

Assessing Corporate Sustainability with the Enterprise Sustainability Evaluation Tool (E-SET)

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Abstract: Implementing a sustainable business strategy entails assessment of corporate sustainability. In this communication, the Enterprise Sustainability Evaluation Tool (E-SET) is presented and its importance is illustrated. E-SET was developed using the indicators from six global sustainability reporting frameworks and the programming language R. The platform, which can be used for self-assessment and comparison purposes, will provide a comprehensible sustainability score and its graphical representation. Although different sector-specific indicators are proposed in existing literature, E-SET, which is intended to promote sustainability in business practices, incorporates indicators relevant to the three pillars of sustainability. The free and easy tool is expected to help managers of all industries assess their companies, and, based on the results, they would be able to judge their sustainability standing and take remedial steps founded upon the low-scoring sustainability elements. Wider adoption of E-SET will help firms to contribute significantly to national sustainability goals.

Keywords: sustainability assessment; sustainability indicators; R programming

1. Introduction

Sustainability is a multi-faceted concept that has evolved over the years. The overarching idea of sustainability was presented by Brundtland, who explained sustainable development as “development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs” [1]; this explanation is vague and open to wide interpretations [2]. This applies to sub-topics within sustainability as well, for example corporate sustainability—in fact, there is no consensus on the definition of this concept among business scholars [3]. Nevertheless, several of the academics believe that corporate sustainability revolves around responsible economic, social, and environmental management [3]. In addition, corporate sustainability must also ensure long-term value for stakeholders [4]. Despite the complexity that arises from the plethora of interpretations of sustainability-related topics and the multifaceted nature of sustainability, assessment of corporate sustainability should be undertaken to ensure eco-efficiency, fair trade practices, and environmental justice [5].

To evaluate corporate sustainability, appropriate platforms should address sustainability’s multidimensional criteria [6], namely the environmental, economic, and social pillars at different spatial (international, national, and local) and temporal (long-term and short-term) levels [7]. There has been a significant increase in the number of corporate sustainability rating platforms [7], and well over 100 articles regarding sustainability assessment have been published between 2007 and 2018 [8]. This may cause difficulties for firms to choose an appropriate tool. Furthermore, relying on an in-house sustainability evaluation tool is not ideal because it may inadvertently give biased results. Tools will only provide accurate results if the assessor inputs unbiased information, and the best person to perform the evaluation will be a sustainability officer who argues for more sustainability

commitments in an organisation [9]. There are platforms developed by independent parties; for example, *Sustainalytics* provides environmental, social, and governance ratings [10]. Unfortunately, their services are expensive and hence inaccessible to small firms. These arguments and the multitude of academic literature that proposes suitable indicators for different sectors [11–17] indicate that there is no widely-accepted tool for corporate sustainability assessment. Prior studies provide insights from different perspectives regarding sustainability indicators [7,18] and measurements [11,14–17]. However, these methodologies have several limitations, and hence there is a lack of a universal and widely-accepted corporate sustainability assessment tool. This is a major impediment for understanding businesses' contribution to national sustainable development [5].

This communication aims to present the Enterprise Sustainability Evaluation Tool (E-SET), which incorporates social, environmental, and economic assessment. The purpose of this study was to develop a free and easy tool to evaluate the sustainability of firms. Even though E-SET is not a platform that has been mandated by any government or association, the tool enables managers to gain knowledge regarding their firm's sustainability and the topic of sustainability as a whole, and then take remedial actions to improve the sustainability strategy. The top-down approach to sustainability leads to effective implementation of sustainability policies within companies [19]. Dependable results are expected in such circumstances. Honest and reliable input provided by company representatives will improve the firm's sustainable business strategy if they compare their current sustainability score with (a) past evaluations, (b) future goals, and (c) that of competitors.

This article will continue with a Methods section, where the development of the platform will be explained. The Results will provide information regarding the indicators and detail the usage of the tool and the scores it provides. Then, the tool itself will be discussed further. Finally, this article will end with a conclusion that includes future research directions.

