

Article

How Practically Applicable Are the EU Taxonomy Criteria for Corporates?—An Analysis for the Electrical Industry

Suzana Ostojic ^{1,*}, Lorenzo Simone ¹, Mark Edler ² and Marzia Traverso ¹ 

¹ Institute of Sustainability in Civil Engineering (INaB), RWTH Aachen University, 52074 Aachen, Germany; lorenzo.simone@rwth-aachen.de (L.S.); marzia.traverso@inab.rwth-aachen.de (M.T.)

² Weidmüller Interface GmbH & Co., KG, 32758 Detmold, Germany

* Correspondence: suzana.ostojic@inab.rwth-aachen.de

Abstract: This study addresses the current and future mandatory reporting on taxonomy alignment for companies within the EU, examining the practical applicability of criteria outlined in the Climate Delegated Act. Focusing on the electrical manufacturing industry through a case study, a five-step method was developed to assess the usability of the sector-specific criteria. The results highlight the need for enhanced usability across all criteria and offer key recommendations for policy development. Particularly, the substantial contribution criteria for climate change mitigation relating to the “manufacture of other low-carbon technologies” and “data-driven solutions for GHG emissions reductions” were found to be impaired by usability issues. These results emphasize the relevance of investigating the activities assessed in this study when policymakers revise the current criteria. Finally, the study highlights the necessity for future implementation of assessments to prevent usability issues and provide a holistic picture of the status quo of the current EU taxonomy criteria.

Keywords: EU taxonomy; sustainable finance policy; corporate implementation; criteria usability; case study



Citation: Ostojic, S.; Simone, L.; Edler, M.; Traverso, M. How Practically Applicable Are the EU Taxonomy Criteria for Corporates?—An Analysis for the Electrical Industry. *Sustainability* **2024**, *16*, 1575. <https://doi.org/10.3390/su16041575>

Academic Editor: Donato Morea

Received: 14 December 2023

Revised: 8 February 2024

Accepted: 9 February 2024

Published: 13 February 2024



Copyright: © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Realizing the transformative agenda outlined in the European Green Deal and ensuring that a climate-neutral economy is achieved by 2050 requires large-scale investments [1]. As a frame of reference, for achieving the current EU 2030 climate and energy targets alone, the EU Commission has estimated, based on EU Member State National Energy and Climate Plans (NECPs), that annual investments must be increased by €350 billion [2].

Recognizing the magnitude of investments required, the European Commission has developed a comprehensive sustainable finance strategy to channel capital flows into more sustainable investments [3]. A central element of this strategy is the implementation of the EU taxonomy, which provides the first EU-wide classification system for sustainable economic activities [4].

The foundation of the EU taxonomy is the Taxonomy Regulation (TR), which entered into force in 2020 [5]. It sets the framework for the EU taxonomy, while the actual operational list of technical screening criteria (TSC), defining under which conditions economic activities are considered environmentally sustainable, is outlined in the so-called delegated acts under the regulation [3,6,7]. Notably, a first delegated act (DA), known as the Climate DA, focusing on environmentally sustainable activities related to the climate change adaptation and mitigation objectives, has been applicable since January 2022, whereas a second DA for the remaining environmental objectives was recently adopted in June 2023 [1].

Although the majority of large companies in the EU will be required to report in alignment with the EU taxonomy under the criteria of the first DA and per an upcoming Corporate Sustainability Reporting Directive (CSRD), which came into effect from the 1st of January 2024, very few application studies exist today [8]. As the EU taxonomy disclosures

gradually come into effect, existing research has mainly focused on implementing the EU taxonomy by issuers of financial products [8–12]. Those studies revealed that the practical application of the EU taxonomy by financial market participants (FMPs) is often tied to usability challenges [8,10–12]. These usability concerns are likely to extend to corporate implementation, but assessments of usability aspects for the criteria of the first applicable DA remain limited.

This research endeavors to bridge this knowledge gap through a case study, critically analyzing the practical applicability of the EU taxonomy in the electrical manufacturing industry and drawing a line between the theoretically developed TSC and corporate implementation. The study focuses on the EU taxonomy Climate DA and the TSC, which determine whether an economic activity is qualified as contributing substantially to climate change mitigation. The electrical manufacturing industry has been selected as an application study due to its broad product applicability and significance for the energy transition. A unique five-step methodology was devised to scrutinize and pinpoint usability issues within the TSC. This methodology was applied to the case study, identifying specific usability challenges related to the relevant electrical industry's criteria.

Finally, this study aims to provide key recommendations for EU legislators regarding the usability challenges inherent in the assessment of TSC across diverse sectors under the EU taxonomy. Beyond this immediate analysis, the methodological approach developed for identifying and mitigating usability issues can serve a more extensive purpose. It has the potential to be incorporated as an integral component in the frameworks presented by Canfora et al. [13] and Canfora et al. [3], which provide a methodological, scientifically grounded, and TR-aligned step-by-step approach for drafting technical screening criteria tailored to each of the objectives [3,13]. Moreover, as both frameworks build upon the work of expert groups and the EU Commission, there exists a clear initiative for integrating these methodologies into the ongoing developments of the EU Platform on Sustainable Finance (PSF). Given the vague guidance on addressing the usability aspects, the innovative approach developed within this study offers a means to enhance the usability and practical applicability of the EU taxonomy criteria. Consequently, this pioneering approach can enhance TSC development, thereby contributing to the broader objectives of promoting sustainable finance throughout the European Union.

2. Principles of the EU Taxonomy

The EU taxonomy is the first EU-wide scientific-based regulatory standard affecting financial and non-financial undertakings [14]. The main aim of the EU taxonomy is to establish a comprehensive classification system that clarifies which economic activities qualify as environmentally sustainable, with the overarching goal of facilitating sustainable investments and, thus, achieving sustainable and inclusive growth [15].

2.1. Policy Context

The first attempt to introduce an EU taxonomy was made under the Action Plan on Financing Sustainable Growth dated March 2018 [3]. The result was the formation of the TR (EU 2020/852) [15]. Since the TR sets environmental targets and defines environmentally sustainable economic activities in a rather theoretical way, it is concretized through DAs, including the actual list of TSCs defining environmentally sustainable economic activities [3,7]. The present Climate DA criteria encompass the economic activities of approximately 40% of listed EU companies in sectors that comprise about 80% of direct greenhouse gas emissions in Europe [16].

Moreover, the TR is subsidized by linked disclosure directives that mandate two user obligations to ensure that the EU taxonomy criteria are applied in the market (cf. Figure 1). Entities within this scope are FMPs offering financial products and non-financial undertakings subject to sustainability reporting obligations [17].



Figure 1. The EU taxonomy and linked disclosure obligations [18,19].

On the one hand, the TR supplements and amends the Sustainable Finance Disclosure Regulation (SFDR), making it mandatory for FMPs promoting environmental, social, or sustainable investment to disclose their share of investments in taxonomy-aligned activities. For other financial products, an explicit disclaimer must be included [3,20].

On the other hand, the TR also supplements the Non-Financial Reporting Directive (NFRD) and future CSRD, obliging large companies to disclose their revenue and capital expenditures (CapEx) or, where relevant, operational expenditures (OpEx) from taxonomy-aligned activities [3,21]. Revenue indicates a company's current alignment with the EU taxonomy, while CapEx reflects its direction of travel [22]. In light of this, it is crucial to note that the EU taxonomy assesses the share of green economic activities based on financial key performance indicators (KPIs) but does not assign specific benchmarks or scores to rate companies.

Under the NFRD, only around 11,700 large listed companies, banks, and insurance companies are obliged to report EU taxonomy-related information [23]. To connect the assessment of the EU taxonomy with companies' disclosure obligations on sustainability information, the EU Commission has, therefore, adopted the CSRD [24]. The amended regulation would broaden the scope of entities that need to integrate a non-financial disclosure into their sustainability report from 11,700 to about 49,000 companies in the EU [18,23].

The mandatory corporate taxonomy disclosure aims to stimulate investment in environmentally sustainable activities, offer transparency and protection against "greenwashing" to all stakeholders, and provide the financial sector with the data it needs to redirect capital to genuinely environmentally sustainable activities [25].

2.2. The EU Taxonomy Framework and Current Gaps

The EU taxonomy in Article 9 of the TR addresses six environmental objectives outlined below (cf. Figure 2) [15]. For each of these objectives, a list of environmentally sustainable economic activities is further elaborated in the corresponding DAs [11].

For defining an environmentally sustainable economic activity, the TR (in Article 3) defines four requirements that must be fulfilled when setting out TSC. Accordingly, economic activity is considered environmentally sustainable and thus taxonomy-aligned if the following criteria are met:

- It makes a substantial contribution (SC) to at least one of the six environmental objectives;
- Does not cause significant harm ("do no significant harm—DNSH" principal) to any of the other five objectives;
- Accomplishes the defined set of activity-specific TSC for SC and DNSH; and
- Meets a set of minimum safeguards (MS) listed in Art. 18 TR based on international conventions and guidelines on social rights [15].

