



## Article

# Innovation in Start-Up Business Model in Energy-Saving Solutions for Sustainable Development

Bogdan Wit <sup>1</sup>, Piotr Dresler <sup>2</sup> and Anna Surma-Syta <sup>1,\*</sup><sup>1</sup> Faculty of Management, Lublin University of Technology, 20-618 Lublin, Poland; b.wit@pollub.pl<sup>2</sup> CEO of Formaco Consulting Piotr Dresler, 20-631 Lublin, Poland; p.dresler@dreslergroup.com

\* Correspondence: a.surma@pollub.pl

**Abstract:** Socially expected innovations are innovations considering sustainable development. The subject of the paper focuses on the business model of a start-up providing energy saving services to local government units using smart technologies of Industry 4.0 in the aspect of low touch economy. A methodical critical literature review including quantitative and qualitative assessment, stakeholder analysis and business modeling techniques using Business Model Canvas and Triple Layer Business Model Canvas (TLBMC) was conducted. In addition, an in-depth analysis of a start-up case study was conducted. The research questions are related to the interpretation of the organization's business data and methods of interpreting Sustainability 3.0 business solutions. The research questions were directed to the challenges regarding the creation of the organization's sustainable business model architecture and the Business Sustainability 3.0 sustainable business imaging concept. The research objective is to design a sustainable business model of a start-up providing energy-efficient services to local government units, whose value proposition refers to an extended sustainable value that meets the economic, social and environmental needs of society. The integration of sustainability in the sustainable business model of the start-up allowed to achieve the research objective of designing a sustainable value proposition that meets the economic, social and environmental needs of society.

**Keywords:** sustainable development; business models; start-up; public and private sectors; electricity as a service; Poland



**Citation:** Wit, B.; Dresler, P.; Surma-Syta, A. Innovation in Start-Up Business Model in Energy-Saving Solutions for Sustainable Development. *Energies* **2021**, *14*, 3583. <https://doi.org/10.3390/en14123583>

Academic Editors: Valentina Colla and Patrycja Hąbek

Received: 25 April 2021

Accepted: 9 June 2021

Published: 16 June 2021

**Publisher's Note:** MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



**Copyright:** © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

## 1. Introduction

Start-ups are business ventures with an innovative idea carried out under conditions of high uncertainty in the formula of the so-called fast revenue growth path. The core of the start-up concept are innovative ventures implemented in the form of services or products launched on the market, which offer value to customers and are desired by them. Investment projects that take sustainable development into account are particularly desirable innovations from a social perspective. Thus, start-ups derive the economic benefits from the business formula with additional extended economic, social, and environmental benefits for their own organization and for the environment. The concept of sustainable innovation is based on wider normative concepts such as environmental sustainability, sustainable development [1–3], also in start-up ventures [4,5]. Most often, the concepts of sustainable innovation as values offered by organizations refer to the one-sided market in a transaction between supplier and customer in the value chain in the Business-to-Business (B2B) or Business-to-Citizens (B2C) segments [6,7]. Multiple customer groups and transacting parties from different sectors of the economy, e.g., Business-to-Government (B2G), Government-to-Business (G2B), Government-to-Citizens (G2C), Citizens-to-Government (C2G), Government-to-Government (G2G), involve multiple relationships between them and the multiple value propositions are taken into account. Within many cross-sector relationships, Third Party Funded Model can be distinguished [8]. The distinctive feature of these relationships is the separation of contractor, payer, and user functions for each party. Additionally, taking into account the concept of sustainable development e.g., in the three

areas of the triple bottom line (TBL) [9], the value proposition offered by the organization in each area should be defined and specified. Sustainable development integrates social and environmental issues with technical, economic issues [10] and sustainable innovations must bring specific benefits to the direct parties to the transaction and, in a broader sense, benefits including the drawdown benefit effect [11,12]. Thus, an organization's activities have a multifaceted impact on the environment, social integrity, and economic well-being. Disclosure of multifaceted direct and indirect benefits in a broader context as an effect of innovation introduction into the business model is not a sufficiently recognized issue in the literature. There still is a scientific problem in a manner of integrating the business model of organizations from various sectors of the economy with the model of sustainable development. The result of this combination should be a sustainable business model that is adequate to the current state of affairs and reflects the interests of all stakeholders in a broad ecosystem context should be the result of this combination. This is a multi-faceted business modelling topic covering sustainability in engaged organizations, smart technologies of Industry 4.0, energy-efficient investments for citizens, as well as circular economy and low touch economy. The main point of creating a sustainable business model is to develop a model, the characteristics of which were identified by Steve Blank—to seek a scalable, repeatable, and profitable business model [13].

The issue of integrating sustainable innovations in the business model for organizations from various sectors of the economy with the topic of sustainable development and circular economy in the area of intelligent energy-saving system solutions is the general issue of this paper. The provision of public services, by the government or self-government administration sector, to citizens who benefit from sustainable investment projects in a free or partially paid way in the formula of public levies is a special case of the issue. The obligation to provide public services and ensure their continuity by the administration for citizens results from the provisions of the Polish national law [14] and directives transposed into national regulations as well as EU regulations [15]. The topics of sustainable public investment projects by the administration sector play an important role in the global approach to sustainable financing for sustainable growth and are in line with many European Commission documents. The Europe 2020 Strategy document sets out three dimensions in which the European social market economy should develop:

- Smart growth (based on knowledge and innovation),
- Sustainable (environmentally friendly) development,
- Inclusive growth (ensuring a high level of employment and economic, social, and territorial cohesion) [16].

