

Article

Innovative Green Initiatives in the Manufacturing SME Sector in Poland

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Abstract: Operating a business in the context of current environmental challenges requires managers to shift away from the management model focused solely on the achievement of economic goals. In this situation, pro-ecological (green) initiatives, in particular those that are innovative, are gaining significance. These measures allow for the mitigation and/or elimination of the environmental pollution while generating at the same time certain benefits for the companies implementing them, which is reflected in the improved financial performance. Ecological innovation (eco-innovation) is an ideal solution that allows business entities to achieve both environmental and economic goals. Nevertheless, other green initiatives may also contribute to the accomplishment of such objectives. This article aims to indicate innovative green initiatives undertaken in the SME sector, while identifying at the same time their impact on the operation of entities in this sector. It was accomplished on the basis of empirical research conducted on a sample of 342 manufacturing enterprises operating in Poland. The obtained results gave rise to the conclusion that the undertaken innovative green initiatives do not only combine environmental objectives with economic objectives, but also bring measurable benefits to the implementers (e.g., revenue growth), which occurs in parallel to environmental safety maintenance.

Keywords: innovative (pro-ecological) green initiatives; eco-innovation; manufacturing enterprises; SME sector; business management; sustainable development (SD)



Citation: Wysocki, J. Innovative Green Initiatives in the Manufacturing SME Sector in Poland. *Sustainability* **2021**, *13*, 2386. <https://doi.org/10.3390/su13042386>

Academic Editor: Antonio Boggia

Received: 18 January 2021
Accepted: 18 February 2021
Published: 23 February 2021

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1. Introduction

The problems related to the exploitation and pollution of the environment and a continuous shrinkage of existing natural resources make environmental issues an extremely important corporate imperative. It is essential to connect economic processes with environmental issues, as this is the only approach that allows for further corporate development and real compression of environmental and economic threats. It can be seen even in the shift from the paradigm of traditional economics to the paradigm of ecological economics, which focuses on the protection of the natural environment and the rational management of natural resources [1].

Concentrating on their own business operation and development, companies must not forget about the natural environment, which is a very important part of their appropriate and efficient operation, thanks to which they can obtain measurable business benefits. Therefore, companies must look for solutions that account for the environment, i.e., those that ensure the ecological safety of products and production processes while respecting economic efficiency. As a consequence, companies are increasingly engaged in pro-ecological (called green in this article) initiatives, which is reflected in the inclusion of the concept of sustainable development (SD) in their development strategies [2]. However, this approach requires the integration and balance of three components, i.e., economic, environmental, and social factors at all levels of business management [3]. The survey carried out among 750 CEOs confirms the legitimacy of these measures, since as many as 93% of them identified sustainability as a future indicator of corporate market success [4].

Thanks to the use of green initiatives, with the aforementioned concept as their important source, managers are keen to meet social expectations and, at the same time, win a competitive advantage over their market competitors. A better environmental image of the company, whose role in the public perception is constantly growing, is an additional incentive. At the same time, the shift in the attitude of companies towards the natural environment can contribute to the improved efficiency of their long-term operations through optimizing business processes in terms of sustainability, conscious protection of the natural environment, or reduced pollution. As a result, legal and administrative rules and regulations are no longer the only motivation behind making green initiatives strategic, since they are also congruent with market expectations [5].

Today's reality poses increasingly high challenges to businesses, so their development should be stimulated primarily by innovative activities. As indicated by M.E. Porter, innovation is one of the few factors giving rise to a sustainable competitive advantage, and the economies in which companies go in for innovation are growing much faster than others [6]. Therefore, innovation has long been considered a key factor in corporate development, and at present, innovation should no longer be isolated from environmental problems. Environmental protection issues are becoming another area for new development opportunities to be looked into by business managers. Thus, this area provides opportunities to create eco-innovation (also known as ecological innovation), which is not only practically applicable, but also fits into the social expectations and policies of states and supranational institutions in the field of environmental activities. The development of a company based on eco-innovation means a completely green approach to business and meeting the expectations of the majority of stakeholders.

The departure from business paradigm unrelated to environmental issues seems irreversible, and more and more attention should therefore be paid to the search for and implementation of eco-innovation, which, among all green initiatives, most effectively ensures the simultaneous achievement of economic, environmental, and sometimes also social objectives [7]. Nevertheless, other green initiatives, such as the design of environmentally friendly products and processes, the use of integrated technologies, and the implementation of environmental management systems may also contribute, to a varying degree though, to the accomplishment of such objectives. It seems, the implementation of any such initiatives will be important for the operation and development of SMEs, but requires additional incentives from the state. Hence, this article was aimed to identify innovative green initiatives undertaken by small- and medium-sized manufacturing enterprises in Poland, as well as to determine their impact on the operation and development of these entities. It was accomplished on the basis of the results of quantitative empirical research carried out on a random sample selected from the population of manufacturing SMEs.

2. Theoretical Framework

Any economic activity generates effects that do not necessarily have a positive impact on the natural environment. At the same time, modern societies require companies to respect nature and bear responsibility for their business activities. Consequently, companies must create so-called "green products" and streamline manufacturing processes in order to meet the expectations of stakeholders, which correct their strategic objectives and are not always in line with their economic interests [8]. This situation shows that ecological factors hold a key position among external determinants affecting the competitiveness of companies [9].

The ecological trend is conspicuous in the activities of many states and international institutions. It includes specific programs and plans developed, for example, within the framework of the European Union environmental policy. It regulates the level of environmental pollution in the member states in a top-down manner and encourages the use of ecological solutions in greening processes and the increase of corporate competitiveness [10]. It is exemplified by the Action Plan for Sustainable Consumption and Production (SCP) and Sustainable Industrial Policy (SIP), i.e., an action plan for sustainable

consumption and a sustainable industrial policy aimed to reduce environmental pollution through rational consumption and efficient manufacturing as well as global activities aimed to create a global market for ecological goods and services [11]. In addition, the amended Sustainable Development Strategy recognizes the interdependence of the three fundamental dimensions of sustainable development: social governance, environmental governance, and economic governance [12]. Sustainable development therefore inspires many companies to develop a new approach to address environmental problems while achieving business objectives, preferably through innovative green initiatives, in particular eco-innovation [13].

The literature does not use a generally accepted and explicit definition of green initiatives, although it clearly emphasizes the interdependence between such behaviors and the protection of the natural environment in relation to business companies [14–16]. From the corporate perspective, green initiatives are most often identified with measures aimed at improving their own development, but while being environmentally friendly, which result in a reduced resource and energy consumption, lower pollutant emissions, better use of post-production wastes, use of environmentally friendly technologies, or rational economic activities based on clearly emphasized environmental criteria [17,18]. The key green initiatives also include various systemic solutions [19], tools, programs, plans, and concepts discussing specific environmental practices [11,20–24] as well as various environmental strategies (e.g., dilution, filtering, recirculation, and prevention) [2,25–27].

The growing significance of green initiatives in today's economy derives from the fact that they are environmentally friendly, they do not violate the ecological sustainability and allow for a sustainable competitive advantage. They may also build up the environmental competences of the company as well as its development [28]. Depending on the circumstances, green initiatives may be implemented by companies for different purposes. Firstly, as solutions to reduce or eliminate environmental pollution or aimed to directly protect the natural environment. Secondly, as innovative solutions that apply to all new corporate implementations, whether it is a market novelty or just an adaptation of an existing solution. In the latter case, we deal with broadly understood eco-innovation, which, from the perspective of the companies, is perceived as a manifestation of an ecological as well as innovative approach to business. The author's attempt to capture the interconnections between green initiatives, innovative green initiatives, and eco-innovation is presented in Figure 1.