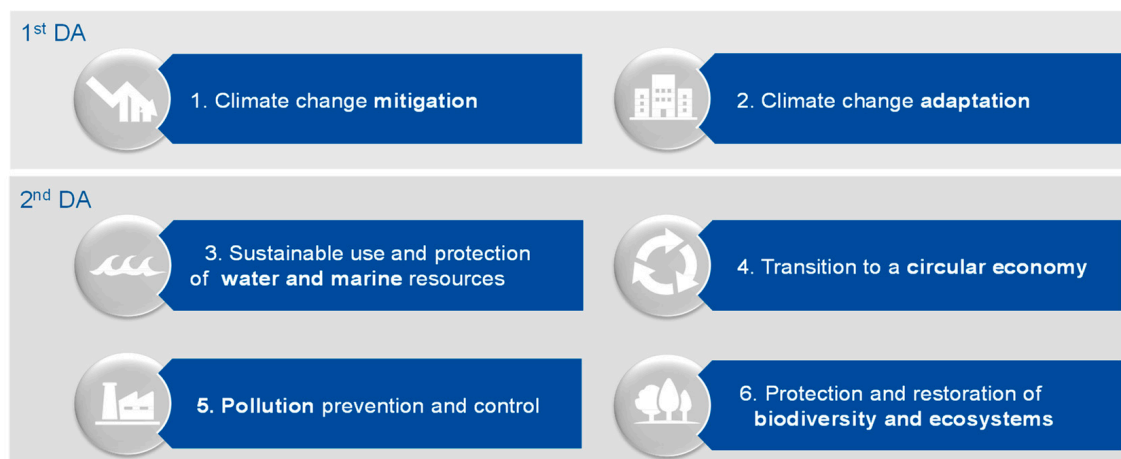


Figure 2. Six environmental objectives [11,19].

Considering the focus of this work on the currently existing Climate DA and the TSC for substantial contribution to the climate change mitigation objective, three types of economic activities can be present:

- Low-carbon activities reduce the pressure on the environment through their own performance;
- Enabling activities directly enabling another activity to make a substantial contribution to one or more of those objectives; and
- Transitional activities support the transition to a low-carbon economy where no technologically and economically feasible low-carbon alternatives exist [11].

Notably, enabling activities need to ensure assets are not locked in, undermining long-term environmental goals, and their environmental impacts need to be positive over their life-cycle [15].

Yet, for an economic activity to be evaluated as taxonomy-aligned, the activity has to be considered taxonomy-eligible, i.e., covered by the EU taxonomy in the first place. This implies that the economic activity related to a specific code of the statistical classification of economic activities—Nomenclature of Economic Activities (NACE)—needs to be on the list of activities included within the DAs [8]. It is important to note that the EU taxonomy is a dynamic tool [26], subject to ongoing development, and therefore activities not currently included in the published DAs are not necessarily considered “brown” activities.

The Climate DA under Annex I lists 88 TSC for defining requirements under which an economic activity qualifies as contributing substantially to the climate change mitigation objective [27]. A detailed list of these included economic activities is provided in Table A1, highlighting the different types of economic activities and NACE macro-sectors.

Ultimately, for developing TSC that is scientifically robust and applicable, the TR provides explicit definitions of substantial contributions for each environmental objective in Articles 10–15 and sets forth additional requirements for TSC in Article 19 [15]. These requirements, among other aspects, address the usability of the TSC [3,15].

In the pursuit of harmonizing and further streamlining the TSC design process, the regulatory guidelines have been translated into comprehensive frameworks for developing TSC, addressing both climate-related objectives [13] and those related to environmental objectives [3]. However, these frameworks lack specificity in terms of usability requirements, particularly in the context of activities contributing substantially to climate objectives. Considering the technical report presenting a framework for defining TSC for activities substantially contributing to climate change mitigation, this methodology entails defining the various types of substantial contribution an activity can make, investigating approaches for defining substantial contribution, determining the level of environmental performance ambition required for SC, and considering the conditions of applicability of each approach considering the TR’s requirements [13]. Nevertheless, this approach only conducts a final

check to ensure compliance with TR requirements, including the usability of criteria, highlighting a deficiency in further defining these requirements and lacking qualitative criteria against which the usability of the TSCs is evaluated. Similarly, the methodological framework addressing other environmental objectives comprises a seven-step methodology for drafting TSC for a substantial contribution [3]. However, the step of checking approaches against TR requirements remains consistent with the prior report and thus lacks further elaboration on assessing the usability of TSC. This underscores the need for additional qualitative criteria to comprehensively assess the usability of TSCs and ensure alignment with TR mandates across all environmental objectives.

Therefore, this study aims to evaluate the usability of TSC, employing the electrical industry as a relevant case study. The ultimate objective is to contribute to the enhancement and refinement of the TSC development framework by providing a clear structure for assessing usability, ultimately aiding legislators in fine-tuning the criteria.

In order to assess the novelty of this research, a comprehensive literature screening was conducted to gauge the current state-of-the-art in the field, primarily utilizing the Scopus database due to its extensive coverage of high-quality peer-reviewed literature [28,29]. The findings revealed a limited yet growing body of scientific literature addressing the EU taxonomy framework, with only nine relevant hits (for searching “EU taxonomy sustainable finance” within the title, abstract, and keywords, limiting the search to English-language articles from 2020, when the TR entered into force, and the keyword “EU taxonomy”) identified, all of which were published within the last two years. Nevertheless, upon closer examination, it was observed that two studies merely touched upon the EU taxonomy as a peripheral topic rather than examining it as a primary focus [30,31]. In contrast, the remaining seven studies predominantly delved into the application and implications as well as the overall effectiveness of the EU taxonomy, including its effectiveness in redirecting capital towards sustainable investments [32,33], its impact on corporate investments [34] and the banking sector [35,36], its potential application in constructing environmental risk indicators [37], and its linkage to loan interest rates and future CO₂ prices [38]. When focusing on the corporate context (searching “corporate EU taxonomy” within the title, abstract, and keywords, limiting the search to English-language articles from 2020, when the TR entered into force, and the keyword “corporate”), a mere six relevant hits were obtained, of which three were deemed irrelevant to the research question. From the remaining publications, two new studies were identified, yet neither specifically addressed the usability of the EU taxonomy criteria; one evaluated corporate compliance with the EU taxonomy in a first vendor study [26], while the other examined its effectiveness in transitioning to sustainable corporate governance [20]. The snowballing technique was employed to explore related publications by the same authors, revealing a focus on the effectiveness of the EU taxonomy in achieving the path to climate neutrality [5,14]. Notably, no scholarly, peer-reviewed studies were found to comprehensively explore the practical adaptation and usability aspects of the EU taxonomy’s criteria, particularly from the perspective of corporations tasked with implementing these criteria.

Therefore, gray literature and reports examining the practical applicability and usability of the EU taxonomy within corporate assessments were sought. However, only reports addressing these aspects from the perspective of FMP were discovered [8,10–12]. Additionally, two reports were identified that touched upon usability aspects for both financial and non-financial companies, albeit at a high level without systematically examining specific sectors and TSC [39], and one of these reports solely assessed the general DNSH criteria without addressing SC criteria [40].

Concludingly, this research aims to bridge this gap by shedding light on the usability challenges and practical applicability of the comprehensive TSC, particularly within the electrical industry, which plays a significant role in the transition toward more sustainable economic activities.

3. Materials and Methods

This study focuses on identifying the usability of the TSC relevant to the electrical industry. For this purpose, a case study was conducted with an EU company in the electrical manufacturing industry, examining the relevant criteria for a substantial contribution to the climate change mitigation objective.

Case studies are a valuable research method for comprehending the real-life context within contemporary phenomena [41], enabling researchers to delve into the “how” and “why” of complex questions [42]. Their value lies in the depth of analysis they provide, making them a valuable tool for exploring and learning about diverse aspects of the phenomena being studied [43,44].

While various case study methodologies have been referenced in the literature, the case study in this research was conducted using the widely applied approach by Yin [45,46]. This framework is well established and has provided guiding principles that enrich the case study methodology [45,47,48]. This study utilizes a descriptive case study approach, aiming to comprehensively describe the phenomena of usability challenges within the TSC of the EU taxonomy and quantitatively as well as qualitatively assess these practical application challenges within the electrical industry’s context. Furthermore, a qualitative single-case study design was applied, enabling a thorough examination of the methodology’s contextual development [45]. In contrast to multi-case study designs, this approach provides a more profound and contextually rich understanding [45], further validating this choice given the highly context-dependent nature of TSC.

Structured around four essential steps, the case study design adapted the approach presented by Yin [45]: (i) formulation of the study question and propositions (presented in the sections above); (ii) development of a usability assessment methodology (to be subsequently presented); (iii) implementation of the developed usability assessment methodology in the electrical industry context (Section 4); and (iv) discussion and interpretation of findings (Section 5).

3.1. Methodological Approach for Assessing Usability Challenges in the TSC

The methodological assessment for defining usability issues within the TSC follows a consecutive five-step approach described in Figure 3.

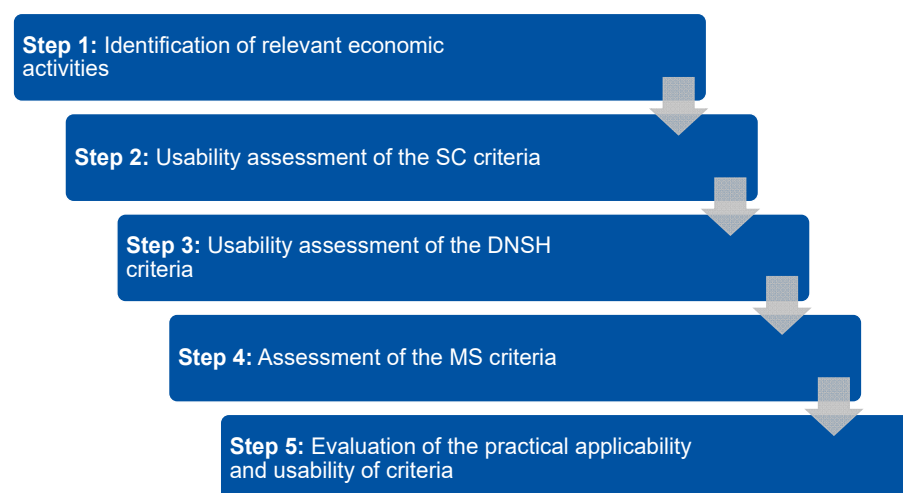


Figure 3. Methodological approach for assessing practical application challenges of the EU taxonomy TSC.

