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Through the Blurry Looking Glass—SDGs in the GRI Reports

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Abstract: “Transforming our world: the 2030 Agenda for Sustainable Development” was agreed upon in 2015 by the global community and proposes 17 Sustainable Development Goals (SDG) for the period between 2015 and 2030. Since the greater integration of goals was an explicit claim, there are numerous overlaps among them. One of the novelties of the SDGs is that, in order to achieve the set goals, the Agenda 2030 addresses not only the states but the businesses as well. In our study, the relationships between the SDGs were analyzed on the base of the Global Reporting Initiative (GRI) indicators linked to the goals. The analysis was carried out by cluster analysis. Our results indicate that there is a strong relationship to be found among nine of the 17 SDGs. That relationship is mainly technical, which is caused by the number of aligned (genuine) GRI indicators. Though there are relationships between the SDGs as well, their strength is much weaker. According to our classification of SDGs, we suggest that the gap of business attention among SDGs is smaller than it is showed by KPMG.

Keywords: sustainable development; corporate sustainability reporting; sustainable development goals; SDG; GRI

1. Introduction

At the Rio + 20 Sustainable Development Conference of the United Nations, held in 2012, it was decided to establish a new 15-year agenda, replacing the 15-year program of the Millennium Development Goals (MDGs), adopted in 2000. Launched in 2015, “The 2030 Agenda for Sustainable Development” was finally signed by 193 countries, including the USA, India, and China. The Agenda has developed a system of specific objectives, called the Sustainable Development Goals (SDG) [1]. The SDGs represent the most comprehensive approach to sustainable development to date. And by that, after their establishment, they were soon integrated into existing sustainability models, such as UN Global Compact, national sustainability agendas, etc. [2].

The adopted 17 SDGs form a global framework that covers both the social, environmental, and economic dimensions of sustainable development. In order to facilitate its implementation, 169 associated targets and 230 indicators have been developed for the 17 SDGs, which define the specific tasks of the given SDG and the related deadlines for their implementation. Although these targets, at least according to their number, could provide an adequate basis for operational realization,

Kerekes [3] says, “it gives us the impression, that we know what the problems are and it promises, that we are able to solve these problems, too”. However, most SDGs embodies unstructured problems, i.e., there are no optimal solutions for them.

The new framework brought three significant new features along.

1. Unlike the Millennium Development Goals (MDGs), SDGs have objectives not only for the developing but for the developed countries as well [4]; while in accordance with the MDGs’ objectives, SDGs 1–6 defines objectives such as health-reduced undernutrition, child and maternal survival, and control of pandemic diseases [4,5], SDGs 7–17 appeared as new elements [6].
2. The Agenda 2030 awaits the achievements of the objectives not only by the growing engagement of the states but also by all relevant actors, such as businesses and civil society organizations. The goals set out in the SDGs are not achieved without the contribution of the business sphere, particularly with regard to the cutting-edge technologies and the massive capacities to reach large-scale solutions of multinational corporations (MNCs) [4]. Nevertheless it is important to point out, that SMEs are key employers in modern economies and their economic capacities are at least as large, as in the MNC sector. Thus, sustainable development (especially its economic pillar, see for example SDG 8 Decent work and economic growth) can not be achieved without the participation and development of the SME sector [7].
3. Learning from the mistakes of the MDGs, for tracking the results and exploring potential intervention needs, Agenda 2030 includes an intermediate milestone, and the results are tracked annually [4].

In the case of large companies, the translation of sustainability into business practice is gaining ground. According to a survey of KPMG [8], 92% of the G250 companies publish a corporate sustainability report, but in the meantime, reporting is becoming an expectation for other players, too. The processes developed during the implementation of reporting practices can be a basis for companies to make commitments and report on the organization’s contribution to global goals. It is important to point out, however, that experience shows that both for non-financial reporting [9] and for the SDGs [10], companies focus only on the positive impacts, which does not correspond to the holistic approach of sustainability.

In the study, we examined the Sustainable Development Goals based on the most widely used indicators of the Sustainability Reporting System (GRI) related to the Global Reporting Initiative.

The paper is structured as follows: the next chapter contains the literature review on corporate responsibility and on the Sustainable Development Goals. In the following chapter, we are presenting the applied methodology and the results. In the last chapter, we outline our conclusions and their limitations, as well as further research directions.

2. Theoretical Frameworks

2.1. The Sustainable Development Goals

The new global development framework for the period 2015–2030 called “Transforming Our World: The 2030 Agenda for Sustainable Development” (hereinafter referred to as “Agenda 2030”) was adopted in 2015 and is anchored around 17 Sustainable Development Goals (SDGs). The operationalization of the objectives is supported by 169 targets, including deadlines for them, and 230 indicators. The 17 SDGs [11] are classified in accordance with the tripartite nested model of Rockström and Sukhdev (2016):

1. Biosphere: SDG 6, Clean Water and Sanitation; SDG 13, Climate Action; SDG 14, Life Below Water; SDG 15, Life On Land
2. Society: SDG 1, No Poverty; SDG 2, Zero Hunger; SDG 3, Good Health and Well-Being; SDG 4, Quality Education; SDG 5, Gender Equality; SDG 7, Affordable and Clean Energy; SDG 11, Sustainable Cities and Communities; SDG 16, Peace and Justice, Strong Institutions;

3. Economy: SDG 8, Decent Work and Economic Growth; SDG 9, Industry, Innovation, and Infrastructure; SDG 10, Reduced Inequality; SDG 12, Responsible Consumption and Production;
4. SDG 17: Partnerships to Achieve the Goal.

