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# Resonance of Investments in Renewable Energy Sources in Industrial Enterprises in the Food Industry

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**Abstract:** Investments in renewable energy sources are an important direction in the development of modern economies. Motivating organizations to include appropriate investments in their development strategies becomes an essential issue. It seems clear that organizations need to see the long-term benefits of such investments in order to follow this trend. This article presents a thesis that assumes that from the microeconomic perspective, such investments are conducive to the implementation of various goals of the organization, causing the phenomenon of resonance in spheres such as the implementation of the sustainable development strategy, the level of innovation in the organization, brand image, and brand equity. The survey method was carried out on a sample of 143 industrial companies in the food industry in order to verify the hypotheses based on previous examples. Among the most important findings, it should be noted that investments in renewable energy sources make a significant contribution to building the market position of enterprises, in particular, to the level of innovation, creating value in a sustainable enterprise, and achieving goals in the area of creating a positive brand image and brand equity. The findings show that investing in renewable energy is compatible with the organization's different goals.

**Keywords:** renewable energy; renewable energy sources; sustainable development; innovation; innovativeness; creating value in a sustainable enterprise; brand image; brand equity

## 1. Introduction

In September 2015, the UN General assembly adopted the Sustainable Development Goals (SDGs), which contain 17 goals, including ending poverty and hunger, ensuring access to sustainable energy, promoting sustainable industrialization, supporting innovation, counteracting climate change, and creating sustainable consumption patterns [1]. Increasing investments in renewable energy sources (RES) can contribute to these goals. Any effort to achieve the sustainable development goals will thus generate demand for renewable energy (RE). According to the Agenda of the European Union (EU), sustainable development is the goal, which aims to develop better conditions for companies [2,3] and living conditions for society [4]. Consequently, the EU considers achieving sustainable development through the use of renewable energy as a way to mitigate the negative effects of climate change and to generate direct and indirect economic benefits [5]. Various studies have identified drivers facilitating green technology investments, such as environmental commitment, customer pressure, and cost savings [6–9]. Some study results imply [10] that as far as investing in green technologies is concerned,

small companies do not consider its environmental impact as the main value. In their opinion, it is instead perceived as a way of achieving social and economic value.

Energy production is the main cause of climate change and accounts for around 60% of global greenhouse gas emissions. Renewable energy in the form of wind, water, sun, biomass, and geothermal energy is inexhaustible and clean. Renewable energy currently accounts for 15% of the world's energy production [1]. The sustainable use of natural resources is becoming more and more difficult in times of rapid technological development, urbanization, and climate change [11]. According to the Energy Roadmap 2050 that was signed in 2011, EU countries should achieve the goal of increasing the share of RES in total energy consumption to more than 25% in 2050; however, in 2020 it should be 20% [12]. The World Economic Forum (2015) report ranked the water–energy–food nexus (WEF nexus) as one of the biggest risks to world economic stability. Many authors recognize the need to focus on sustainability in the WEF nexus, together with tools to analyze and approaches to govern the linkages at different scales [13].

Saidi and Mbarek [14] studied the impact of clean energy consumption, CO<sub>2</sub> emissions, and renewable energy on economic growth for nine developed countries. Their findings suggest that in the long run, renewable energy consumption is a key component of the countries' economic growth. Cho et al. [15] studied the causal link between renewable energy consumption and economic growth for 31 OECD countries and 49 non-OECD countries for the period 1990–2010. They confirmed the existence of a long-term relationship between the variables mentioned above for developed countries. Saunila et al. [10] found out in their study that when investing in green technologies, companies do not treat environmental sustainability as the main value but as a way of achieving social and economic value.

Many previous studies have focused on the involvement of economies, societies, cities, or enterprises investing in renewable energy and assessing the importance of these investments for the implementation of various goals [16]. However, there is a gap in the existing literature regarding the importance of investments in renewable energy sources for the achievement of goals in a sustainable enterprise, the level of innovation, and the achievement of goals in the area of brand equity in the food industry.

The essence of all investments of enterprises is that after a certain (usually long) period, they not only reimburse the costs incurred but also bring specific benefits [17]. The positive effects of investments can be perceived in various areas of the organization. This may mean that some investments have the ability to cause resonance, such as brand investments that strengthen relationships with customers by stimulating their desired behavior, as described by Keller [18]; this perspective is generally missing in the literature.

Provided that the essence of the brand is to create a relationship with customers, brand resonance refers to the nature of these bonds, their intensity, and their depth. In order to trigger a brand resonance, brand attributes need to be created since they provide the foundation of the brand [19]. Following Keller's theory and adapting it into different areas, the investments in renewable energy sources (RES) are required (independent variable) to spark the RES resonance, which again relates to the essence of organizational aspects, such as the sustainable development, innovation, or the sheer brand equity, which are the dependent variables considered in this article. As Keller suggests, resonance has its dimensions [19]. Therefore, the authors of this present paper describe the basic dimensions in each of the analyzed domains in the respective parts of the article and then provide a verification of them through statistical analysis.

