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Article

A Meta-Indicator for the Assessment of Misleading Sustainability Claims

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Abstract: In order to address environmental and climate change in a sustainable manner, it is necessary for corporations to make commitments in accordance with sustainable principles, which can be communicated through the use of indicators. In certain cases, indicators are subject to manipulation for the benefit of corporations, a strategy also referred to as "greenwashing". One method of misleading is the transfer of non-sustainable activities of a company to other collaborating companies. This paper proposes and defines the Sustainability meta-Indicator (*SmI*) which can serve as a tool for the assessment of misleading sustainability claims. Its value depends on the sustainability indicators of the other collaborating companies where the company in question pays money and the corresponding amount of paid money. The results of the use of *SmI* on synthetic data demonstrate that the proposed meta-indicator facilitates the assessment of misleading sustainability claims. Additionally, it can be used as a communication mechanism to enhance the value of companies and to support new partnerships and business strategies. For policymakers, this meta-indicator serves as a tool to support measures against consumer misinformation and deception.

Keywords: misleading; sustainability; indicators; corporate sustainability; greenwashing

1. Introduction

The increasing and inefficient use of natural resources and the agricultural green transformation have a negative impact on health and humanity in general. Addressing these impacts requires more scientific and systematic measures to continuously improve human health and is linked to the effectiveness of sustainability [1,2]. It is argued that we should abandon the search for a single consensus definition of sustainability, as sustainability relates to both short and long term environmental, economic and social impacts [3]. In general, the minimum condition for maintaining sustainability is the stability of natural capital and the conservation of stocks [4]. Contributing to sustainable development is now a strategic goal for both businesses and governments. And while there is a growing body of literature on sustainability in the research community, the question of how to measure sustainability remains unclear [5]. Societies should now approach sustainable development as the integration of sustainability issues into corporate and social activities and strategies, analysing possible future development paths and their implications [6].

The European Union, with measures focusing on sustainable agriculture, the Green Deal and a ban on misleading corporate environmental claims, aims to tackle the existential threat of climate change and environmental degradation [7]. But European directives are not enough to ensure sustainability. A way out in this direction is the change in consumption patterns which can contribute to ensuring sustainability and tackling climate change. Consumers need to become more informed about sustainable products, spend time researching product choices, consider the life cycle of products, and demand transparency and accountability regarding companies' commitments to sustainability [8]. Of course, consumer interest in sustainable products increases the popularity of companies that seek to present themselves as environmentally responsible [9]. But, because consumers have different perceptions of sustainability, they often rely on misleading, inaccurate and popular beliefs that reinforce their attitudes towards ineffective environmental decisions [10]. Many companies around the world use false environmental identities and misleading claims about their environmental performance to influence public opinion in their favor. It is also observed that companies develop marketing campaigns

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that overstate their performance in relation to climate change [11]. However, existing self-regulatory initiatives could help protect consumers from misleading claims by providing specific guidance to companies on how to make credible and understandable sustainability claims [12].

The level of sustainability of a company is determined by various factors such as: transparent and credible communication of how a company is addressing government commitments, the characteristics of the products it develops, provides or grows, and the disclosure of climate investments, financial risks and losses. As the measurement of a company's sustainability performance is influenced by the sustainability performance of other members of its supply chain, research is needed to create a governance model to ensure the outcome of the measurement. Using a broader framework of sustainability indicators and constructing them in a more participatory way increases the usability of the information by contributing to the integration of the concept in current policies [5,13,14]. The implementation of appropriate indicators and metrics enables the monitoring of progress towards the realisation of a more circular agricultural system. Furthermore, it facilitates the development of strategies and policies designed to encourage the adoption of more sustainable practices [15].

This study aims to contribute to highlighting the concept of sustainability of a company, in the sense of revealing the extent to which all the entities involved in it adhere to sustainable conditions. We propose an innovative and credible indicator that detects and highlights attempts to mislead corporate sustainability.

The rest of the paper is structured as follows: Section 2 provides a literature review on the issue of misleading sustainability indicators and how to tackle misleading claims. The proposed Sustainability meta-Indicator for the assessment of potential misleading sustainability is defined and described in detail in Section 3. Examples on the use of the meta-Indicator is given in Section 4. Section 5 presents the discussion points and Section 6 presents the conclusions of this study.