The 17 Goals are ultimately aimed at achieving an “ultimate end”, a fair and prosperous, high quality of life that is equitably shared and sustainable [5]. The 17 SDGs can be assigned to the three elements of ecological economics proposed by Daly [5,12]:

1. Efficient allocation: SDGs 7–9; SDGs 11–12;
2. Fair distribution: SDGs 1–5; SDG 10; SDGs 16–17;
3. Sustainable scale: SDG 6; SDGs 13–15.

During the development of the SDGs, the integration of the goals was explicitly demanded. Because of the integration, the relationship between the goals and the targets can be described as an n:n-type relationship, i.e., a target can be linked to several goals. The relationship between the goals can be used as a basis for the examination as follows: the goals as peaks of a graph, and the targets associated with one or more goals as the edges of the graph. The analysis of the graph shows that the degree of integration between goals varies considerably; while, the most integrated objectives (Responsible Production and Consumption (SDG 12) and Reduced inequalities (SDG 10)) are connected to 14 and 12 other goals based on their targets. Affordable and Clean Energy (SDG 7) and Industry, Innovation, and Infrastructure (SDG 9) are both connected to three other ones, while Life Below Water (SDG 14) is connected to only two other goals. On the basis of the analysis, the core and the extended targets can be distinguished for all the goals [13].

Interviewing a small group of experts, the International Council for Science (ICSU) and the International Social Science Council (ISSC) [14] analyzed the relationships between different goals. Based on their results, the network they found was denser than the one identified by Le Blanc [13].

Bergman et al. [2] analyzed the contribution of UNESCO Chairs from seven countries of the Northern Hemisphere toward achieving SDGs. SDG 4 (Quality Education) and SDG 7 (Affordable and Clean Energy) were excluded from the analysis because these goals are part of the core framework of the United Nations Educational, Scientific and Cultural Organization (UNESCO) Chairs. The authors concluded, that on the basis of their interviews, four SDG clusters (social, political, technology, integrated) can be created.

Whereas graph-based models analyze the number of relationships among SDGs, Guijarro and Poyatos [15] formed SDG indices of EU states on the basis of Eurostat sustainable development indices. The authors find that (1) most of the pairwise correlations are not significant; (2) some SDGs are positively correlated to others (for example SDG 8, Decent Work and Economic Growth, and SDG 9, Industry, Innovation, and Infrastructure); (3) some correlation is negative (SDG 3 Good health and Well-Being and SDG 6 Clean Water and Sanitation).

According to the results of Muff et al. [16], at the beginning of the Agenda 2030, in 2015, 70 percent of the goals' criteria were already met by the developed countries, and in some cases, even more of them, which suggests that it is necessary to work to satisfy the requirements of the goals primarily in the developing world. However, it is important to point out that this is also the result of outsourcing socially or environmentally objectionable activities partly or wholly to the developing world [17].

In terms of sustainable development, the results and challenges of each country or region differ, so the range of interventions that may be proposed is necessarily different. The most effective intervention(s) can be determined by the Gap Frame, compiled by Muff et al. [16]. According to the results gathered by using the Gap Frame, in the Organisation for Economic Co-operation and Development (OECD) countries, climate change is by far the biggest challenge posed by the protection of the marine ecosystem and gender equality. In developing countries, the biggest gaps can be found in terms of social inclusion, peace, and cooperation. Waste management, however, is a serious problem in both groups of countries.

These results are partly consistent with the corporate priorities identified by KPMG [18], where the greatest emphasis was placed on fighting climate change, while half of the companies emphasized the importance of gender equality as well. Nevertheless, it is an inconsistency that companies consider the oceans' wildlife (Life Below Water, SDG 14) to be the least important one, as well as the fact, that waste management alone is not included in the SDGs. The latter can be interpreted in two ways: (1) waste management has been classified as an environmental goal and is, therefore, less pronounced from a corporate point of view; (2) waste management is not independent of responsible production and consumption (SDG 12), which is the fourth most important SDG for companies.

When researching sustainable development and the ability to maintain the planet's capacities, Kerekes et al. [19] emphasize two crucial works: the first is the 1972 report of the Rome Club, i.e., *The Limits to Growth*, in which researchers supported the zero growth concept. Public thinking on sustainability has been altered to a similar extent by the model of planetary boundaries of Johan Rockström and his colleagues [20]. The model determines the Earth's load capacity, i.e., ecosystem services, in nine areas: (1) climate change; (2) the acidification of the oceans; (3) the thinning of the ozone layer; (4) nitrogen and phosphorus cycles; (5) water use; (6) change of land use; (7) biodiversity loss; (8) atmospheric aerosol loading; (9) chemical pollution. Researchers could quantify seven of the nine areas. The essence of the concept is that if the annual use of individual services is at most equal to the annual production, mankind will be sustainable, otherwise, it will deplete the planet's reserves.

The model was developed by Johan Rockström's work-group at several points [21]:

1. Authors proposed a hierarchy of ecosystem services. In this context, core services include climate change and biosphere integrity;
2. the definitions of ecosystem services were clarified;
3. the model treats territorial differences differentially where it's relevant and can be calculated;
4. based on recent model calculations, the annual production of ecological services was updated;
5. In the case of biosphere integrity and biochemical flows, the authors proposed a two-tiered approach, whereby services were broken down into several interconnected parts.

