

customer expectations (Zilahy & Széchy, 2020). Studies on environmental investment can be found since the end of the last century (Szász, 1985). In the present research, we focus on the SME sector, and within that on the manufacturing sector. We chose the manufacturing sector because it is one of the most numerous industries in our country, and thus, in terms of regionality, it is likely to be more numerous in several regions for comparability.

The aim of our research is to investigate whether there are any regional differences or similarities in environmental investments and their reported information among medium-sized enterprises in the domestic manufacturing sector. Research on the environmental and sustainability activities of the corporate sector and on the calculation of the ecological footprint can be found in (Szigeti, et al., 2019) (Széchy & Zilahy, 2018), regional sustainability efforts (Zsóka & Zilahy, 2011), and a number of methods are available for corporate environmental performance assessment (Harangozó, 2008) which serve as a basis for our analysis.

## **1. Theoretical background**

The term entrepreneurship, still in use today, dates to the 18th century and is attributed to Richard Cantillon, who described entrepreneurship as ubiquitous and attributed to the entrepreneur a central role in the economy (Brown & Thornton, 2013). In defining the concept of the entrepreneur, Jean-Baptiste Say and Joseph Schumpeter highlighted innovation (Filion, 2021) (Eroglu & Picak, 2011), according to Frank Knight, a person with power in a production project, a decision maker, a manager of uncertainty (Snow, 2021).

According to János Vecsenyi, entrepreneurship is a value-creating process of creating something useful from almost nothing, taking uncertainty and risk to succeed. It includes the activities necessary to create, operate and maintain a new business (Vecsenyi, 2017).

In the European Union, small and medium-sized enterprises are the most important source of employment, which is why various programmes are being implemented to encourage entrepreneurship and increase their turnover. And in the longer term, it is cheaper to support these small businesses that create jobs than to support and support those who become unemployed with benefits. The SME sector is therefore crucial from both an economic and a social policy point of view, although the system in each country may differ depending on the social models. In the European Union, the SME sector is supported through an active enterprise policy (Lengyel, 2003).

Organisations engaged in economic activities, including the SME sector, are classified according to the main economic activity according to the Standard Industrial Classification of Economic Activities, i.e. TEÁOR'08, by sector (KSH, 2008). Among the branches of the economy, those engaged in manufacturing are of paramount importance for almost all countries. Although many consider services to be dominant, production and services are closely interlinked (for example, production and sales are followed by guarantees) (Vidéki & Kápolnai, 2015). Furthermore, among the economic sectors, manufacturing is the most prominent, as it is the growth that takes place in this sector that contributes most to economic growth (Nagy, 2016).

After the financial crisis of 2008, the promotion of manufacturing industries came to the fore in the economic policies of many countries, replacing the deindustrialisation that had been in place until then with re-industrialisation, a process known as re-industrialisation. Researchers tend to focus on changes in the structure of manufacturing industry in terms of the number of employees and gross value added, and in more detail on labour productivity, sales and export developments. In the early 2000s, labour productivity, gross value added, and export sales increased, while the number of employees decreased. All indicators declined significantly during the 2008 crisis but started to improve again from 2010. These changes are not only due to the re-industrialisation, but also to structural change (Nagy & Lengyel, 2016).

## **2. Environmental protection in business**

Companies need to address this issue not only out of their own initiative and in response to societal pressure, but also to meet increasingly stringent legal requirements and international customer expectations. Environmental protection in the modern sense of the term began to be more prominent in companies after the change of regime, particularly in heavy industry and in projects with a major environmental impact, while the problems caused by the service sector and light industry seemed insignificant in comparison with the former. But this trend has changed significantly in recent years, due to changes in the structure of the economy, technological solutions, international and domestic expectations regarding the environmental performance of economic operators. Companies are increasingly concerned about the environment because, among other things, they use natural resources to operate, producing goods, services and unwanted by-products. To minimise the environmental impact of their operations, it is essential to analyse inputs, outputs and processes used. However, there are also limits to improvements in the efficiency of these factors, since, if efficiency is improved, this can lead to further increases, so that environmental gains remain almost unchanged. In fact, if a company

can provide the same product or service using less raw materials/energy, its costs will fall, leading to lower prices, which in turn may encourage consumers to buy more. The increased demand will lead to more production, which will not reduce the amount of raw materials/energy used, nor the amount of harmful emissions. It is therefore necessary to set some limits on this, which can be helped by various environmental policy instruments (taxes/quotas), awareness raising programmes, new innovative business models (Zilahy & Széchy, 2020).