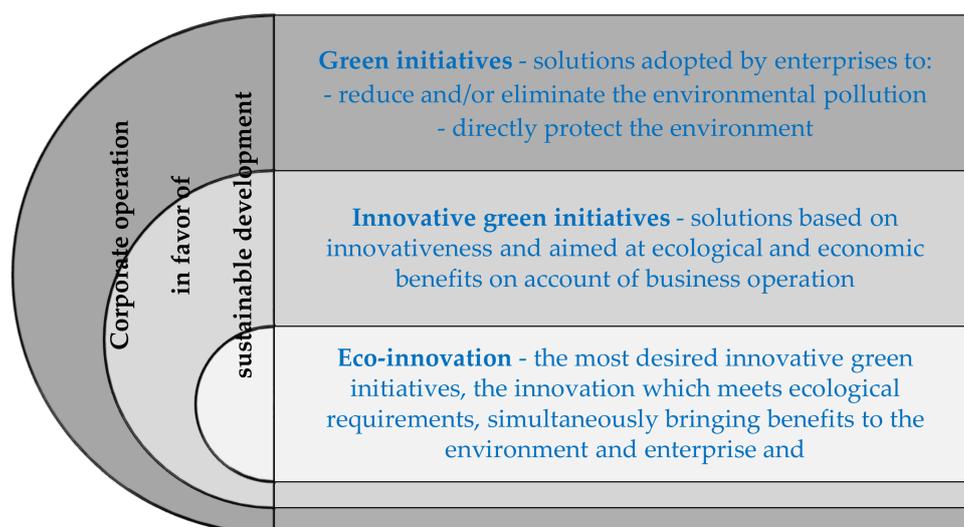


Figure 1. Interconnections between green initiatives, innovative green initiatives, and eco-innovation.

The environmental considerations are regarded to be the principal objective behind eco-innovation [29]. Nevertheless, its implementation may also be caused by cost reduction, greater production efficiency or improved product quality, which results from the very idea

of innovation, anyway [30]. The implementation of eco-innovation also has a significant impact on the image of the entity and its products, making it an important part of the corporate development strategy [31,32]. Thus, in the case of eco-innovation, the economic aspect, which actually constitutes the objective of its implementation by companies, cannot be overlooked, which is indicated by P. Ekins emphasizing the difference in the obtained results on account of eco-innovation activities [33]. It seems that only the inclusion of business aspects allows for considering eco-innovation as a derivative of innovative activities, which are undertaken by companies with a view to a parallel involvement in the environmental protection. That is why it is so important to introduce the economic criterion enabling the identification of two groups of eco-innovation, which in a simplified formula can be called “environmental” and “ecological”. The former group includes environmental innovation, which only generates benefits for the natural environment, and the second group includes ecological innovation, which brings benefit to the environment as well as the company [7]. It is often the case that innovation favorable to the environment proves to be very costly and, apart from a possible improvement in the environmental image, does not translate into measurable corporate financial benefits for businesses, constituting quite an extreme approach as economic aspects are not considered [34]. In this connection, ecological innovation is much more desirable, since as a matter of principle it is intended to bring economic benefits and lead to a rise in the corporate value. This kind of eco-innovation combines innovation with ecology in such a way as to create sustainable and environmentally friendly solutions, the implementation of which results in both better environmental protection and increased competitiveness of the companies implementing it [35]. Ecological innovation generates concrete environmental and business benefits by fulfilling the company’s ecological and economic objectives, co-creating a coherent whole in this respect, which is in line with the principles of the concept of sustainable development [7,36]. As a result, it is ecological innovation that is becoming the key to the development of contemporary enterprises and it will therefore represent eco-innovation as well as be the subject of further discussion in this article.

Opinions on eco-innovation are quite diverse, and there are so many definitions in the literature in which the concept is not explicit. In theoretical terms, eco-innovation is reflected for example in the creation of new goods, services or processes that provide consumers and all other economic entities with measurable advantages while mitigating a destructive impact on the environment [37], additionally reducing the use of natural resources while improving the quality of goods or services [38] or the possibility of generating “green” profits [39]. K. Rennings also regards eco-innovation as an essential element of sustainable development that leads to this development [40]. It is not difficult to see that a common feature of all approaches to this concept is the environmental protection aspect and the environmental benefits on the part of all the beneficiaries of this innovation, not just on the part of companies implementing it. It is manifested by the mitigation of a negative impact of conducted activities on the environment, measures undertaken to increase its resilience to production loads, and ensuring a more efficient and responsible use of natural resources [41].

The European Commission definition of eco-innovation used in economic practice treats the concept of eco-innovation very broadly, “eco-innovation is any form of innovation resulting in or aiming at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment, enhancing resilience to environmental pressures, or achieving a more efficient and responsible use of natural resources” [29]. The Organization for Economic Co-operation and Development represents a similar position. It describes eco-innovation as a kind of innovation that stands out from others as it “reflects the concept’s explicit emphasis on a reduction of environmental impact, whether such an effect is intended or not and also is not limited to innovation in products, processes, marketing methods, and organizational methods, but includes innovation in social and institutional structures and its environmental benefits go beyond the conventional organizational boundaries of the innovator to enter the broader societal

context through changes in social norms, cultural values and institutional structures" [42]. In addition, it introduces a practical eco-innovation typology in which it distinguishes three basic generic criteria: the object, the implementing mechanism, and the environmental impact of implementation [42]. From the perspective of this article, the subject criterion is crucial as it distinguishes technological eco-innovation (product and process innovation) and non-technological (organizational and marketing innovation) [43].

When analyzing both practical approaches to the perception of eco-innovation, it should be noted that "every environmentally improved product or service should be regarded as an eco-innovation, not only new or better environmental technologies" [44]. Such a broad view of this issue blurs the line between what is and what is not eco-innovation, and it generates interpretative doubts. A certain rift can already be seen in the definition of innovation, which is identified with "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations" [45]. The omission of the aspect of novelty is not included in the classic but very broad view of innovation presented by J. Schumpeter [46]. In addition, it is contradictory to a more precise approach by E. Mansfield defining innovation as the first commercial introduction of a new product, system, or device [47] or by S. Kuznets, for whom it is a new application of old or new knowledge in the production process, initiating the application of invention [48]. Consequently, a large number of practitioners and researchers do not consider the concept of innovation in the context of the first use of technology or knowledge in a new way, resulting in market success [45]. This gives rise to a fairly "free" environmental perception, but is partly justified in the context of promoting business competitiveness and growth [49]. However, this approach will not be considered as it would make it impossible to expose eco-innovation among other innovative green initiatives.

The European Union places a strong emphasis on the implementation of eco-innovation in order to encourage economic and environmental activity of enterprises. It does it, for example, as part of the implementation of the Eco-Innovation Action Plan (EcoAP) [50], an action plan focused on supporting the implementation of eco-innovation in enterprises, which is an element of the EU "Europe 2020" flagship initiative, i.e., the Strategy for Smart, Sustainable and Inclusive Growth [51]. In practice, the measures stimulating the creation of demand for eco-innovation among companies, while encouraging all entities to implement the common environmental policy, include [50]:

- using environmental policy and legislation to promote eco-innovation,
- supporting demonstration projects and partnering to bring promising, smart and ambitious operational technologies to market,
- developing new standards to boost eco-innovation,
- mobilizing financial instruments and support services for SMEs,
- promoting international co-operation,
- supporting the development of emerging skills and jobs and related training programs to match labor market needs,
- promoting eco-innovation through European Innovation Partnerships.