The authors of the article decided to check whether investments in renewable energy sources (RES) have such a resonance power. The study aimed to identify the sustainable impact of investments in renewable energy in three different areas. The most obvious sphere in which a resonance could emerge seems to be issues related to sustainable development. In this respect, an organization strives to achieve environmental, economic, and social goals. The development of the organization, which is largely based on the creation and implementation of innovative solutions, is also important. The third

aspect examined concerned the creation of a positive image of the brand and brand equity. The authors decided to check whether industrial enterprises in the food industry perceive positive, long-term effects in these spheres. Positive verification of the hypotheses will provide the basis for identifying further dependencies, and ultimately, for deepening research on the structure of this resonance.

The remainder of this paper consists of the following sections: In Section 2, we review the existing evidence on the effects of investments in renewable energy sources on achieving the goals formulated in the areas of sustainable development, innovation, and brand equity. The dimensions of potential RES resonance are also indicated here. Section 3 describes the method, the results are reported and discussed in Section 4, and finally, a discussion and conclusions are given in Sections 5 and 6, respectively.

## 2. Literature Review and Formulation of the Hypothesis

### 2.1. Renewable Energy Sources

The idea of sustainable development was transferred to the field of energy, thanks to which, the term “sustainable energy development” was created and functions. The fundamental principle of sustainable energy development (SED) is the efficient use of energy, human, economic, and natural resources. It becomes imperative that economic development and environmental protection are closely interrelated, and that economic development does not contribute to the degradation of the natural environment. Achieving a certain compromise and understanding the balance between the inevitable human interference in the environment and the preservation of its valuable values is a key issue in sustainable development.

The significance of renewable energy sources is growing all over the world. It can be stated that renewable energy sources are primary, domestic, and clean or inexhaustible energy resources, also referred to as “alternative energy sources” [20,21]. So far, only some renewable energy technologies have achieved a level of competitiveness similar to technologies based on fossil resources. Renewable energy sources include biomass, hydropower, geothermal, solar, wind, and marine energy, and their share is very diverse, especially when looking at the national summaries, which are presented later in the article. Renewable energy sources that meet national energy needs can provide energy services with zero or near-zero emissions of both air pollutants and greenhouse gases. Sustainable development requires methods and tools to measure and compare the impact of human activities on the environment for different solutions [20,22]. It is obvious that the excessive use of fossil fuels not only leads to an increase in the rate of depletion of their reserves but also has a significant negative impact on the environment, causing an increased threat to health and the threat of global climate change [23].

The world situation is very diverse. The leaders in the application and use of renewable energy are countries such as Norway, Iceland, and New Zealand, which cover most of their energy demand by using renewable energy. However, Norway (over 72.75% in 2018) and Iceland (72.21%) may boast a high degree of use of hydropower and the use of geothermal sources. Denmark achieved over 30% share of RES thanks to wind energy, mainly offshore, and Portugal thanks to solar power plants. On the other hand, the worst results among the EU countries were achieved by Poland (11.28%, with the national target of 15%), Ireland (11.06%, with the target of 16%), Great Britain (11.02%, with the target of 15%), Belgium (9.42%, with the target of 13%), Luxembourg (9.06%, with the target of 11%), Malta (7.98%, with the target of 10%), and the Netherlands (7.39%, with the target of 14%) [24]. The above-mentioned data also show another aspect that should be considered, i.e., the issue of energy security through the emergence of competition in the electricity market and the diversification of supply sources, which is particularly important from the point of view of country management. Although the situation differs from country to country, the share of renewable energy sources is expected to increase significantly (30–80% by 2100) [25].

When analyzing the global situation, it is noticeable that in 2018, about 25% of electricity came from RES. According to the International Energy Agency (IEA), strong growth has been seen in the last decade, although the use of renewable energy has grown more slowly in the industry and real

estate sectors. In 2018, production increased by 450 TWh and was 7% higher than in 2017. The largest, a 90% contribution to the increase in generation, was made by solar, wind, and hydropower plants. About 180 GW of new RES capacities were installed (as of 2017), and the IEA estimates show that in 2019, the increase in capacity was higher [26].

Society is slowly moving toward more sustainable production methods, minimizing waste, reducing vehicle air pollution, distributed energy generation, protecting native forests and green spaces, and reducing greenhouse gas emissions [27]. Moreover, the growing prices of carbon dioxide emission allowances and the falling costs of renewable energy sources (RES) installations mean that green energy is becoming a serious alternative to the traditional one of using fossil fuels. The main goal of a sustainable energy policy is to reduce the negative impact of the energy sector on the atmosphere through:

- Supporting policies and projects leading to the use of environmentally safe and economically viable energy from unconventional renewable sources.
- Less harmful and more efficient energy production, transmission, distribution, and use, and to maintain a balance between:
  - energy security,
  - meeting social needs,
  - competitiveness of the economy,
  - environmental protection.

The six areas mentioned constitute the basic goals of the countries' energy policies and it can be concluded that we find them used jointly for renewable energy sources. Their rational use is one of the essential elements of the sustainable development of the state.

Changes aimed at improving the condition of the environment are becoming more and more acceptable, both socially and politically. Already in the "Green Paper. A European Strategy for Sustainable, Competitive and Secure Energy" of 2006, the topicality of the problem of the depletion of fossil resources and the rising prices of crude oil and natural gas was emphasized, followed by the need to ensure energy security and create competitive internal energy markets [28]. In addition to the conditions for shaping the RES market that result from many EU or international obligations, important environmental factors should be indicated, such as climate protection and maintaining/improving the quality of the environment.