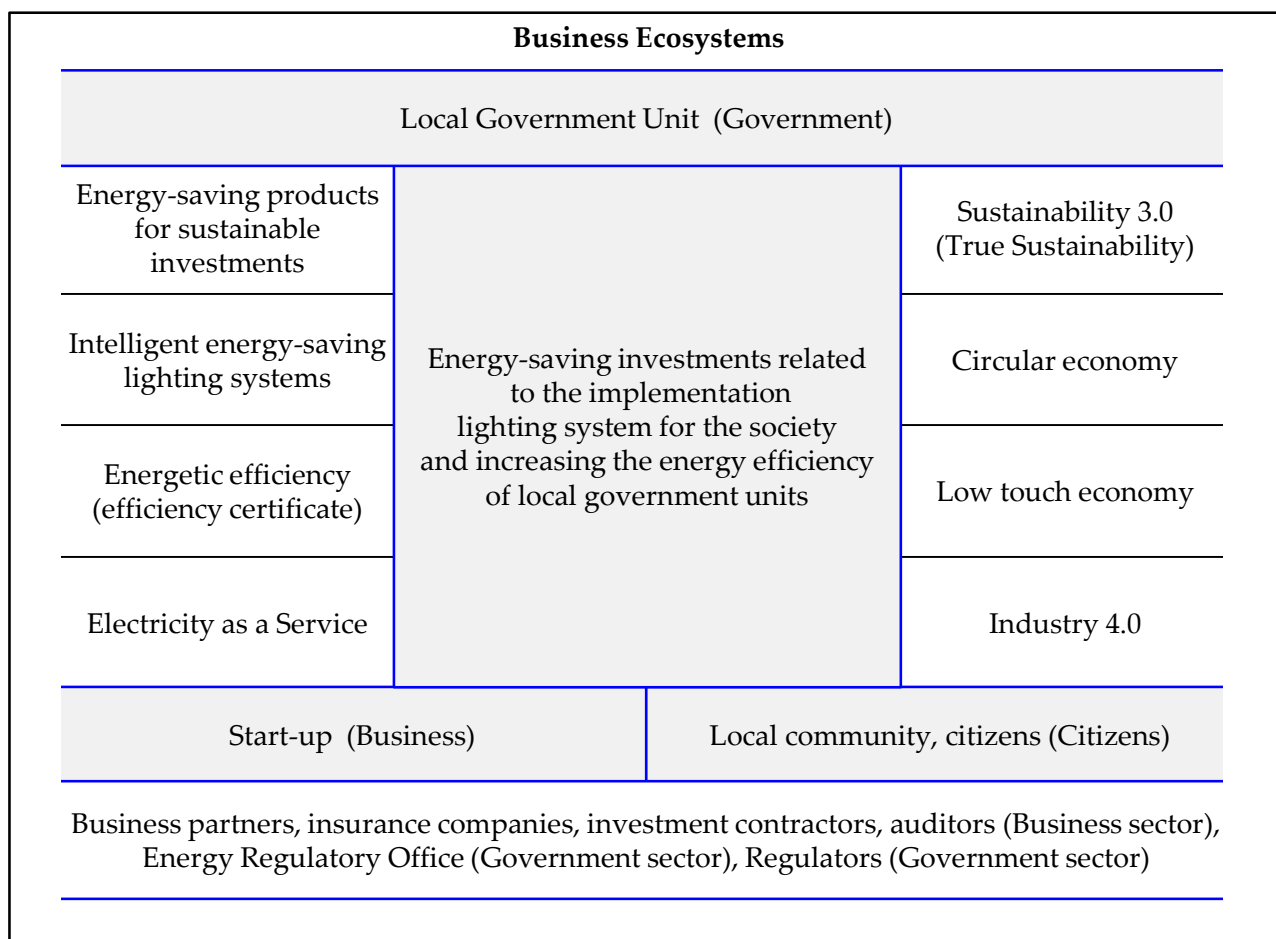
The action plan for the environment, set out in the 8th Environment Action Programme [17] document, which provides the basis for the EU to meet the UN 2030 Agenda, including 17 Sustainable Development Goals [18], is the continuation of EU policy. The issue of sustainable innovation with the use of energy-efficient technical solutions presented in this article fits into the three areas of the EU 2020 strategy, strategies and plans to achieve environmental objectives and sustainable development. These include the European Green Deal which is one of the six political priorities of the European Commission [19,20]. Moreover, issues such as using an innovation platform, production as a service, lifelong service contracts industry 4.0 [21,22].

Within a broad context of the presented research issues and their validity, the authors defined the boundaries of the research area for sustainable investment projects related to the implementation of the lighting system by the business sector and increasing energy efficiency of the local administration sector. Defining boundary conditions helps to understand that a business-designed innovation must be successfully marketed to develop its sustainability potential [23] and that the underlying business model must operate within certain boundaries, and not deny this potential [24]. The research area will be specified, to include the following elements (Figure 1):

- Groups of entities—stakeholders from various sectors of the economy, (1) start-ups that provide a service of the implementation of an energy-efficient investment project

(business sector), (2) local government units (government sector) that are the payer of the investment project, (3) local community, citizens (citizens sector) that are the users of the investment project, (4) Business partners, including: suppliers of equipment and technical solutions, energy-efficiency auditors, investment project contractors, insurance companies (business sector), (5) energy regulatory office (ERO) that makes it possible to obtain an energy-efficiency certificate and regulators (government sector).

- Energy-efficient lighting products used in smart energy-saving systems in sustainable investment projects and related terms: energy efficiency, energy-efficiency certificate, Electricity as a Service.
- Business ecosystem understood as “ecosystem is defined as a set of actors with varying degrees of multilateral, nongeneric complementarities that are not fully hierarchically controlled” [25]. It is a biological metaphor that emphasizes the interdependence of all actors in the business environment, resources, supplemented with the necessary concepts to form a logical confined space for research, including: Sustainability 3.0 (True Sustainability), Circular Economy, Low Touch Economy [26], Industry 4.0). Each ecosystem has architecture that can be presented for deeper understanding and optimized to meet business goals.



**Figure 1.** Conceptual elements of the research area. Source: own elaboration.

Considering the conceptual elements of the research area in the provision of public services to citizens who benefit from sustainable investment projects free of charge, the authors presented two supporting research questions. The first question relates to the creation of architecture for a sustainable business model for the organization and is formulated as follows: (RQ1) How can innovation be presented, from architectural per-

spective, in a start-up business model in providing energy-efficient investment services for sustainable development?

The creation of sustainable investment architecture leads the authors to pose a second question which is also cognitive in nature: (RQ2) How can the concept of sustainable business (Business Sustainability 3.0, True Sustainability [27]) be introduced to develop effective, energy-efficient solutions that meet the economic, social and environmental needs of society?

The aforementioned questions combine the knowledge of management in a system, resource, process approach, and engineering knowledge of smart electrotechnical solutions using energy-efficient products for public use, tied together by the multi-faceted nature of sustainable development in circular economy and low touch economy. The research questions support the achievement of the research objective. The scientific goal is to design a sustainable business model of a start-up whose value proposition relates to an extended sustainable value that meets the economic, social and environmental needs of society.

The implementation of the goal will occur in the process of conceptualization, that is, in defining the research object by explanatory categories in formulating the necessary concepts [28,29] in the elements of architecture? The result of the conceptualization process is the creation of a start-up sustainable business model in the modelling process, taking into account the relationships between parties from various sectors of the economy. The authors demonstrate in the developed models that, in addition to the core value offered by the start-up to the customer (Local government unit) and users (citizens), the company can demonstrate extended value in three areas of sustainable development, including circular economy and low touch economy. According to the authors' assumptions, the developed models should make it possible to comprehensively show the positive effects of introducing sustainable value for the community by both the private and the public sector. Understanding the key elements, dimensions, and financing mechanisms of sustainable investment projects is of significant societal importance in order to demonstrate that it is in the society's interest to have companies offering smart energy-saving systems that operate in parallel to meeting economic and environmental needs. The social benefit of the results presented is to make public and demonstrate the economic, social extended value of the company.

In the implementation of the scientific goal which includes two research questions relating generally to the issue of sustainable investment projects in energy-efficient systems, the structure of five numbered sections was adopted, preceded by an introduction which includes two questions and the scientific goal of this work, a subsection of research methods and literature studies. The next subsection provides an introduction to the context of the research topic and the business model of the start-up ecosystem. The next section presents the sustainable business model which is the result of the integration of two models, the start-up business model and the sustainable development model in its three dimensions. The final section discusses the main findings of this research and the implications of continuing scientific research and innovation as activities that improve socio-economic situation and environmental sustainability.