According to the model, the most serious ecological problem is the decline of biodiversity, the eradication of species, while the most "popular" one, i.e., climate change is only the third in the row. However, it is important to point out that there are many connections between services, for example, the increase in land use contributes significantly to biodiversity loss, caused by agricultural production, mining, and construction [22]. The basics of the concept alone were not, but its details were subject to many criticisms. The main issue is the number of services that should be considered, which necessarily has implications for the conclusions. According to the typology of the TEEB, ecological services can be divided into four categories [23]: Provisioning services; regulating services; support services; and cultural services. Going beyond the simple quantification of ecological services, Raworth [24] outlined a safe operating range, where the value of a service can be regarded as sustainable. According to the model, the role of society and politics is twofold: it must help reduce social and/or economic shortcomings while preventing excessive use of ecological services.

It is an external assumption of the models of Gap Frame [16] and Raworth [24] that a strong definition of sustainability prevails, that is, natural capital cannot be replaced with artificial capital at all [25,26]. In other words, due to their special contribution to human well-being, some elements of natural capital can be considered as critical since their degradation beyond a certain tolerance can cause irreversible damage [26]. Accordingly, sustainable development can only be achieved by decoupling economic growth, as well as human well-being from the use of resources [27]. Under the SDG framework, this requirement is explicitly defined in section 8.2.

Using expert questionnaires, Wood et al. [28] examined the relationship between the SDG targets and the ecological services used by TEEB [23]. In their research, the environmental aspects of both SDGs and ecological services were studied. Thus, SDGs that did not have direct environmental linkages or the ones that were related to public policy issues were omitted, while from the range of ecosystem

services, cultural services were left out (Ornamental resources, maintenance of genetic diversity, aesthetic information, an inspiration for art, culture, design, information, cognitive development) (see Table 1). Based on the results of the authors, only five of the 12 SDGs were heavily associated with ecosystem services.

Table 1. The linkages between ecosystem services and Sustainable Development Goals (SDG) (based on Wood et al. [28], own elaboration).

Examined SDGs	strongly linked to ecological services	Zero Hunger (SDG 2), Clean Water and Sanitation (SDG 6), Sustainable Cities and Communities (SDG 11), Life Below Water (SDG 14), Life on Land (SDG 15)
	not linked to ecological services	No Poverty (SDG 1) Good Health and Well-Being for People (SDG 3) Affordable and Clean Energy (SDG 7) Decent Work and Economic Growth (SDG 8) Industry, Innovation, and Infrastructure (SDG 9) Responsible Consumption and Production (SDG 12) Climate Action (SDG 13)
Eliminated SDGs		Quality Education (SDG 4) Gender Equality (SDG 5) Reducing Inequalities (SDG 10) Peace, Justice and Strong Institutions (SDG 16) Partnerships for the Goals (SDG 17)

The SDG concept is based on the fact that “stable functioning of the Earth system is a prerequisite for thriving societies around the world” [21]. In an optimal framework, implementation of this goal can only be achieved through global coordination and co-operation—for which the SDGs framework can be an appropriate tool. It is important to emphasize that there is no general solution for each country or region—it can be achieved by using regional-specific interventions based on different ecological service approaches.

2.2. The Role of Companies in Achieving Sustainable Development Goals

In the age of globalization, transnational corporations (TNCs) and multinational corporations (MNCs) often have a measurable turnover to the GDP of the states and, in parallel, they not only affect the societies of states belonging to their area of operation but they have a significant impact on the whole ecosystem of the planet. One of the most common criticisms of these companies is that their operation goes beyond the regulatory and sanctioning frameworks of individual nation-states [29].

In the changing environment, “the former division between the state and the economy, or the division of political/social and economic responsibility does not work anymore, so companies are no longer depoliticized but politicized” [29]. This means that instead of their former passive social (and environmental) engagements, large corporations must act as active actors. It is important to point out that the increase in engagement can be confined only to the activities of the company and to its narrower environment since the assessment of the wider environmental and global impacts of activities requires a systemic approach [30].

According to Harangozó [30], the performance of a company is determined by its efficiency, long-term success, and adaptability. Effectiveness means setting and achieving the right goals, while efficiency is realized by the achievement of the goals by using an optimal array of resources. Given that SDGs reflect a system-wide approach and through setting the goals, they can contribute to effectiveness, they can both be used to bridge the gap between corporate and global levels and can support the efficient use of resources of enterprises.

The idea of partnerships between different sectors has become increasingly popular since the United Nations’ Conference on Environment and Development (UNCED) held in 1992 [31]. Agenda

2030 can be a good example of this, which also calls on business actors to contribute to addressing the challenges posed by sustainable development with their creativity and innovation [1], however, the document underlines the heterogeneity of the corporate sector by size, responsibility-related measures, communication, and activities that legitimize their operation primarily concern large-scale business actors.

The sustainable and transparent operation, however, is not only important for sustainable development but based on the extensive literature on corporate social responsibility (CSR), it also generates benefits to the company. Such positive effects include, for example, that (1) continuous monitoring of environmental impacts will contribute to avoiding environmental fines and preventing environmental damage; (2) grants to subsidized organizations or received from subsidized organizations may reduce the risk of corruption, thus protecting the company's reputation; (3) quality management systems can help to eliminate consumer-damaging products, thereby they can increase customer satisfaction and reduce the losses resulting from compensation cases; (4) greater transparency can reduce agency costs.