Apart from the regulatory (both legal and political), environmental, and technological premises, there are also economic premises that cover all the above-mentioned areas. They are related to the estimation of the profitability of investing in RES. Renewable energy sources are still perceived by the public as much more expensive to use than fossil fuels. In fact, after taking into account the external costs and benefits in the economic analysis, renewable energy turns out to be much cheaper than traditional energy based on fossil fuels. This creates an economic prerequisite for the emergence of the RES market regarding the improvement of maintaining resource efficiency and improving the quality of the environment at lower costs. It should be noted that this is about long-term total social costs, i.e., including both strictly financial costs and environmental or health costs that are difficult to valorize and quantify.

Climate issues are another important element in the relationship between renewable energy and sustainable development. The unfavorable climate change scenario is one of the main problems facing humanity in the 21st century and is widely discussed by various groups of politicians and leaders of countries, as well as by many international organizations. It is the increasing concentration of greenhouse gases, such as CO<sub>2</sub>, CH<sub>4</sub>, CFC, halons, N<sub>2</sub>O, ozone, and peroxyacetyl nitrate, in the atmosphere that causes the heat to be retained and the temperature of the earth's surface to rise. Any measures to counteract this unfavorable phenomenon have a positive impact on the health of society, reducing the number of deaths related to cold or heat waves [29]. It is also a step toward

reducing the occurrence of floods and droughts, which improves the quality of life of society and reduces the negative effects of weather anomalies.

An important aspect of sustainable development is also the moral dimension, which is undoubtedly connected with the aforementioned ones, but its overtones are important. It covers the problems of preserving the environment for future generations, maintaining its landscape values, nature protection, maintaining biodiversity, not deteriorating the quality of the atmospheric air, etc. Investments in renewable energy sources and supporting activities in this area allow for combining both investment activities with agricultural activities (cultivation and animal husbandry on the premises of wind farms), as well as recreation and tourism (investments in modern technologies increase the tourist attractiveness of the region).

Although the activities of states and societies in the field of environmental protection are visible, further work is needed to promote alternative renewable sources in order to also meet the growing energy needs of developing countries. This can have many benefits, including the development of the renewable energy system, improvement of the reliability of energy supply, and saving of organic fuels; solving problems of local energy and water supply; raising the standard of living and employment of the local population; ensuring the sustainable development of remote regions in desert and mountain zones; and the fulfillment of countries' obligations in the scope of fulfilling international agreements on environmental protection [30].

The listed elements linking RES with sustainable development are so dependent on each other that it is difficult to consider them individually. These relationships mean that the activities of the organization must be well thought out, and they are often solutions included in the strategy in the areas of both hard, production-related activities, and soft activities, such as brand equity. At the same time, it should be noted that all implemented measures in the field of renewable energy are innovative, and the need for sustainable development generates, *inter alia*, the need to take into account ecological aspects when conducting production processes, as well as creating new, innovative processes or product solutions, which is referred to in the subject literature as "eco-innovation."

## 2.2. Sustainable Development of Enterprises

Sustainable development is a concept that covers most aspects of the human world [31]. A core issue emphasized in definitions of sustainable development is that both current and future needs must be fulfilled. The overarching objective is to ensure sustainable prosperity that aims to tackle issues of injustice, inequality, peace, climate change, pollution, and environmental degradation. There is abundant literature on sustainable development, and the academic community has made a significant contribution to the conceptualization and materialization of the three basic pillars of environmental, economic, and social sustainability [32–35]. Economic stability is about long-term economic growth while preserving environmental and social resources.

Sustainable development focuses on the following three principles: environmental integrity, economic prosperity, and social equality [33,36–39]. Each of these principles is a *sine qua non* condition and must be supported in order to ensure that economic development is simultaneously sustainable [40]. The rule of environmental integrity guarantees that the effects of human beings' activities will not be harmful to the environment (the earth, air, and water resources). Equal access to resources and opportunities for everyone in society should also be ensured. In turn, the principle of economic prosperity promotes a reasonable quality of life thanks to the productive capacity, creation, and distribution of products and services by organizations and individuals in society [40–42].

As noted in the work of Liczmańska et al. [41], sustainability is a concept that stands for long-term economic, environmental, and community goals. Actions that are taken to ensure the implementation of the principles of sustainable development must be the result of integrating the state administration, scientific communities, entrepreneurs, and citizens. According to Assef [43], an economically sustainable system continuously produces goods and services by applying some strategies to streamline the use of existing resources such that a long-term, beneficial balance is reached. The definitions of

sustainable development also refer to the use and protection of natural resources and to directing the development of technology in such a way as to achieve and maintain the satisfaction of present and future human needs [41,44–48].

Incorporating social and environmental values into business practices can have positive, long-term effects in relevant areas, including an organization and its stakeholders, as well as the environment and humanity as a whole [49–52]. Nidumolu, Prahalad, and Rangaswami [53] state that the pursuit of sustainable development begins to transform into a competitive landscape, which forces people to change the way people think about products and processes, as well as change business models. All this poses an incentive for companies to adopt the idea of sustainable development in their business activities [54], including employee training, supply chain management [55], and new product development [56,57]. Achieving corporate sustainability also requires paying attention to non-economic areas of organizational performance, such as social and environmental implications [58–61]. Building overall corporate sustainability requires systemic changes and the involvement of all stakeholders [62–64].