2. Methods

The development of E-SET can be regarded as constructive research [20,21]. We have identified a problem: the inability of all companies—both small and large, in all industries—to assess their sustainability using a common metric. Then, we used established guidelines to obtain indicators, and justified their relevance using knowledge obtained from sustainability-related literature. Finally, a tool was developed using the indicators to solve the aforementioned problem. As suggested by Oyegoke, the usage of “the solution”, namely E-SET, will be demonstrated in the results section [21].

The first step in the creation of E-SET was to find suitable indicators to measure corporate sustainability. Therefore, a literature review of six global sustainability reporting frameworks recommended by the Task Force on Climate-related Financial Disclosures [22] was conducted. The reviewed frameworks were:

- The Climate Change Reporting Framework by the Climate Disclosure Standards Board
- The G4 Sustainability Reporting Guidelines by the Global Reporting Initiative (GRI)
- The Investor Expectations reports by the Institutional Investors Group on Climate Change
- The Global Climate Change Risk Survey reports by the Asset Owners Disclosure Project
- The International Integrated Reporting Framework by the International Integrated Reporting Council

Despite the lack of consensus among scholars on sustainability assessment, G4 is a legitimate sustainability reporting standard [3]. Therefore, first we selected factors from this framework for E-SET. Then, to include all the characteristics of sustainability that are in the triple bottom line, additional indicators were derived from the other guidelines. Relevant indicators were thus selected, rephrased, and incorporated in E-SET. These indicators come under social, environmental (ecological), and economical aspects as grouped by Baumgartner and Ebner [23].

Based on the theoretical concept that the triple bottom line consists of eco-efficiency, fair trade, and environmental justice [3], thirty-one indicators each for different environmental,

social, and economic responsibilities (Table 1) were chosen to measure corporate sustainability. The three-pronged evaluation tool consists of only 93 indicators (31×3) because aggregation was necessary to include all the points in the abovementioned frameworks. A successful indicator aggregation process (a) summarises pertinent data, (b) communicates desired information, and (c) facilitates time comparisons [24]. The indicators were selected from the frameworks and phrased in a way that fulfils these criteria.

Table 1. Topics included in the environmental, social, and economic indicators.

Environment	Society	Economy
Eco-friendliness of products, packaging etc.	Health and safety of employees and customers, including consumer privacy and data protection	Investments on research and development and on the local community, and assessment of investments
Waste and recycling	Positive impacts on the local community	Long term business strategy and assessment of current and future economic losses
Energy use and saving methods	Ethics, corruption, and human rights	Equal pay
Impacts on biodiversity and habitats	Employee training and benefits	Fair competition and long-term profits, including but not limited to income from after sales services
Greenhouse gas emissions	Diversity and discrimination	The triple bottom line
Transportation-related environmental impacts	Planning for positive social impacts	Process improvement and cost reduction
Value chain's impacts on the environment	Value chain's societal impacts	Value chain's economic position
Environmental concerns of the stakeholder	Societal concerns of the stakeholder	Economic concerns of the stakeholder
Internal awareness on environmental issues	Internal awareness on societal issues	Internal awareness on economic issues

All the 93 indicators are worth 10 points each, allowing firms to obtain a maximum score of 930. Sharifi and Murayama indicate that assigning weights to different criteria is subjective [25]. One way of calculating the total score is to employ weighting, using tools like the Analytic Hierarchic Process, Analytic Network Process, or the Principal Component Analysis [26–28]. Much of the literature use such adjustments—however, Munda's study shows that weights are required when there are different numbers of indicators in each dimension [29]. Because E-SET has 31 indicators for each aspect, the platform gives all indicators equal weightage to bestow equal importance on the three pillars of sustainability, as mentioned by Pope et al. [30]. Several assessment tools have used this approach [28].

E-SET was made using the programming language R and mainly its packages shiny v1.0.5 and ggplot2 v2.2.1, which are effective in creating interactive and pleasing applications and graphs, respectively [31,32]. Other packages employed were rconnect v0.8.8 (to publish E-SET online) and tibble v1.4.2 (to change the format of the input data). Factors that ensure the user-friendliness of E-SET are its simple layout, straightforward instructions, and a comprehensible graph that visually represents the sustainability scores of companies. The tool is published on <https://aarchazanya.shinyapps.io/E-SET/> through the shinyapps.io website. The platform is accessible from any computer, smartphone, or tablet. Ergo, irrespective of the size and type of firm, managers around the world can assess the sustainability of their companies.