Today, the scope of innovative green initiatives, including eco-innovation, is extremely wide. In the case of enterprises, it may refer to such areas as the use of alternative modes of energy, more efficient use of natural resources, energy saving, decarbonization, environmental damage repair, electric transport, recycling, designing new processes, production of new products, creation of new business models, alternative use of existing products and materials, friendly construction, or eco-tourism [52]. However, eco-innovation, and in particular technological eco-innovation, plays the most important role in the micro-economic dimension. In practice, these are the used products, their disposal or recycling, as well as the manufacturing processes that cause the greatest ecological problems and therefore require innovative solutions. New ecological technologies are helpful in this regard; and due to the effect of their implementation, they are divided into integrated and additive technologies [53]. Integrated technologies include new or substantially modified processes,

technologies, or systems that avoid or significantly reduce environmental pollution. These technologies usually require significant investment, but in the long term they become very cost-effective, generating significant cost reductions, e.g., in the form of lower energy expenses. This cannot be said of additive technologies, i.e., the last stage of production, considered in the category of corrective actions, usually boiling down to recycling or reclamation [54]. In the current phase of economic development, new integrated technologies are the most desirable, as their implementation results in environmental prevention measures. Unfortunately, their complex nature requires specific ecological competences. Naturally, the condition *sine qua non* is to implement only such innovative initiatives that will bring economic benefits to the company and environmental benefits to the other beneficiaries.

3. Research Methodology

The basic research method to achieve the research objective was a quantitative approach. Within this approach, the survey of respondents was conducted on the basis of computer-assisted telephone interviews (CATI technique), where the main research tool was a survey questionnaire.

Generally, the quantitative method is the method used for surveys of a large number of respondents, which allows to study the frequency of occurrence of the phenomena in question, the distribution of the answers given as well as the quick and efficient analysis of results to obtain comprehensive knowledge in the research topic. The cited advantages of this method and the need to reach the widest possible range of companies, together with obtaining a representative sample, determined its choice. The rationale for the choice of small- and medium-sized enterprises from the manufacturing sector in Poland is discussed below.

The idea of examining companies in the manufacturing sector was associated with an important economic function and a strong position of this sector in the Polish economy, which results from a large number and diversity of companies it consists of as well as their economic potential. The manufacturing sector plays a dominant role worldwide in terms of social services and contribution to the development of regional, national, and global economy. In addition, it faces several megatrends and must therefore continuously innovate in order to improve the quality and sustainability of production [55]. Besides, many companies in this sector would not be able to operate without access to natural and environmental resources, which are crucial components of the majority of their production processes. In this dimension, this sector is an interesting subject of research, especially from the perspective of its negative impact on the natural environment and the type of green initiatives undertaken to eliminate or reduce this impact.

At the same time, the choice of SMEs from the manufacturing sector resulted from the fact that this sector was associated with a growing significance in the development of the national economy, among other things, because the entities it consists of represent a fairly large population and are characterized by flexibility and speed of response to changes occurring in a turbulent environment. According to P.F. Drucker, SMEs are the quintessence of the market economy, as they affect the reduction in unemployment, job creation, development of private property, legislative changes, and are actively involved in the process of changing the industrial structure of the country [56]. This was the case in Poland, where small- and medium-sized enterprises contributed significantly to the economic transformation and the mitigation of unemployment problems, which lets us believe that they will play an important role in mitigating economic crises in the future.

The empirical studies presented were carried out in September 2017 among SME representatives in the manufacturing sector, which, according to the Polish Classification of Activities (PKD), belongs to Section C—Industrial Processing. The examined entities represented a variety of production activities, form of ownership, market operation period, and annual turnover. Due to the number of staff employed, they also differed in employment size.

The survey included a stratified random sample of companies ($N = 342$), which were randomly and proportionally (within two strata) selected from a population of 12,938 active

manufacturing companies; each of them made the F-02 financial statement for 2015 and was obliged to make the F-01 statement for the four quarters of 2016. Besides, no additional selection criteria of companies were introduced. The proper survey was preceded by a pilot survey on a sample of entities $N = 12$, aimed at verifying the correctness of the design of research tool and understanding of the questions by respondents. The sample size was selected so that the maximum relative error of the statistical estimate was 5%. The survey assumed a confidence level of 95%. The companies constituting the sampling frame created strata of small- and medium-sized manufacturing enterprises, i.e., employing between 10 and 49 people and 50 to 249 people, respectively. The distribution of enterprises to each stratum in the examined population and in the random sample is presented in Table 1.

Table 1. Distribution of the surveyed sample to each group of companies.

| Company Size | Population in 2016 | Share in Population (%) | Sample (N) | Share in Sample (%) |
|--------------------------|--------------------|-------------------------|------------|---------------------|
| Small enterprises | 7273 | 56.2% | 192 | 56.1% |
| Medium-sized enterprises | 5665 | 43.8% | 150 | 43.9% |
| Total enterprises | 12,938 | 100% | 342 | 100% |

The contact details of the companies selected for the survey were obtained from the Central Statistical Office in Warsaw (with the support of a research company technically conducting the survey). The statistical data used to carry out the survey also came from the databases of the Central Statistical Office (GUS), but did not include micro-enterprises, which do not submit financial statement F-01 and F-02.

A key element of the research process was the development of the author's designed questionnaire. It consisted of two main parts, the first of which covered the characteristics of the research sample and the second referred to the relevant research objective, namely the identification of innovative green initiatives, including eco-innovation used in the sector of small and medium-sized manufacturing enterprises in Poland. In the first part of the survey, respondents were to provide information on the type of production activity carried out, the period of operation, the form of ownership or annual net revenues. The second part of the survey included questions aimed at obtaining information on the type of innovative green initiatives implemented, including eco-innovation, the rationale for their implementation, the effects of implementation, the average annual expenditure associated with their implementation, and the potential annual revenues resulting from the actions taken in this respect.

Due to the complexity of the issue, including definition- and interpretation-related problems in the subject of green initiatives and eco-innovation, the questions in the survey questionnaire were closed-ended and involved the possibility of selecting answers to a specific question. In addition, eco-innovation was identified as separate initiatives in order to emphasize their specificity (in terms of novelty and/or first application) taking also into account the defining requirements of the European Commission/OECD. As a result, the representatives of the entities surveyed had the opportunity to choose one or more green initiatives from among the initiatives presented below, i.e.:

- implementation of technological eco-innovation,
- implementation of non-technological eco-innovation,
- application of environmental management systems (e.g., according to ISO 14001 or EMAS directive)
- application of the Integrated Pollution Prevention and Control (IPPC) and Best Available Techniques (BAT) guidelines,
- use of new or improved integrated technologies,
- use of new or improved additive technologies,
- design and offer of environmentally friendly products (a new eco-product),
- design and implementation of environmentally friendly solutions (eco-design),

- introduction of eco-marking on raw materials, products, packaging (FSC, PEFC, Blue Angel, Ecolabel).

All green initiatives indicated in the questionnaire were identified on the basis of literature and documents developed by the European Commission and the OECD. In addition to the aforementioned eco-innovation, the examples of initiatives that have the status of official environmental measures are formalized environmental management systems enabling the implementation of environmental policy recommendations in an orderly manner within the framework of comprehensive business management. The basic document regulating the principles of sustainable production is the Integrated Pollution Prevention and Control (IPPC) document, which provides guidance on the use of the so-called Best Available Techniques (BAT). Community certificates and eco-marking awarded to products meeting the ecological criteria established by the EU should be also considered classified activity, confirming less or no ecological harm of the marked products. The questionnaire questions were addressed to the representatives of the managerial staff of small- and medium-sized manufacturing enterprises operating in Poland, and the results were subject to statistical and comparative analysis. The process of research described above and carried out by the author together with its most important stages is synthetically presented in Figure 2.