2. Literature Review

The concept of corporate sustainability is framed by environmental, social, economic and governance pillars to provide equal opportunities for future generations. As the qualitative description of sustainability can be misleading and counterproductive [16], research is continuously being developed on the measurability of sustainability pillars to ensure accountability and avoid misleading [17]. The emergence of new concepts such as greenwashing and pseudo-ecological identity appears to be associated with concerns related to sustainable development, as they appear to be intertwined with misleading. In the literature review that follows, we identified research that focused on the reasons why sustainability terms are manipulated and ways to minimize misleading claims.

2.1. Misleading Sustainability

Companies often use misleading environmental claims for marketing purposes, in order to increase their production and profits [18,19]. Many companies engage in sustainability operations for sensationalism in order to achieve their corporate goals, without necessarily intending to deceive others [20]. In recent years, due to mounting pressure and intensifying competition for the disclosure of corporate environmental performance, companies have resorted to the use of deceptive practices, including the underreporting of their environmental performance [21]. This has an impact on long and opaque supply chains as globalization increasingly involves unethical suppliers with low compliance capacity [22]. Deceptive communication practices are employed by all types of companies due to the absence of control mechanisms and the lack of enforcement of sanctions [23,24]. Furthermore, it seems that misleading manipulation occurs when certifications for viable claims are not based on tangible evidence, thereby creating misleading perceptions [25].

Sustainability indicators are tools that are increasingly used by managers to base their strategies on sustainability. Their popularity has caused an explosion of indicators [26]. However, their use is sometimes problematic mainly because of the multiple interpretations of sustainable development [27,28]. Companies use a multitude of methodologies and indicators, which can make comparison

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difficult. In some cases, presenting positive results can be a form of projecting a pseudo-ecological identity [29]. It can be reasonably deduced that the utilization of various laudable sustainability indicators in policy practice is ultimately futile and potentially misleading with respect to specific aspects of sustainability and tailored policy council [30]. The discrepancies that emerge from indicator measurements lead to the conclusion that Europe is not on a sustainable trajectory [31]. Furthermore, the databases of international organizations utilized to furnish data in the domains of sustainability, development and transition studies are riddled with shortcomings, and can be held culpable for the dissemination of misguided policy interpretations, practices and research [30,32]. Furthermore, indicator selection and data collection should be informed by a diverse range of perspectives, including those of local stakeholders and international experts [33].

In the context of the supply chain, the selection of suppliers is primarily based on economic indicators, with environmental and social criteria playing a less prominent role. This underscores the need for a redefinition of the criteria for selecting suppliers in terms of sustainability as a fundamental aspect of transitioning towards a sustainable supply chain [34]. Additionally, numerous sustainability assessments concentrate on the production stage, thereby neglecting the other phases of the supply chain and their associated impacts. This often results in incomplete and misleading information [35].

The sharing of information and the establishment of green trust are of great importance in customer-supplier relationships, as they have a beneficial impact on the sustainability of the supply chain. Conversely, the asymmetry of sustainability information within the supply chain has a detrimental effect on sustainable development [36]. In case that an unethical foreign supplier demonstrates a lack of capacity for compliance, the advantage of supply chain transparency will result in the sale of an increased number of counterfeit green products, thereby causing further social harm [22,37].

A comprehensive investigation of a company's stakeholders can yield insights into the genuine extent of its dedication to sustainability. Furthermore, an investigation into the background or historical context of this data can assist in identifying any inconsistencies or discrepancies.

2.2. Tackle Misleading Claims About Sustainability

Over one hundred environmentally active labels have been created in the EU and more than four hundred and fifty worldwide with the intention of countering deception. With regard to the question of who is responsible for sustainability assessment, the EU is urged to create a list of environmental claims and innovative proposed documentation methods to support consumers against misleading information [12].