3. Results

E-SET is a cloud-based application and users can access the tool by visiting <https://aarchazanya.shinyapps.io/E-SET/>. In the application, company representatives will find simple instructions on how to use the tool (Figure 1). In the indicators tab, there are 93 indicators. They were carefully selected from the six sustainability reporting frameworks, and the indicators measure a variety of sustainability criteria (Table 1). The environmental indicators assess, among others, impacts on the flora and fauna affected by the actions of the company, while the social ones evaluate the firm's

considerations for its stakeholders. The economic indicators focus on financial development that benefits not only the business but also all parties that are affected by the actions of the firm. The sliders associated with the indicators can be altered to appropriately rank a firm's environmental, social, and economic commitments (Figure 2).

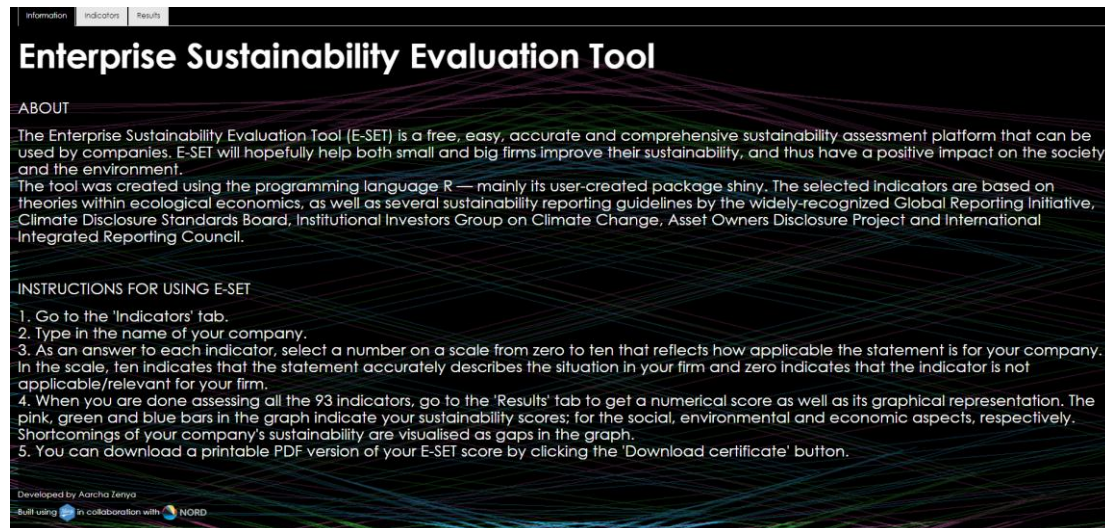


Figure 1. The information tab of the Enterprise Sustainability Evaluation Tool (E-SET). This tab is the first thing users see when they visit the website. Here, they can get information about the application and understand how to use the platform.