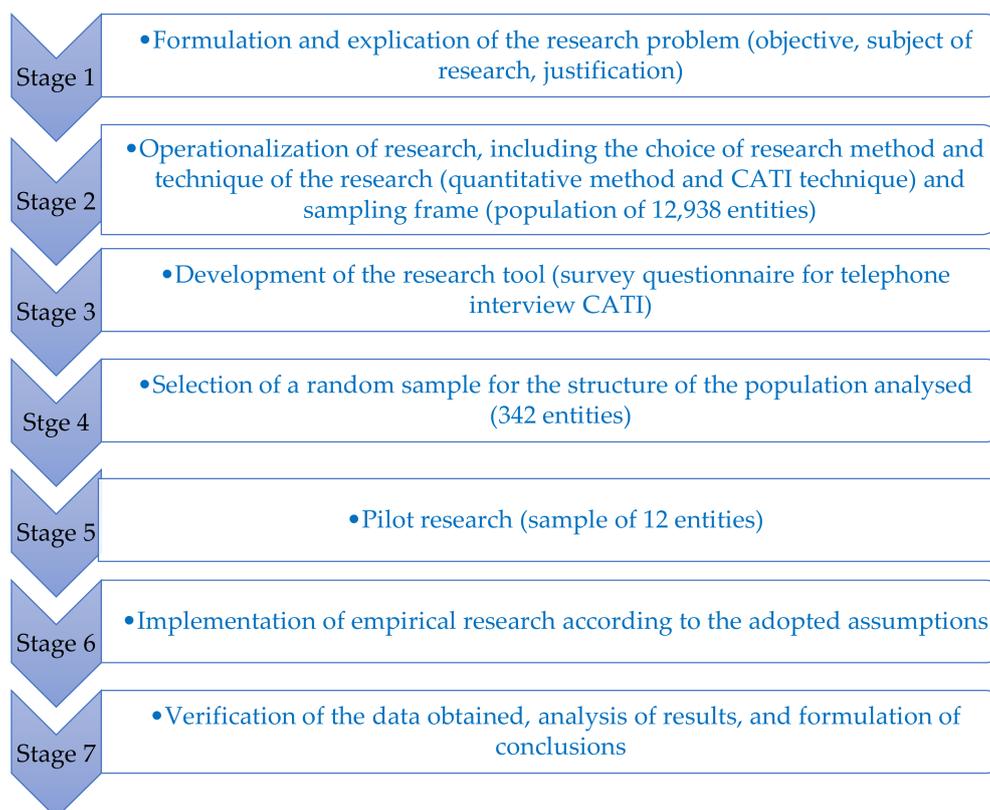


Figure 2. Algorithm of the process of research carried out by the author.

4. Analysis and Results

4.1. Characteristics of the Activities of the Surveyed SMEs

The analyzed small- and medium-sized enterprises represented a variety of economic activities in the production area (Section C), with the largest number of companies dealing with foodstuffs production (Division 10)—more than 90 entities, those dealing with other non-metallic mineral products (Division 23)—27 entities, and producing finished metal products excluding machinery and equipment (Division 25)—25 entities. The dominant

form of ownership was Polish capital including more than 83% of small- and medium-sized enterprises. By far, the largest number of companies surveyed operated on the market for more than 20 years, and slightly fewer of them less than 20 years. Annual turnover below or equal to 10 million EUR was achieved by 21% of the surveyed small- and medium-sized enterprises, while the remaining 79% declared the annual turnover in the range of 10 million to 50 million EUR. Detailed information in this respect is presented in Table 2.

Table 2. Characteristics of SMEs participating in the survey.

| Type of Production Activity Conducted by the Entities Surveyed-(within Section C of PKD) | % |
|------------------------------------------------------------------------------------------|------|
| Manufacture of food products (division 10) | 27.5 |
| Manufacture of other non-metallic mineral products (division 23) | 7.9 |
| Manufacture of fabricated metal products, except machinery and equipment (division 25) | 7.3 |
| Manufacture of electrical equipment (division 27) | 5.3 |
| Manufacture of machinery and equipment N.E.C. (division 28) | 5.3 |
| Manufacture of wearing apparel (division 13) | 5.0 |
| Manufacture of chemicals and chemical products (division 20) | 4.7 |
| Manufacture of textiles (division 14) | 4.7 |
| Manufacture of chemicals and chemical products (division 22) | 4.1 |
| Other divisions together | 28.2 |
| Form of Ownership of the Entities Surveyed | % |
| Private Polish | 83.3 |
| Private with foreign capital of >50% | 7.6 |
| Private with foreign capital of <50% | 9.1 |
| Duration of Operation of the Entities Surveyed | % |
| Up to 5 years | 8.8 |
| Up to 10 years | 16.4 |
| From 11 to 20 years | 34.8 |
| Over 20 years | 40.0 |
| Amounts of Annual Revenues (Turnovers) of the Entities Surveyed | % |
| Up to 10 million EUR | 20.8 |
| Up to 50 million EUR | 79.2 |

4.2. Results of the Survey of the Opinions of Manufacturing SME Managers

The analysis of the responses provided by manufacturing SME managers showed that in the analyzed sample (N = 342), just over 37% of entities (N1 = 128) carried out innovative green initiatives, including eco-innovation (Table 3). At the same time, only slightly more than 11% of entities (N2 = 39), i.e., only one in 10 companies indicated the implementation of technological or non-technological eco-innovation. This fact does present the SME sector in a very favorable light, especially in the area of combining environmental and economic objectives.

Table 3. SMEs implementing innovative green initiatives.

| SMEs | Number | Share in Sample N |
|---------------------------------------------------------------------------|--------|-------------------|
| Implementing innovative green initiatives (including eco-innovation) (N1) | 128 | 37.43% |
| Implementing technological and non-technological eco-innovations (N2) | 39 | 11.40% |

However, knowledge of innovative green initiatives in the group of entities declaring them (N1 = 128) looked much better. In this case, respondents could choose more than one answer, and such situations occurred. After analyzing the results, it appeared that most indications were recorded in relation to such innovative green initiatives as: design and offer

of environmentally friendly products (23.9%), design and implementation of environmentally friendly solutions (19.6%), implementation of technological eco-innovation (13.6%), and the use of environmental management systems (e.g., according to ISO 14001 or EMAS) (12.5%) (Figure 3). The least common initiatives were: the introduction of eco-labeling on raw materials, materials, products, packaging (2.7%) and the application of the IPPC directive and BAT guidelines (2.2%), which are rather the domain of large and financially stable manufacturing companies. It should be emphasized, however, that all possible initiatives were selected and that the identification of more than one initiative by a quarter of respondents may in a way confirm their environmental awareness and understanding of the legitimacy of applying innovation to protect the environment. Ultimately, however, this creates a lower-than-average image of the surveyed entities in terms of the scale of implementation of innovative green initiatives, as well as the eco-innovation itself.