According to the survey of PwC [10], 71% of the companies are planning to respond in some way to the challenges posed by SDGs, of which only 44% are planning to evaluate the impact of their activities on company-relevant goal. Managing SDGs from the company's point of view can be problematic for two reasons; on the one hand, due to the number, the complexity and interconnection of the SDGs, the framework is difficult to review, on the other hand, it is advisable to choose the goals that affect the company and/or can really contribute to the given goal [32]. For example, for an agricultural enterprise, the impact of the (excessive) use of fertilizer on the oceans' life (Life below water) may not necessarily be considered as self-explanatory.

Based on a detailed, content-driven review of the sustainability reports of the 250 largest corporation (G250), KPMG [18] found, that only 40 percent of companies deal with SDGs in their reports. Mentioned by more than half of the companies, the most prioritized SDGs, were Climate Action (SDG 13), Decent Work and Economic Growth (SDG 8), and Good Health and Well-Being (SDG 3). Interestingly, the popularity of the ecosystem goals (Life Below Water (SDG 14), Life on Land (SDG 15)) and Zero Hunger (SDG 2) did not reach half of these goals from above.

The survey of PwC [10] examined the companies by industries. It focused on the questions of, according to the companies, which of their activities have the greatest impact on their goals. Their results can be regarded as consistent with the findings of KPMG [18], but based on the evaluation of chemical and retail firms, the elimination of starvation (Zero Hunger, SDG 2) became one of the five most important goals of their activities.

According to an analysis of 37 non-financial reports, Zsóka and Vajkai [9] suggest that although some of the activities of the companies may have both a positive and negative impact on sustainable development, the reports show almost exclusively positive aspects of their operations, i.e., the principle of balance is compromised. KPMG [18] came to a similar conclusion in their research involving the G250 companies for SDGs.

According to Géring [29], the counterpoint of the re-politicized company is considered as the concept expressed by Milton Friedman [33]. According to that, since the company itself is an artificial (i.e., legal) person, its responsibilities are also artificial. In other words, the responsibility attributed to the company is, in fact, the responsibility of the manager. Since the manager is an employee of the owner, he or she must follow the owner's choice of values, so his or her responsibility can only extend to the maximization of the shareholders' assets.

The shareholder value maximization and issues related to responsibility were incorporated into the framework by Archie B. Carroll [34]. Carroll argues that ownership can contribute to profitable growth, suggesting that there are projects with at least zero net present value. Since managers decide on these projects, the behavior of the company is ultimately influenced by the personality and the attitudes of the managers. These values appear in the leader's messages at the beginning of company reports, which aim to share the major leadership priorities, goals, and experiences with the stakeholders.

According to the research of KPMG [18], SDGs were mentioned by the chief executive officers (CEO) in 39 percent of the companies reports mentioning SDGs, meaning that only 16 percent of the 250 studied companies have leadership engagement in this field.

2.3. The GRI

There are a number of instruments available for companies to report their commitments towards sustainability. Siew [35] distinguished three tools of formal reporting on three ways of corporate sustainability:

1. standardizing reporting systems of non-financial (or otherwise sustainability) reporting,
2. certifications according to different standards, and
3. rating systems and indexes.

Strategy can be mentioned as a fourth tool, including, for example, the eco-efficiency approach developed by World Business Council of Sustainable Development (WBCSD) and the Sustainability Balanced Scorecard (SBC) [36].

Although “such reporting has to highlight firms’ “commitment” to the environment and social responsiveness, even covering the respect for human rights, anti-corruption, and bribery issues, and diversity on the boards of directors” [37], critics say these are not necessarily accomplished in practice. The main problem of reporting lies in its voluntary nature, which provides the opportunity to cover essential things, such as greenwashing [38]. Fortune 500 companies often engage in strategies and counter-strategies which are capable of interfering with the company’s goals, thereby undermining their credibility [39].

Ninety-two percent of the G250 companies report on their sustainability performance, while 74 percent are reporting according to the Global Reporting Initiative (GRI). Although the proportion of companies using GRI has decreased slightly since 2013, it remains the most widely used framework [8].

GRI is a framework that can be applied to any organization around the world, whether it is a small or a large company. GRI reporting principles can be divided into two groups, the content of the report and the principles of reporting quality [40]. The methodology of the framework is constantly evolving, though many companies are reporting according to the previous methodology (e.g., GRI G3 or G3.1), while GRI G4 was replaced by GRI Standards in July 2018 [41].

Transparency and accountability of organizations can contribute to sustainable development, and sustainability reporting can be considered as a resource for this. Implementing joint projects with NGOs can be an obvious way of achieving accountability and credibility [31], but any such cooperation will also help to improve a corporation’s reputation [39]. With the help of the Sustainability Report, an organization can explore its essential social, environmental, corporate governance and economic aspects of its activities, which will enable the organization to consciously seek sustainable development [42]. This activity does not require the organization to act altruistically: by supporting competitiveness the pursuit of sustainable development reduces the risks of the company and promotes its positioning in the global market in a favorable direction [42].

GRI divides its indicators into social, economic, and environmental dimensions accordingly to the so-called Triple Bottom Line (TBL). General indicators for the company as a whole can be regarded as the fourth dimension.