## 2. Literature Review

This paper uses a systematic, methodical literature review including quantitative and qualitative assessment, stakeholder analysis (including, stakeholder group identification, prioritization, stakeholder relationships, goals, expectations, and accountability), a business modelling technique [30] using the graphic modelling language Business Model Canvas (BMC) and Triple Layer Business Model Canvas (TLBMC), as well as an in-depth case study of the start-up that makes subscription-based investment projects named Formaco Consulting Piotr Dresler placed in Lublin, Poland. The presented start-up business model as a result of the modelling process was developed before the legal establishment of the company and is presented in Section 3. In developing the business model, assumptions

were made about the qualitative features of the model for the verification of the business assumptions that will enable:

- Presentation of key stakeholders, resources, and flows of various streams between them;
- Showing the value triad solution by visualizing the business case;
- Completeness of the inclusion of the conceptual elements of the research area;
- Cohesion of the information presented in the models in the form of internal consistency and coherence of the information collected and documented by the start-up;
- Transparency of the solution (clarity, unambiguity), by giving an appropriate layout (structure), proper grouping of information and selection of the form of presentation, considering the appropriate level of abstraction and concretization.

Literature studies should reveal the current state of knowledge regarding the conceptual elements of the research area. A two-stage methodological approach to bibliographic research was used, which was based on a structured literature review with quantitative and qualitative assessment. The first stage was a quantitative analysis involving data mining and the extraction of a set of source documents and metadata (metrics) from multidisciplinary databases and specialized websites. The extracted documents and metadata form a repository which is stored in the computing cloud and is available to all co-authors of the publication. The second stage consists of qualitative analysis of the data and interpretation of the results obtained. The aforementioned steps are used iteratively depending on the context of the keyword search. The two-step approach applied is consistent with the systematic literature review process [31].

In the first stage of the literature study, three major multidisciplinary databases were systematically searched: Google Scholar, Scopus, Web of Science [32] and specialized websites of publishers: “Springer Link,” “Elsevier—ScienceDirect.” The following keywords were used in database exploration: sustainable business model, business models; sustainable development, public and private sectors, business models for sustainability, start-up, which were used to create queries to perform bibliographic inquiries. The number of document occurrences for keywords and phrases formed from them is the result of the search in sources and datasets. The results of quantitative analysis from multidisciplinary databases exploration are presented in Table 1.

**Table 1.** Number of document occurrences for keywords and phrases derived from them in the multidisciplinary databases Google Scholar, Scopus and Web of Science.

Keywords/Phrases	Google Scholar		Scopus		Web of Science	
	1	2	1	2	1	2
“business model”	26,400	909,000	7369	32,455	3276	13,717
“sustainable business model”	496	18,100	209	839	88	378
“business models for sustainability”	88	2170	25	62	23	49
“business model” AND (“start-up” OR “startup”)	69	64,800	79	931	23	326
“business model” AND “sustainable development”	24	73,100	23	1764	7	372

Legend: 1—Number of occurrences in the article title, 2—Number of occurrences. Source: Author’s own study. Research conducted on 12 December 2020.

The quantitative results for the words “business model” in the multidisciplinary databases analyzed are the reference number in the study of the number of articles constituting the subtopics. An analysis of the number of articles by subtopics showed that the group relating to “sustainable business model” is the most numerous, followed by “business models for sustainability” and “business model” AND (“start-up” OR “startup”). The Google Scholar open access database contains the most references, as in addition to reviewed documents, the database includes “grey publications” [31], conference proceedings, dissertations and reports, and also includes the contents of publication indexes and websites. Additional search of the publisher websites “Springer Link,” “Elsevier—



ScienceDirect" did not change the distribution of the number of occurrences of article, hence quantitative results are not presented. The result of the study was a set of documents obtained on the basis of the substantive assessment most relevant and convergent to the presented research topic. The collection of documents sought to demonstrate the positive effects of introducing sustainable value to communities by both the private and public sectors. The result of bibliographic studies is the identification of a certain deficit of knowledge on combining the horizontal policy of the European Union in sustainable development with innovation and business model designing and implementation of these two issues therein. Thus, the identified methodological gap in linking sustainable value with innovation, considering the relationship between parties from various sectors of the economy became a starting point to the concept of a new extended scientific, research, and practical achievement, which is presented in this paper. For Web of Science database queries: AK = "business model \*" and TS = (("start-up" OR "startup")) yielded 126 results. Finally, the three queries yielded 104 unique full-page documents with metadata for analysis and their citation from multidisciplinary databases and specialized websites: Web of Science, Scopus, Google Scholar, Semantic Scholar, Research Gate, SSRN, Kopernio, Microsoft Academic, Academia.eu. Also, 115 full-page articles with metadata were yielded from the Journal of Business Models [33] and 20 highest evaluated papers [34]. All documents with static and dynamic metadata were saved in a cloud-computing repository.

In the second stage, a qualitative analysis was performed, which consisted of selecting scientific articles and monographs from the surplus of documents obtained from the quantitative analysis of the bibliographic study. An application that determined the keyword density in full-page documents and analyzed dynamic metadata yielded from specialized on-line platforms determining the bibliometric parameters of documents with respect to keywords, phrases, author metadata, content, and journal and monograph metadata, was used to carry out the selection. From the Web of Science platform, Publons text and graphics analysis tool with dynamic metrics were used: Citations, Score, Altmetric. From the Scopus platform, the SciVal analytics tool with a group of metrics in the Overview, Trends, Reporting commands was used. Metadata from the research community from ResearchGate website, taking into account document metric, were also included in the qualitative assessment: Research Interest, Citations, Recommendations, Reads. Formulas and sorting in a Microsoft Excel spreadsheet were used to analyze such a large collection of different types of metadata.

The identified methodological gap in terms of linking sustainable value with innovation, considering the relationship between actors from different sectors of the economy, became a contribution to the conception of a new, extended scientific-research and practical achievement, which is presented in this work—contextual, start-up business model.

### 3. Innovation in Start-Up Business Model

#### 3.1. Context

The basis for developing a business model is the conceptual research area to be modelled and making visible the key stakeholders of the investment project, relationships between them, the most important activities in the life cycle of the investment service for a start-up and in the life cycle of the investment project from the local government unit's point of view.

Investment activities in the ecosystem involve nine key stakeholders from three institutional sectors:

1. Start-up, business partners: Suppliers of energy-efficient lighting equipment and systems, energy-efficiency auditor, investment project contractor, insurance companies (business sector),
2. Local government unit, regulator, ERO (government sector),
3. Local community, citizens (citizens sector).