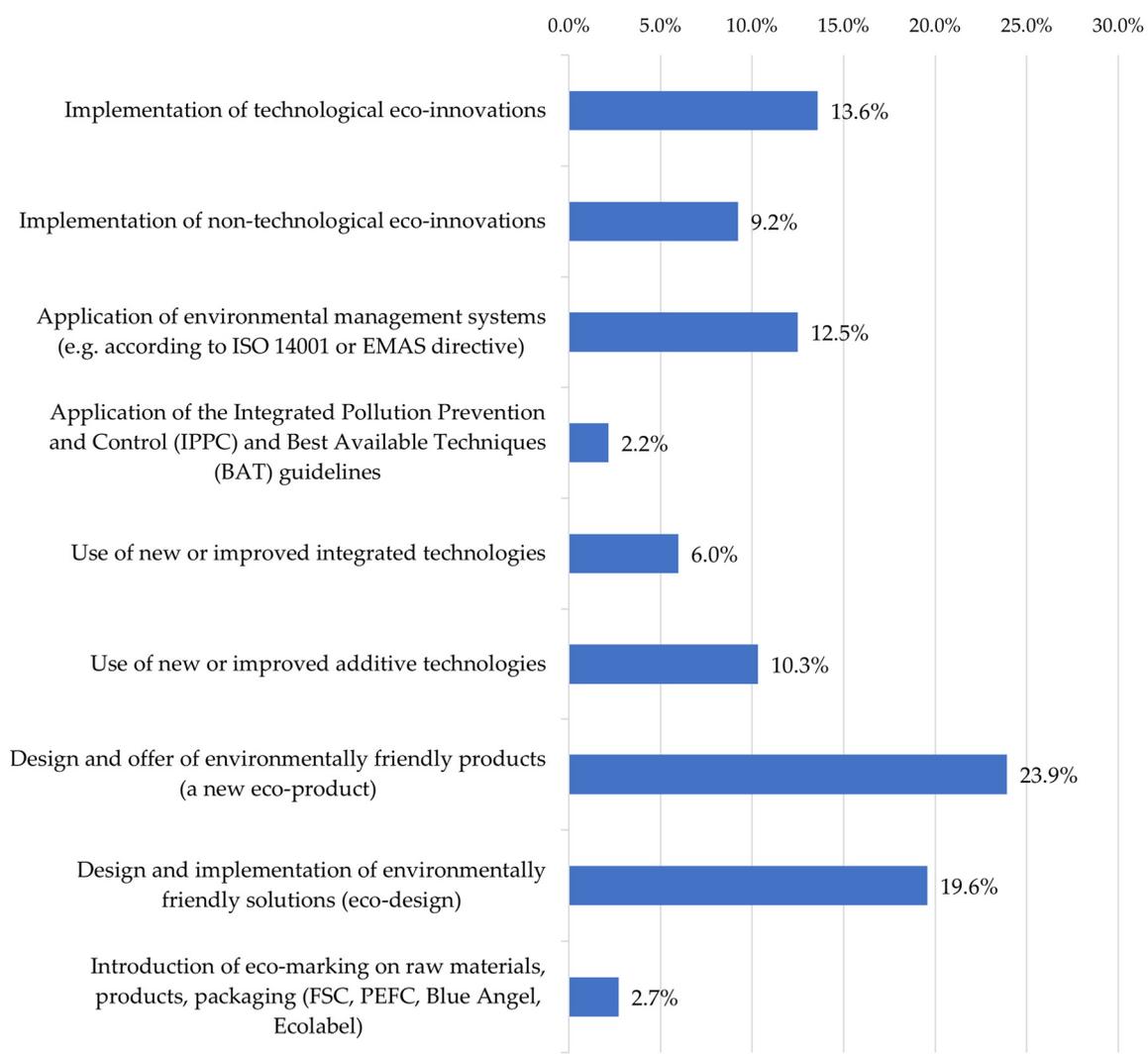


Figure 3. Innovative green initiatives implemented by manufacturing SMES in Poland (number of indications in %).

An important element of the analysis of innovative green initiatives was also the identification of the motivation behind the selection made by the respondents (N1 = 128). The most frequently mentioned motivators were: environmental policy recommending the compliance with environmental legal requirements (19.8%), reducing the harmful effects of production on the natural environment, for example, by reducing emissions of wastewater, waste, noise (13%), and reducing the costs of business operation in the long term (11%) (Figure 4). The least common motivation for the analyzed entities was the possibility of

increasing turnover in the long term and standing out from competition due to their green approach (less than 2% of indications).

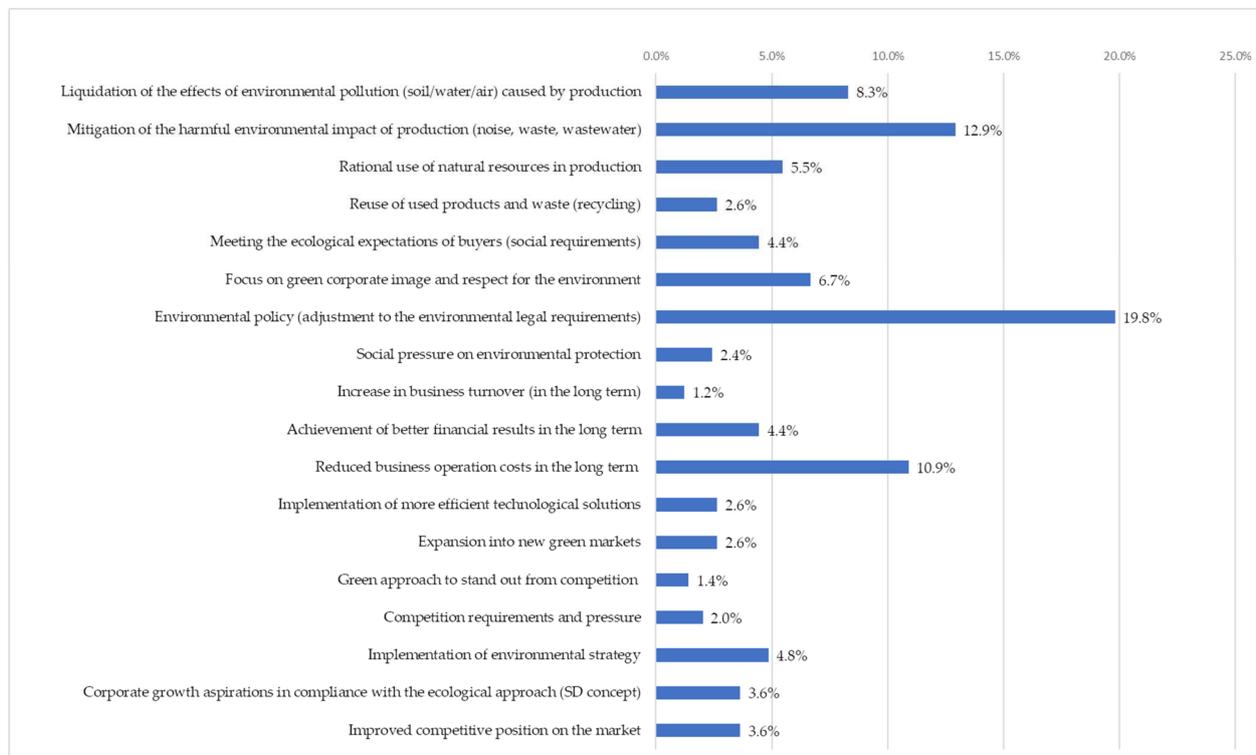


Figure 4. Motivation behind the implementation of innovative green initiatives in manufacturing SMEs in Poland (number of indications in %).

With regard to the motivation behind the decisions made by respondents to undertake innovative green initiatives, a certain lack of rationality should be noted. On the one hand, the entities sought to respect the recommendations of the state institutions in the field of environmental protection and pollution reduction, simultaneously counting on cost reductions, but on the other hand they did not treat eco-innovation as a factor that, without any doubt, significantly affects the competitiveness of the company. A certain mitigation of this situation may be the fact that more than 93% of respondents pointed to more than two motivators behind their decisions to take these initiatives. At the same time, almost 28% of them admitted to five or more motivators stimulating this type of action. It may indicate a growing environmental awareness of SMEs, which are beginning to see opportunities to combine economic and environmental objectives in this sort of initiatives.