Steps 2 and 3 of this methodology entail the comprehensive identification of various types of usability issues that may arise for corporations when assessing their activities against the SC and DNSH criteria. These identified issues are categorized based on insights gleaned from previous studies, primarily focusing on the usability and practical implementation of EU taxonomy requirements, predominantly by FMP [8,10–12,39,40]. Notably,

no prior study has undertaken this comprehensive transfer of insights to the corporate sector, particularly categorizing types of usability issues within SC and DNSH criteria. Furthermore, primary qualitative data derived from an EU taxonomy assessment conducted within an electrical manufacturing company proved to be valuable in identifying specific types of usability issues encountered during the company's assessment of alignment with the TSC outlined in Annex I of the Climate DA. The resultant methodological approach is subsequently delineated and holds the potential for application across all sectors to assess the practical challenges associated with TSC implementation.

3.1.1. Step 1: Identification of Relevant Economic Activities

In the first screening step, all electrical manufacturing sector-associated NACE codes were determined, providing a list of the sector-relevant activities to be assessed for taxonomy-eligibility. Subsequently, the taxonomy-eligible sector-relevant activities were determined, considering the economic activities included in Annex I of the Climate DA as contributing substantially to the climate change mitigation objective. This screening process aimed to identify those activities related to the electrical manufacturing sector for which the EU taxonomy defines criteria.

3.1.2. Step 2: Usability Assessment of the SC Criteria

The second step of our study involved assessing the usability of the SC criteria within the context of the electrical manufacturing sector, focusing on the relevant economic activities identified in Step 1. For evaluating practical applicability and usability, the criteria requirements were examined to be set so that the evaluation of alignment is facilitated, and reporting requirements are precise and understandable.

To guide this assessment, we framed and further examined the following usability issues based on insights from prior reports and identified issues from a corporate EU taxonomy screening in an electrical manufacturing company, adapted to our research context:

- TSC, including qualitative measures rather than quantitative metrics and thresholds for ease of alignment [12,40];
- Unclear definition of products included in the activity scope;
- Subjective wording [12,40];
- Imprecise financial KPIs due to interdependence on supply chain data [12];
- Resource-intensive and granular corporate data requirements [10,12,39];
- Unstandardized data availability and accessibility for required benchmarks [8,10–12];
- Leeway in the TSC requirement scope.

Specifically, the usability issues referring to an unclear definition of products included in the activity scope and leeway in the TSC requirement scope were based on our primary data obtained throughout a corporate EU Taxonomy screening assessment. Furthermore, it is worth noting that none of the prior reports we identified have formulated such a comprehensive list of qualitative criteria to assess the usability of the entire TSC from a corporate perspective.

To evaluate the prevalence of these identified usability issues, we compiled a table for each SC criterion of the specified activities within the previous step (see Section 4). Within this table, the usability issue concerning whether the TSC is based on qualitative measures rather than quantitative metrics and thresholds was assessed in a separate column, as it is important to acknowledge that metrics and thresholds may not always be applicable, making this aspect challenging to evaluate consistently across all criteria.

3.1.3. Step 3: Usability Assessment of the DNSH Criteria

The third step of our analysis involves evaluating the usability of the DNSH criteria associated with the assessed activities. For this purpose, the generic DNSH criteria applicable to all economic activities and listed in Appendices I of the Climate DA were assessed. Therefore, it is important to note that specific activities introduced additional criteria along-

side these generic ones. Particularly, the criteria pertaining to the transition to a circular economy were individually specified for each economic activity and assessed separately.

Consequently, a nuanced set of usability issues was delineated and further evaluated for our specific case study within subsequent sections, drawing insights from previously identified reports and an initial EU taxonomy assessment within an electrical manufacturing company, tailored to our research context:

- TSC, including qualitative measures rather than quantitative metrics and thresholds for ease of alignment [12,40];
- Subjective wording [12,40];
- TSC requirements are based on EU legislation only [10–12,39,40];
- Resource-intensive corporate data requirements [10,12,39];
- Unstandardized data availability and accessibility for required benchmarks [10–12,39];
- Leeway in the TSC requirements;
- Misalignment between the reporting requirements across activities' DNSH criteria.

Thereby, the usability issues referring to leeway in the TSC requirements and misalignment between reporting requirements across activities' DNSH criteria pertain to our primary data obtained through an initial corporate EU Taxonomy screening assessment within an electrical manufacturing company. It's noteworthy that this assessment represents a novel approach, as none of the prior reports identified have formulated such a comprehensive list of qualitative criteria to assess the usability of the entire TSC from a corporate perspective. Again, we compiled a table to assess the prevalence of the identified usability issues for each DNSH criterion, separately evaluating the aspects of quantitative and qualitative criteria characteristics.

3.1.4. Step 4: Usability Assessment of the MS Criteria

The MS criteria ensure alignment with international guidelines and principles on business and human rights of the OECD, the UN, and the International Labor Organization [15]. In contrast to the SC and DNSH criteria assessments, these criteria are overarchingly applicable [49] and evaluated on an entity-level [50].

Given recent clarifications by the PSF and ongoing efforts in data and usability, an aligned usability assessment of the criteria is not conducted within Step 4 [51]. Due to the focused assessment of the electrical manufacturing industry, this step evaluates which international standards and frameworks typically implemented by companies in this sector are relevant for complying with the MS criteria. The objective is to pinpoint potential discrepancies with existing regulatory standards and propose forthcoming guidance for effective implementation.

Thus, this novel approach represents the first instance of such an assessment within the context of the electrical manufacturing sector. Specifically, this step scrutinizes whether corporations within the electrical manufacturing sector have implemented standards or frameworks related to social rights, which could potentially serve as benchmarks for evaluating their compliance with the MS criteria and facilitate future assessments of companies' adherence to these standards. The streamlined assessment maintains a focus on the electrical manufacturing sector, ensuring adaptability to other industries in future assessments.

3.1.5. Step 5: Evaluation of the Practical Applicability and Usability of Criteria

Ultimately, in this step, the previously identified usability challenges identified throughout Steps 2 and 3 were quantified per economic activity. Activities with the highest number of identified usability issues for both the SC and DNSH criteria were pinpointed, indicating significant challenges in practical applicability.

4. Results

The assessment of the usability challenges in the TSC relevant for the electrical manufacturing sector is based on the previously elaborated methodology. This study focuses on outlining the burdens and structural challenges that appeared in the usability assessment

and can be relevant across all sectors. Yet, the evaluation within this chapter is limited to the criteria assessed as suitable for the electrical manufacturing sector and based on the TSC defining SC as the climate change mitigation objective.

4.1. Identification of Relevant Economic Activities

The screening analysis identified significant business activities in the electrical manufacturing sector falling under NACE codes C 26 and C 27, encompassing the manufacturing of computers, electronic and optical products, and electrical equipment. Additionally, the manufacturing of machinery and equipment under the national electrical code (n.e.c.), corresponding to NACE code C 28, contributes to the electrical manufacturing industry. These industry-relevant activities are complemented by activities corresponding to NACE code J 62, focusing on developing software solutions for processing data from electronic sensors and controlling machinery and electronic equipment. Given the diverse applications of electrical manufacturing industry products, wholesale trade activities classified under NACE code G 46 are also considered relevant [52]. These identified NACE codes were mapped to the manufacturing activities included in the Climate DA and referenced to the specific NACE codes (cf. Table A1).

As depicted in Figure 4, all identified NACE codes related to the manufacturing and engineering of industrial products and solutions are eligible, except for wholesale activities under NACE code G 46, which are deemed ineligible due to the absence of any business activity within this NACE code in the Climate DA [27].

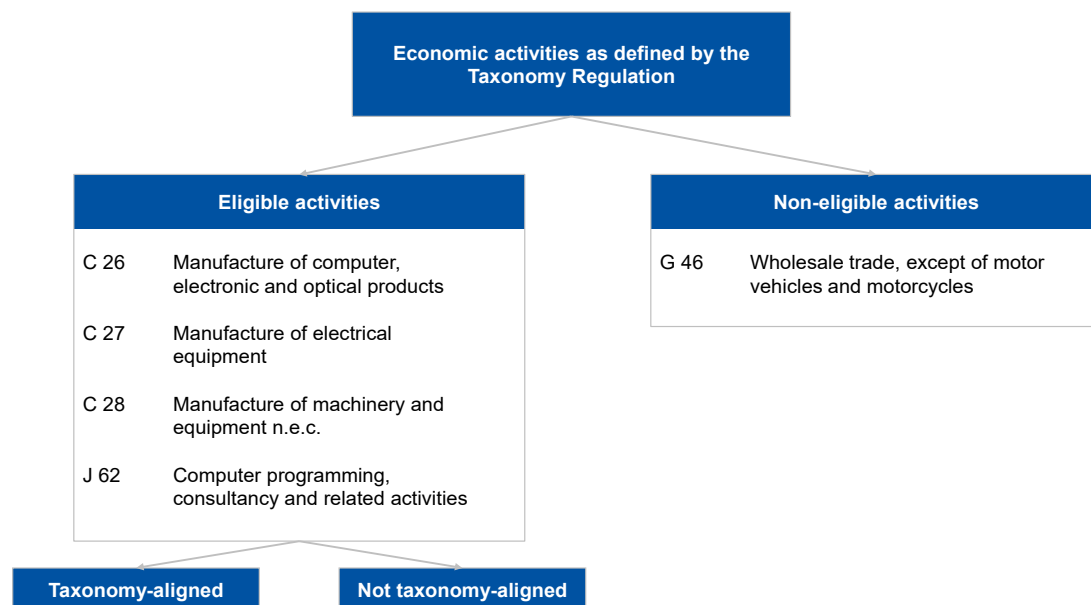


Figure 4. Taxonomy-eligible NACE codes for the electrical manufacturing industry [27,52].