The fundamental aspects of sustainable entrepreneurship are not actually targeting management systems or procedures. The focal point is personal initiative and skills to achieve large-scale market success and environmental and social change or social innovation [65–67]. Sustainable entrepreneurship is essentially the implementation of sustainable development innovations that target the mass market and benefit the greater part of society. Such entrepreneurs are usually focused on the unfulfilled needs of stakeholders [66–69]. Stakeholder demands usually go beyond their economic interests and may be seen as the ultimate source of organizational sustainability innovation [70], the discovery and exploitation of which is the basis of sustainable entrepreneurship [71]. This interpretation is also consistent with recent work that shows that certain market failures are the underlying cause of entrepreneurial activities aimed at achieving social goals, as well as improving the environment [39,51,57,72].

Hediger [48] points out that sustainable development is associated with the maximization of enterprise value and does not decrease with time. This suggests a non-diminishing total contribution of the current corporate activity to its profits over time at the highest possible level. Knowledge, creativity, analytical skills, and learning are developed by a sustainable company in order to achieve a sustainable competitive advantage [73–75]. From this perspective, the growth of economic capital should not be at the expense of the decline in natural or social capital. Thus, economic growth should not ignore the balance of natural resources, ecosystems, social welfare, and wealth distribution [15]. Sustainable development emphasizes the evolution of human society from an economically responsible point of view, in line with environmental and natural processes. Therefore, this study postulated that:

**Hypothesis 1 (H1).** *There is a positive relationship between the level of investment in renewable energy sources and value creation in a sustainable enterprise (understood as achieving environmental, social, and economic goals) in the food industry.*

### 2.3. Innovation and Innovativeness

Over the past few years, the approach to the innovation process has changed. The following models of innovation can be distinguished: the idea of a “black box,” linear models, interactive models, system models, evolutionary models, and models of the innovative environment. Each of these models brought not only a new approach to the problem but also attempts to explain what influences the innovation of individual territorial systems. In the first model, only financial resources invested in activities of research and development units are taken into account, while in the latter, complex approaches prevail, such as the concept of regional innovation systems [76]. Apart from the adopted model, the key role of innovation in national economies basically results from two premises [77]. First, under steady conditions, the rate of production growth (economic growth) is equal to the sum of the rate of population growth and the rate of technological progress; however, according to Schumpeter’s theory of innovation, great discoveries are accompanied by “long waves,” i.e., periods of increased economic activity lasting for many years that are related to derivative innovations.

When economic growth slows down, many entrepreneurs increase investment in risky R&D projects, which fuels the economy. Innovations reflecting technological progress and modernity are a factor that stimulates organizational development and builds a competitive advantage [78–80].

Innovation can be understood as a specific process that includes all activities related to the creation of an idea and the creation of an invention and its implementation. Innovation also applies to a service, process, or new product or its improvement. Currently, holistic actions should be taken into account based on the innovation strategy, which can be described as a “long-term action plan prepared to improve the innovation management process [81], that is the process of searching for such types of innovations that, based on the resources available, will increase the company’s market efficiency” [56,57]. The components of the innovation strategy primarily include [82]:

- Choice of innovation, i.e., the deliberate choice of technology and technique that should be invested in.
- Acquiring innovations, i.e., determining the sources of acquiring innovations, methods of acquiring innovations, identification of valuable innovations in the environment, and analysis of integration possibilities.
- Use of innovation through internal use and improvement, or the sale of innovation.

The binding, contemporary definition taken from the Oslo Manual handbook describes innovation as “the implementation of a new or significantly improved product (product or service), a new or significantly improved process, a new marketing method, or a new method of organization in the field of business practices, workplace organization, or relationships with the external environment” [83].

Independent implementation of the overall innovation process in an enterprise is difficult and possible only if the company exhibits certain pro-innovative features. They include, first of all, a pro-development orientation, vigilance, sensitivity, flexibility, risk acceptability, involvement in technology, cooperation, diversity, and the so-called “slack.” The features and their detailed description are contained in Table 1.

**Table 1.** Features of an organization that is focused on the implementation of innovative processes.

Features of the Enterprise	Characteristics
Pro-development orientation	Operational and tactical activities should be focused on the implementation of a strategy that assumes long-term growth of the company’s value and not maximizing profit in the short term
Vigilance	Management and employees should constantly analyze the company’s environment, see trends in it, and anticipate key changes in the market
Sensitivity	In addition to generating their own innovations, enterprises should demonstrate appropriate sensitivity, enabling them to perceive, identify, and implement solutions that have been developed beyond their formal boundaries
Flexibility	In addition to noticing changes in the company’s environment, they must also show readiness to accept them and quickly adapt the company to new market conditions
Risk acceptability	The innovative process is burdened with the risk of obtaining results different from the assumed ones, which is why it is important to approach it in such a way that it will also allow the implementation of quite risky projects
Involvement in technology	Intensive progress in the technological area means that innovations taking into account these changes may be critical for the company and the market
Limited competition within the organization and tendency to cooperate	The implementation of large and complex innovative projects forces the building of an organizational culture that will be focused on cooperation
Diversity	The creation of a pro-innovative organizational culture that includes creativity is fostered by the diversity of employees who have different competencies, come from different cultures, and are of different ages
“Slack”	The organization must provide space for the creativity of employees, enabling them to solve problems occurring in the company in an unconventional way and to use unconventional methods of creative work

Source: Own study based on Tranfield D., Young M., Partington D., Bessant J., Sapsed J., *Knowledge management routines for innovation projects: developing a hierarchical process model*, International Journal of Innovation Management, 2003, 7 [84]; Trott P., *Innovation Management and New Product Development*, Prentice Hall, Harlow-Milan 2005 [85].