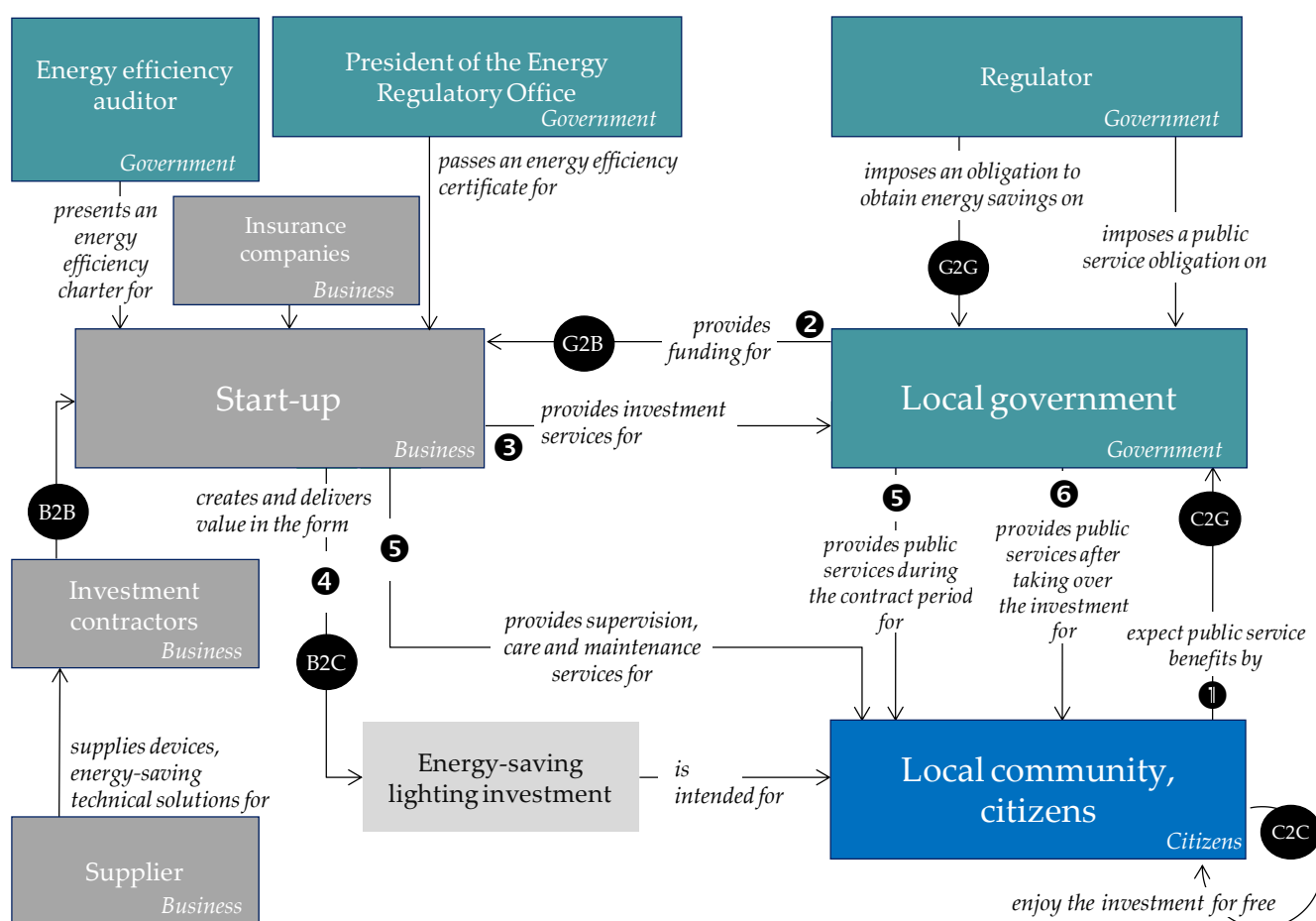
Local government unit performs tasks commissioned by the government administration and its own tasks which consist in meeting the collective needs of the community.

When performing public tasks, the local government unit must take account of the legal obligations imposed by the provisions of laws and regulations issued by the regulator, namely the legislative body of Poland. The legal obligation to improve energy efficiency may be fulfilled by purchasing and implementing energy-efficient products or by outsourcing services whose performance is related to energy consumption. The outsourced service may therefore relate to, among others, the use of energy-efficient lighting products in smart energy-saving systems, i.e., lighting control and monitoring of the operation of equipment and the environment. The local community expects public services to be provided by the local government unit, including lighting of sidewalks, squares, rest areas, playgrounds, recreational sports facilities and urban infrastructure (roads, bicycle paths, access alleys, parking lots). The society expresses a demand for an investment project that solves its specific problem and meets its needs. The solution idea, suggestions are formally transferred to the local government units and in this sense citizens initiate the investment project, so it is a citizens-to-government (C2G) market relationship. Then, the local government unit develops the assumptions of the energy-saving investment project, prepares necessary documentation, and commissions the market inquiry including the public procurement. The transaction in the form of a contract with a start-up is initiated by the administration and is implemented in the subscription fee formula for a strictly specified period of time, and thus it is a government-to-business (G2B) relationship. The start-up's sales product is the implementation and operation of smart energy-saving systems using energy-saving products to upgrade the city's "smart city" infrastructure. At the request of the start-up, the manufacturer of the luminaires and control systems should provide a technical system that enables energy savings of 40–60% in annual consumption to be achieved, with a five-year guarantee. Under the contract, the start-up carries out the investment project using subcontractors. The start-up offers and delivers value in the form of the investment project and provides the service free of charge to citizens who use it, so it is a B2C (business-to-consumer) market relationship. Upon completion of the contract, the start-up earns revenue from the investment project supervision and maintenance services.

A contextual model of start-up functioning in relation to other players in the market is shown in Figure 2.

Provision of public services by the start-up on behalf of the local government unit and generating positive aspects in the social dimension makes the company similar to the activity of a social enterprise, implementing the social goal of serving the community or a specific group of people [35]. However, operation for profit and privatization of profit exclude the start-up from social economy and prevent ranking it into the group of social enterprises according to Polish legal regulations [36].

In terms of creating, delivering sustainable value to multiple recipient groups from different sectors of the economy, it increases the growth potential of the start-up [37]. Offering a product as a service, the so-called servitization [38], product-service systems [39] increases the business potential of the start-up [40], poses a greater chance for the company's growth [41], becomes an element of competitive advantage and is an alternative to the traditional "buy and hold" business model. A transition toward energy-efficient solutions, energy savings and offering it as a subscription service (electricity as a service (EaaS) [42]) is conducive to the development of the start-up as part of the low touch economy and a feature of the Economy 4.0. However, energy-efficient lighting solutions that foster a low-emission economy and incorporate sustainability are usually more expensive [43]. In this case, the increased durability and extended lifetime of the smart lighting system will be the economic compensation