A 2013 study by Trucost concludes that industries with significant environmental impacts are not able to generate enough value to cover the negative impacts of the industry on the natural environment (Trucost, 2013).

In terms of the eco-efficiency of large multinational companies present in Hungary, the accession to the European Union and the environmental regulations set by them in several areas have led to an improvement. Resource use and emissions have decreased, but there is still work to be done to reduce environmental impacts. A number of factors still hamper the environmental performance of SMEs. Although the environmental impact of individual small businesses is low, overall these small firms are responsible for around 60% of industrial pollution. The European Union is therefore explicitly trying to promote cleaner production in this sector through various efforts: increasing competitiveness, efficient use of resources, reducing environmental impact. For SMEs, the main obstacle to achieving these objectives is the availability of adequate capital (Széchy & Zilahy, 2018).

Environmental protection is now also reflected in the accounting activities of businesses. At the broadest level, sustainability accounting deals with this, measuring, analysing and integrating social and economic sustainability in a comprehensive way (Schaltegger & Burritt, 2010) (Bosnyák-Simon, 2021). Two further branches of this can be considered social accounting on the one hand and environmental accounting on the other. The latter links the natural environment and the company (Bosnyák-Simon, 2021). In another formulation, environmental accounting is described as a part of the traditional accounting system that discloses the financial impacts of the environment on a given economic system, together with activities, methods and systems (Reyes, 2002) (Bosnyák-Simon, 2021).

Why should companies engage in environmental accounting? In traditional accounting, environmental costs are included in overheads, so it is not clear exactly to which product the cost of the pollution emitted belongs. If the scale of these costs is significant, this is a serious problem. Thus, it has become increasingly important to include in overheads not only direct material and labour costs, but also transaction

costs that are necessary for production but do not directly become part of the product. Environmental protection can also be included. It may also be the case that a significant proportion of environmental costs is incurred in the production of only one or two products, and thus the separate inclusion of this factor may be crucial from a business point of view, since the product may not be profitable. Environmental considerations should also be considered in relation to products and investment decisions and should be expressed in monetary terms where possible (Csutora, 2001).

Environmental accounting treats information on environmental costs separately, which can reveal effects that can lead to cost savings. For example, the environmental costs of polluting products and services can be clearly identified, or savings can be generated as revenue for pollution prevention projects. Furthermore, environmental accounting also supports the implementation and operation of environmental management systems (e.g. ISO 14001). This also means that more attention is paid to up-to-date environmental information, environmental factors are assessed, impacts are analysed, with a focus on the financial impact on the company (Csutora, 2001) (Ván, 2008).

Environmental accounting therefore focuses on the following areas:

- identification and analysis of environmental expenditure, environmental costs,
- present the financial implications of environmental transactions, which will help facilitate decision-making,
- identification of areas of environmental risk (Ván, 2008).

In Hungary, there is no legislation in force on environmental accounting, but the Accounting Act sets out specific requirements for companies in relation to their environmental activities, including data reporting (Kozma & Bosnyák-Simon, 2022).

### **3. The additional annex**

The entrepreneur is obliged to report on his/her assets, financial and income situation and its changes, presenting a true and fair view. Act C of 2000 on accounting provides that "objective information on the assets, liabilities, financial position and profit or loss of both entrepreneurs and non-profit organisations and other entities engaged in economic activities, and on changes therein, must be available to market participants in order to enable them to make informed decisions."