The foundation for creating innovation is knowledge, and in order to acquire it, enterprises build relationships with entities, which may be customers, suppliers, competitors, general partners, communities, local authorities, etc. [86–91]. Definitions of enterprise innovativeness focus on various manifestations of innovative activity, which result in product, process, organizational, and marketing innovations (where these four aspects are taken as dimensions for potential RES resonance). Therefore, innovation must be understood as a system that runs differently depending on the specificity of the company, its area of activity, size, type of innovation, number of people involved, level of knowledge, financial resources involved, and expected results [92].

Innovation capacity is defined as the continuous improvement of the company's capabilities and resources to explore and use the opportunities to develop the new products necessary to meet market expectations [93,94]. The term innovation is closely related to the concept of innovation, which reflects the company's tendency and the ability to undertake and support new ideas, experiments, practices, and processes that can generate innovative products, services, or techniques [79,95,96]. Innovation can be understood as the ability to create, implement, and absorb innovation, which is associated with active involvement in innovative processes. Thus, in this study, we posited the following hypothesis:

**Hypothesis 2 (H2).** *There is a positive relationship between the level of investments in renewable energy sources and the level of innovation of industrial enterprises in the food industry.*

#### 2.4. Brand Image and Brand Equity

An essential tool for companies to compete on the market is their brand, where in a narrow sense, it is equated with the name of the organization. However, the brand is more often understood as the total value provided to buyers along with the product. A strong brand may result in customer loyalty but also with other benefits, such as larger margins, expected customer response to price changes, vulnerability to competitive marketing actions and marketing crises, etc. [97]. From the perspective of competitive processes, the intangible value of a brand, referred to as "brand equity," is particularly important. As explained by Keller, brand equity is the additional value that makes the buyer feel a greater benefit from buying a branded product than an analogous product not sponsored by a given brand [19]. It is worth emphasizing here that brand equity is largely based on knowledge about the brand, which in turn, is based on a specific, developed, and unique association structure [98]. What is very important here is brand awareness and brand image [99,100]. Brand awareness should be understood as the ability of customers to identify it, as well as recognize it in various circumstances. The brand image can be defined as its image in the minds of consumers, where the image of the brand identity is associated with the associations kept in mind [99,101,102].

The aforementioned associations may refer to both the product attributes and the functional and symbolic properties of the brand and its overall evaluation [99]. Therefore, it can be concluded that it is a subjective category, synthesizing the consumer's experience with the brand and the interpretation of the added value [103–106].

It is worth emphasizing at this point that the perceived brand equity is strongly related to the beliefs of the consumers [102], who react not so much to the objective reality but rather to a set of perceptions about it [107]. In the process of making purchasing decisions, buyers tend to choose products they are familiar with, which they already know something about, and from brands that they trust. The brand association structure systematizes new information [98], and combined with knowledge and experience, it minimizes the cognitive effort that usually accompanies decision-making processes [108]. Brand equity is a reflection and symbol of certain values that are important from the perspective of consumers' beliefs and their lifestyle. The image of such a brand allows the consumer to identify with a specific social group. This is so because the brand symbolizes the values desired in a given social group and thus contributes to the assimilation of the individual by the group. Therefore, this translates into purchasing decisions, and from the perspective of enterprises, into their

predictability. Research shows that the brand image largely determines the strength with which brand equity influences consumers and their subsequent purchasing decisions [109].

The brand image is built through continuous brand communication with the environment [110]. What is significant here is not only what the brand intentionally informs stakeholders about but also what entities in the environment notice in the behavior of a given organization. Brand equity is the ultimate result of all efforts of an organization and results from its mission and long-term, strategic goal [111]. Investment in marketing communication, as well as in various fields of operations and execution of their strategy, have the potential to build brand equity since they create stakeholders' knowledge and experience [102].

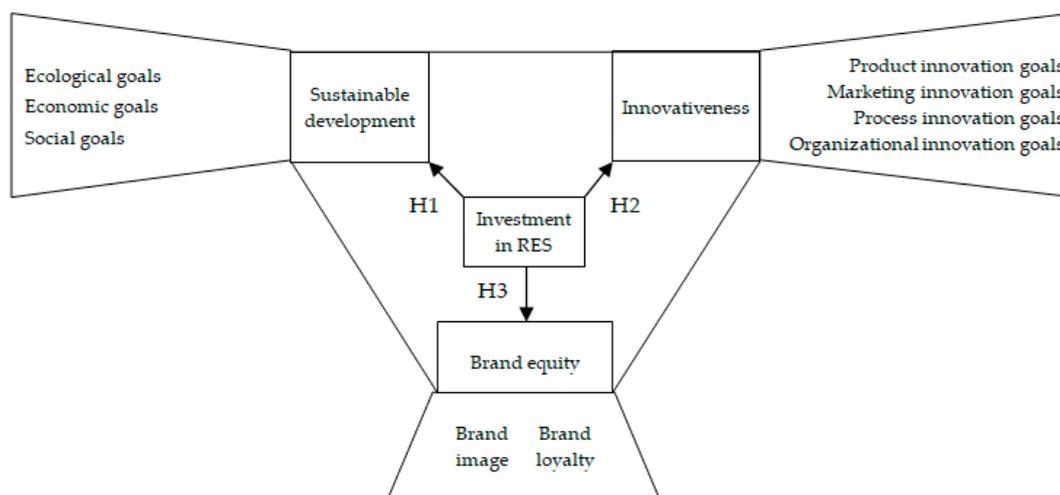
Nowadays consumers are concerned by the environmental issues and long-term effects of human beings' activities [112]. Customers' decision-making and purchasing behavior are often enhanced by the ecological aspects of brands, which is perceived by customers as green brand equity [113]. A previous study conducted by Chen suggests that companies should invest in increasing their green brand image, green satisfaction, and green trust because this is all positively associated with green brand equity [114]. Research also shows that a green image is positively associated with brand loyalty [115]. Thus, the brand image and brand loyalty are taken by the authors of this paper as dimensions of potential RES resonance.