Although GRI is now considered as a “global standard” for sustainability reporting, both GRI and the underlying TBL concept are subjects of criticisms. According to Shridhar and Jones, the three main criticisms of TBL are as follows [43]:

1. The performance of different dimensions can only be compared with compromises, because, while economic performance can be expressed in monetary terms, for the environment, and for the social dimension, there are only naturally occurring units (e.g., CO₂ equivalent emission) or various indicators (such as gender, training expenditure) available. This phenomenon is exacerbated by the fact that social aspects in the indicators of GRI are overrepresented [44],

- which is also the case with the GRI G4. Due to the different units used for the measurement, organizational performance can be determined either by index calculations or by the expression of various indicators in monetary terms [45], however, all of these can cause significant distortions;
2. The TBL concept treats its three dimensions separately, which encourages the organization to strive for balance. Sridhar and Jones [43] recognize that some interventions may have an opposite effect on the performance achieved in different dimensions, but since the focus of sustainability has been precisely on the integration between different impacts, the Authors urge the conceptualization of IBL (integrated bottom-line). This problem can be overlooked by the concept used by Raworth [24], which compares the performance to the target values of the indicators or to a predetermined interval of these indicators, thus performance trade-offs, measured in different dimensions can be displayed explicitly;
 3. Since governments, international organizations, and organizations that are developing standards for sustainability reporting are employing the TBL, there is a strong incentive for organizations to focus on compliance with standards alone, instead of a real commitment to sustainable development.

A further criticism is that GRI offers a “menu” of environmental and social performance indicators, from which the choice is made to companies “a la carte”—i.e., the selected indicators do not necessarily reflect a holistic approach to sustainable development [46]. As a result, Garcia-Torres et al. [47] emphasize, that within the framework of their Fast-Fashion Sustainability Scorecard, companies should be required to report at least the level of compliance with all SDGs, with which “the possibility of orphan issues or easy-to-solve problem biases” could be avoided. The veracity of reporting according to the selected indicators is typically not controlled by independent external actors [39].

In addition to these issues, it is important to emphasize that voluntary reporting and the freedom to compile reports can also lead to a process, in which companies share and more and more data about their activities [39].

3. Methodology: The GRI and the Sustainable Development Goals

In order to measure the companies’ activity in achieving their objectives from the perspective of sustainable development, synchronization of the related indicators with the existing indicator systems can be a solution. However, this approach raises two problems:

1. Different measurement frameworks refer to different aspects of phenomena [48];
2. The use of existing (ready-to-use) indicator systems involves the risk that the terminology or content does not correspond to the indicator-indicated fact [6]. Nevertheless, it is important to point out that the relevance of the data provided by the indicators can be established by the fact that they are not defined at the global level, but at enterprise scales [46].

In our study, we examined the relationships between different SDGs, performed on the basis of the GRI G4 indicators proposed by SDG Compass. The data used in our analysis was downloaded on 25 March 2018. The SDG Compass is a methodology developed by GRI, the United Nations Global Compact (UNGC) and the WBCSD, which helps to find the linkages between SDGs and business processes and provides tools and guidance in order to incorporate sustainability into business strategy. The integration process—which does not differ significantly from the implementation of other management approaches in business processes—consists of the following five steps (SDG Compass): (1) understanding Sustainable Development Goals; (2) definition of priorities; (3) setting targets; (4) integration; (5) reporting and communication. Although the process can be applied on its own, it can be expanded by using additional tools—Muff [16] suggests implementing the first three steps by incorporating three additional tools, i.e., the Gap Frame, the Business Sustainability 3.0 (BST 3.0) and stakeholder co-operation. At the same time, SDG Compass—and several other tools and frameworks for implementing SDGs in strategic management—can be criticized because SDGs are not taken

into account when defining organizational goals but in the implementation phase, “this means that organizations lack sufficient support in shaping strategic actions towards the SDGs” [49].

The GRI indicators are defined at the level of the SDG targets, and in our analysis, we have assigned them directly to the goals. Despite the fact that, due to the relations between the targets of the goals, a GRI indicator could be linked multiple times to an SDG, they were considered as one indicator in each case.

While developing the goals of sustainable development, they have been explicitly structured to be integrated so that the relationships between SDGs and overlaps can be analyzed. This was done by Le Blanc [13] on the basis of the identity of the targets, whereas in this study the correlations between the goals were examined, based on the GRI indicators related to the goals.

GRI-homogeneous groups can be classified according to the weighted neighborhood matrix, in which the matrix's cell values show how many times a GRI “meets” another one. On this basis, the so-called GRI vectors that place the GRIs in an n-dimensional Euclidean space are clearly visible, so some are close to each other, others are far apart from the others. They can be categorized and by that, grouped into homogeneous categories on the basis of their quadratic Euclidean distance. The methodology of cluster analysis offers an opportunity for merging. Cluster analysis is a process of dimensional reduction, which allows the classification of data blocks. There are two main directions, one being the so-called hierarchical clustering, which can be merging or dividing. The other is the non-hierarchical clustering or k-means clustering.

For our analysis, the k-center (non-hierarchical) cluster analysis method was chosen, since this methodology is suitable for determining the individual Euclidean distance of each cluster in the n-dimensional space. Based on MacQueen's paper, published in 1967 the steps of the algorithm are as follows [50]:

- determining the number of clusters;
- randomly generating k clusters, defining the initial centroids of each cluster, or creating a random cluster center;
- assigning each point to a cluster with the nearest centers;
- definition of new cluster centers;
- iteration until a predetermined convergence criterion (for example, the classification is unchanged) is met.