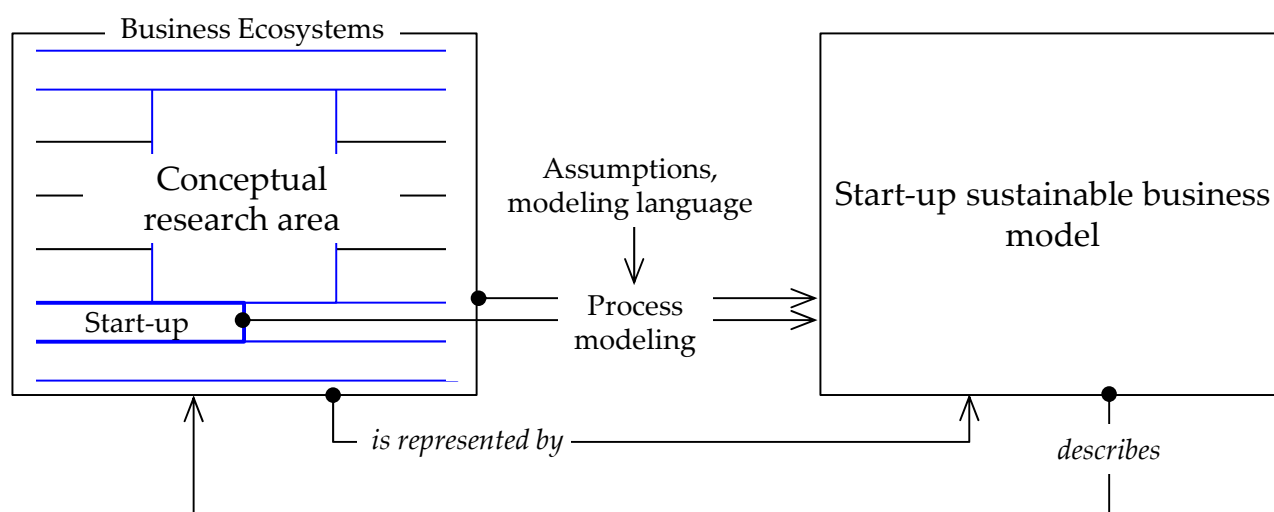


**Figure 2.** Relations between the market parties in the ecosystem in the life cycle of the investment service. Source: author's own development.

### 3.2. Start-Up Ecosystem Business Model

The point of existence of an organization is to satisfy the needs of customers (consumers). A developed business activity model, commonly referred to as the business model, is the formal reflection of the functioning of an organization. Each model is made in the process of modelling based on the developed assumptions, for a specific purpose, using a modelling language. The business model, on the one hand describes the behavior of the organization from a certain point of view and, on the other hand, the organization is represented by the model. For an organization, a model is a tool designed to explore and imagine a solution for how to deliver value and capture that value from the customer. Due to the complex arrangement of the value network (value triad), the start-up will be made visible in its ecosystem by developing the ecosystem business model and then the start-up business model will be developed considering the conceptual research area (Figure 3). The ecosystem business model will help to understand the business model innovations introduced in the context of the ecosystem.



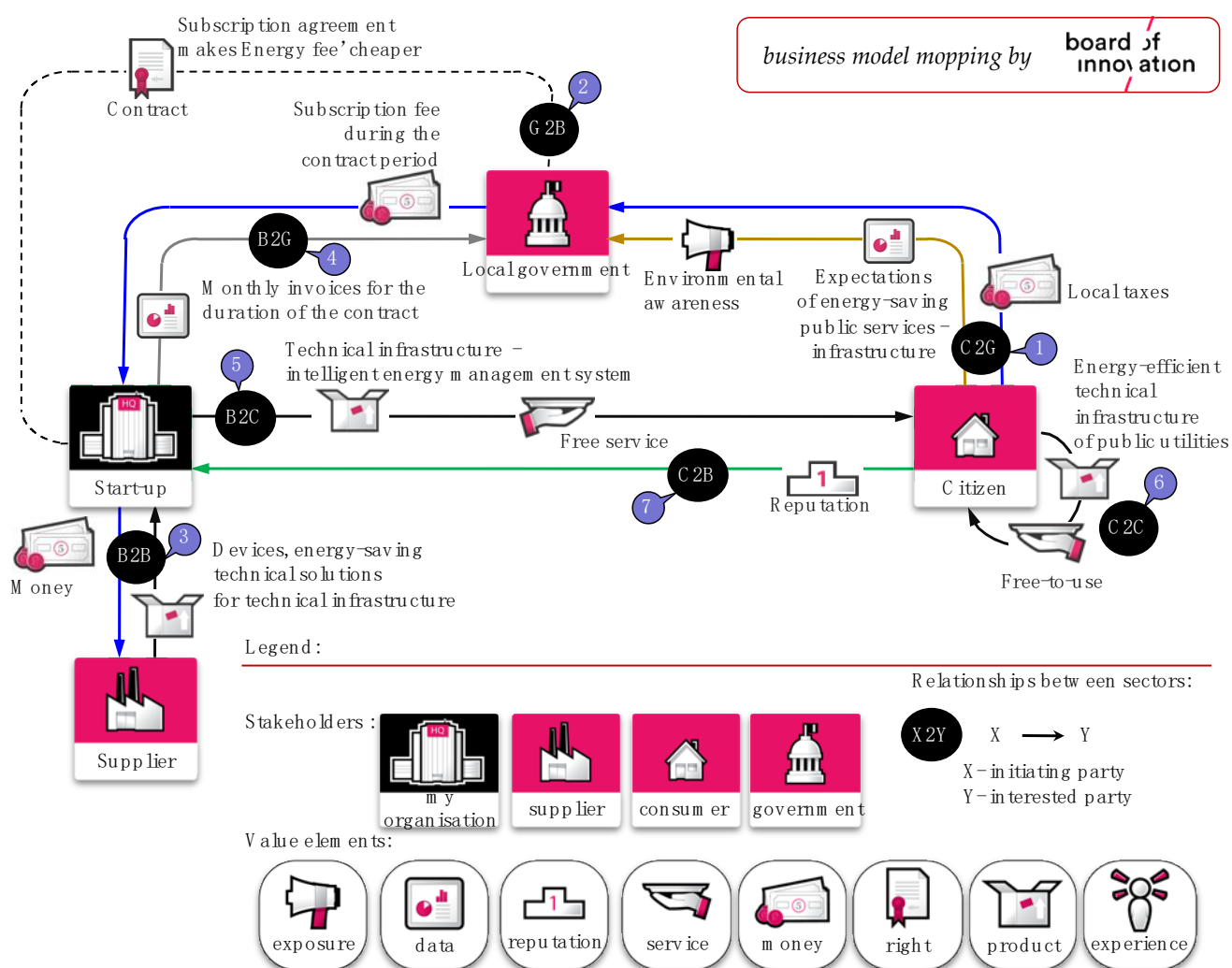


**Figure 3.** The research model of the process of developing a start-up's sustainable business model. Source: author's own development.

Referring to the research topic and the first research question (RQ1) regarding the representation of the innovation architecture in the start-up business model, the Board of Innovation (BoI) visual modelling language was used. The graphical notation of the model, or modeling language, consists of several different graphical architectural objects: six stakeholders representing the organizations (groups of people-consumers) between whom values are exchanged, ten value elements representing the main types of values that stakeholders may exchange among themselves, and lines connecting the objects as value flows and relationships among stakeholders. The BoI modelling tool has been developed for at least 10 years, designed to explore, visualize, construct business models [44,45], document artefacts and the various flows among them. In this sense, the modelling tool used fits Paul Timmers' definition of a business model, which must include:

1. An architecture for the product, service and information flows, including a description of the various business actors and their roles; and
2. A description of the potential benefits for the various business actors; and
3. A description of the sources of revenues [46].

Considering Paul Timmers' proposed understanding of the business model term and to achieve the objective of the first research question (RQ1), the business model of the start-up ecosystem offering smart energy-saving systems in a service of providing free public services to citizens during the term of contract with the administration is presented in Figure 4. The numbers in the figure indicate the order of relationships between segments with value flows between stakeholders. The start-up captures the value offered through monthly infrastructure usage revenue in the form of subscriptions from the administration.