As evidenced by the research results, the impact of the customer-perceived ethicality of an organization on brand equity can be observed and this is mediated by brand image and recognition benefits. Thus, it can be analogously assumed that developing a green brand image will enhance brand equity [116]. Therefore, it appears that the activities of the organization aimed at strategic environmental issues should strengthen brand equity and contribute to the achievement of the effects related to it, which were mentioned at the beginning of this subsection. Therefore, we hypothesized that:

**Hypothesis 3 (H3).** *There is a positive relationship between the level of investments in renewable energy sources and the achievement of goals in the area of brand equity in industrial enterprises in the food industry.*

### 3. Methods

The adopted research objective involved determining whether there is a positive relationship between investments in RES in three different areas: sustainable development, innovation strategy, and building brand equity, which would initiate the phenomenon of resonance understood as positive long-term effects (see: Appendix A). Taking all the considerations into account, the following model of the hypotheses was proposed (Figure 1).



**Figure 1.** Model of renewable energy sources (RES) investment resonance in the areas of sustainable development, innovativeness, and brand equity.

For the purpose of achieving the research goal, a literature review was carried out and cognitive methods were supported by our research. Statistical measures and data analysis with the use of pivot tables were used to analyze the results of our research.

This study presents the partial results of empirical research that allow for the assessment of the relationship between investments in renewable energy sources in industrial enterprises of the food industry and their level of achievement of goals in the areas of sustainable development (which consists of economic, environmental, and social goals), innovation and brand equity.

Representatives of the management of companies operating in the food industry were invited to participate in the study conducted in the period from September 2019 to the end of December 2019. Small-, medium-, and large-sized industrial enterprises in the food industry participated in the study. The selection of the research sample was deliberate and consisted of those companies that were assessed by their management boards as innovative ones. The qualifying criterion for participation in the study was the introduction of innovation (product, process, technology, or marketing) in the last three years. Taking into account the objectives of the research, the computer-assisted telephone interviewing (CATI) method was chosen. The same interview questionnaire was used in each case. The study was conducted using the questionnaire method. Although this article presents the partial results of empirical research, it allowed for assessing the importance of investments in renewable energy sources undertaken by food industry enterprises for the achievement of their goals in the areas of sustainable development, innovation, and brand equity. In total, 143 observations were taken into account. Table 2 shows the characteristics of the test sample.

**Table 2.** Characteristics of the enterprises surveyed (N = 143).

Enterprise Size	No. Surveyed	Proportion of Sample (%)
Small (10–49 employees)	58	40.56
Medium (50–249 employees)	50	34.96
Large (over 250 employees)	35	24.48

Source: Analysis conducted by the authors based on the results of the study.

The food and beverage industry is one of the largest production sectors in the European Union, with an annual turnover of EUR 1.2 trillion, and is also the largest employer; the majority of plants in the sector are small- and medium-sized (99%). The value of the annual EU exports of food and beverages is EUR 110 billion, nearly 25% of production is exported to countries outside the EU, and the EU share in world food exports is 19% [117].

The unit price in this market is rather moderate or low and the products are purchased frequently and in mass quantities. Prices, changes in market trends, and how customers conform to new circumstances are important for companies and their offers. Abundant available literature and market examples prove a strong relationship between an organizational orientation that is in line with sustainable development, the level of their innovativeness, the strength of their brands, and the company's market success.

Statistical analyzes were carried out using the IBM SPSS Statistics version 24 software package (IBM, Armonk, NY, USA). Altogether, 143 observations derived from enterprises operating in the food sector were taken into account. Table 3 presents descriptive statistics of the variables examined.

**Table 3.** Descriptive statistics of the variables examined (N = 143).

Variable	Range	Min.	Max.	Average	M	D	Standard Deviation
The level of investments in renewable energy sources	4.00	3.00	7.00	5.73	6	6	0.771
Realization of innovative goals	4.00	3.00	7.00	5.77	6	6	0.718
Realization of product innovation goals	4.00	3.00	7.00	5.88	6	6	0.774
Realization of marketing innovation goals	4.00	3.00	7.00	5.81	6	6	0.750
Realization of process innovation goals	4.00	3.00	7.00	5.69	6	6	0.743
Realization of organizational innovation goals	4.00	3.00	7.00	5.78	6	6	0.745
Creating value in a sustainable enterprise	4.00	3.00	7.00	5.79	6	6	0.722
Realization of ecological goals	4.00	3.00	7.00	5.76	6	6	0.888
Realization of economic goals	4.00	3.00	7.00	5.77	6	6	0.738
Realization of social goals	4.00	3.00	7.00	5.76	6	6	0.787
Realization of brand equity goals	4.00	3.00	7.00	5.85	6	6	0.685

Source: Analysis conducted by the authors based on the results of the study.