The advantage of the algorithm lies in its simplicity and its speed while the disadvantage of this algorithm is that it may give different results during different runs, as its result is influenced by the initial random classification. The method minimizes the within-group variance of the clusters but does not minimize the total variance. Despite the small data table, this method was chosen due to its simplicity, speed, and the possibility of predetermination of the centers' number.

The analysis was performed between clusters (the number of clusters was between 2 and 10). The result of nine cluster analyses can help determine whether there are any of the 17 SDGs that are placed in the same cluster due to the small distance between them. This suggests whether two SDGs can be considered to be similar, or not. In contrast, SDGs, which are in separate clusters, should be considered as separate ones.

4. Results

From the 149 indicators of GRI G4's environmental, social, economic, and global organization categories, 90 indicators (89 from the GRI's set of indicators and one from the procurement guidelines) were assigned to the 17 sustainable development goals, from which a total of 244 indicator-SDG linkages were generated. Sixty of the GRI indicators were not assigned to any of the goals, from which two were economic, two environmental, and 11 belonged to the social dimension. The missing, comprehensive indicators relate to the supply chain, local community, employee training, and customer satisfaction, so these are not necessarily linked directly to SDGs with a global approach. Since the remaining 45 are

general indicators for the company as a whole, the omission of them from the assignment will not require further explanation.

For each sustainable development goal, the number of indicators varied considerably: while two indicators belonged to the Sustainable Cities and Communities (SDG 11), two to the Partnership for the Goals (SDG 17), 39 indicators belonged to the decent work and economic growth (SDG 8). It was found that there were seven SDGs (41%) that had less than ten GRI indicators, 10 to 20 indications were linked to six goals, and at four goals more than 20 indicators were identified. There were 10 SDGs that had an indicator which wasn't found at other goals, while for two SDGs the ratio of individual indicators was less than 10%. Most of the individual indicators belonged to Peace, Justice, and Strong Institutions (SDG 16), but their proportion is also significant in the case of Quality education (SDG 4) (see Figure 1).

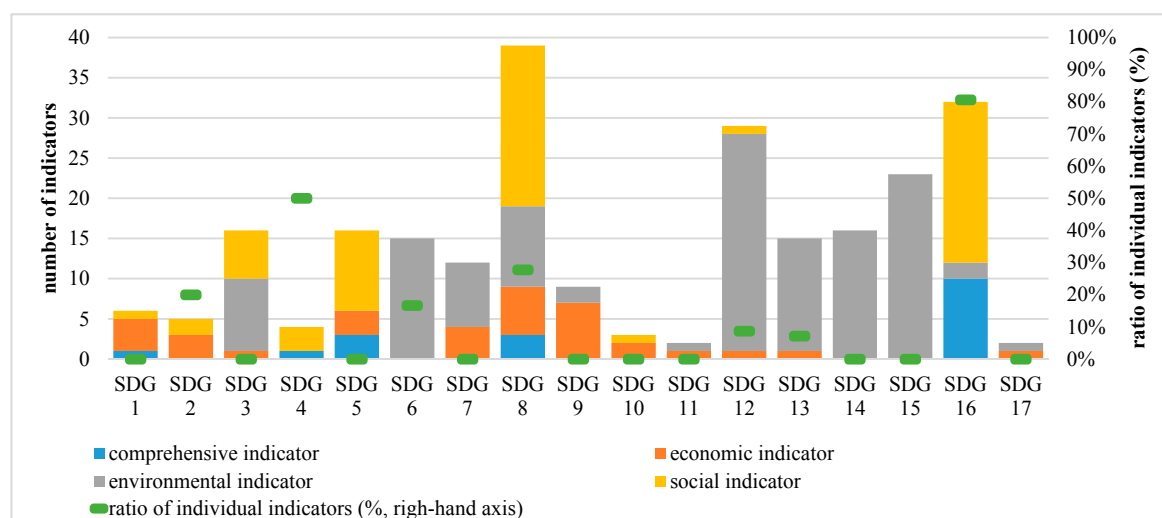


Figure 1. The type and number of Global Reporting Initiative (GRI) indicators related to Sustainable Development Goals (SDGs) and the ratio of individual indicators (%) (own calculations).

Based on the classification defined by the triple result criteria, it is possible to examine which dimension of the TBL the goals essentially belong to. This was performed in two versions (with and without general indicators), as well as along two thresholds (66.6 and 75%). The decisive weight was considered to be the dimension whose indicators represent the ratio which corresponds at least to the threshold values within all indicators.

Based on the results of the analyses, it was found that (1) seven goals can be characterized by pure dominance, that is, with a threshold of 75%, there was a decisive dimension with and without the general indicators; (2) there was a strong dominance in one case. In this case, together with the general indicators, the indicator was found to be determinant only in the case of the 66.6% threshold; (3) in two cases, dominance was to be observed only with the specific indicators at the 75% threshold; (4) we also found a dominant direction in two cases with a threshold of 66.6% only; however, general indicators did not play a role in these cases; (5) in five cases, the dominant dimension couldn't be identified. Although the GRI-based classification compared with the tripartite nested model shows the same results in some cases (e.g., biosphere goals), there is a lot of bias well. The reason for the bias can be the different scope or purpose of GRI indicators. The classification of each SDG is shown in Table 2.

Table 2. The classification of SDGs into sustainability dimensions on the basis of GRI indicators (source: own research).