Thus, the taxonomy-eligible activities identified in the Climate DA, although named according to the scope covered within the EU taxonomy and not precisely matching the specific NACE code names shown in Figure 4, include:

- Manufacture of renewable energy technologies;
- Manufacture of equipment for the production and use of hydrogen;
- Manufacture of energy efficiency equipment for buildings;
- Manufacture of other low-carbon technologies;
- Manufacture of batteries; and
- Data-driven solutions for GHG emissions reductions [23].

For the subsequent evaluation, the sole activity excluded from consideration was the manufacture of batteries. This exclusion was made because this particular activity

involves the production of distinct electrical equipment that does not align with the typical manufacturing activities associated with the electrical manufacturing industry.

4.2. Usability Assessment of the SC Criteria

Following Step 1, relevant activities and associated criteria for the electrical manufacturing industry are summarized in Table 1 below. The table specifies the assessment type of TSC, indicating whether it encompasses quantitative, qualitative, or a combination of requirements. Additionally, it outlines usability issues specific to these criteria, as detailed in the categorization provided in the methods section.

Table 1. Usability Assessment of the SC criteria [23].

Relevant Activity from Climate DA Annex I	Section in the Climate DA	Summary of SC Criteria	Assessment Type	Usability/Practical Applicability Issues
Manufacture of renewable energy technologies	3.1	The economic activity manufactures renewable energy technologies.	Qualitative criteria	-Unclear definition of products included in the activity scope -Imprecise financial KPIs due to interdependence on supply chain data
Manufacture of equipment for the production and use of hydrogen	3.2	The economic activity manufactures equipment for the production of hydrogen compliant with the TSC set out in 3.10 and equipment for the use of hydrogen.	Qualitative criteria	-Unclear definition of products included in the activity scope -Imprecise financial KPIs due to interdependence on supply chain data
Manufacture of energy-efficiency equipment for buildings	3.5	The economic activity manufactures energy-efficient equipment for buildings. The criteria define different types of energy efficiency equipment through quantitative values or quantitative measures.	Quantitative (defined metrics and thresholds) or qualitative (specifying explicit products) criteria	-Imprecise financial KPIs due to interdependence on supply chain data -Unstandardized data availability and accessibility for required benchmarks
Manufacture of other low carbon technologies	3.6	The economic activity manufactures technologies that demonstrate substantial life-cycle GHG emission savings compared to the best-performing alternative technology/product/solution available on the market. Life-cycle GHG emission savings are calculated according to standards. Quantified life-cycle GHG emission savings are verified by an independent third party.	Quantitative criteria	-Subjective wording -Resource-intensive corporate data requirements -Unstandardized data availability and accessibility for required benchmarks -Leeway in the TSC requirements

Table 1. Cont.

Relevant Activity from Climate DA Annex I	Section in the Climate DA	Summary of SC Criteria	Assessment Type	Usability/Practical Applicability Issues
Data-driven solutions for GHG emissions reductions	8.2	The ICT solutions used for the provision of data and analytics enabling GHG emission reductions The ICT solution demonstrates substantial life-cycle GHG emission savings compared to the best-performing alternative solution/technology. Life-cycle GHG emission savings are calculated according to standards. Quantified life-cycle GHG emission savings are verified by an independent third party.	Quantitative criteria	-Imprecise financial KPIs due to interdependence on supply chain data -Subjective wording -Resource-intensive corporate data requirements -Unstandardized data availability and accessibility for required benchmarks -Leeway in the TSC requirements

4.3. Usability Assessment of the DNSH Criteria

The generic DNSH criteria in Appendix A–D of Annex I Climate DA, addressing climate change adaptation, sustainable use and protection of water and marine resources, pollution prevention and control, and protection and restoration of biodiversity and ecosystems objectives, apply to all listed activities that do not further specify any supplementary criteria requirements. Consequently, the usability assessment was initially performed for the generic criteria set out in Appendix A–D (cf. Table 2). Given the overarching relevance of the generic DNSH criteria to all economic activities within the EU taxonomy, this assessment holds significance across all sectors and economic activities currently encompassed by the Climate DA.

Table 2. Usability Assessment of the generic DNSH criteria set out in Appendix A–D of Annex I Climate DA [23].

DNSH Objective	Summary of DNSH Criteria	Assessment Type	Usability/Practical Applicability Issues
Climate change adaptation	Appendix A: -Performing a robust climate risk and vulnerability assessment based on best practice and available guidance (considering the state-of-the-art science for vulnerability and risk analysis and related methodologies in line with the most recent IPCC reports, scientific peer-reviewed publications, and open source or paying models) -Reducing material physical climate risks	Quantitative and Qualitative criteria	-Unstandardized data availability and accessibility for required benchmarks -Leeway in the TSC requirements -Subjective wording -Resource-intensive corporate data requirements
Sustainable use and protection of water and marine resources	Appendix B: No deterioration nor compromise to achieve good status of water bodies.	Qualitative criteria	-TSC requirements based on EU legislation only

Table 2. Cont.

DNSH Objective	Summary of DNSH Criteria	Assessment Type	Usability/Practical Applicability Issues
Pollution prevention and control	Appendix C: The activity does not lead to the manufacture, placing on the market, or use of substances of concern except where there is full compliance with the conditions specified in the explicit legislation.	Quantitative or qualitative criteria	-TSC requirements based on EU legislation only
Protection and restoration of biodiversity and ecosystems	Appendix D: Environmental impact assessment carried out and mitigation measures implemented Appropriate assessment in/near biodiversity-sensitive areas.	Qualitative criteria	-TSC requirements based on EU legislation only

Moreover, as no generic DNSH criteria are defined for the environmental objective of *transition to a circular economy*, a further assessment of the specific criteria concerning the usability aspects was performed within Table 3. The DNSH criteria for the transition to a circular economy remain the same for all relevant and assessed activities, except for the activity *data-driven solutions for GHG emissions reductions*. Therefore, a separate usability assessment was carried out for this specific activity and criterion.

4.4. Usability Assessment of the Minimum Social Safeguards Criteria

To streamline the practical application of the MS criteria, which involve a complex two-step assessment [50], companies could link existing EU standards and frameworks they already comply with and prevent redundant assessments. Nevertheless, a thorough investigation of specific laws, standards, and frameworks is essential to ensuring alignment with MS requirements.

Considering the complexity of such an examination and drawing insights gained through the case study with a European electrical manufacturing company, this study provides a concise overview of the international standards commonly adhered to by companies in this sector. These frameworks cover aspects such as compliance with human rights, including labor rights and anti-corruption, but strictly require further assessment for alignment with the MS. The initial list of potentially relevant EU standards and frameworks indicates whether they include external verification or audits.

- ISO 45001 on occupational health and safety. It is assessed by an external certification authority every three years. Additional yearly audits monitor consistency [53].
- UN Global Compact on Human Rights, Labor, Environment and Anti-Corruption. Companies submit yearly reports; however, the reports are neither validated nor audited by the UN Global Compact [54].
- VDMA Code of Conduct on Sustainability and Energy. Monitoring and auditing of the companies included, however, is not further specified under the VDMA [55].

Ultimately, an assessment should also explore how the proposed Corporate Sustainability Due Diligence (CSDD) Directive, potentially serving as human rights due diligence under the MS requirements if enacted, and the obligations under the new European Sustainability Reporting Standards (ESRS) align with the evaluation of the MS.

Table 3. Usability Assessment of the DNSH criteria relevant for the electrical manufacturing sector, and referring to the objective of transition to a circular economy [23].

Relevant Activities from Climate DA Annex I	Summary of DNSH Criteria for Transition to a Circular Economy	Assessment Type	Usability/Practical Applicability Issues
-Manufacture of renewable energy technologies -Manufacture of equipment for the production and use of hydrogen -Manufacture of energy-efficiency equipment for buildings -Manufacture of other low-carbon technologies	Techniques that support: -Reuse and use of secondary raw materials and re-used components in products manufactured -Design for high durability, recyclability, easy disassembly, and adaptability of products manufactured -Waste management that prioritizes recycling over disposal in the manufacturing process -Information on and traceability of substances of concern throughout the lifecycle of the manufactured products	Qualitative criteria	-Subjective wording -Resource-intensive corporate data requirements -Misalignment between the reporting requirements across activities' DNSH criteria
Data-driven solutions for GHG emissions reductions	-The equipment used meets the requirements set in accordance with Directive 2009/125/EC for servers and data storage products -The equipment used does not contain the legally listed restricted substances except where there is full compliance with the conditions specified in the explicit legislation -A waste management plan ensuring maximal recycling at the end of life -The equipment undergoes preparation for reuse, recovery, or recycling operations, or proper treatment, including the removal of all fluids and a selective treatment.	Quantitative and qualitative criteria	-TSC requirements based on EU legislation only -Subjective wording

4.5. Evaluation of the Practical Applicability and Usability of Criteria

In this step, the overall quantity of usability issues identified in the SC and DNSH criteria per economic activity (cf. Table 4) is evaluated.

Table 4. Quantity of usability and practical applicability issues per assessed criteria.