#### 4. Results

The surveyed companies were pretty interested in investing in renewable energy sources. Over 40% of these enterprises already had specific plans for the next year of operation. The companies were asked to declare their long-term investment plans in renewable energy sources. The distribution of answers is presented in Table 4.

**Table 4.** Distribution of responses regarding the plans for investments in renewable energy sources (N = 143).

Specification	Response Share
They have a plan for the next year of operation	40.56%
They have a plan for the next two years	20.98%
They have activity plans for the next >2 years	18.18%
They do not plan for the long term	20.97%

Source: Analysis conducted by the authors based on the results of the study.

Nearly 21% of them had plans for the upcoming two years, and for over 18% of enterprises, the plans were for over two years. Investments in photovoltaic panels (36.36%) and solar collectors (34.26%) were most often declared. Slightly fewer entrepreneurs planned to invest in small wind farms (23.07%) and heat pumps (20.97%). Less popular, but also occurring in the plans of the enterprises, were micro biogas plants (18.08%) and biomass boilers (11.88%).

First of all, in order to answer the target question and confirm the validity of hypothesis H1, a statistical analysis of the relationships between the level of investments in renewable energy sources and value creation in a sustainable enterprise, understood as the implementation of ecological, economic, and social goals, was carried out. The examined variables were assessed on a seven-point scale, where the Cronbach's alpha coefficient of reliability for the group of factors was 0.947. This result shows the internal consistency of the factors analyzed. The Spearman's rank correlation coefficient was used, where the values obtained are presented in Table 5.

The values of the Spearman's rank correlation coefficient proved a positive and statistically significant relationship. This means that the increase in the level of investments in renewable energy sources was accompanied by an increase in the level of creating value in a sustainable enterprise, as expressed by the level of achievement of goals in social, economic, and ecological areas. The correlation coefficient between the level of investment in renewable energy sources and the level of creating value in a sustainable enterprise was 0.873 ( $p < 0.01$ ), which shows a fairly strong relationship.

Subsequently, in order to verify the existence of the aforementioned dependence and answer the question of how large an impact on the level of innovation in the surveyed enterprises was caused by the level of investments they undertook in the field of renewable energy sources and thus confirm the correctness of hypothesis H2 adopted in the research procedure, a statistical analysis of the relationships between the referenced variables was conducted. The examined variables were assessed on a seven-point scale, where the Cronbach's alpha coefficient of reliability for the group of factors was 0.973. This result shows the internal consistency of the analyzed factors. The Spearman's rank correlation coefficient was used and the values are presented in Table 6.

**Table 5.** Correlation between the level of investments in renewable energy sources and creating value in a sustainable enterprise.

Variable		Type of Statistics	The Level of Investments in Renewable Energy Sources
Spearman's rho	Realization of ecological goals	Correlation coefficient	0.761 **
		Significance (two-sided)	0.000
		N	143
Spearman's rho	Realization of economic goals	Correlation coefficient	0.748 **
		Significance (two-sided)	0.000
		N	143
Spearman's rho	Realization of social goals	Correlation coefficient	0.752 **
		Significance (two-sided)	0.000
		N	143
Spearman's rho	Creating value in a sustainable enterprise	<b>Correlation coefficient</b>	<b>0.873 **</b>
		Significance (two-sided)	0.000
		N	143

\*\* Correlation significant at the 0.01 level (two-sided). Source: Analysis conducted by the authors.

The values of the Spearman's rank correlation coefficient showed a positive and statistically significant relationship, which again means that the increase in the level of investments in renewable energy sources was accompanied by an increase in the level of innovation expressed by the level of achievement of goals in the areas of product, marketing, process, and organizational innovations. The correlation coefficient between the level of investment in renewable energy sources and the level of innovation was 0.725 ( $p < 0.01$ ), which shows a fairly strong relationship.

The next step was to assess the relationship between the level of investments in renewable energy sources and the realization of brand equity goals using the Spearman rank correlation coefficient (Table 7). The examined variables were assessed using a seven-point scale, where the Cronbach's alpha coefficient of reliability for the group of factors was 0.946. This result shows the internal consistency of the analyzed factors.

**Table 6.** Correlation between the level of investments in renewable energy sources and the realization of innovative goals.

Variables		Type of Statistics	The Level of Investments in Renewable Energy Sources
Spearman's rho	Realization of product innovation goals	Correlation coefficient	0.679 **
		Significance (two-sided)	0.000
		N	143
Spearman's rho	Realization of marketing innovation goals	Correlation coefficient	0.747 **
		Significance (two-sided)	0.000
		N	143
Spearman's rho	Realization of process innovation goals	Correlation coefficient	0.728 **
		Significance (two-sided)	0.000
		N	143
Spearman's rho	Realization of organizational innovation goals	Correlation coefficient	0.708 **
		Significance (two-sided)	0.000
		N	143
Spearman's rho	<b>Realization of innovative goals</b>	<b>Correlation coefficient</b>	<b>0.725 **</b>
		Significance (two-sided)	0.000
		N	143

\*\* Correlation significant at the 0.01 level (two-sided). Source: Analysis conducted by the authors.