The information on the motivation behind innovative green initiatives was completed by responses from respondents (N1 = 128) on the expected effects due to their implementation (Figure 5). In this case, the SME representatives mentioned in the first three places: political and legal effects—allowing for the adaptation to the requirements of state and EU environmental policy (23.6%), environmental effects—resulting in the elimination of the effects of pollution and/or its reduction (15.3%), and image effects—allowing for the creation of the image of an environmentally friendly entity truly caring for the environment (13.3%). On the other hand, organizational effects (3.4%) were considered to be the least important, which seems justified due to the size of the entities. It is also noteworthy that the effects of implementing innovative green initiatives accumulated positively, as more than 23% of respondents mentioned more than one benefit resulting from their implementation. Noticing a wide range of benefits of simultaneous actions aimed at the environmental protection and corporate growth is a positive sign of the environmental awareness and managerial skills of business managers. It also suggests that the SME sector is slowly

beginning to see the advantages of innovative green initiatives, which may translate into a growing interest in them in the future.

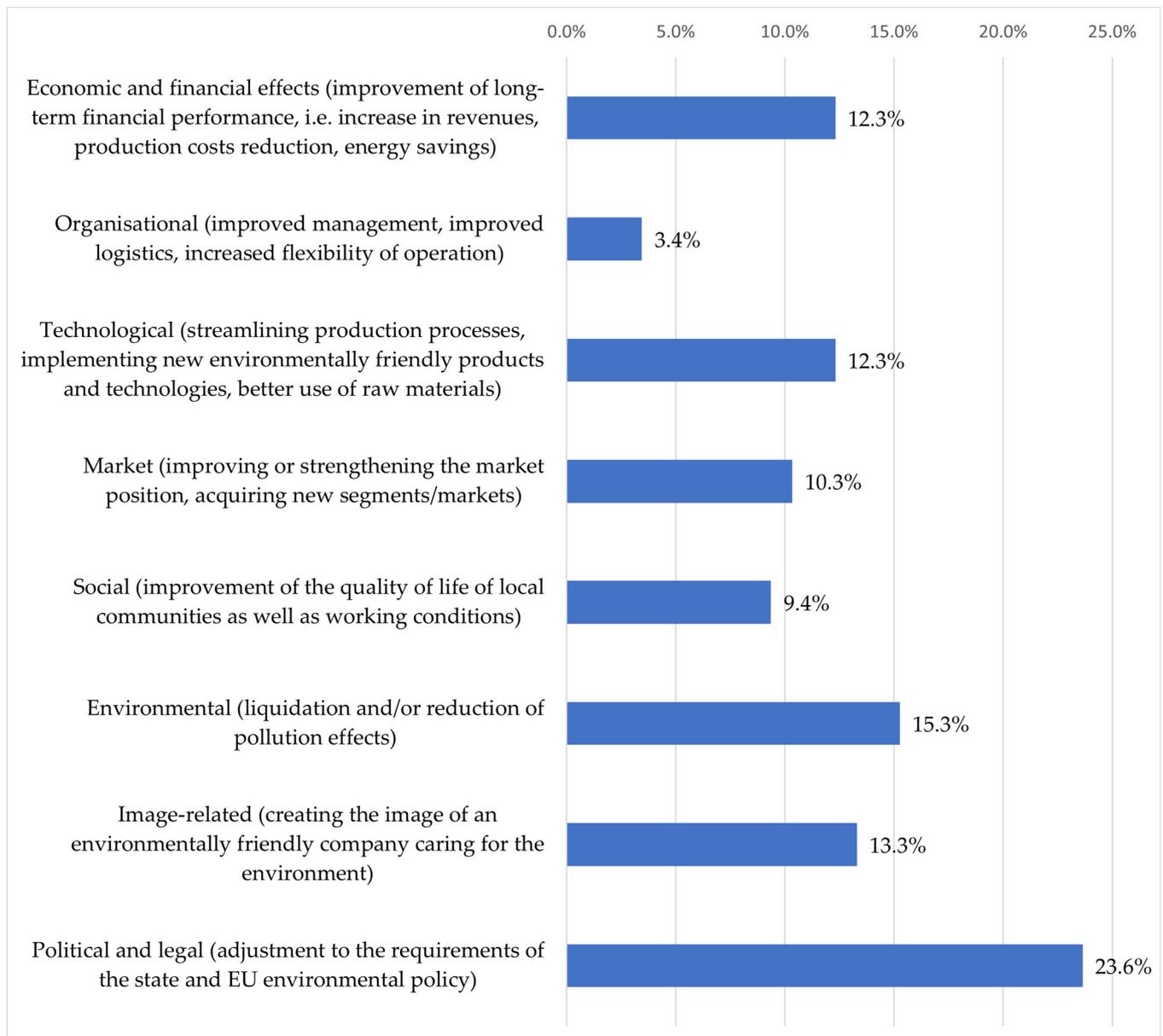


Figure 5. Effects of the implementation of innovative green initiatives in manufacturing SMEs in Poland (number of indications in %).

However, a key issue with regard to the legitimacy of implementation of innovative green initiatives was the response of respondents ($N_1 = 128$) related to the average annual expenditure (in relation to annual revenue) and the annual revenue resulting from the SME activity in this area. The obtained results are discussed below and presented in Figures 6 and 7, respectively.

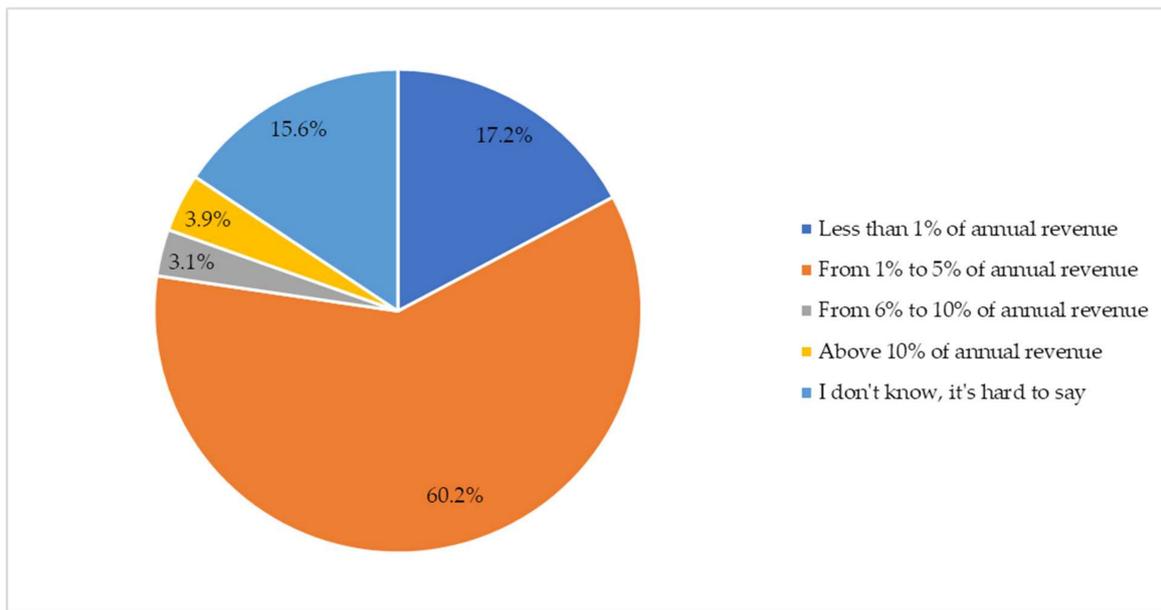


Figure 6. Average annual expenditure on the implementation of innovative green initiatives in manufacturing SMEs in Poland (number of indications in %).