**Figure 4.** Visualization of the ecosystem business model for a start-up. The Source: Own study based on the BoI [47].

In the context of the auxiliary research question (RQ1) targeting the innovation solution architecture of the start-up business model, the triadic structure of stakeholders and values in the ecosystem business model are presented. The use of the BoI tool to execute the servitization ecosystem business model makes it possible to visually highlight the fact that all ecosystem stakeholders provide the desired values and capture valuable elements for each other. From an architectural point of view, the BoI visual tool enabled to gain, in the ecosystem business model, an in-depth understanding of stakeholder interactions, helped to create and improve the start-up's business model, to correct identified problems, and to communicate the results in a simple way to other start-up employees. The establishment of the sustainable investment project architecture leads the authors to answer the second research question presented in the following sections of the paper.

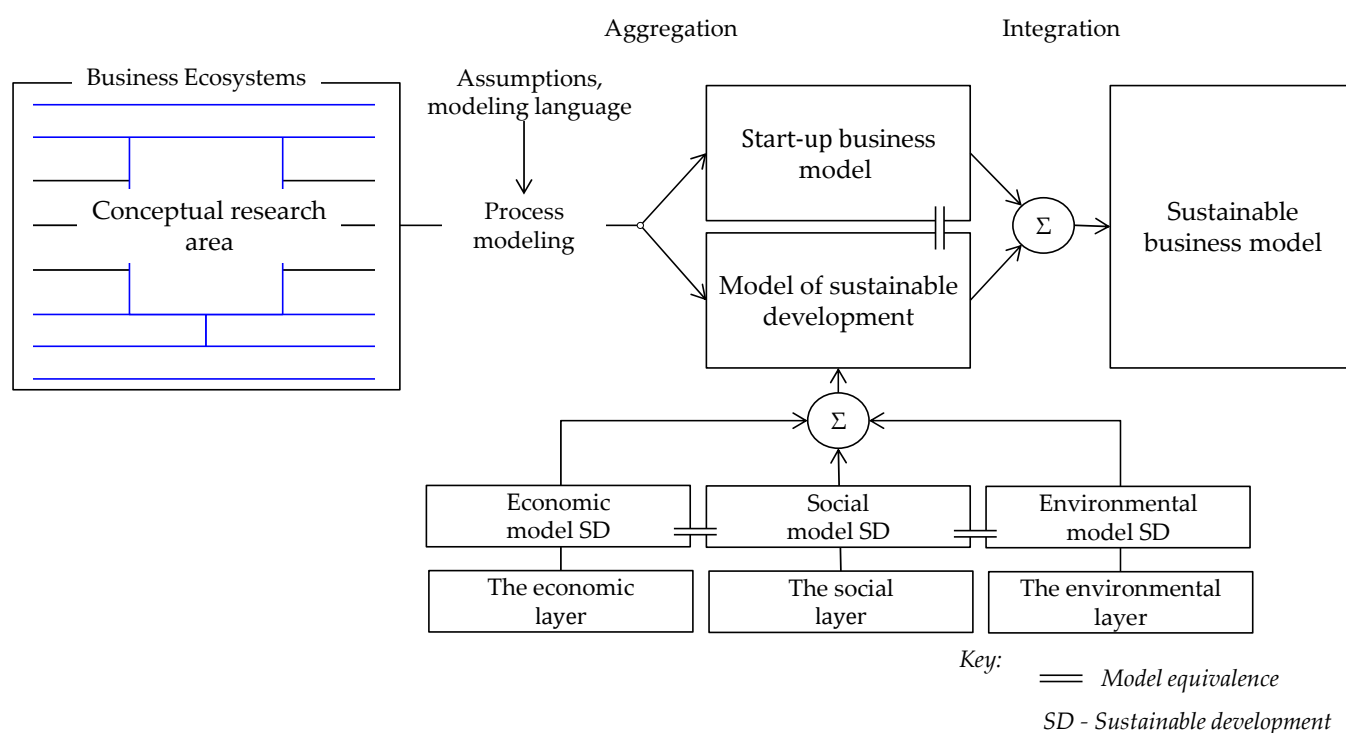
#### 4. Sustainability-Oriented Business Model Innovation

##### 4.1. Business Model of a Start-Up in Providing Public Services

The business ecosystem architecture model developed with the BoI tool presents the complex subject matter in a very accessible way, considering the most important stakeholders and the flows of various streams between them, facilitating the understanding of the context of value creation, delivery and capture among recipients from different segments of the economy. However, the business model does not capture all the conceptual elements of the research area, e.g., sustainable development, ecosystem, circular economy, low touch economy. Moreover, it does not consider the costs and benefits of all parties

in the context of sustainable development. Therefore, there arose a need for a repeated literature search as regards the use of the visual tool for “sustainable business model” and “sustainability model” terms. The authors set two conditions: (1) the model should be a visual template and take into account all conceptual elements of the research area, (2) the “sustainable development” term should be interpreted and implemented according to the “three-pillar” or “triple bottom line” (TBL) concept [48,49]. To this end, the authors reviewed a list with 113 visual templates available at AndiRoberts.com [50], 45 visual business model representations and 50 model visualizations [51], 45 Patterns to Support Sustainability-Oriented Business Model Innovation [52], and also Google image search for the aforementioned terms was used. A search by elimination yielded a list of templates: Triple Bottom Line Business Models (TBLBM) [8], Strongly Sustainable Business Model Canvas (SSBMC) [53] and a simplified version Flourishing Business Canvas (FBC) [54], Flourishing Business Canvas 2.1 [55], Triple Layered Business Model Canvas (TLBMC) [56], Public governance canvas [57], Social Enterprise Model Canvas [58], 3D canvas of the sustainable business model with risk [59], Business Model framework “Value Triangle” (VT) [60], reDesign canvas [61], Circular Business Model [62], Model Canvas for Social Enterprise [63], the visual coding scheme [64], and the Business Model Canvas (BMC) approach extended for infrastructure [65]. The screening analysis for the application of the sustainable business model in this paper led to the selection of the Triple Layer Business Model Canvas (TLBMC) tool by Joyce, A., Paquin, R.L. in the form of a set of three templates corresponding to the three dimensions of sustainability: economic, social [66,67] and environmental [56].

The Business Model Canvas (BMC) by A. Osterwalder and Y. Pigneur was the basis for the development of TLBC. Pigneur [8] extended with two layers: an environmental layer with a life cycle perspective and a social layer based on a stakeholder perspective. First, such a presentation of the concept of sustainable development is a considerable simplification. According to the authors, the economic aspect of sustainable development should not be the same as the business model because in-depth understanding of the interactions between elements in the business model is not obtained and the economic aspects of sustainable development are not considered. Second, a holistic view of the sustainable business concept in the context of the evolution of the Sustainability 3.0 term with an external perspective [10,68] requires the development of an adequate model that meets the needs of all stakeholders and is in line with their expectations. Considering the aforementioned comments and the results of literature studies, the manner of creating the sustainable business model was developed in a methodological way. The sustainable business model will result from the integration of two models, (1) the start-up business model and (2) the sustainable development model. The sustainable development model is the additive effect of the integration of three models that represent the three dimensions of sustainable development. Each model describes an area and at the same time the area is represented by the model. Model equivalence is the condition that makes it possible to integrate models, which is understood as the creation of the model in the same modelling language, at the same level of detail of expression, i.e., the appropriate level of abstraction and concretization. The common modelling language is a template consisting of nine blocks described by text and icons which form models when completed. Figure 5 shows the logical aggregation of the research area and the process of modelling the partial models and then compiling them into a final sustainable business model.