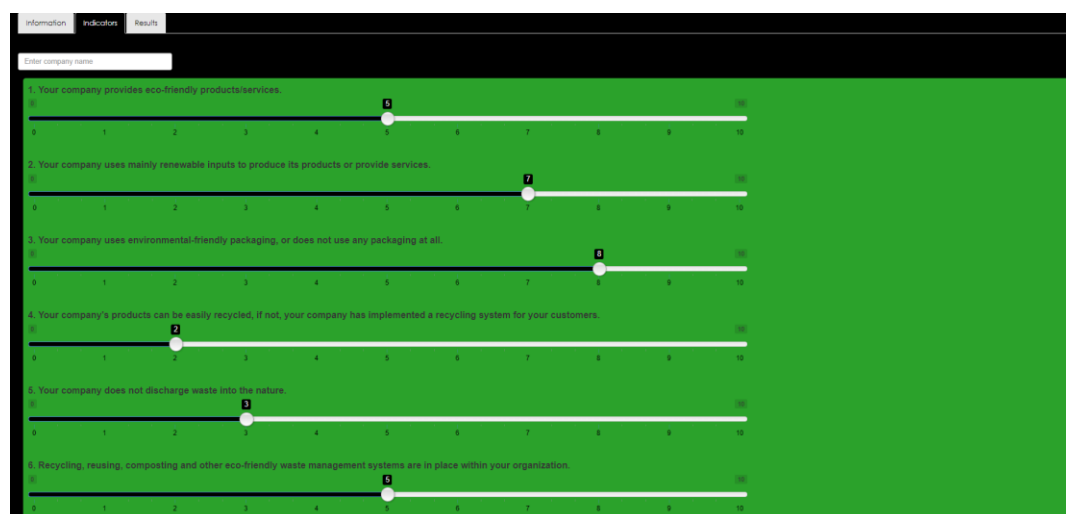


Figure 2. Six of E-SET's environmental indicators. In the indicators tab of E-SET, users can input the appropriate numbers that best describe the actions of their company by moving the sliders.

E-SET will give a numeric sustainability score of enterprises and a self-explanatory graph that summarizes the score. Shortcomings in sustainable business practices will lead to a low score. Well above 465 points (50% of the total) is the optimal range (Figure 4d,f–h), while scores well below 465 (Figure 4a–c,e) indicates that the firm needs to take significant measures to improve its sustainability.

The input numbers in the indicators tab determine the height of the bars in the results tab; short pink, green, or blue bars show that the company needs to improve its social, environmental, and economic factors, respectively. See Figure 3 for the ratings of two companies that conducted sustainability evaluations using E-SET and Figure 4 for various score scenarios. These high and low scores indicate the quality of the sustainability paths followed by the companies.

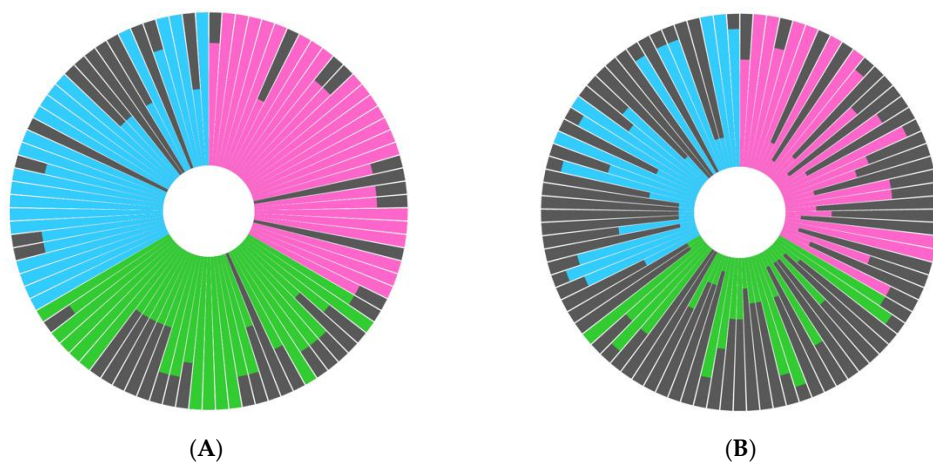


Figure 3. The E-SET scores of two firms. Both companies have good sustainability scores, but company (A) has fared better than company (B).