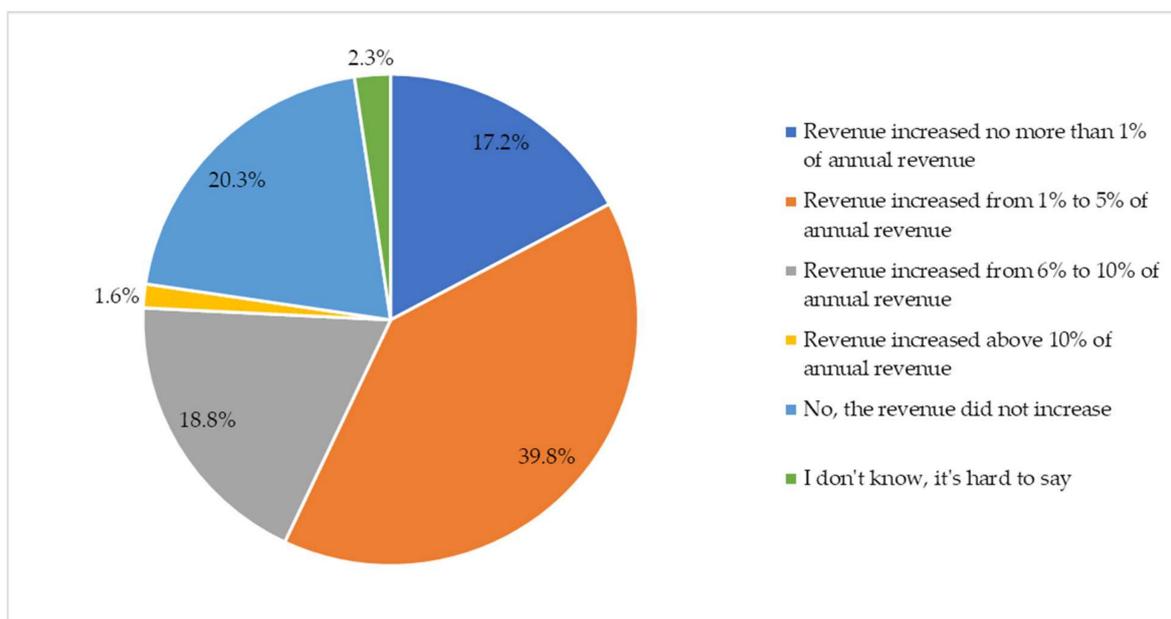


Figure 7. Effects of the implementation of innovative green initiatives in manufacturing SMEs in Poland on revenue growth (number of indications in %).

When estimating the average annual expenditure on innovative green initiatives, it appeared that more than 60% of the entities surveyed spent between 1% and 5% of their annual revenues on these initiatives, and 7% of them spent more than 6% of the revenues. It is of little concern that more than 15% of the analyzed entities did not provide information on the amount of this expenditure. It may mean reluctance to disclose information as well as fear of disclosure that these expenditures were scarce and did not play a significant role in the development of the company. The situation was slightly better among those who carried out typical eco-innovation ($N_2 = 39$); more than 66% of them marked expenditure on the scale of 1% to 5% of annual revenue, and only 10% did not specify the scale of this expenditure.

The responses aimed at the determination of impact of the implementation of innovative green initiatives on the increase in annual revenues showed that more than three quarters of the analyzed entities saw this kind of interdependence. In this group, the revenue growth of 1% to 5% and 6% to 10% was most often indicated, which was documented by 40% and 19% of indications, respectively. It should also be noted that in the group of entities that reported revenue increase, indications of growth exceeding 1% of revenues in the earlier period prevailed. Certainly, it should not be ignored that there was a group of entities which did not see a positive effect of implementing these initiatives on revenue growth. However, this does not undermine a positive impact of innovative green initiatives on the increase in revenues of companies implementing such initiatives. It is confirmed by the example of entities implementing typical eco-innovation ($N_2 = 39$), where almost 80% of respondents indicated a positive interdependence between its implementation and revenue growth. At the same time, more than two thirds of these respondents estimated that as a result of eco-innovation, their revenues increased by more than 1% compared to the revenues generated before undertaking these initiatives.

It is important to point out that the responses based on the financial data can be considered prospective, as they show that 85% of the analyzed entities consciously increase spending on environmental initiatives, which is not necessarily in conflict with their business aspirations. They also show the scale of this spending, which confirms the knowledge and importance of the issues discussed in the article. In addition, there are measurable advantages in the form of growing revenues, which were mentioned by more than 77% of the analyzed SMEs. It is difficult to argue that the implementation of innovative green initiatives definitely contributes to revenue growth, but it is possible to risk a statement that such a phenomenon occurs and to extrapolate it to the whole group of manufacturing companies in the SME sector.

5. Discussion

The empirical research allowed for the identification of innovative green initiatives (including eco-innovation), which were most often conducted in the manufacturing SME sector in Poland as well as for the determination of the level of activity of the entities analyzed in this regard. The motivation and advantages of implementation of these initiatives were also identified and responses on the scale of expenditure and the changes in annual revenues resulting from their implementation were analyzed. The obtained results should be considered as not very optimistic as they exposed the weakness of the manufacturing SME sector in the use of innovative solutions to protect the natural environment. It turned out that far less than half of SMEs undertook innovative green initiatives, and in the case of eco-innovation it was only one in ten. This situation applies not only to the manufacturing sector, but to the entire Polish SME sector, where in 2017 only 0.17% of small- and medium-sized enterprises implemented eco-innovation, while the EU average was 0.25% [57].

The fact that the least eco-innovation is carried out by small enterprises followed by medium-sized enterprises does not come as a discovery, as these entities often do not have sufficient resources to finance them and therefore treat eco-innovation expenditure as secondary [58]. In particular, it applies to small enterprises, which make their development really dependent on the profits earned. For example, in the European Eco-Innovation Scoreboard, the Polish economy is ranked well below the EU average of 100 with its score of 59. The poor performance in this ranking, especially in terms of investments and eco-innovation activities, confirms the overall low innovativeness in our country [57]. In this respect, only large and publicly owned energy and mining companies, which can rely on state support in the area of research and development, perform slightly better [59].

It is worth emphasizing the dominant position of solutions applied by the implementers of the analyzed initiatives within environmentally friendly products and production processes, with technological eco-innovation being less significant. Although this indicates the right business decisions of the managers of manufacturing companies, due

to the lack of information, we cannot determine the scale of these activities. However, we know that preventive integrated environmental technologies are still not as popular as corrective additive technologies. The knowledge of implemented initiatives among business managers and, in some cases, the declarations of implementation of more than one initiative should be positively assessed.

It should be noted that the analyzed SMEs pursued innovative green initiatives, understanding not only the need to implement them, as indicated by the motivation and incurred expenditures, but also recognizing the environmental advantages (e.g., pollution reduction) and business benefits (e.g., revenue growth). The motivators guiding the representatives of the examined companies were quite diverse, but the environmental policy, the harmfulness of production, and the costs of long-term activities played a key role. What is more, the responses obtained indicate the common sense on the part of the SME managers, as the failure to comply with environmental recommendations or standards may result in the loss of customers, contractors, or social rejection, and consequently, in bankruptcy. On the other hand, they show little confidence among respondents that these initiatives have an impact on the increase in revenues from their activities or the creation of a greener image to stand out from competition. Most SMEs still do not see the opportunities arising from the implementation of eco-innovation, and if they do see them, they will expect results in the short term and will be therefore reluctant to take such initiatives. However, administrative environmental measures and a growing environmental awareness of consumers increasingly reporting demand for ecological products are an effective stimulator [60].