**Figure 5.** A methodical approach to developing a reference model of sustainable business. Source: author's own development.

Business Model Canvas was used because of mapping a sustainable business using Triple Layer Business Model Canvas for model equivalence. In this way, the integration of the four models will make it possible to present a concept of sustainable business that meets the economic, social, and environmental needs of the society.

Using the developed ecosystem and its model as the unit of analysis in the modelling process, a start-up business model was created. This model in the context of the investment service offer related to the implementation of the technical infrastructure for the society and increasing the energy efficiency of the local government unit is presented in Figure 6.

A sales product turned into an investment service is the core value which in the business model is referred to as Value provided. The service offered is the primary benefit that the start-up achieves by functioning in the market and that satisfies customer needs. The business model created in the triad structure (B2G2C) takes into account the direct benefits for individual parties: for the start-up revealed in the Revenue element, for the local government unit and the local community, citizens in the Value provided element. In order to create a value proposition, the start-up cooperates with many utility providers, luminaire manufacturers, and insurance companies. The business model includes key partners without highlighting direct or indirect measurable or unquantifiable effects of their cooperation with the start-up. The implementation of an energy-efficient investment project by the start-up for free use by citizens on behalf of the local administration causes certain benefits for the stakeholders, but also, in the form of an induced effect, has a long-term impact that goes beyond the aspects of the stakeholder in the transaction.

<b>Key partners</b>  <ul style="list-style-type: none"> <li>Producers of energy-saving lighting systems</li> <li>Manufacturers of intelligent lighting control systems (automation)</li> <li>Enterprises specialized in energy-related services</li> <li>Enterprises with organizational and technical potential to implement energy-related investments</li> <li>Insurance companies</li> <li>Energy advisers</li> <li>Energy Regulatory Office (ERO)</li> </ul>	<b>Key activities</b>  <ul style="list-style-type: none"> <li>Designing assumptions for an energy-saving investment</li> <li>Energy efficiency pre-audit</li> <li>Supervision in the implementation of the investment</li> <li>Provision of post-investment maintenance service</li> <li>Final audit of energy efficiency</li> </ul> <b>Key resources</b>  <ul style="list-style-type: none"> <li>Financial resources for investments.</li> <li>Know how in the field of designing and conducting investment services</li> </ul>	<b>Value provided</b>  <p>For local government unit:</p> <ul style="list-style-type: none"> <li>Energy-efficient technical infrastructure of public utilities</li> </ul> <p>PRODUCT   servitization ↓ SERVICE</p> <ul style="list-style-type: none"> <li>Investment service in the subscription fee rule ensuring lower investment costs</li> </ul> <p>For the local community, citizens:</p> <ul style="list-style-type: none"> <li>Energy-efficient technical infrastructure in the provision of free public services</li> </ul>	<b>Customer relationships</b>  <ul style="list-style-type: none"> <li>Agreements with clients and partners</li> <li>Offer lists</li> <li>Binding payment systems</li> <li>Managerial dashboard</li> </ul> <b>Channels</b>  <p>Sales channel:</p> <ul style="list-style-type: none"> <li>A corporate start-up website with a transactional function</li> </ul> <p>Physical delivery channel:</p> <ul style="list-style-type: none"> <li>Car transport</li> </ul> <p>Digital news channel:</p> <ul style="list-style-type: none"> <li>Social media channels</li> <li>Contact by phone, e-mail, videoconference with communicator</li> </ul> <p>Digital communication channel:</p> <ul style="list-style-type: none"> <li>Managerial dashboard</li> </ul>	<b>Customers</b>  <ul style="list-style-type: none"> <li>Local government units (local government sector) - public service payer</li> <li>Local community, citizens - free use of the investment</li> </ul>
<b>Cost</b>  <ul style="list-style-type: none"> <li>The cost of an investment carried out by a specialized company on behalf of a loss-up</li> <li>Infrastructure maintenance cost</li> <li>The cost of pre-audit and final audit</li> </ul>		<b>Revenue</b>  <ul style="list-style-type: none"> <li>Monthly subscription revenue for the duration of the contract</li> <li>Revenue from supervision and maintenance of energy-efficient infrastructure (after the investment is handed over)</li> <li>Energy efficiency certificate tradable on the commodity exchange, expressed as the amount of final energy planned to be saved on average per year</li> </ul>		

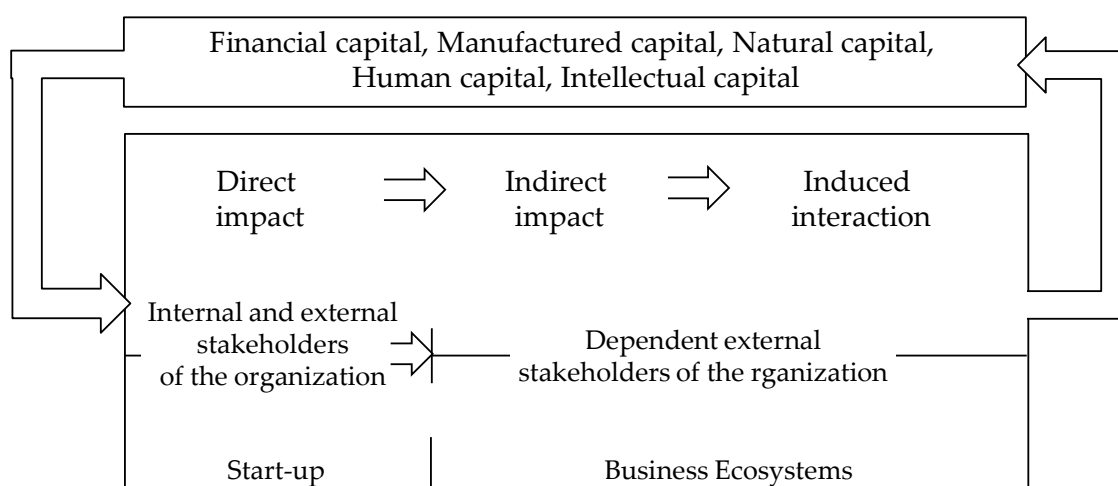
**Figure 6.** A start-up business model that provides an investment service in the subscription fee formula. Source: Own study based on the template Business Model Canvas [69].

The architecturally presented innovation in the ecosystem business model using BoI and the start-up business model in the BMC from different economic sectors does not include information about the potential costs, benefits or needs of the community and environmental impacts, and thus the sustainability of the investment project. On these issues, the logic economic, social, and natural environment impact of the investment are insufficiently presented in the discussed models. The presentation of the next three consecutive models in the following sections will contribute to answering the second research question (RQ2) regarding the presentation of the sustainable business concept with an external perspective and in the creation of value for the common good, as part of Sustainability 3.0.