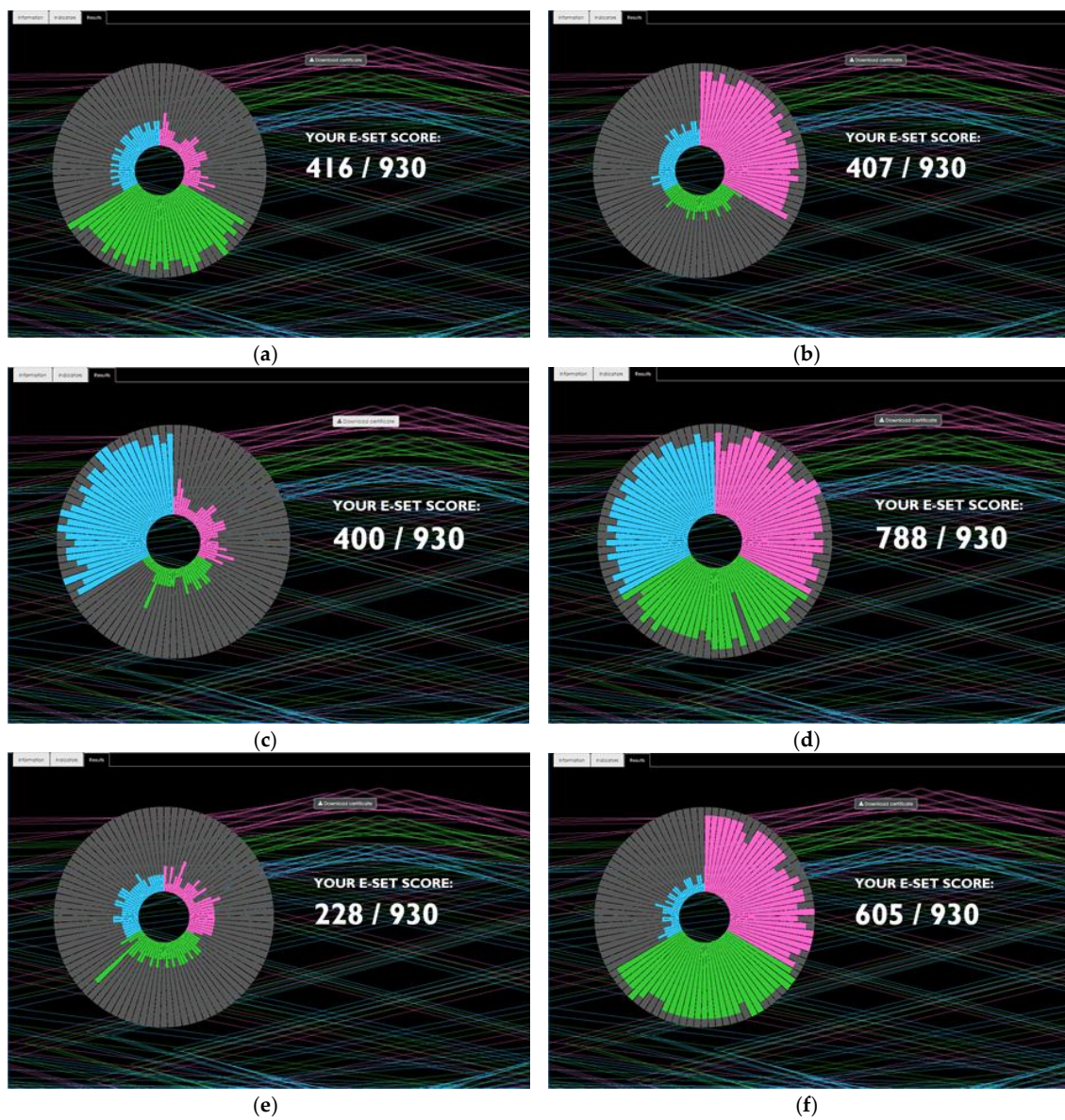


Figure 4. Cont.

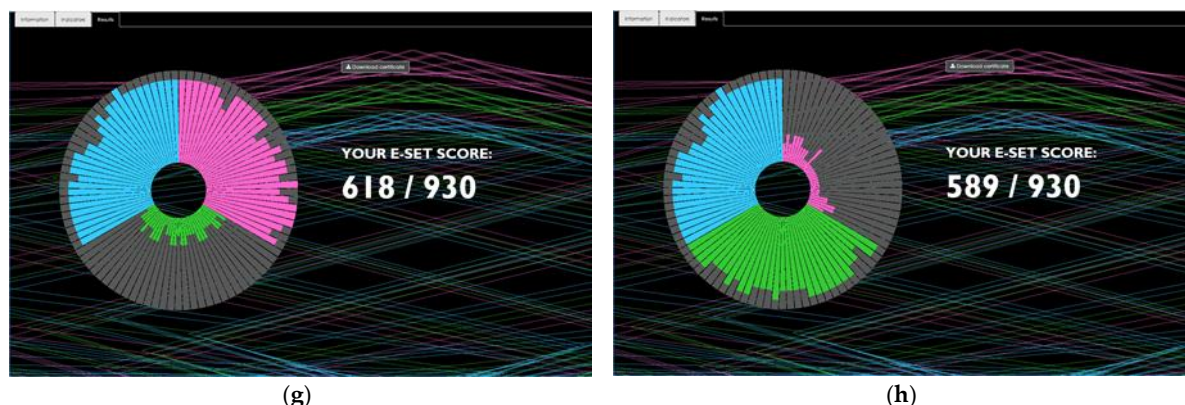


Figure 4. Hypothetical score scenarios were created using E-SET. In some cases, the fictional company only focuses on one (a–c) or two (f–h) of the three pillars. (d,e) represent one of the best and worst cases, respectively.