The lack of conviction that innovative green initiatives are economically advantageous is also reflected in the responses related to the potential benefits of their implementation, where political and legal advantages are mentioned in the first place. In fact, they shape the way companies operate on the market, but they are an expression of the state environmental activity and not the initiatives launched by the companies themselves, which have in a way to comply with environmental requirements out of necessity. This proves a certain carelessness of SMEs with regard to environmental protection and not a fully mature awareness of the advantages of eco-innovation. What is encouraging, however, is the mere knowledge of the benefits that may arise as a result of such initiatives. In addition to political, legal, and environmental advantages, there are image-related, economic, financial, and technological benefits. This may translate into a further increase in the interest in broadly understood eco-innovation, e.g., in the area of increased competitiveness of the company, although it must be borne in mind that improvements in the financial performance or environmental image were still not the main motivators behind the implemented initiatives. It is also worth mentioning that in Poland this trend began already in earlier years, when the first signs of the interdependence between the level of eco-innovation and the company image appeared [58].

Undoubtedly, the correctness of the above conclusions is confirmed by the financial data, which quite explicitly showed that the vast majority of the surveyed manufacturing SMEs (more than 80%) incur expenditure on the implementation of innovative green initiatives (including eco-innovation) and are aware of the volume of this expenditure. However, the obtained data are not satisfactory due to the scale of the funds spent, which in most cases accounted for only a small part of the revenues generated by the analyzed entities. It shows that eco-innovation contributions are still not sufficient in Poland in relation to the scale of needs, which is the result of a small number of implementations in companies [59] and is correlated with generally low investment in innovation activities, i.e., below the EU average [57].

A much more favorable situation was noticed with regard to the revenue generated through the implementation of innovative green initiatives (including eco-innovation). In most cases, the examined SMEs clearly indicated an improved financial performance and increased revenues compared to the period before these initiatives were launched. The obtained results are not isolated. A research of Spanish food processing companies

also confirmed that eco-innovation enhances the chance of improved performance (cost reduction, sales growth, profitability), regardless of the company size [61]. A positive impact of eco-innovation on the performance of companies was also noted in the Italian wine industry, where the use of environmentally friendly practices led to the development of a sustainable competitive advantage [62]. The case of eco-innovation implemented in automotive component manufacturing processes developed by a network of small- and medium-sized sub-suppliers in the Italian automotive industry [63] also demonstrates the ability of SMEs to develop integrated and more environmentally friendly processes. These examples bode well for the perception of these initiatives as valuable not only in the context of environmental protection, but also with regard to increased corporate turnover and growth. As a result, this may encourage other SMEs to make effort in this area, in particular because of the potential for notable financial benefits and improved competitiveness [64].

In the summary of the discussion, it should be noted that the research objective set out in the article has been achieved. It is possible to conclude that launching innovative green initiatives (including eco-innovation) has many advantages, as they affect the achievement of environmental objectives combined with the achievement of economic objectives. The assessment of the obtained results, however, demonstrates quite an average innovative green picture of manufacturing SMEs operating in Poland. It seems that these entities are just acquiring knowledge and developing their environmental awareness as well as learning environmentally innovative activity. Although the vast majority requires some external “inspiration” and awareness of the importance of the natural environment for their smooth operation, they need also some financial and legislative support to achieve their development goals without harming the environment. In the case of the examined SMEs, it is necessary to launch activities aimed at encouraging them to use new management tools and methods, to create new products in communication with customers, to develop their own ecological competences, and to cooperate with research and scientific centers. Unfortunately, there are 77 entities per 1 million inhabitants in Poland certified according to ISO 14001, while the EU average is 172 entities and primarily results from a large share of SMEs [57]. It should also be borne in mind that, despite the passage of time, the barriers to the innovativeness of SMEs are present all the time. They include high costs and risks of eco-innovation, insufficient skills and qualifications of people, regulatory instability, lack of economic and fiscal incentives, and, above all, difficulties in acquisition of funding sources [57]. In this context, it would undoubtedly be useful to develop a transparent and stable system of financing eco-innovation at national, regional, and local levels, supported by EU funds and a broad information campaign, dedicated to the whole SME sector.

The author of the article is aware that the empirical research covered significantly different small- and medium-sized manufacturing enterprises, which were additionally represented by different senior management personalities. Such a research mix may have resulted in a certain degree of declarative response, depending on the environmental situation of respondents, in order to show their company in a slightly better light. With this in mind, it seems important to continue the discussed research and to extend it by a qualitative dimension, which will allow for the further analysis and verification of results.

6. Conclusions

The issues related to the exploitation of the natural environment are the subject of consideration not only of scientists and environmental organizations, but also individual countries and companies. It is due to the fact that in the long term, maintaining environmental sustainability results in the maximization of profit. It also develops proper relations between environmental and economic governance [65]. As a result, everybody is looking for solutions that will protect the natural environment and reduce emissions, while allowing companies to develop and achieve their basic economic goals. What seems to address the problem are innovative green initiatives, and in particular eco-innovation, which will have a decisive impact on resource savings and pollution prevention in the manufacturing industry [13]. They will be the only ones to benefit both the natural environment (e.g., by

reducing waste and protecting natural resources) and the companies implementing them (e.g., reducing costs or improving production processes) [66].

The innovation in support of environmental protection always has a positive environmental impact and, by conserving resources, becomes the key to sustainable development, which is recognized as a method to solve environmental threats and develop a low-carbon economy [35,67]. However, it is the company that should be able to integrate innovation into the sequence of environmental measures and to know that in the longer term its absence may result in failure [68]. It will therefore be useful to make SMEs aware that the rational implementation of innovative green initiatives will not reduce their competitiveness. Even if it does not bring immediate financial benefits, it will allow them to develop and operate in the future. Besides, through the operationalization of the acquired eco-innovation capacities, SMEs can place a greater emphasis on creating value for customers and thus ensure synergies between innovation and sustainable development initiatives [41]. However, in order to avoid errors in the implementation of eco-innovation, it will be necessary to know its types and the factors determining its diffusion [69].

These innovative green initiatives may also be a source of competitive advantage, but they must contribute to the minimization of material and energy flows through changes in products and methods of production, better use of resources or creation of quality and eco-innovativeness, or become an integral part of the overall corporate development strategy [64,70]. Due to the role of the analyzed innovative green initiatives in maintaining economic governance, the development of the national economy, business advantages, and the protection of the natural environment, their importance will continue to grow and should therefore be prioritized to allow for the further operation and development of companies. Paradoxically, this approach may be fostered by the coronavirus pandemic, which will accelerate the materialization of a new value system, based for example on the respect for the rights of nature and the promotion of sustainable development in every aspect of economic life. The current situation provokes reflection and makes people aware of the need for changes to avoid environmental pollution, cataclysms, irrational behavior, and consumerism. This gives rise to a new perspective on the role and operation of SMEs, whose production activities, having a negative impact on the environment, are connected not only with the character of production processes, but also with a large number of entities employing a huge number of employees. Certainly, there is a separate question of the environmental education of these companies, supported by the relevant environmental and economic state policies, but this issue requires separate research.

Funding: This research received no external funding.

Conflicts of Interest: The author declares no conflict of interest.

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