The European Union has enacted a directive that prohibits deceptive commercial practices. Article 6 of the directive specifies that an environmental claim is to be based on the main environmental impacts of a product throughout its life cycle, including its supply chain. Additionally, Article 12 of the same directive, which pertains to the substantiation of good practice, requires that traders possess evidence to support their claims, which can be verified by the relevant public authorities [38]. However, environmental claims can be deceptive and may result in misinterpretations, thereby raising questions about the approach taken by the draft European Directive [39]. Moreover, in response to deceptive assertions, there has been a decline in consumer confidence in brands, which poses a threat to the potential of green marketing [40]. In this regard, numerous researchers are seeking to identify the most effective means of preventing the dissemination of deceptive sustainability claims.

High transparency eliminates the possibility of deception and can motivate a socially responsible firm to make additional observable investments in response to the threat of projecting a pseudo-ecological identity on the part of a profit-driven firm [41]. In order to ensure the authenticity and ethicality of their sustainability, businesses must address a number of factors related to change management, environmental commitments, the cultivation of a green brand, policy support and stakeholder engagement [42].

The latest research indicates that new technologies, such as blockchain applications, are being promoted in the field of sustainability communication in food supply chains [43,44]. This is occurring

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at a time when brands are seeking to protect themselves from perceived deception, rather than relying on certification schemes [45].

Generally, the implementation of collaborative innovation and a systems approach, coupled with the optimization of resource utilization and the reduction of environmental and social impacts associated with production and distribution processes within the stakeholder supply chain, facilitates an expedient transition to sustainability [35,46].

It would be prudent for governments to consider implementing mandatory disclosure and strengthening social monitoring in order to avoid any potential for misleading individuals. Conversely, companies could enhance their capacity building and improve the governance mechanism of "pseudo-identity projection" with the help of digital empowerment [47,48].

The importance of accurate information in influencing consumer preferences, as well as those of other stakeholders, is uppermost. Consequently, actions to prevent the dissemination of misleading information are of the utmost significance [49]. It is essential to establish a unified set of sustainability indicators that includes all participants in the value chain, in alignment with the Sustainable Development Goals (SDGs) [50].

3. Description of the Sustainability Meta-Indicator

The preceding literature review highlighted the need for sustainable development especially in the agri-food sector. It was also highlighted that the definition of sustainability is not unique or universally accepted and that many indicators have been proposed which try to measure sustainability with different targeting, different data and different methodologies.

An important problem is also the need to address attempts of misleading consumers as to the actual degree of a company's sustainability claims. One of the misleading tactics that companies use to appear to be responding to consumer demands regarding sustainability is to transfer their non-sustainable operations to other companies either subsidiaries or partners. These non-sustainable operations, which may negatively impact the sustainability indicator of a company may concern the purchase of raw materials, the packaging materials used, the ways of transportation, the type and amount of energy required in the production process and others.

This paper proposes the Sustainability meta-Indicator (SmI) for the assessment of misleading sustainability claims. The objective of SmI is to satisfy consumers' need for information about the sustainability of products or services provided by a company. Acting in an upper level, this meta-indicator takes into account the sustainability of other companies that are in collaboration with the company in question. The transfer of non-sustainable activities to other companies will be reflected in the meta-indicator. Expenses paid to companies that are not sustainable is recorded as a decrease in the SmI.

In order to ensure the effectiveness of the Sustainability meta-Indicator, it is essential to define it in a manner that encompasses the following characteristics:

- The more a company spends on sustainable companies, the more it increases its SmI, and vice versa.
- SmI should be time-dependent to allow the company to change its sustainability over time.

The SmI identifies a reliable way to reinforce the validity of the concept of sustainability. It uses information related to the company's expenses to other companies and the sustainability of collaborating companies to define the meta-indicator of sustainability and generate new knowledge for the company and the public.

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3.1. Definition of Sustainability Meta-Indicator (SmI)

The definition of the proposed Sustainability meta-Indicator (SmI) is based on the Sustainability Indicators of the other collaborating companies where the company in question pays money and the corresponding amount of paid money. The definition of SmI is given by the following Equation:

$$SmI = \frac{\sum_{j=1}^{N} S_j \cdot e_j}{\sum_{j=1}^{N} e_j} \tag{1}$$

where N is the number of entities (collaborating companies) that are paid by the company in question, j is the index that shows the entity, e_j is the sum of expenses paid to the entity j and S_j is the Sustainability Indicator of the entity j. Any of the indicators identified in the literature review can be used as a Sustainability Indicator S_j with valid value from 0 to 1 (or 0% to 100%). By definition, the Sustainability meta-Indicator takes also value from 0 to 1 and can be expressed as a percentage from 0% to 100%.