Degree of Dominance	Environment	Society	Economy
Pure Dominance	SDG 6, SDG 12, SDG 13, SDG 14, SDG 15	SDG 4	SDG 9
Strong Dominance		SDG 1	
Only Dominant If Measured by Specific Indicators		SDG 5, SDG 16	
Dominant in a Ratio of Two Thirds	SDG 7		SDG 10
There Is no Dominant Dimension	SDG 2, SDG 3, SDG 8, SDG 11, SDG 17		

The cluster analysis of the SDGs, indicated by the GRI indicators was performed in three scenarios: (1) in the weighted neighborhood matrix of the individual and common GRI indicators; (2) in the normalized neighborhood matrix of the individual and the common GRI indicators, due to the different number of GRI indicators pertaining to the objectives; (3) by examining the simple fact of the relationship, in the unweighted neighborhood matrix of the individual and common GRI indicators.

Based on the two analyses carried out on the weighted matrix, based on their GRI indicators, nine goals (SDG 1–2, SDG 4, SDG 7, SDG 9–11, SDG 16–17) are classified into the same cluster up to the subdivisions of seven clusters. Falling into the cluster is primarily based on the alignment with the GRI indicators instead of considering their content. In other words, although there is no significant similarity between the contents of the nine SDGs, based on the distance between the vertices of the graph taken on the basis of the associated GRI indicators, the goals can be considered similar (see Table 3). This is clearly shown by the fact that the nine goals can be described by 75 GRI indicators, out of which 27 are unique GRI indicators. Although up to the six clusters division done on the non-normalized matrix, gender equality (SDG 5) is classified into the same cluster, in all cases, it can be considered as the most distant element from the cluster center.

Based on the results of clustering on weighted matrices, Decent Work and Economic Growth (SDG 8) was found to be a separate cluster. The only exception was found as the results of two-clustering division done on the non-normalized matrix, where Responsible Consumption and Production (SDG 12) became a separate cluster. The reason for the separation was again rather technological since 36 GRI indicators (of which 10 were individual ones) were assigned to this target, and these indicators were linked to almost all other goals, so the distance from the other clusters was always rather large (Table 4).

Table 3. The classification of SDGs into clusters and their distance from cluster centers according to different cluster numbers—calculated on weighted and normalized (z-score) neighborhood matrix (own calculations).

SDG No.	SDG Name	2 Clusters		3 Clusters		4 Clusters		5 Clusters		6 Clusters		7 Clusters		8 Clusters	
		Cluster No.	Distance	Cluster No.	Distance	Cluster No.	Distance	Cluster No.	Distance	Cluster No.	Distance	Cluster No.	Distance	Cluster No.	Distance
1.	No poverty	1	2908	1	2937	1	2760	1	2258	1	2304	1	2304	1	2284
2.	Zero hunger	1	3395	1	3525	1	3495	1	3203	1	3363	1	3363	1	3485
4.	Quality education	1	2829	1	2776	1	2558	1	2192	1	2151	1	2151	1	1916
7.	Affordable and clean energy	1	3846	1	3957	1	3990	1	3970	1	4067	1	4067	7	0000
9.	Industry, innovation, and infrastructure	1	2884	1	2896	1	2846	1	2535	1	2668	1	2668	1	2783
10.	Reduced inequalities	1	2396	1	2369	1	2168	1	1756	1	1771	1	1771	1	1665
11.	Sustainable cities and communities	1	2462	1	2461	1	2222	1	1687	1	1781	1	1781	1	1772
16.	Peace, justice, and strong institutions	1	3054	1	3044	1	2879	1	2459	1	2477	1	2477	1	2328
17.	Partnership for the goals	1	2420	1	2521	1	2326	1	1974	1	1908	1	1908	1	1826
3.	Good health and well-being	1	2849	1	2785	1	2718	5	2576	1	3094	1	3094	1	3108
5.	Gender equality	1	6153	2	0	2	0	3	0	5	0	5	0	5	0,000
6.	Clean water and sanitation	1	2921	1	2787	1	2773	5	2693	1	3110	1	3110	1	2989
8.	Decent work and economic growth	2	0	3	0	3	0	4	0	3	0	4	0	8	0
12.	Responsible consumption and production	1	5486	1	5467	4	0	2	0	2	0	6	0	2	0
13.	Climate action	1	3854	1	3826	1	4013	5	3294	6	0	2	0	6	0
14.	Life below water	1	4824	1	4662	1	4838	5	3416	4	2428	7	0	4	0
15.	Life on land	1	4362	1	4193	1	4372	5	3060	4	2428	3	0	3	0

Table 4. The classification of SDGs into clusters and their distance from cluster centers according to different cluster numbers—calculated on neighborhood matrix (source: own calculations).