The balance sheet and the profit and loss account are part of the accounts, but additional information is needed to fully comply with the requirements. A

supplementary annex is therefore a mandatory and integral part of the accounts and contains the additional information necessary to give a true and fair view. In other words, the supplementary notes must be published alongside the financial statements. The notes to the accounts are in an open-ended format, containing textual explanations in addition to the figures, to supplement and explain the information presented in the balance sheet and profit and loss account to interested parties, in chronological order (Ormos, 2018) (Paár, et al., 2021). The depth and level of detail to which this information is made available, the level of detail provided in relation to the importance of a particular topic, depends on the decision of the enterprise (Tóth, 2010).

The Accounting Act specifies the information on environmental protection that companies must provide in the supplementary annex (§ 94 (1), (2), (3)):

"The details of the tangible assets directly serving the protection of the environment, as specified in Article 92(1), shall be presented separately in the supplementary annex.

The supplementary annex shall present the opening and closing stocks of hazardous waste and hazardous substances harmful to the environment in terms of quantity and value, and the increase and decrease in the quantity and value of hazardous waste and hazardous substances harmful to the environment during the year, based on the hazard classes according to the relevant legislation.

In the supplementary annex, the amount of the provision for environmental liabilities, the amount of the provision for future environmental protection costs established in the current and previous financial years, the amount of the costs related to environmental protection recognised in the current and previous financial years and the expected amount of the environmental protection and restoration liabilities not recognised as liabilities shall be presented separately by title." (Act C of 2000 on Accounting, undated)

#### **4. Database of the research**

The aim of this research is to investigate whether there are any regional differences or similarities in environmental investments and their reported information among medium-sized enterprises in the domestic manufacturing sector. We limited our analysis to medium-sized enterprises in the manufacturing sector, as it is one of the most polluting industries. The enterprises were collected using the Opten database, where the parameters included the manufacturing sector and the number of employees. In Hungary, there are currently 1671 medium-sized enterprises in this

industry, of which 239 were randomly selected for the study, and were proportioned by county for representativeness. For the 239 enterprises in the sample, the supplementary annexes for the financial year 2022 were downloaded from the Hungarian e-report site, as they are required to report and are therefore publicly available to all. Once downloaded, we looked at the categories of environmental protection that could be created based on their content, after learning about the methodology used, which is described below. Based on the first read-through, we created the categories and their corresponding criteria, then looked again at the documents one by one and summarised in an excel spreadsheet which criteria were true for each category. The number of elements in the sample was eventually reduced to 236, as for 3 companies the supplementary annex for 2022 was not available.

## **5. Research methodology**

In our research, we examined the factors and activities that appear in the supplementary annexes that companies are required to disclose in relation to environmental protection. In the literature, the method of content analysis is used to analyse texts of written documents intended for the public, and this is relevant to our research, so we used this method.

Content analysis is, simply put, the analysis of texts that have been read or heard. It is a research technique that can draw valid, repeatable conclusions from data by systematically and objectively identifying specific characteristics (R. Fedor, et al., 2016). A well-defined definition of content analysis: 'Content analysis is a research technique that draws repeatable and valid inferences from texts (and other meaningful raw materials) about the context of their use.' (Géring, 2014).

The use of content analysis in the social sciences is not very recent, having spread in the late 20th century, mainly in media studies, sociology, political science, psychology, literature and history, and even later in economics. (Vincze, 2019).

There are also different classifications of this method in terms of how it is used in practice. Majoros (2004) identified two main types: pragmatic and semantic content analysis. In the former, the data and information in a text are grouped according to the impact they have on the recipient and the reason for which they are included in the text. In the latter, signs and data are categorised according to their meaning, for example, the number of times each element occurs in a text (Majoros, 2004).

The main methodological steps of content analysis are like other methods:

- formulating research questions (hypotheses)

- sampling
- definition of units of analysis, categories, coding system
- carrying out analysis (Géring, 2014).