Relevant Activity from Climate DA Annex I	Section	Usability/Practical Applicability Issues of the SC Criteria	Usability/Practical Applicability Issues of the DNSH Criteria	Total Number of Usability/Practical Applicability Issues
Manufacture of renewable energy technologies	3.1	2	7 (Appendix A–D) + 3	12
Manufacture of equipment for the production and use of hydrogen	3.2	2	7 (Appendix A–D) + 3	12
Manufacture of energy-efficient equipment for buildings	3.5	2	7 (Appendix A–D) + 3	12
Manufacture of other low-carbon technologies	3.6	4	7 (Appendix A–D) + 3	14
Data-driven solutions for GHG emissions reductions	8.2	5	7 (Appendix A–D) + 2	14

The assessment reveals that all activities pertinent to the electrical manufacturing sector require enhanced robustness against usability concerns. Yet, most usability issues account for the activities *manufacture of other low carbon technologies* and *data-driven solutions for GHG emissions reductions*, particularly when leaving aside the usability issues related to the generic DNSH criteria. Consequently, these criteria are evaluated as notably challenging in terms of practical application and usability.

5. Discussion

The evaluation revealed usability issues for all electrical manufacturing activities' assessed SC and DNSH criteria. Notably, the SC criteria was afflicted with a high number of usability challenges. Yet, the evaluation cannot be extrapolated to represent all SC criteria in other sectors. Different sectors and their associated criteria could potentially exhibit considerably lower levels of usability challenges.

The findings of this study align with and reinforce conclusions drawn from previous reports addressing usability aspects. The substantial number of usability issues identified in this study regarding the assessed criteria is further validated by the latest data and usability subgroup report of the EU PSF, which advocates for additional technical guidance for specific criteria within the Climate DA. Notably, out of the eight specifically mentioned activities by the PSF, five activities (3.1, 3.2, 3.5, 3.6, and 8.2 of Annex I Climate DA) were also examined within this study. While the EU PSF has not provided a rationale behind this choice of activities, the findings of the present study shed light on this choice, offering insights into the relevance and significance of these activities within the context of usability assessments [39].

Furthermore, it is crucial to consider the plausible explanations for the prevalence of usability issues within the analyzed criteria. As indicated within Table A1, the analyzed activities are all enabling activities. The Technical Working Group of the EU PSF, in its latest report from October 2022, has introduced a new methodological framework for developing enabling activities, suggesting that the prior methodological approach for developing such activities had limitations in establishing robust criteria [56]. Consequently, this study supports the hypothesis that current formulations of enabling activities exhibit numerous usability challenges. Nevertheless, further comprehensive studies are crucial to validating this hypothesis in the broader context of enabling activities.

Additionally, it is striking that similar conclusions can be drawn for the usability assessment of the DNSH criteria. The latest report of the EU PSF data and usability subgroup has assessed the practical applicability of the DNSH criteria and developed a classification system on usability aspects of the DNSH criteria. The report found that some DNSH criteria, especially the ones providing measures beyond the generic ones, present significant challenges in interpretation and usability [40]. These findings resonate with the outcomes of the present study. However, it is essential to point out that this study's objective and methodological approach differ from the one applied within the report. This study does not explicitly aim to evaluate whether criteria are poorly or well-usable; instead, it primarily focuses on identifying criteria to assess usability aspects. The intention was to suggest qualitative criteria that can concretely frame and identify usability issues.

Building on the MS evaluation, results suggest that future studies or companies' assessments consider examining EU standards, laws, or frameworks for verifying alignment with the MS, ensuring that the coverage of the scope is alike or broader than the requirements.

Overall, the methodological approach and findings of this study stand out for their nuanced and comprehensive nature, aligning with the limited existing research in this domain. The subsequent sections delve into a more in-depth exploration of the identified usability issues, offering additional insights and discussion.

5.1. Discussion on the Usability of the Assessed SC Criteria

The assessed economic activities of the *manufacture of renewable energy technologies* and the *manufacture of equipment for the production and use of hydrogen* both encompass a

wide range of product applications, framing an unclearly defined activity scope. The manufacturing products included in the criteria scope are not explicitly limited to material products exclusively used in renewable energy or hydrogen production technologies but encompass a diverse array of components designed for the technologies' specific purposes. For instance, lighting installations used in windmill towers are not manufactured and are confined solely to this application. Yet, these multiple application field products are not specifically excluded under the activity scope. This lack of clarity in product specifications allows for the inclusion of all products applied to, e.g., renewable energy technologies, making it difficult for companies to assess their partially widespread product distribution to determine alignment. The multi-layered nature and indistinct product specifications also pose a challenge in establishing quantifiable criteria with precise metrics or thresholds. Notably, this specific usability issue has not been addressed in previously assessed literature. It was identified during the corporate EU taxonomy screening of a company in the electrical manufacturing sector, underscoring the necessity for additional examination and clarification in this area.

In the context of this described cross-industry applicability of products, corporations face additional usability challenges. As the affected activities of the electrical manufacturing sector encompass products suitable for both environmentally friendly sectors, such as renewable energies and traditional energy sectors, determining precise financial KPIs for only the renewable energy sector is often challenging for corporations due to their interdependence on downstream supply chain data. Therefore, to align with the TSC, corporations need to collect and process customer-specific supply chain data to ascertain product application in environmentally sustainable sectors. Thus, manufacturing companies are tasked with verifying that their products are used as intended, relying on frequently vague data from customers, other manufacturers, or equipment suppliers. Consequently, this complexity introduces layers of uncertainty and usability challenges within the framed criteria. Hence, when evaluating compliance and financial KPIs for the activities related to the *manufacture of renewable energy technologies* and the *manufacture of equipment for the production and use of hydrogen*, the revenues from these products are often based on estimates derived from customer data. This is also highlighted for the *manufacture of energy efficiency equipment for buildings*, where electrical products used in a smart home system to improve the energy efficiency of buildings can be declared taxonomy-aligned, but companies are challenged to provide downstream data verifications that often remain unclear due to the involvement of multiple suppliers in producing comprehensive smart home systems. While similar findings have been identified in previous literature, they focus on the perspective of FMPs, who cope with imprecise data regarding taxonomy-aligned expenditure [12]. However, it is noteworthy that this could also be the result of a lack of expertise to determine the data [11].

Lastly, the activities *manufacture of other low carbon technologies* and *data-driven solutions for GHG emissions reductions*, which target many electrical manufacturing industry products, include various usability issues, as outlined in the results. Despite being based on quantitative criteria, the activities lack precise metrics or thresholds. The primary usability challenge arises from subjective wording within the SC criteria, where the activity must "demonstrate substantial life-cycle GHG emission savings compared to the best-performing alternative technology/product/solution available on the market" [27]. The criteria fail to define "substantial" or provide benchmarks, instead referencing the "best performing alternative on the market", echoing previous usability assessment reports [12,40]. This makes assessment challenging for electrical manufacturing companies, as no standardized and cross-company benchmarking data facilitating the comparison of life-cycle GHG emission savings associated with electrical components exists to identify the best-performing alternative. Noting that consistent calculation methodologies for processing proxies and benchmarking scores are crucial. As a result, conducting comprehensive market research becomes imperative to establish the qualifications for the "best performing alternative". Thereby, a detailed data collection and assessment of life-cycle emissions related to corpo-

rate products and the available products within the market becomes necessary. In light of this, companies will inevitably face the need for resource-intensive data collection across a broad spectrum of products, imposing significant time and cost burdens. This mirrors the usability issues identified by FMP, which emphasizes similar challenges in processing corporate data [10,12,39]. Furthermore, the lack of standardized calculation methodologies and assumptions in life-cycle GHG emissions assessment, along with benchmarking against the best-performing alternative, could lead to difficulties in comparability between corporate disclosures, demanding consideration.

The findings of this study highlight two primary usability challenges: firstly, the insufficient availability and accessibility of data required for benchmarks within the technical screening criteria, such as transparent and consistent methodologies for life cycle GHG emissions calculations and comparative data for competitors' products; and secondly, the identification of revenue streams associated with specific product categories. Notably, the first of these two usability aspects has been frequently highlighted in the literature from the perspective of FMPs [8,10–12]. Therefore, key recommendations should take these often-encountered usability challenges into account.

5.2. Discussion on the Usability of the Assessed DNSH Criteria

In order to comply with the generic DNSH criteria on *climate change adaptation*, corporations must perform a climate risk and vulnerability assessment to identify physical climate risks that are material to the assessed economic activity. Usability challenges in the criteria arise from the absence of standardized and harmonized data for such risk assessments, the introduction of leeway in applied risk assessment data models, and potentially diminishing comparability between corporate disclosures. While previous literature, from the perspective of FMPs, indirectly addresses the issue by highlighting problems related to data quality and comparability [10,12], the core of this usability challenge was identified during the initial corporate EU taxonomy screening conducted as a prerequisite to this study. Moreover, the risk assessment was found to necessitate granular, resource-intensive corporate data points, requiring, in turn, specific expertise for the evaluation. Additionally, the subjective nature of terminology also influences the usability evaluation, particularly concerning the term “reducing risk”, which lacks further definition. The criterion lacks specifications on reduction measures and the effectiveness required for potential reduction measures. Ultimately, as the risk assessment is supposed to be carried out based on “best practice and available guidance”, the assessment structure leaves leeway for evaluation and compliance. Similar findings highlighting usability issues stemming from subjective language are also identified in the data and usability report of the EU PSF [40] and by PRI [12].