SDG No.	SDG Name	2 Clusters		3 Clusters		4 Clusters		5 Clusters		6 Clusters		7 Clusters		8 Clusters	
		Cluster No.	Distance	Cluster No.	Distance	Cluster No.	Distance	Cluster No.	Distance	Cluster No.	Distance	Cluster No.	Distance	Cluster No.	Distance
1.	No poverty	1	6040	1	2486	1	2486	1	2486	1	2486	1	2519	1	2349
2.	Zero hunger	1	6122	1	3253	1	3253	1	3253	1	3253	1	3182	1	2918
4.	Quality education	1	6470	1	3344	1	3344	1	3344	1	3344	1	2731	1	2065
7.	Affordable and clean energy	1	6963	1	8281	1	8281	1	8281	1	8281	1	8538	7	0
9.	Industry, innovation, and infrastructure	1	5035	1	3685	1	3685	1	3685	1	3685	1	3182	1	3165
10.	Reduced inequalities	1	5998	1	2565	1	2565	1	2565	1	2565	1	2264	1	1737
11.	Sustainable cities and communities	1	5808	1	3490	1	3490	1	3490	1	3490	1	2606	1	2401
16.	Peace, justice, and strong institutions	1	7070	1	4264	1	4264	1	4264	1	4264	1	4348	1	4332
17.	Partnership for the goals	1	4688	1	3159	1	3159	1	3159	1	3159	1	2669	1	2649
3.	Good health and well-being	1	7809	3	6444	4	6539	4	4630	3	4346	3	4346	4	4346
5.	Gender equality	1	12,129	1	10,449	1	10,449	1	10,449	1	10,449	5	0	5	0
6.	Clean water and sanitation	1	8268	3	6797	4	6493	4	5517	3	4819	3	4819	4	4819
8.	Decent work and economic growth	1	14,760	2	0	3	0	3	0	2	0	2	0	8	0
12.	Responsible consumption and production	2	0	3	12,578	4	12,648	5	0	6	0	4	0	2	0
13.	Climate action	1	11,800	3	8477	4	8183	4	7479	3	5764	3	5764	4	5764
14.	Life below water	1	16,093	3	11854	2	0	2	0	5	0	6	0	3	0
15.	Life on land	1	15,082	3	10748	4	9662	4	9871	4	0	7	0	6	0

Although the Euclidean distance between the environmental goals (SDG 13–15) was relatively small, a pattern with a strength similar to the ones described above was not found. The similarity, however, is shown by the fact that up to the five clusters division, performed on the normalized matrix, these goals fell into the same cluster during the analyses.

5. Limitations of Results

There are two main limitations to the results of the analysis. On the one hand, SDGs serve global goals, so their scopes are also rather global. At the same time, the effective solution of the Agenda 2030 tasks can only be achieved through simultaneous and coordinated actions by all actors, and by taking into account their opportunities and options. This explains why SDGs have been included in national agendas [2], in the programs of NGOs and corporate reporting after their adoption [2,10,18]. Another major limitation of our results is the binding of SDG targets and GRI indicators. Although the source of pairing is the SDG Compass [11], which incorporates feedback received through three consultation periods from companies, government agencies, academic institutions, and civil society organizations worldwide. At the same time, as a criticism, it should be also mentioned that different actors may associate different content with the same goal, and may reveal different relationships between different goals and objectives or indicators. Furthermore, SDGs themselves can be interpreted as a possible source of distortion, since the definition of SDGs was formulated as a result of political processes, the emphasis could be influenced by the bargaining positions of each negotiating party, which can be another problem in this field.

6. Discussion and Conclusions

In the study, the role of the Sustainable Development Goals (SDGs) of the “Transforming our world: the 2030 Agenda for Sustainable Development” were examined from the perspective of corporate responsibility reporting. The significance of this topic is shown by the fact that Agenda 2030 explicitly calls for corporate involvement in achieving the global objectives [1]. The appearance of these objectives in corporate responsibility reporting was examined on the basis of their relationship with the indicators of the Global Reporting Initiative (GRI). Developed by GRI, the UN Global Compact (UNGC) and the World Business Council of Sustainable Development (WBCSD), the SDG Compass was used for finding the linkages between the goals and the indicators.

In the light of the results, it is concluded that for seven out of 17 SDGs (41%), there were fewer than 10 indicators to be linked, to six SDGs 10 indicators were assigned, and to four goals there were more than 20 indicators to be associated. For ten goals, there was no indicator that would not be found at any other goals, but there were for only five, for which the percentage of individual indicators would exceed 10%.

Based on the cluster analysis we can conclude that there was a very close connection between the nine goals indicated by the GRI indicators (SDG 1–2, SDG 4, SDG 7, SDG 9–11, SDG 16–17) since up to the seven cluster divisions, they always belonged to the same cluster. Apart from the two-cluster division performed on the weighted but non-normalized neighborhood matrix, Decent Work and Economic Growth (SDG 8) constituted a separate cluster in all of the analyses, meaning that it differed significantly from the other SDGs. Although the Euclidean distances between the environmental goals (SDG 13–15) were relatively small, a pattern with a strength similar to the above was not found.

Our analyses can bring an additional perspective to the results of KPMG [18]:

1. in terms of the GRI indicators, 8 (SDG 1–2, SDG 7, SDG 9–11, SDG 16–17) of the 11 SDGs moderately or least prioritized goals are classified into one cluster;
2. the second most prioritized SDG consists of eight distinct groups;
3. the Euclidean distance between goals of the ecosystem (SDG 14–15) and the objective with the highest priority for the companies (SDG 13) are small and thus their low priority can be explained by the similarity of the indicators.

Based on the results of KPMG [18], these goals are at the forefront of the G250 companies' accounts. There are also three independent goals (Quality education, SDG 4), Sustainable Cities and Communities (SDG 11), Peace, Justice and Strong institutions (SDG 16)), which are also related to the other goals, but the strength of these relationships do not reach a critical level for another target. Significant similarities can be observed between the remaining 11 goals, an extreme example of similarity can be found in the case of Life Below Water (SDG 14) and Life on Land (SDG 15), with almost total conformity between these two ecosystem-related goals.

For further research, we suggest a deeper analysis of the relationship between sectoral GRI indicators and SDGs, as well as the adaptation of the gap frame model proposed by Muff [16] and/or the model Raworth [24] to companies.

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