This definition has the advantage that a company is considered more sustainable if it pays other sustainable companies and its sustainability decreases if it pays non sustainable companies. Thus any attempt to mislead the public by transferring non-sustainable activities to other companies will be reflected in the indicator.

3.2. Time Dependency

It is proposed that the Sustainability meta-Indicator should be time-dependent, whereby older expenses should have a reduced impact on the indicator value. It is also proposed that the indicator's value will be calculated on an annual basis. In calculating this value, the expenses of the last T years should be taken into account with a scaled weight, where the weights for recent years will be greater than the weights for earlier years. It should be noted that the annual basis may also change for a more frequent or rarer calculation of the SmI.

The embedding of time-dependency in the SmI extends its definition, so as to be defined for a certain year t, symbolized as $SmI(t)$ and calculated by the following Equation:

$$SmI(t) = \sum_{y=t-1}^{t-T} w_y \frac{\sum_{j=1}^{N} S_j(y) \cdot e_j(y)}{\sum_{j=1}^{N} e_j(y)} \tag{2}$$

where N is the number of entities (collaborating companies) that are paid by the company in question, j is the index that shows the entity, t is the year for which the Sustainability meta-Indicator is calculated, T is the number of the previous years that will be taken into account, y is the index that shows the previous years from $t-1$ to $t-T$, $e_j(y)$ is the sum of expenses paid to the entity j during the year y, $S_j(y)$ is the Sustainability Indicator of the entity j for the year y and w_y is the weight factor for the year y.

The weight factors w_y could be expressed in percentages and their sum should be 100% in order to keep the possible values of the Sustainability meta-Indicator from 0% to 100%. A good selection of the previous years that will be taken into account is five ($T = 5$) and typical values for the corresponding weights are given in the following Table 1.

Table 1. Typical values of weight factors for a five years period.

y	t-1	t-2	t-3	t-4	t-5
w_y	50%	25%	12%	8%	5%

This choice of weight values allows a relatively quick adjustment of the Sustainability meta-Indicator, as 50% of its value depends on the previous year's expenses. The calculation of the Sustainability meta-Indicator (SmI) for a specific company and year needs the knowledge of the Sustainability Indicators (S_j) of all the entities that are paid by the company for all the previous T years. Similarly, as

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with the preceding definition of Equation 1 , it is also true that any of the indicators identified in the literature review can be used as Sustainability Indicators (S_j).

4. Examples on the Use of *SmI*

4.1. First Example

First, a simplified example regarding the definition of *SmI* (Equation 1) is presented. Suppose a company has a value (e.g. $S = 70\%$) for a sustainability indicator, calculated according to the methodology provided by its definition. This company pays money to $N = 5$ other entities (partner companies). The amount of paid expenses and the sustainability indicators of the entities are given in Table 2.

Table 2. The expenses (e_j) of a company paid to $N = 5$ entities ($j = 1, \ldots 5$), their sustainability indicators S_j and the product $S_j \cdot e_j$.

j	**1**	**2**	**3**	**4**	**5**
e_j	60,000	30,000	40,000	20,000	50,000
S_j	50%	60%	40%	20%	10%
$S_j \cdot e_j$	30,000	18,000	16,000	4,000	5,000

By using Equation 1 and data from Table 2 the Sustainability meta-Indicator of the company is calculated as:

$$SmI = \frac{30{,}000+18{,}000+16{,}000+4{,}000+5{,}000}{60{,}000+30{,}000+40{,}000+20{,}000+50{,}000} = \frac{73{,}000}{200{,}000} = 36.5\%$$

In this example, all expenses are paid to companies with sustainability indicators below 70% which is the sustainability indicator of the company in question. The calculated value of the Sustainability meta-Indicator is 36.5% and the difference between the two numbers indicates that the choice of partner companies does not align with the company's sustainability goals.