The other three generic DNSH criteria on the sustainable use and protection of water and marine resources; pollution prevention and control; as well as the protection and restoration of biodiversity and ecosystems mainly require alignment with already applicable legally binding legislation, e.g., the Water Framework Directive; the RoHS Directive on the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment; the REACH Regulation concerning the Registration, Evaluation, Authorization, and Restriction of Chemicals; and the Environmental Impact Assessment Directive. For the manufacturing of electrical and electronic equipment, the relevant legislation already applies to manufacturing these products, and thus, companies are generally expected to comply. Moreover, corporations are already required to share information on the material composition with customers and business partners at an institutionally defined level of granularity. Therefore, many companies in this sector also require their suppliers to sign an Environmental Code of Conduct (CoC) to ensure compliance before initiating a business relationship. This CoC builds on an internal environmental compliance guideline that specifies substance restrictions. From a usability perspective, issues for all three environmental objectives are merely related to the criteria requirements being based on EU legislation. Due to the fact that Member States are responsible for converting the EU text and frequently

have different understandings, usability issues may arise. Furthermore, the applicability of the criteria assessment could also become challenging in cases where directives still need to be implemented in some countries. Moreover, from a usability perspective, the criteria would need to allow for international applications of the EU legislation referenced in the Climate DA. This was also reflected in further EU taxonomy applicability studies focusing on FMPs [10–12,39,40].

Moreover, the DNSH criteria for the environmental objective *transition to a circular economy*, applicable to a majority of the assessed economic activities, is fraught with a high number of usability issues. Again, the criteria lack precise definitions, applying subjective and imprecise wording, such as “high durability, recyclability, easy disassembly”, to the criteria. Additionally, the availability of such data on products plays a significant role, as the durability and robustness of materials prove to be challenging to measure, and product specifications can differ between different years of production. Moreover, concerning this objective, limited and resource-intensive corporate data requirements outside the corporate system boundary, relating to the “traceability of substances throughout their lifecycle”, pose usability challenges for corporations. Since 2021, the EU Waste Framework Directive mandates companies in the EU to document details of articles containing designated substances of very high concern (SVHCs) from a candidate list provided by the European Chemical Agency in the so-called SCIP database. While this promotes traceability throughout the entire lifecycle of products and recycling, the complex database integration into existing production tools challenges companies in tracing substances beyond their system boundary.

Ultimately, a misalignment between the reporting requirements and activities’ DNSH criteria can also be found, as the DNSH criteria for *the transition to a circular economy* criteria requirement reach beyond the legal obligations when compared to the other environmental objectives. However, this discrepancy has not been addressed in any of the previous studies assessing usability aspects within the EU taxonomy criteria.

In general, the most critical aspects affecting the usability assessment of the DNSH criteria are subjective wording and requirements grounded in EU legislation. This is also reflected in the most frequently encountered usability challenges. Therefore, key recommendations should take these into account.

6. Conclusions and Policy Recommendations

The EU taxonomy will gradually come into effect between 2022 and 2026, initially testing its practical applicability for corporations. With the climate taxonomy and first disclosure obligations already being applicable since 2022, first market feedback has shown that usability issues severely impact the implementation of the EU taxonomy. Yet, many EU taxonomy criteria still need to be further developed, and case studies are required to show how the market responds to their usability and applicability.

This study addresses a critical information gap by examining the usability of the EU taxonomy criteria under the climate change mitigation objective, focusing on the electrical manufacturing industry. In light of this, a comprehensive methodological five-step approach has been developed for conducting a usability assessment of the taxonomy criteria. The evaluation demonstrated several usability issues that appeared to be aligned with the currently limited available research and proceedings on data and usability of the EU taxonomy taking place at the regulatory development level.

Therefore, further action and practical guidance on usability are urgently required. Against the background that the current climate taxonomy will undergo regular revisions to ensure the criteria are applied to activities supporting the transition to a sustainable economy and achieving the Paris Agreement goals, legislators will work on adjusting and expanding the TSC. The proposed methodology can serve as a valuable tool for legislators to systematically evaluate and address usability issues within the criteria.

Consequently, based on the methodology and identified usability challenges, six overarching key recommendations are derived from EU legislators and creators to improve the usability of newly developed criteria:

- Prevent the use of subjective wording in the criteria, e.g., “substantial savings” or “high durability, recyclability, easy disassembly”, without providing quantifiable measures or technical guidance on what constitutes, e.g., a “substantial” saving;
- Provide a list of adequate EU legislation standards linked to the technical screening criteria to enable the international application of referenced EU legislation within the DNSH criteria;
- Ensure that comparability in corporate disclosures is maintained by avoiding leeway in the technical evaluation, e.g., through best-effort proxy practices or benchmarks based on the best-performing alternative, and ensuring consistent calculation methodologies are used throughout;
- Create tools and centralized databases that support standardized data availability and accessibility for required benchmarks in the technical screening criteria, e.g., tools including a standardized model for risk and vulnerability assessment or life-cycle GHG emission databases for electrical equipment;
- Where feasible, develop TSC, including quantitative metrics and thresholds rather than qualitative measures; and
- Continue to carry out further corporate studies assessing the usability gaps within the technical screening criteria, e.g., using the methodological approach developed within this study or developing a complementary approach.

Moreover, it is recommended that all criteria evaluated within this usability study be revised and improved, considering the identified usability challenges above. Alternatively, providing further technical guidance could address these usability concerns.

Nonetheless, as the EU taxonomy features a structurally highly complex tool that, even with the cooperation of various stakeholders from the industry, is analytically developed, the probability is still high that all necessary data will not always be accessible and specific TSC will leave some interpretative leeway. Consequently, assessing alignment with specific criteria will always involve some estimation and judgment.

Moreover, as this study is limited to the electrical manufacturing sector and the usability of the relevant SC and DNSH from Annex I Climate DA, future studies are required to holistically assess the usability of the taxonomy criteria for other relevant economic sectors and objectives under the upcoming DAs. For this forthcoming assessment, the applicability of the developed methodological framework within this study has to be examined and could be adopted. Future studies on the usability of the EU taxonomy criteria and accompanying improvements are indispensable to promoting the green transition within corporations.

In conclusion, the EU taxonomy stands as a pivotal instrument in advancing sustainability across the global financial landscape, offering transparent definitions and criteria for identifying environmentally sustainable economic activities. Recognized not only within the EU but also on an international scale, its implementation bolsters competitiveness by providing a recognized benchmark for sustainable finance initiatives. To effectively compete with other frameworks, the EU taxonomy underscores its science-based approach, dynamic nature, and alignment with international practices, reinforced by ongoing efforts to harmonize taxonomies worldwide. However, as highlighted in this study, addressing usability challenges within the EU taxonomy is crucial to ensuring its efficacy in guiding investment decisions and facilitating the transition to a sustainable economy. Through the development of practical guidance and continuous refinement of criteria, policymakers and market participants can enhance the usability of the EU taxonomy, solidifying its leading position in driving forward sustainable finance practices globally.

Author Contributions: Conceptualization, S.O.; methodology, S.O. and L.S.; validation, L.S. and M.E.; formal analysis, S.O.; investigation, S.O. and L.S.; resources, L.S. and M.E.; data curation, S.O. and L.S.; writing—original draft preparation, S.O. and L.S.; writing—review and editing, M.E. and M.T.; visualization, L.S.; supervision, M.E. and M.T.; project administration, M.E. and M.T.; funding acquisition: M.T. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data are contained within the article.

Conflicts of Interest: The authors declare that they have no known competing financial interest or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A

Table A1. Classification of substantial contribution activities for the climate change mitigation objective [27].

NACE Macro-Sector	Activity Number	Activity	SC	DNSH
Forestry	1.1	Afforestation		2, 3, 5, 6
	1.2	Rehabilitation and restoration of forests, including reforestation and natural forest regeneration, after an extreme event		2, 3, 4, 5, 6
	1.3	Forest management		2, 3, 4, 5, 6
	1.4	Conservation forestry		2, 3, 4, 5, 6
Environmental protection and restoration activities	2.1	Restoration of wetlands		2, 3, 4, 5, 6
	3.1	Manufacture of renewable energy technologies		2, 3, 4, 5, 6
Manufacturing	3.2	Manufacture of equipment for the production and use of hydrogen		2, 3, 4, 5, 6
	3.3	Manufacture of low-carbon technologies for transport		2, 3, 4, 5, 6
	3.4	Manufacture of batteries		2, 3, 4, 5, 6
	3.5	Manufacture of energy-efficient equipment for buildings		2, 3, 4, 5, 6
	3.6	Manufacture of other low-carbon technologies		2, 3, 4, 5, 6
	3.7	Manufacture of cement		2, 3, 5, 6
	3.8	Manufacture of aluminum		2, 3, 5, 6
	3.9	Manufacture of iron and steel		2, 3, 5, 6
	3.10	Manufacture of hydrogen		2, 3, 5, 6
	3.11	Manufacture of carbon black		2, 3, 5, 6
	3.12	Manufacture of soda ash		2, 3, 5, 6
	3.13	Manufacture of chlorine		2, 3, 5, 6
	3.14	Manufacture of organic basic chemicals		2, 3, 5, 6
	3.15	Manufacture of anhydrous ammonia		2, 3, 5, 6
	3.16	Manufacture of nitric acid		2, 3, 5, 6
	3.17	Manufacture of plastics in primary form		2, 3, 5, 6

Table A1. Cont.