To carry out this research, we have gone through these points. Our aim is to see if there are any regional differences in environmental investment in medium-sized enterprises in the manufacturing sector. For this purpose, the sample size is 236 medium-sized enterprises. We started the analysis by understanding the content analysis methodology, where we looked for the following items in the supplementary annexes, based on the first read-through after downloading:

- elements relating to waste in general
- elements relating to hazardous waste
- investments related to the activity for the protection of the environment
- general environmental mentions.

For each of these aspects, we have created categories to help the analysis and comparability, also based on the experience gained during the reading of the report. We have defined 3 categories for waste in general and for the environment in general: 0- no mention, 1- only textual, 2- complex in the supplementary annex, i.e. with figures, data and text.

And for hazardous waste and investments related to the activity for the protection of the environment, 5 categories were defined: 0- no mention, 1- mention that it is not displayed in the enterprise, 2- only textual display, 3- textual display with values already displayed, 4- categorised, with specific numbers and figures displayed for each item.

In our review of the supplementary annexes, we looked at the amount of information provided by companies on the environmental elements also mentioned in the Accounting Act, and this is how we have included them in the categories we have developed.

## **6. Analysis**

We therefore examined the content of the supplementary annexes, focusing on four elements. However, to get a better sense of the efforts made by businesses to protect the environment, we have differentiated between those related to the activity and those not related to the activity by weighting. This means that double weighting is given to elements that are not related to the environmental activities of the enterprises. This means that a company can score a maximum of 16 points per

criterion. The table below summarises the scores achieved by each company and the number of companies achieving each score, and the cumulative percentage of each of these scores. The cumulative percentage means that only 4.66% of the enterprises scored 8 or more points out of a total of 100%, i.e. 11 enterprises. No enterprise reached the maximum, with only one enterprise scoring 12 points, which is outstanding for the sample. A significant majority of the businesses in the sample scored low, with only 7.63% achieving at least half of the maximum, the rest all scoring below the maximum. Most also scored only 2 overall on these criteria.

Table 1 Scores achieved by enterprises

Point	pc	Rate
12	1	0,42%
9	4	2,12%
8	6	4,66%
7	7	7,63%
6	11	12,29%
5	15	18,64%
4	40	35,59%
3	14	41,53%
2	66	69,49%
1	21	78,39%
0	51	100,00%

source: own editing

This data was plotted on a graph, which was used to group the businesses. The design of these groups is shown in the following figure.

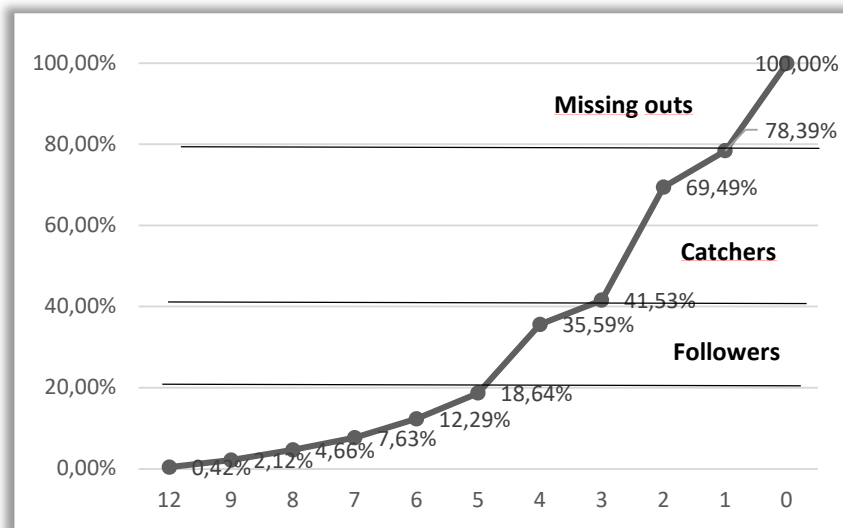


Figure 1 Grouping of enterprises according to the scores obtained

source: own editing

After plotting, we found that the 80-20 rule is the most obvious, as there are breakpoints in the graph close to 20 and 80%, making it easier to create categories. The middle box contained a significant proportion of the businesses, so we split it into two further groups, also with a breakpoint at 40%. We have tried to name each group according to the content behind the scores obtained, with the group of leaders comprising businesses that scored at least 5 points in the categorisation, followers those that scored at least 3 points, catchers those that scored at least 1 point, and the last category comprising businesses that scored no points according to the categories created.