4.2. Second Example

In a second example, suppose that the same expenses are paid in companies with sustainability indicators greater than 70%, as in the Table 3.

Table 3. The expenses (e_j) of a company paid to $N = 5$ entities ($j = 1, \ldots 5$), their sustainability indicators S_j and the product $S_j \cdot e_j$.

j	**1**	**2**	**3**	**4**	**5**
e_j	60,000	30,000	40,000	20,000	50,000
S_j	80%	90%	75%	85%	95%
$S_j \cdot e_j$	48,000	27,000	30,000	17,000	47,500

By using Equation 1 and data from Table 3 the value of *SmI* is calculated as:

$$SmI = \frac{48{,}000 + 27{,}000 + 30{,}000 + 17{,}000 + 47{,}500}{60{,}000 + 30{,}000 + 40{,}000 + 20{,}000 + 50{,}000} = \frac{169{,}500}{200{,}000} = 84.75\%$$

This value of 84.75% compared with the value of company's sustainability (70%) shows that the choice of partner companies exceed the company's sustainability goals.

The couple of the two indicators <S, SmI> provides a more accurate representation of a company's commitment to sustainability. When SmI is significantly less than S, this may be an indication of potential misleading through the transfer of non sustainable activities to other companies or subsidiaries.

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4.3. Third Example

The following example presents the use of time dependent SmI (Equation 2). Suppose that the company in question pays money to $N = 3$ other entities (partner companies). The amount of paid expenses and the Sustainability Indicators of the partner companies for the previous ten years, are given in Table 4.

Table 4. The expenses $e_j(y)$ of a company paid to $N = 3$ entities ($j = 1, 2, 3$) for 10 years ($y =$ 2023, ...2014) and their Sustainability Indicators $S_j(y)$ for all previous years.

	$j=1$		$j=2$		$j=3$	
y	$e_1(y)$	$S_1(y)$	$e_2(y)$	$S_2(y)$	$e_3(y)$	$S_3(y)$
2023	85,000	80%	60,000	71%	45,000	70%
2022	80,000	75%	55,000	70%	32,000	76%
2021	70,000	72%	62,000	65%	20,000	72%
2020	60,000	71%	60,000	64%	41,000	64%
2019	80,000	70%	50,000	60%	34,000	63%
2018	70,000	66%	55,000	58%	42,000	60%
2017	65,000	63%	62,000	55%	38,000	55%
2016	75,000	60%	63,000	50%	28,000	53%
2015	70,000	61%	52,000	48%	35,000	50%
2014	65,000	58%	50,000	45%	29,000	45%

By using Equation 2 and data from Table 4 the time-dependent Sustainability meta-Indicators $SmI(t)$ of the company can be calculated for six years from 2019 to 2024. For every year, data from its previous five years is used. The results of calculations are presented in Table 5.

Table 5. The Sustainability meta-Indicator $SmI(t)$ values for 6 years ($t = 2024, ...2019$).

t	2024	2023	2022	2021	2020	2019
$SmI(t)$	72.7%	70.4%	66.9%	64.5%	62.3%	59.0%

The synthetic data presented in Table 4 are chosen so that the expenses values for each partner company are more or less the same over the years, but the Sustainability Indicators of all the partner companies paid by the company in question increase. For this reason, the company's Sustainability meta-Indicator also increases over the years, as can be seen in Table 5.

4.4. Fourth Example

The last example will highlight the SmI's ability to detect possible consumer misleading through the transfer of non sustainable activities to other companies or subsidiaries. Let us consider that the sustainability indicator of a company is 50% and that this value is regarded as relatively low due to the fact that it is affected by operations which, based on the criteria of the specific index, reduce the sustainability indicator. According to the company's own estimation, the value of the sustainability indicator could potentially increase to 70% if these "non-sustainable" operations were not taken into account.

The company has decided to outsource these operations to other entities. As a result, it is now in a position to meet the criteria set out in the sustainability indicator, and is therefore able to claim a value of 70% in this regard. However, this may lead consumers to form an inaccurate impression of the company's commitment to sustainability.