NACE Macro-Sector	Activity Number	Activity	SC	DNSH
Energy	4.1	Electricity generation using solar photovoltaic technology		2, 4, 6
	4.2	Electricity generation using concentrated solar power (CSP) technology		2, 3, 4, 6
	4.3	Electricity generation from wind power		2, 3, 4, 6
	4.4	Electricity generation from ocean energy technologies		2, 3, 4, 5, 6
	4.5	Electricity generation from hydropower		2, 3, 6
	4.6	Electricity generation from geothermal energy		2, 3, 5, 6
	4.7	Electricity generation from renewable, non-fossil gaseous and liquid fuels		2, 3, 5, 6
	4.8	Electricity generation from bioenergy		2, 3, 5, 6
	4.9	Transmission and distribution of electricity		2, 4, 5, 6
	4.10	Storage of electricity		2, 3, 4, 6
	4.11	Storage of thermal energy		2, 3, 4, 6
	4.12	Storage of hydrogen		2, 4, 5, 6
	4.13	Manufacture of biogas and biofuels for use in transport and bioliquids		2, 3, 5, 6
	4.14	Transmission and distribution networks for renewable and low-carbon gases		2, 3, 5, 6
	4.15	District heating/cooling distribution		2, 3, 5, 6
	4.16	Installation and operation of electric heat pumps		2, 3, 4, 5
	4.17	Cogeneration of heat/cool and power from solar energy		2, 4, 6
	4.18	Cogeneration of heat/cool and power from geothermal energy		2, 3, 5, 6
	4.19	Cogeneration of heat/cool and power from renewable non-fossil gaseous and liquid fuels		2, 3, 5, 6
	4.20	Cogeneration of heat/cool and power from bioenergy		2, 3, 5, 6
	4.21	Production of heat/cool from solar thermal heating		2, 4, 6
	4.22	Production of heat/cool from geothermal energy		2, 3, 5, 6
	4.23	Production of heat/cool from renewable non-fossil gaseous and liquid fuels		2, 3, 5, 6
	4.24	Production of heat/cool from bioenergy		2, 3, 5, 6
	4.25	Production of heat/cool using waste heat		2, 4, 5, 6
Water supply, sewerage, waste management, and remediation	5.1	Construction, extension and operation of water collection, treatment and supply systems		2, 3, 6
	5.2	Renewal of water collection, treatment, and supply systems		2, 3, 6
	5.3	Construction, extension and operation of wastewater collection, and treatment		2, 3, 5, 6
	5.4	Renewal of wastewater collection and treatment		2, 3, 5, 6
	5.5	Collection and transport of non-hazardous waste in source-segregated fractions		2, 4
	5.6	Anaerobic digestion of sewage sludge		2, 3, 5, 6
	5.7	Anaerobic digestion of bio-waste		2, 3, 5, 6
	5.8	Composting of bio-waste		2, 5, 6
	5.9	Material recovery from non-hazardous waste		2, 6
	5.10	Landfill gas capture and utilization		2, 5, 6
	5.11	Transport of CO ₂		2, 3, 6
	5.12	Underground permanent geological storage of CO ₂		2, 3, 5, 6

Table A1. Cont.

NACE Macro-Sector	Activity Number	Activity	SC	DNSH
Transport	6.1	Passenger interurban rail transport		2, 4, 5
	6.2	Freight rail transport		2, 4, 5
	6.3	Urban and suburban transport, road passenger transport		2, 4, 5
	6.4	Operation of personal mobility devices, cycle logistics		2, 4
	6.5	Transport by motorbikes, passenger cars, and light commercial vehicles		2, 4, 5
	6.6	Freight transport services by road		2, 4, 5
	6.7	Inland passenger water transport		2, 3, 4, 5
	6.8	Inland freight water transport		2, 3, 4, 5
	6.9	Retrofitting of inland water passenger and freight transport		2, 3, 4, 5
	6.10	Sea and coastal freight water transport, vessels for port operations, and auxiliary activities		2, 3, 4, 5, 6
	6.11	Sea and coastal passenger water transport		2, 3, 4, 5, 6
	6.12	Retrofitting of sea and coastal freight and passenger water transport		2, 3, 4, 5, 6
	6.13	Infrastructure for personal mobility and cycle logistics		2, 3, 4, 5, 6
	6.14	Infrastructure for rail transport		2, 3, 4, 5, 6
	6.15	Infrastructure enabling low-carbon road transport and public transport		2, 3, 4, 5, 6
	6.16	Infrastructure enabling low-carbon water transport		2, 3, 4, 5, 6
	6.17	Low-carbon airport infrastructure		2, 3, 4, 5, 6
Construction and real estate	7.1	Construction of new buildings		2, 3, 4, 5, 6
	7.2	Renovation of existing buildings		2, 3, 4, 5
	7.3	Installation, maintenance, and repair of energy efficiency equipment		2, 5
	7.4	Installation, maintenance, and repair of charging stations for electric vehicles in buildings (and parking spaces attached to buildings)		2
	7.5	Installation, maintenance, and repair of instruments and devices for measuring, regulating, and controlling the energy performance of buildings		2
	7.6	Installation, maintenance, and repair of renewable energy technologies		2
	7.7	Acquisition and ownership of buildings		2
Information and communication	8.1	Data processing, hosting, and related activities		2, 3, 4
	8.2	Data-driven solutions for GHG emissions reductions		2, 4
Professional, scientific, and technical activities	9.1	Close to market research, development, and innovation		2, 3, 4, 5, 6
	9.2	Research, development, and innovation for direct air capture of CO ₂		2, 3, 4, 5, 6
	9.3	Professional services related to the energy performance of buildings		2
Color Legend:		Own performance activity		
		Enabling activity		
		Transitional activity		

References

1. European Commission. EU Taxonomy for Sustainable Activities: What the EU Is Doing to Create an EU-Wide Classification System for Sustainable Activities. Available online: https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en (accessed on 28 February 2023).
2. European Commission. An EU-Wide Assessment of National Energy and Climate Plans. 2020. Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2020:564:FIN> (accessed on 28 February 2023).
3. Canfora, P.; Arranz Padilla, M.; Polidori, O.; Pickard Garcia, N.; Ostojic, S.; Dri, M. *Development of the EU Sustainable Finance Taxonomy: A Framework for Defining Substantial Contribution for Environmental Objectives 3–6*; Publications Office of the European Union: Luxembourg, 2022.
4. Lucarelli, C.; Mazzoli, C.; Rancan, M.; Severini, S. Classification of Sustainable Activities: EU Taxonomy and Scientific Literature. *Sustainability* **2020**, *12*, 6460. [CrossRef]
5. Schütze, F.; Stede, J.; Blauert, M.; Erdmann, K. *EU Taxonomy Increasing Transparency of Sustainable Investments*; DIW Weekly Report; Deutsches Institut für Wirtschaftsforschung (DIW): Berlin/Heidelberg, Germany, 2020; Volume 10, pp. 485–492, ISSN 2568-7697.
6. Dumrose, M.; Rink, S.; Eckert, J. Disaggregating confusion? The EU Taxonomy and its relation to ESG rating. *Financ. Res. Lett.* **2022**, *48*, 102928. [CrossRef]
7. Dusík, J.; Bond, A. Environmental assessments and sustainable finance frameworks: Will the EU Taxonomy change the mindset over the contribution of EIA to sustainable development? *Impact Assess. Proj. Apprais.* **2022**, *40*, 90–98. [CrossRef]
8. Sweatman, P.; Hessenius, M. Applying the EU Taxonomy: Lessons from the Front Line. 2020. Available online: <https://www.euractiv.com/wp-content/uploads/sites/2/2020/10/> (accessed on 28 February 2023).
9. Alessi, L.; Battiston, S. Two sides of The same coin: Green Taxonomy alignment versus transition risk in financial portfolios. *Int. Rev. Financ. Anal.* **2022**, *84*, 102319. [CrossRef]
10. Raux, C.; Fischer, S. Testing the Application of the EU Taxonomy to Core Banking Products: High Level Recommendations, United Nations Environment Programme Finance Initiative. 2021. Available online: <https://www.ebf.eu/wp-content/uploads/2021/01/Testing-the-application-of-the-EU-Taxonomy-to-core-banking-products-EBF-UNEPFI-report-January-2021.pdf> (accessed on 28 February 2023).
11. UNEP FI and the European Banking Federation. Practical Approaches to Applying the EU Taxonomy to Bank Lending. 2022. Available online: <https://www.unepfi.org/wordpress/wp-content/uploads/2022/02/Practical-Approaches-to-Applying-the-EU-Taxonomy-to-Bank-Lending-2022.pdf> (accessed on 28 February 2023).
12. PRI. Testing the Taxonomy: Insights from the PRI Taxonomy Practitioners Group. 2020. Available online: <https://www.unpri.org/download?ac=11662> (accessed on 28 February 2023).
13. Canfora, P.; Dri, M.; Polidori, O.; Solzbacher, C.; Arranz Padilla, M. *Substantial Contribution to Climate Change Mitigation: A Framework to Define Technical Screening Criteria for the EU Taxonomy*; Publications Office of the European Union: Luxembourg, 2021; ISBN 978-92-76-28364-5.
14. Schuetze, F.; Stede, J. EU Sustainable Finance Taxonomy—What Is Its Role on the Road towards Climate Neutrality? *SSRN J.* **2020**. DIW Berlin Discussion Paper No. 1923. [CrossRef]
15. European Parliament and the Council of the European Union. Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the Establishment of a Framework to Facilitate Sustainable Investment, and Amending Regulation (EU) 2019/2088. 2020 (OJ L 198). Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32020R0852> (accessed on 28 February 2023).
16. European Commission. Questions and Answers: Taxonomy Climate Delegated Act and Amendments to Delegated Acts on Fiduciary Duties, Investment and Insurance Advice. Available online: https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_1805 (accessed on 28 February 2023).
17. European Commission. FAQ: What Is the EU Taxonomy and How Will It Work in Practice? 2021. Available online: https://finance.ec.europa.eu/system/files/2021-04/sustainable-finance-taxonomy-faq_en.pdf (accessed on 28 February 2023).
18. Baumüller, J.; Grbenic, S.O. Moving from non-financial to sustainability reporting: Analyzing the EU Commission’s proposal for a Corporate Sustainability Reporting Directive (CSRD). *FU Econ. Org.* **2021**, *18*, 369–381. [CrossRef]
19. Dudout, A.; Vitulano, C.; François, C. Exploring the Implementation of the EU Taxonomy for Sustainable Activities. 2021. Available online: <https://www.reply.com/avantage-reply/en/Shared%20Documents/010-VAR-Paper-Taxonomy.pdf> (accessed on 28 February 2023).
20. Paccas, A.M. Will the EU Taxonomy Regulation Foster Sustainable Corporate Governance? *Sustainability* **2021**, *13*, 12316. [CrossRef]
21. Brühl, V. The Green Asset Ratio (GAR): A new key performance indicator for credit institutions. *Eurasian Econ. Rev.* **2023**, *13*, 57–83. [CrossRef]
22. EU Technical Expert Group on Sustainable Finance. Taxonomy: Final Report of the Technical Expert Group on Sustainable Finance. 2020. Available online: https://finance.ec.europa.eu/system/files/2020-03/200309-sustainable-finance-teg-final-report-taxonomy_en.pdf (accessed on 31 January 2024).