**Table 7.** Correlation between the level of investments in renewable energy sources and the realization of brand equity goals.

Variables		Type of Statistics	The Level of Investments in Renewable Energy Sources
Spearman's rho	Realization of brand image goals	Correlation coefficient	0.745 **
		Significance (two-sided)	0.000
		N	143
Spearman's rho	Realization of brand loyalty goals	Correlation coefficient	0.700 **
		Significance (two-sided)	0.000
		N	143
Spearman's rho	<b>Realization of brand equity goals</b>	<b>Correlation coefficient</b>	<b>0.793 **</b>
		Significance (two-sided)	0.000
		N	143

\*\* Correlation significant at the 0.01 level (two-sided). Source: Analysis conducted by the authors.

The correlation coefficient between the level of investments in renewable energy sources and the realization of brand equity goals was 0.793 ( $p < 0.01$ ), which again shows a fairly strong relationship.

The presented results do not justify rejecting the H1, H2, and H3 hypotheses. The implications of this research indicate that there was a positive relationship between the level of investment in RES

and the level of innovation, value creation in a sustainable enterprise, and the achievement of brand equity goals. Therefore, it is justified to assume that investing in renewable energy sources brings a number of benefits to industrial enterprises in the food industry, which will directly translate into their competitive position.

## 5. Discussion

Contemporary industrial food production is struggling not only with intense competition and increasingly demanding consumers but also with problems related to the intensive use of natural resources, as well as the growing mass of waste and residues from food processing. Environmental policies are based on the idea of sustainable development, where the priority is continuous improvement in the rational use of natural resources, resulting in high living standards (economic, social, and environmental) for all living and future generations. Horbach, Oltra, and Belin [6] suggest that customers expect companies to manufacture products with improved environmental performance and process innovations that reduce energy consumption.

The purpose of the study carried out was to identify the relationship between investing in renewable energy sources and the level of innovation, creating value in a sustainable enterprise, and building brand equity in the food sector, which is one of the most competitive and dynamically developing sectors.

The study results presented in this paper confirm that the level of investment in renewable energy is important for both creating value in sustainable organizations, understood as achieving environmental, social, and economic goals, as well as for building a brand image and brand equity. It was also confirmed that the level of investment in renewable energy is important for the innovativeness of enterprises. This study confirmed that an increasing number of industrial enterprises of the food sector plan to invest in renewable energy sources as part of their activities and these activities affect their market position. The market position was therefore the final resonance of investments in renewable energy sources. Having a strategy in the three areas analyzed is a triggering (sufficient) condition, while investment in RES is a necessary condition (*sine qua non*) for resonance to occur. All signified dimensions in each field were perceived by respondents as being enhanced by the RES investments. Further research should focus on the contextual factors that determine the strength of the resonance. Among the internal factors, after analyzing the subject literature, we can propose, among others, organizational culture, mission, management's attitudes, and resources. Their mediating role will be decisive.

The results presented in the article should be considered as the starting point for the analysis of the resonance of investments in renewable energy. Further contextual analyses will be conducted. As limitations, it should be noted that the study was conducted in one country (although it also concerned foreign enterprises; however, the economic, regulatory, and social conditions prevailing here may affect the answers provided). Moreover, a certain limitation may have been created by the deliberate selection of the sample, given that the study involved enterprises that assessed themselves as innovative and had introduced new products within the last three years.

## 6. Conclusions

With these conclusions and with the orientation of future research, we aimed to contribute to a more contextual understanding of the issue related to the importance of investments in renewable energy sources for the achievement of key objectives in enterprises of the sector analyzed.

The impact of investments in RES in enterprises and its activity is a complex and multidimensional issue; therefore, its analysis requires continuous research in this area. A modern enterprise, which is a complex system, cannot develop its strategy solely on economic criteria; its existence should aim at the implementation of four equal and large-scale goals that are strategically interdependent from each other: ecologically sustainable development, economic competitiveness, social justice, and democracy based on the rules of law.

We believe that the findings may provide some management implications, as being aware of the RES resonance means that the investments in this field may be perceived as more justified and beneficial since it supports creating value and a competitive advantage. While this study covered some cutting-edge issues, it still has some limitations that should be considered in future research. Analysis from the point of view of customers and employees of enterprises seems to also be justified.

The most important goal of ecological policy is to reduce the resource consumption of the production process, as it is the key way to achieve economic benefits in the form of reducing production inputs, and consequently, reducing the burden of using natural resources to protect the environment. The presented conclusions also encourage further research to identify the impact of investments in renewable energy on the competitiveness of enterprises. In light of the current socio-economic realities, with particular emphasis on changes in the labor market, the above-mentioned activities should constitute an important element of contemporary strategies.

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## Appendix A

The level of investments in renewable energy sources (the RES resonance dimensions in respective areas) that create value in a sustainable enterprise: the realization of ecological, economic, and social goals. The realization of innovative goals: the realization of product, marketing, process, and organizational innovation goals. Realization of brand equity goals: the realization of brand image and brand loyalty goals.

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