4. Discussion

We have developed a tool that assesses the sustainability of companies and provides a score that highlights their environmental, social, and economic strengths and weaknesses. Previous studies within the field of sustainability have not created a universal set of indicators to assess corporate sustainability. Since the indicators are derived from established sustainability frameworks, one may claim that E-SET is an extension of existing platforms. Nevertheless, users can obtain comprehensive knowledge regarding all three sustainability pillars and evaluate sustainability using E-SET instead of assessing each dimension using a different framework. This research intends to make an important contribution within sustainability assessment by providing a tool to help all corporate stakeholders understand firms' sustainability status. The E-SET scores of different companies can provide managers and the scientific community with valuable sustainability information that can be used for improvement or research purposes.

4.1. Abiding by the Bellagio Principles

The long-established Bellagio Principles highlight several important points of sustainable development [33]. E-SET is a platform that follows the principles. Firstly, the principles express the necessity of having a guiding vision—E-SET's aim is to measure corporate sustainability so as to help managers improve it. The holistic nature of E-SET is maintained to evaluate the negative and positive social, economic, and environmental impacts of both the organisation in its entirety and its individual elements. Assessment platforms should also collect data that is large enough to incorporate most of the sustainability aspects across time and space but small enough for handling. These principles are acknowledged by the wide variety of topics addressed in E-SET (Table 1) through the 93 indicators. It is also crucial that the indicators could be modified to adapt to the dynamic world; E-SET's codes can be altered to solve this problem. In addition, some of E-SET's indicators measure organisations' intentions to mitigate sustainability issues, unlike other rating systems [12]. Since the indicators in E-SET fulfil these criteria, the application facilitates a continuous assessment.

Kuhlman and Farrington are of opinion that our focus on social, environmental, and economic aspects in sustainability clouds the conflict between the well-being of the people and the preservation of our planet, overshadows the importance of environmental protection, and disconnects social and economic factors, even though they are two sides of the same coin [34]. However, E-SET gives equal importance to all three dimensions because it is vital to direct the attention to societal, economic, and environmental impacts [35]. Singh et al. also claim that multi-dimensional sustainability indicators are the leaders of the global sustainability assessment industry [28].

A sustainability assessment program needs to give relevant feedback to its users [33]; this is what the platform's score provides through its numeric and graphic results. E-SET acknowledges Espeland

and Stevens' recommendation; numerical pictures must be lucid and contain essential information [36]. Even though subjectivity in the interpretation of results cannot be ignored, users can analyse the low-scoring indicators and find strategies to improve the rating. The E-SET rating of the companies in Figure 3 illustrates this feature. The score of company B is just above 50%, and the representatives must look at the polar graph to fathom how they can improve their sustainable business strategy. Since the pink bars are long, one can comprehend that the enterprise's practices are socially responsible. However, because the green and blue bars are not as tall as the pink ones, the firm has to concentrate on improving their economic and environmental anchoring. Company A can also conduct a similar analysis of their sustainability, even though they have fewer areas for improvement than company B. Likewise, the better or worse scores in Figure 4 will inform the company about their position on the sustainability ladder. Based on the assessment, the manager can implement measures to ameliorate economic, environmental, and social impacts.

A sustainability measurement tool should be effective, inexpensive, quick, and easy to use; otherwise, firms will not retake them. Re-evaluation of corporate sustainability is vital for positive effects [37]. The aforementioned Bellagio Principles also highlight the need for user-friendliness [33]. E-SET can be easily accessed, and its simple and precise instructions will help the users to assess their company's sustainability.