23. European Commission. Impact Assessment Report Supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by Establishing the Technical Screening Criteria for Determining the Conditions under Which an Economic Activity Qualifies as Contributing Substantially to Climate Change Mitigation or Climate Change Adaptation and for Determining Whether That Economic Activity Causes no Significant Harm to Any of the Other Environmental Objectives. 2021. Available online: https://ec.europa.eu/finance/docs/level-2-measures/taxonomy-regulation-delegated-act-2021-2800-impact-assessment_en.pdf (accessed on 28 February 2023).
24. European Commission. Proposal for a Directive of the European Parliament and of the Council Amending Directive 2013/34/EU, Directive 2004/109/EC, Directive 2006/43/EC and Regulation (EU) No 537/2014, as Regards Corporate Sustainability Reporting. 2021. Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0189> (accessed on 28 February 2023).
25. Pettingale, H.; Kuenzer, J.; Reilly, P.; de Maupeou, S. EU Taxonomy and the Future of Reporting. 2022. Available online: <https://corpgov.law.harvard.edu/2022/04/04/eu-taxonomy-and-the-future-of-reporting/> (accessed on 28 February 2023).
26. Hoepner, A.G.F.; Schneider, F.I. EU Green Taxonomy Data—A First Vendor Survey. *Econ. Voice* **2022**, *19*, 229–242. [CrossRef]
27. European Commission. Commission Delegated Regulation (EU) 2021/2139 of 4 June 2021 Supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by Establishing the Technical Screening Criteria for Determining the Conditions under Which an Economic Activity Qualifies as Contributing Substantially to Climate Change Mitigation or Climate Change Adaptation and for Determining Whether That Economic Activity Causes no Significant Harm to Any of the Other Environmental Objectives. 2021 (OJ L 442). Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32021R2139> (accessed on 28 February 2023).
28. Elsevier. Scopus. Available online: <https://www.elsevier.com/de-de/solutions/scopus> (accessed on 31 January 2024).
29. Baas, J.; Schotten, M.; Plume, A.; Côté, G.; Karimi, R. Scopus as a curated, high-quality bibliometric data source for academic research in quantitative science studies. *Quant. Sci. Stud.* **2020**, *1*, 377–386. [CrossRef]
30. Balp, G.; Strampelli, G. Institutional Investor ESG Engagement: The European Experience. *Eur. Bus. Org. Law Rev.* **2022**, *23*, 869–904. [CrossRef]
31. Johnstone, S.; Long, F.J.; Bin Azhar, A. Progress and notions of progress in sustainable finance. *J. Sustain. Financ. Investig.* **2023**, *13*, 1554–1576. [CrossRef]
32. Schütze, F.; Stede, J. The EU sustainable finance taxonomy and its contribution to climate neutrality. *J. Sustain. Financ. Investig.* **2024**, *14*, 128–160. [CrossRef]
33. Papari, C.-A.; Toxopeus, H.; Polzin, F.; Bulkeley, H.; Menguzzo, E.V. Can the EU taxonomy for sustainable activities help upscale investments into urban nature-based solutions? *Environ. Sci. Policy* **2024**, *151*, 103598. [CrossRef]
34. Lucarelli, C.; Mazzoli, C.; Rancan, M.; Severini, S. The impact of the eu taxonomy on corporate investments. *J. Financ. Manag. Mark. Inst.* **2023**, *11*, 2350004. [CrossRef]
35. Kirschenmann, K. The EU Taxonomy’s (Potential) Effects on the Banking Sector and Bank Lending to Firms. *Econ. Voice* **2022**, *19*, 275–283. [CrossRef]
36. Nyikos, G.; Kondor, Z. National Development Banks in Europe—A Contribution to Sustainable Finance. *CEPAR* **2022**, *20*, 135–165. [CrossRef]
37. Esposito, L.; Mastromatteo, G.; Molocchi, A.; Brambilla, P.; Carvalho, M.; Girardi, P.; Marmioli, B.; Mela, G. Green Mortgages, EU Taxonomy and Environment Risk Weighted Assets: A Key Link for the Transition. *Sustainability* **2022**, *14*, 1633. [CrossRef]
38. Edenhofer, O.; Klein, C.; Lessmann, K.; Wilkens, M. Financing the transformation: A proposal for a credit scheme to finance the Paris Agreement. *Clim. Policy* **2022**, *22*, 788–797. [CrossRef]
39. Pfaff, N.; Altun, O.; ICMA. Ensuring the Usability of the EU Taxonomy. 2022. Available online: <https://www.icmagroup.org/assets/GreenSocialSustainabilityDb/Ensuring-the-Usability-of-the-EU-Taxonomy-and-Ensuring-the-Usability-of-the-EU-Taxonomy-February-2022.pdf> (accessed on 31 January 2024).
40. Platform on Sustainable Finance. Platform Recommendations on Data and Usability. 2022. Available online: https://finance.ec.europa.eu/system/files/2022-10/221011-sustainable-finance-platform-finance-report-usability_en_1.pdf (accessed on 28 February 2023).
41. Yin, R.K. *Case Study Research: Design and Methods*, 3rd ed.; Nachdr; Sage: Thousand Oaks, CA, USA, 2003; ISBN 9780761925521.
42. Yin, R.K. *Applications of Case Study Research*, 3rd ed.; Sage Publications, Inc.: Thousand Oaks, CA, USA, 2012; ISBN 1412989167.
43. Channaveer, R.M.; Baikady, R. Case Study. In *Principles of Social Research Methodology*; Rezaul Islam, M., Khan, N.A., Baikady, R., Eds.; Springer: Singapore, 2022; pp. 313–321, ISBN 978-981-19-5219-7.
44. Leavy, P. *The Oxford Handbook of Qualitative Research*; Oxford University Press: Oxford, NY, USA, 2014; ISBN 9780199811823.
45. Yin, R.K. *Case Study Research: Design and Methods*, 4th ed.; Sage: Thousand Oaks, CA, USA, 2009; ISBN 9781412960991.
46. Lucas, P.; Fleming, J.; Bhosale, J. The Utility of Case Study as a Methodology for Work-Integrated Learning Research. 2018. Available online: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiXvMDR-7aEAXUTrIYBHAGbBfAQFnoECA4QAQ&url=https://www.ijwil.org/files/IJWIL_19_3_215_222.pdf&usg=AOvVaw1VMVSQW4rU-VKcJggFMvxO&opi=89978449 (accessed on 13 December 2023).
47. Tellis, W. Application of a Case Study Methodology. *TQR* **1997**, *3*, 1–19. [CrossRef]
48. Hyett, N.; Kenny, A.; Dickson-Swift, V. Methodology or method? A critical review of qualitative case study reports. *Int. J. Qual. Stud. Health Well-Being* **2014**, *9*, 23606. [CrossRef] [PubMed]

49. European Commission. Frequently Asked Questions about the Work of the European Commission and the Technical Expert Group on Sustainable Finance on EU Taxonomy and EU Green Bond Standard. 2021. Available online: https://finance.ec.europa.eu/system/files/2021-01/200610-sustainable-finance-teg-taxonomy-green-bond-standard-faq_en.pdf (accessed on 28 February 2023).
50. Platform on Sustainable Finance. Final Report on Minimum Safeguards. 2022. Available online: https://finance.ec.europa.eu/system/files/2022-10/221011-sustainable-finance-platform-finance-report-minimum-safeguards_en.pdf (accessed on 28 February 2023).
51. European Commission. Platform on Sustainable Finance. Available online: https://finance.ec.europa.eu/sustainable-finance/overview-sustainable-finance/platform-sustainable-finance_en (accessed on 28 February 2023).
52. Eurostat. *NACE Rev. 2: Statistical Classification of Economic Activities in the European Community*; Office for Official Publications of the European Communities: Luxembourg, 2008; ISBN 978-92-79-04741-1.
53. *ISO 45001*; Occupational Health and Safety Management Systems: Requirements with Guidance for Use. ISO: Geneva, Switzerland, 2018. Available online: <https://www.iso.org/standard/63787.html> (accessed on 13 December 2023).
54. Orzes, G.; Moretto, A.M.; Moro, M.; Rossi, M.; Sartor, M.; Caniato, F.; Nassimbeni, G. The impact of the United Nations global compact on firm performance: A longitudinal analysis. *Int. J. Prod. Econ.* **2020**, *227*, 107664. [CrossRef]
55. VDMA e. V.; ZVEI e. V. ZVEI-VDMA: Code of Conduct. 2022. Available online: https://www.zvei.org/fileadmin/user_upload/Themen/Nachhaltigkeit_Umwelt/Nachhaltigkeit/Code-of-Conduct-2022/ZVEI-VDMA-Code-of-Conduct-2022-01-en.pdf (accessed on 13 December 2023).
56. Platform on Sustainable Finance. Technical Working Group: Supplementary: Methodology and Technical Screening Criteria. 2022. Available online: https://finance.ec.europa.eu/system/files/2022-11/221128-sustainable-finance-platform-technical-working-group_en.pdf (accessed on 28 February 2023).

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.