The utilisation of the Sustainability meta-Indicator serves to protect against such practices. To illustrate, let us assume that the preceding years' expenses, as presented in Table 6 (lines from $T-5$ to $T-1$), encapsulate a more or less unified behaviour of the company during these years. For these years the company pays three other partners which have sustainability indicator about 50% ($50 \pm 5\%$) with an amount of about 70,000 ($70{,}000 \pm 5\%$) to each partner. That yields a yearly value of around

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50% for SmI for the years from $T-5$ to $T-1$ and for the time dependent indicator $SmI(t)$ the value of 50.6% for the year T (by using the typical values of weight factors).

Table 6. The expenses $e_j(y)$ of a company paid to $N = 5$ entities ($j = 1,...,5$) for 10 years ($y = T-5,...,T+4$), their Sustainability Indicators $S_j(y)$ for all years, the Sustainability meta-Indicator of the company SmI for all years and the time dependent Sustainability meta-Indicator of the company $SmI(t)$.

	$j=1$		$j=2$		$j=3$		$j=4$		$j=5$		SmI	$SmI(t)$
y	$e_1(y)$	$S_1(y)$	$e_2(y)$	$S_2(y)$	$e_3(y)$	$S_3(y)$	$e_4(y)$	$S_4(y)$	$e_5(y)$	$S_5(y)$		
T+4	67,900	51%	74,700	50%	72,200	53%	73,200	12%	74,800	9%	34.7%	34.7%
T+3	66,500	49%	72,100	45%	71,600	55%	69,300	11%	66,500	9%	34.1%	35.9%
T+2	67,800	52%	71,400	48%	71,000	49%	71,600	8%	69,000	12%	33.7%	37.9%
T+1	74,600	50%	69,900	47%	72,700	46%	68,000	12%	70,500	11%	33.6%	42.0%
T	72,900	46%	73,600	53%	70,300	46%	67,100	11%	73,100	9%	33.3%	50.6%
T-1	72,000	52%	71,800	49%	67,200	52%					51.0%	
T-2	73,800	52%	74,500	50%	72,700	52%					51.3%	
T-3	74,500	48%	73,600	51%	65,600	54%					50.9%	
T-4	66,100	47%	66,600	51%	68,300	45%					47.6%	
T-5	70,100	46%	68,800	45%	70,800	53%					48.0%	

Then, at year T the company decides to transfer the non-sustainable operations to two other partners. This will be reflected in the companies' data as expenses to these partners, which have low sustainability indicators because they undertake to carry out the non-sustainable operations. The exact values used in this example are shown in columns $j = 4$ and $j = 5$ of Table 6. For the calculation of the next years SmI, all the expenses to five partners and the respective sustainability indicators of the partners are taken into account. Regarding the $SmI(t)$ the typical weights and data from the previous five years are used.

As it is presented in Table 6 the SmI immediately reduces to 33.3% at year T, from 51.0% at year $T-1$ and remains more or less to this level for the next years. This rapid decline in the value of SmI shows that the company has transferred a significant share of non-sustainable operations to partner companies. Although, the time dependent indicator $SmI(t)$ has a more smooth decline since it uses 5-years data, the decrease in its value at year $T+1$ (from 50.6% to 42.0%) is also noticeable.

5. Discussion

To evaluate the possible misleading sustainability claims by corporations, an innovative mathematical definition that provides new insights into sustainability indicators has been introduced. The proposed Sustainability meta-Indicator reflects the sustainability of a company and incorporates possible transfer of non-sustainable activities to other companies. It acts as a non-manipulative meta-indicator that fills a gap in the existing literature, as no studies have been identified that attempt to assess the sustainability of a company by taking into account the sustainability of collaborating companies.