4.2. Connecting the Indicators with Sustainability-Related Concepts

Even though the traditional Anglo-Saxon business view of creating short-term value for shareholders is in direct contradiction to the concept of corporate sustainability [38], economic prosperity should not be ignored when assessing sustainability. In fact, Lankoski defines economic responsibility as the distribution of wealth to not only shareholders but also other stakeholders [4]. E-SET measures long and short-term economic responsibility that benefits the firm itself, employees, customers, and other relevant stakeholders, upon whom the future corporate growth and survival is hinged [39]. Internal economic progress is also crucial for firms to have the resources to ensure social and environmental sustainability.

According to Montiel, social and environmental sustainability can be considered as corporate social responsibility (CSR) and environmental management (EM), respectively [40]. The oft-cited definition of CSR is "the social responsibility of businesses [that] encompasses the economic, legal, ethical, and discretionary expectations that society has of organizations at a given point of time" [41]. Shrivastava and Addas claim that all social policies need to positively affect the workforce and surrounding community [42]—these criteria are reflected in all social indicators in E-SET. Regarding EM, the term can be explained on the basis of theories such as the Ecological Footprint. According to this theory, global human actions should not exceed the Earth's limitations, i.e., our resource consumption should not affect our ecosystem's functionality [5]. The indicators in E-SET measure firms' abilities to ensure that the Earth's capacities are upheld. Another environmental theory, which also incorporates CSR, is the Natural Step, which claims that the society must meet global human needs without being subject to increasing exploitation of natural resources, materialism, or induced degradation.

E-SET pushes firms to take both proactive and reactive measures within the economic-environmental-social nexus. The indicators in E-SET are also aligned with sustaincentrism, which is the continuous development towards social, ecological, and economic equity at both global and local levels [43]. E-SET's indicators are also in accordance with Kantabutra's Sufficiency Economy Leadership Practices, which says that a sustainable company must (a) have an organizational culture that promotes values such as ethical behaviour; (b) adopt a long-term business strategy that positively affects all stakeholders, including employees; (c) develop products or services through innovation and effective and efficient resource use; and (d) make fair and well-contemplated financial decisions [44].

E-SET's score output can be analysed using a triple bottom line approach. According to this theory, a firm must align its financial and ecological targets, consider social repercussions of its business

practices, and ensure that social equity does not negatively affect the environment and vice versa [5]. A firm that only focuses on financial aspects (Figure 4c) does not abide by national sustainability goals and will eventually face great pressures from stakeholders. Companies that ignore economic aspects and focus solely on the environment and/or the society (Figure 4a,b,g,h) will not be able to benefit either the people or the planet in the long run due to financial distress. These examples demonstrate that the ideal company must combine all three aspects of sustainability (Figure 4d) to meet the needs of both current and future generations.

4.3. Using E-SET in Different Sectors

As mentioned previously, several studies have developed different sets of frameworks and analytical procedures to assess sustainability in various sectors. For example, twenty-four indicators based on the Delphi methodology were created to evaluate the sustainability of dehesa and montado systems in Spain and Portugal, respectively. Likewise, many methods or indicators that measure, among others, the sustainability of neighbourhoods [25], the oil and gas sector [15], and aquaculture systems [11] have been created. These tools are not only made for specific sectors, but also developed using various techniques. Even though these tools are useful in the sense that they are highly industry-specific and detailed, they lack the degree of sustainability coverage and fail to create a balanced inclusion of all the pertinent criteria of the three dimensions. E-SET can be used to understand any company's sustainability performance, and the information generated can be utilised to improve their biospheric and anthropocentric dimensions.

4.4. Limitations of E-SET

There is no doubt that all sustainability evaluation tools have their own limitations, and E-SET is no exception. There are several factors that may affect E-SET's score. One inherent risk is the principal-agent problem [45]. Another point is the firm's sustainability strategy; companies with introverted or extroverted strategies [23] might give inaccurate input to distort the results without considering the ramifications to the company or its stakeholders. These issues will be mitigated by changing the business strategies and improving the attitudes and knowledge of the company staff. It should be noted that "there is moderately strong relationship between connectedness to nature scale (emotional connection to nature world) and eco-friendly actions", as pointed out by Mayer and Frantz [46]. Therefore, we argue that companies that have institutionalised the idea of sustainability will have the advantage of accurately inputting information to obtain correct scores, unlike smaller firms that lack such expertise. However, the businesses that aspire to climb up the sustainability ladder will acquire the knowledge, and we encourage them to input precise facts. We acknowledge that the subjectivity of the users can affect the evaluation process [8], and it is crucial that the representative is as objective as possible to prevent dishonesty. Considering that E-SET is a self-exercise to develop a road map for the sustainability journey [47], it is presumed that the tool will be used appropriately.