After creating the categories, we looked at the proportion of each category in each region of the country. The region of Central Transdanubia has the highest number of enterprises in the leading category, but they are also found in a similar proportion in the Eastern regions. This diagram illustrates that in almost all regions, enterprises in the catching-up category are in the majority, i.e. they already have some environmental elements in their annexes. There are similar proportions of followers and laggards in all regions.

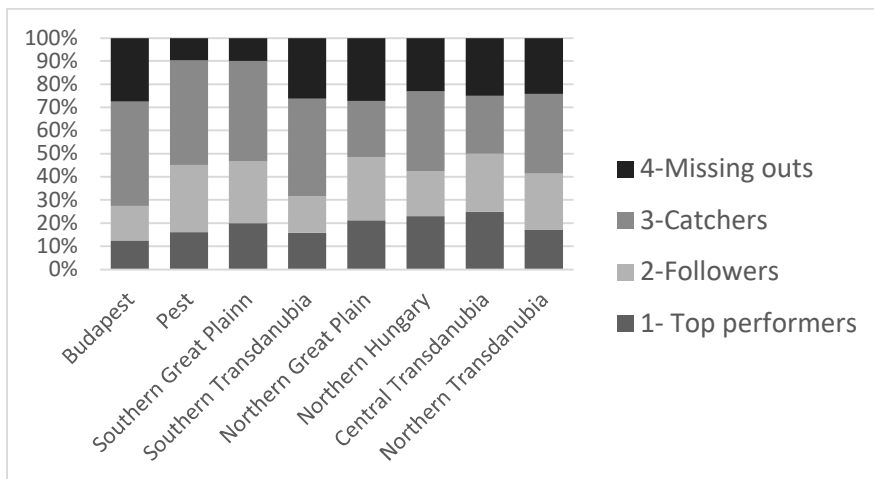


Figure 2 Distribution of categories in each region

source: own editing

The average of the total scores of the enterprises in each region was taken to compare the scores of the enterprises in each region based on the scores they received for the environmental elements of their supplementary annexes. This regional representation is shown in the following figure.

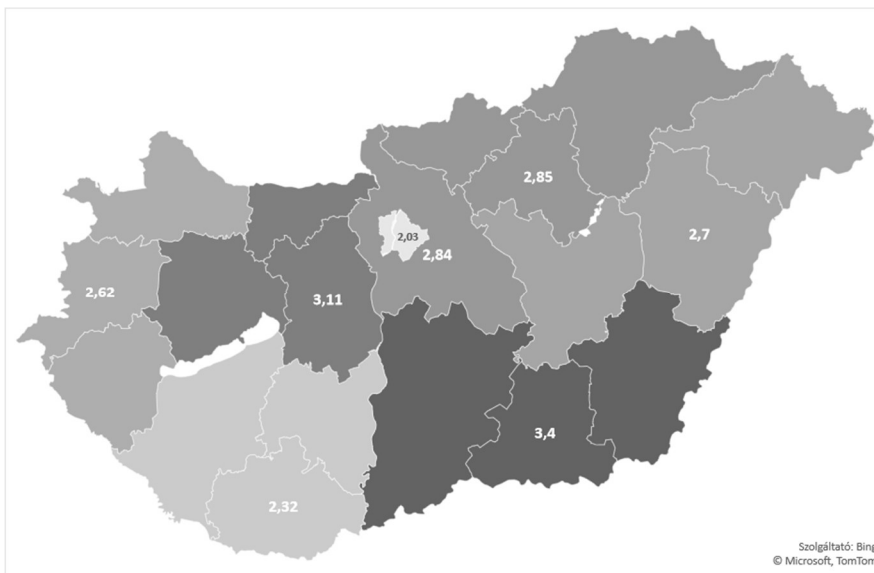


Figure 3 Distribution by region based on average scores

source: own editing

The map shows that the South Great Plain region scored the highest with 3.4, followed by the Central Transdanubian region with 3.11 and the North Hungary region in third place with 2.85. Which is a bit surprising for us, as the capital, Budapest region, is ranked lowest with an average score of 2.03. As the statistics do not show that it is one of the lagging regions, we assumed that businesses in this region would be more environmentally aware.