The successful implementation of SmI is contingent upon the availability of specific data. Firstly, it is essential to ascertain all transactions certifying the expenses a company incurs in relation to its business interactions with other entities. The data in question are readily accessible, as they are communicated to the tax authorities and are also found in the information systems that are currently in use by all companies. Moreover, it is essential that all partner companies possess sustainability indicators that are consistently and scientifically aligned with the established standards and requirements. It would be optimal for all companies to utilise the same indicator for calculating their sustainability. In the event that this is not feasible, alternative indicators could be employed, with the data normalised to be expressed as a percentage. If a company does not have a sustainability indicator, it could be assigned a zero value, so that it also acts as an incentive to activate the indicator. The time dependence

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of SmI is necessary so that past expenses are weighted by elapsed time. Recent expenses should affect the indicator more strongly than older ones, so that a smoother transition of the indicators value results in cases where the company changes its strategy in relation to sustainability.

How this data affects the calculation of the SmI is discussed in the four examples presented in the previous Section 4. By using appropriately selected synthetic data, extractable information is highlighted that contributes to a nuanced and valid assessment of sustainability meta-indicators. Thus it is revealed how misleading or valid the indicators that a company uses as a communication mechanism and as a measure of its responsibility towards society can be.

While each sustainability indicator S measures the extent to which a company aligns with the principles of sustainability based on its internal operations, the SmI considers the sustainability practices of its partner companies, ultimately assessing whether a company sources products or services from sustainable suppliers. This aspect of SmI is employed to identify potential instances of misleading by transferring non-sustainable operations to partner companies.

When the value of SmI is significantly lower than the value of S then the sustainability of the collaborating companies is significantly less than that supported by the company in question. In this case, if the company wants to enhance its sustainability terms it should develop strategies to align the selection of partner companies with its sustainability objectives. Conversely, when the value of SmI is significantly greater than the value of S, this means that the partner companies exceed the sustainability objectives of the company in question.

When SmI is significantly lower than S it may be an indication of misleading due to the transfer of non-sustainability activities to other companies or even to subsidiaries of the parent company. The detection of such misleading behaviour is achieved by the ability to monitor the indicator over time. The company in the example in Section 4.4, which promotes specific values of sustainability indicators, transfers activities to non-sustainable companies and thus the SmI indicator decreases significantly over time, demonstrating in percentage terms the transfer of a significant share to non-sustainable companies, identifying the misleading behaviour. The graduation of the time-dependent indicator, together with the company's expenses that affect the SmI, helps us to evaluate misleading sustainability claims.

The utilization and the communication of the sustainability meta-indicator may serve to mitigate the potential for claims of pseudo-ecological identity, whilst simultaneously facilitating the communication of potential sustainability trade-offs [51]. Additionally, the model has the capacity to extract information on the evolution of companies' sustainability over time, and to identify those companies that fail to be characterized in terms of sustainability. This may also serve to reinforce the EU directive to ban pseudo-ecological identity [52]. The availability of the indicator permits a comparison of environmental performance over time, the identification of potential areas in the company for improvement, the extraction and pursuit of environmental targets, the discovery of market opportunities, the communication of results in environmental studies and reports, and the benchmarking of performance against other companies [53]. Furthermore, the use of SmI enables companies to substantiate their sustainability claims, improve the integration of their green supply chains and enhance trust and communication with their partners [21].

6. Conclusions

The main scientific objective of this study is to provide valid information on the sustainability of a company to support the company's real commitment to sustainability. The objective is achieved by processing data that is already captured in the modern information systems used by most companies and organizations and can be easily exploited. The way the data is processed is framed by an innovative process that defines the Sustainability meta-Indicator of companies. It ensures that there is no manipulation of the sustainability indicators, which are calculated using information on the expenses paid by companies to other partner entities and the sustainability indicator of these partner entities.

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This study highlighted an innovative method that can be used to assess the degree of misleading regarding the sustainability of the company. The efficacy of this method is contingent upon the availability of comprehensive and accurate data on sustainability, the processing of which generates new knowledge. In addition, the communication mechanism of sustainability indicators contributes to strengthening the value chain of companies, while supporting new forms of collaboration that address new business strategies. For policy makers, the use of the proposed Sustainability meta-Indicator clearly shows which companies are lasting longer under sustainable conditions, and it can be used as a tool to support measures against misleading and deceiving consumers.

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Abbreviations

The following abbreviations are used in this manuscript:

EU	European Union
SDGs	Sustainable Development Goals
SmI	Sustainability meta-Indicator

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