4.5. Positive Effects by Using E-SET

Enterprises opt for a sustainable business strategy due to both intrinsic and extrinsic reasons. The intrinsic incentive is that sustainability is good for business: sustainability leads to increased turnover through higher stock prices [48] and product innovation [49], and reduced costs through energy saving [50]. Extrinsically, businesses should embrace sustainable strategies solely to impart positive effects on the world—for example, some firms have taken measures to reduce their waste to minimise adverse effects on the environment [51], and others have created jobs in conflict areas [52]. The abovementioned environmental and social effects prove that sustainability should be a pivotal goal of all businesses because companies have the power and resources to alter our lives and determine the future of the planet.

Even though all managers are expected to embrace sustainability, only 5553 sustainability reports were published in 2015 [53]—meaning that hardly 15% of the publicly-traded companies were oriented

towards sustainability. Managers cannot succumb to the status quo; they must instead actively work towards a sustainable business strategy. Corporate sustainability can be improved by using an accurate measurement platform [54]. Considering the fact that sustainability assessment is an intricate appraisal method, firms must use the right tool [18]. In fact, the choice of sustainability assessment platform will have extensive repercussions [55]. Managers have a wide variety of options—there are over 200 sustainability ratings, rankings, and indicators [56].

E-SET can be used to measure corporate sustainability and is key to find areas of improvement within the economic-environmental-social nexus. As explained in this section, E-SET is a platform that is expected to provide sustainability scores for companies. Firms are gradually becoming aware that sustainability-friendly business practices positively affect their competitiveness and survival [47]. Once companies start to evaluate their sustainability using the tool, the managers and board members will acquire the knowledge necessary to initiate or enhance sustainable business practices. This comprehension and the associated managerial actions are valuable assets, not only to managers and companies but also all the stakeholders [57]. We should however admit that corporate sustainability will be institutionalised only through legitimacy, voluntary initiatives, and adoption of best practices [58]. While the code of conduct from the GRI can lead to coercive isomorphism, mimetic processes like borrowing of models occur during uncertainties such as political turmoil and climate change [58,59]. Sustainability ratings are known to affect companies' intrinsic motives, which are less inferred by consumers; therefore, such ratings are expected to discourage green sheen [60].

Finally, it is worth mentioning that E-SET simplifies the assessment process because it combines relevant indicators from several frameworks. This makes sustainability evaluation a less complicated task. E-SET is therefore a useful tool for self-assessment, from which academia and companies can obtain condensed knowledge for comparison and decision-making.

5. Conclusions

To help companies adopt a sustainable business strategy, E-SET, a free and easy sustainability evaluation platform, was developed using the programming language R. The tool, which can be used by all types of firms, considers social, environmental, and economic dimensions to measure corporate sustainability. The platform's 93 indicators are inspired by six global sustainability reporting frameworks. After evaluation, businesses will obtain a numerical and graphical sustainability score. Since more corporations need to measure their sustainability, E-SET should be used as a self-exercise to inculcate sustainable business thinking and accordingly improve the business strategy. The tool is intended to promote sustainability in business practices.

Although E-SET is a useful platform, it can be further developed. The sustainability scores of different corporations could be analysed and used for comparison purposes in research projects. Another possible research direction could be to evaluate the long-term effect of E-SET: whether relying on E-SET for periodic sustainability evaluation has left a mark on the business world. However, to achieve this goal the users of the platform should perform an honest evaluation of their practices. Yet another future research direction is the creation of a similar platform to measure the sustainability of countries. Furthermore, the full potential of E-SET could be realized if governments consider using the tool as a means to create awareness regarding sustainability.

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