Next, we also looked at companies based on their investment score, where a maximum of 8 points could be achieved by continuing to apply the weighting. These data were aggregated in a table, which shows that 47.88% of the enterprises had no activity in this respect, based on the information presented in the supplementary annex.

Table 2 Investment scores for the sampled enterprises

Point	pc.	Rate
5	2	0,85%
4	2	1,69%
3	10	5,93%
2	16	12,71%
1	93	52,12%
0	113	100,00%

source: own editing

Using the data from the table, we have also produced a graph showing the number of businesses with each score in a more illustrative format. In this case we also defined categories, considering two scores, one at ~13% and the other at ~53%. This allowed us to group the businesses into three categories. None reached a maximum of 8 points, the highest being 5 points. The categories were as follows: between 2 and 5 points for the standouts, 1 point for starters, and 0 points for invisibles, which represents the 47.88% mentioned above.

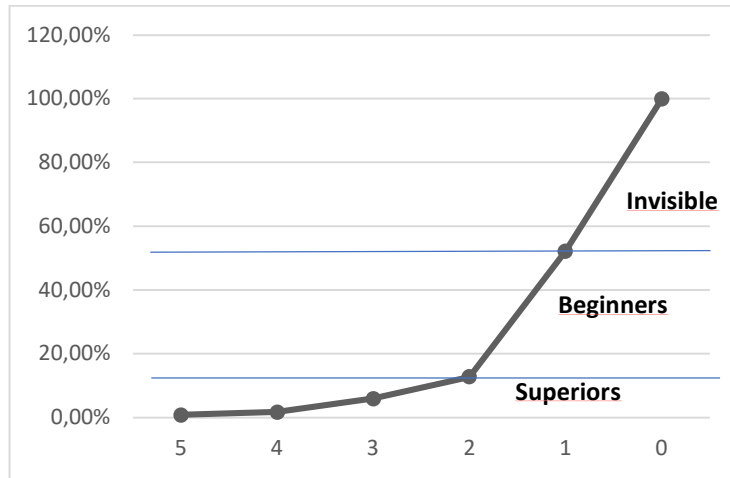


Figure 4: Graphical display of investment scores

source: own editing

The distribution of the three categories based on the investment scores in each region is also shown in a graph. As already shown in the table and graph above, the category "started" appears in a higher proportion in almost all regions. The West-Hungary region has the highest number of high performers, which is surprising because overall, the elements related to environmental protection were not in the top three scorers.

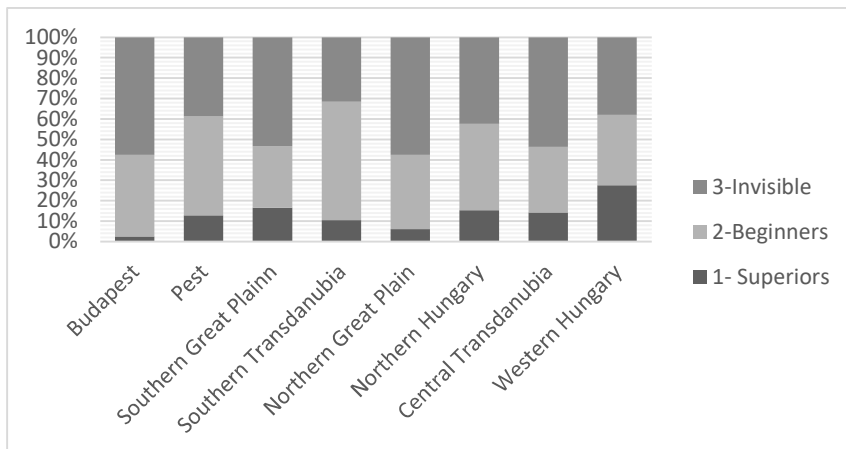


Figure 5 Distribution of investment score categories by region

source: own editing

Also, for the purpose of regional comparison, we have plotted the average of the overall scores for each region, where we found that the highest scoring region, West Hungary, also scored only 1 point. The Budapest region also scores the lowest here, but the Pest region is in second place.

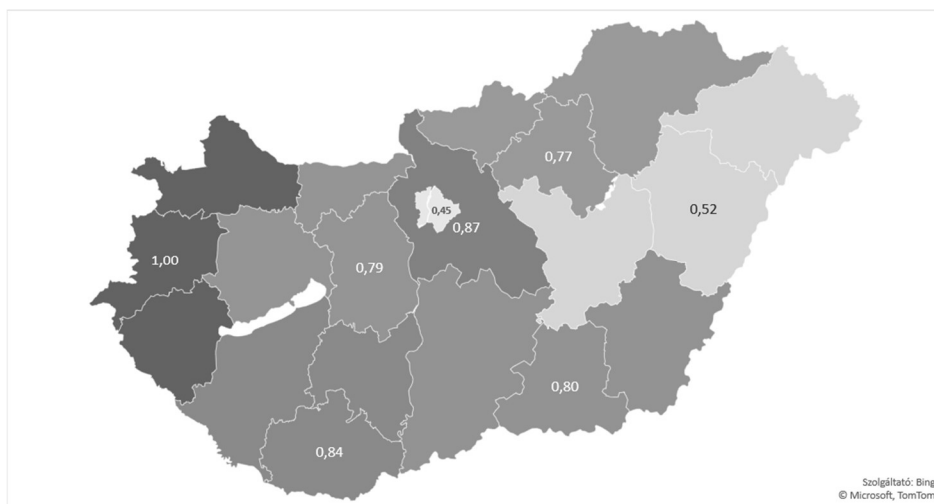


Figure 6: Regional differences by investment score

source: own editing

Going through the two strands of the survey, none of the businesses in the sample reached the maximum score available, and the highest scorers were few and far between. In terms of overall scores, the highest score was 12 points, achieved by a single enterprise, and in terms of investment scores, the highest of the 8 points available was 5, in this case two enterprises.

## 7. Summary

In the present research, we examined the environmental expenditures and investments of medium-sized enterprises in the manufacturing sector in Hungary, based on the supplementary annexes, in a regional context. Based on previous research and experience, the supplementary annexes are more accessible than the annual report, so I used the former document.

The number of items in the sample was designed to be representative at the county level, i.e. the proportion of enterprises in each county was the same as the proportion of all enterprises in each county. Thus, we looked at the supplementary annexes of a total of 236 enterprises, downloaded from a publicly accessible website, the e-report. A content analysis method was applied, focusing on four aspects: elements relating to

waste in general, elements relating to hazardous waste, investments related to the activity for the protection of the environment, general environmental mentions. Within these elements, a set of criteria was developed, depending on the level of detail of the data and information available within each category. That is, for the activity-related elements this was five-level criteria, and for the general elements this was three-level criteria. For the latter category, a double weighting was applied to highlight the non-activity related activity of enterprises.

Overall, the analysis has shown that, although the importance of environmental protection is becoming more and more prominent in almost all areas, for which there are already certain restrictions, laws and regulations, the facts do not justify a series of activities in this field. Regarding the Accounting Act 2000, the supplementary annexes require companies to include elements relating to environmental protection, but this was found to be the case for only a small number of the 236 companies. The number of non-prescribed activities and the information disclosed on them is overwhelming, with most enterprises not paying sufficient attention to the disclosure of information on environmental protection. This also means that it is not possible to draw conclusions or make comparisons from a regional perspective, and there is insufficient information available at present. It may be worthwhile to further narrow down the scope of enterprises in the manufacturing sector to those sectors with the largest share in this industry, to gain insight into the environmental efforts of a narrower area.

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