#### 4.2. The Economic Layer of Sustainable Development

The economic aspects of sustainability consider transactions between parties with the assumption that all stakeholders in the ecosystem possess, provide values that are desirable to the other party, and capture the values of interest to them in the exchange process. Capturing the value from its exchange generates added value which is an important economic category. Considering the economic layer, the external perspective of sustainable business and the delivery of value in a broader context, it is necessary to demonstrate the economic growth derived from the increase in the value of the organization [70,71]. In terms of the input-output model, the functioning of a start-up entity makes it possible to visualize its impact on the economy in direct, indirect induced with the use of capitals: financial, productive, and natural (Figure 7).














**Figure 7.** The influence of the entity on the economy in the direct, indirect and induced dimensions. Source: author's own development.

The direct impact of the start-up results from the effects of the primary activity in the form of added value from sales revenue. The measure of direct impact may be the number of employees hired and the amounts of salaries and social benefits paid to them, the number or value of products or services offered, thus estimating the customer value. Direct employment in a start-up affects the growth of household income, which translates into an increase in the standard of living of an employee, the owner, and then their families.

Indirect impacts are derived from direct impacts. A start-up cannot function without utility providers, business partners (including manufacturers of smart control systems, energy-saving products, insurance companies), and waste collectors. By paying for goods ordered or secured by contracts, the start-up increases demand for their products or services. The demand impulse initiated by the start-up makes it possible to increase the production or service scale and thus create added value in the dependent entities. The added value generated in these entities allows for redistribution, including maintaining, employing, and paying employees and granting social benefits. Salaries increase household budgets and social benefits reduce family spending. In this way, the start-up exerts an indirect impact on other players in various sectors, industries, and related branches of the economy. Start-ups and subsidiaries, through employment and payment of salaries, create household income directly (start-up) and indirectly (subsidiaries). Household income is the budget that is spent on consumption and the money goes into the market. Consumer spending creates added value in the entities where purchases are made, thus creating jobs and further wages in the economy. Thus, the start-up produces an induced effect by its activity.

The impact of a start-up on the economy in direct, indirect, induced dimensions is difficult to capture in model terms because the economic aspect of sustainable development is about a specific entity with key stakeholders. However, in the economic area of the sustainable development model, the impact on the economy should be included in its elements and the external effects of innovation should be listed. In the economic aspects also the impact of restrictions due to the SARS CoV-2 virus should be considered. In response to the citizens' health crisis, the decision-makers included in the start-up's strategy, in the supply chain, the necessary physical supply channels and digital sales, information and communication channels for increasing the social distance, which contributed to building the economic resilience of the business model.

Figure 8 presents the sustainable development economic area model using the modified Economic Business Model Canvas template.

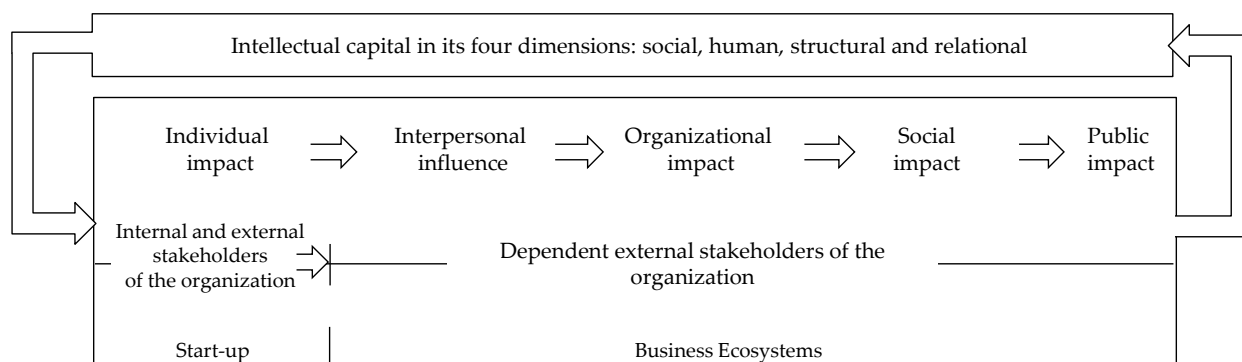
<b>Partners</b>  <ul style="list-style-type: none"> <li>– Citizens in various professional roles</li> <li>– Employees</li> <li>– Employers (owners, shareholders, shareholders)</li> <li>– Media providers</li> <li>– Insurance companies</li> <li>– Producers and suppliers of energy-saving lighting systems</li> </ul>	<b>Activities</b>  <ul style="list-style-type: none"> <li>– Setting the price of the service and the schedule of payments</li> <li>– Pricing of services: energy audits, insurance</li> <li>– Timely payment control</li> <li>– Concluding contracts and issuing sales documents</li> </ul> <b>Resources</b>  <ul style="list-style-type: none"> <li>– Financial capital</li> <li>– Intellectual capital</li> <li>– Manufactured capital</li> <li>– Human capital</li> <li>– Natural capital</li> </ul>	<b>Value proposition</b>  <ul style="list-style-type: none"> <li>– Monetary value of energy-efficient lighting infrastructure</li> <li>– The price of the investment service in the subscription fee rule (during the term of the contract)</li> <li>– Supervision and maintenance service price (after handover of investment)</li> </ul> <b>External effects</b> <ul style="list-style-type: none"> <li>– Salaries</li> <li>– Local taxes</li> <li>– Corporate income taxes</li> </ul>	<b>Customer relationship</b>  <ul style="list-style-type: none"> <li>– Agreement for investments in the subscription fee formula</li> <li>– Price lists, cost estimates</li> <li>– Payment systems</li> <li>– Sales documents (invoices, receipts)</li> </ul> <b>Channels</b>  <ul style="list-style-type: none"> <li>– Payments for the use of digital payment channels</li> </ul>	<b>Customer segments</b>  <p>Direct recipients of value:</p> <ul style="list-style-type: none"> <li>– Local government units</li> </ul> <b>External effects</b> <p>Recipients of the value:</p> <ul style="list-style-type: none"> <li>– Employees</li> <li>– Employers</li> <li>– Families</li> <li>– Local society</li> <li>– Community</li> <li>– Suppliers</li> <li>– Tax offices</li> <li>– Insurance companies</li> <li>– Recipients of waste</li> </ul>
<b>Economic costs</b>  <p>Costs listed in BMC plus:</p> <ul style="list-style-type: none"> <li>– The cost of working capital involvement</li> <li>– The absorption of financial, material and personal resources to implement the investment in question becomes an alternative cost to the use of resources in other business processes (opportunity cost)</li> <li>– Payroll costs with components</li> <li>– Cost of insuring workers and infrastructure</li> <li>– Medical expenses and payments for accidents at work (health detriment)</li> <li>– Increase in costs by increasing the amount of work, selecting the best available technique BAT</li> </ul>		<b>Economic benefits and spillover effects</b>  <ul style="list-style-type: none"> <li>– Obtaining sales revenue is the basis for the sustained growth of the organization, which translates into economic growth and development</li> <li>– Employment leads to an increase in the income and living standards of the employee, employers, families and communities</li> <li>– Maintaining economic activity of people by creating jobs (increasing the level of employment affects human well-being)</li> <li>– The purchase of equipment and materials necessary for the investment translates into revenues of cooperating entities</li> <li>– Payment of local taxes and fees to the commune budget</li> </ul> <p>External effects of using energy-saving lighting:</p> <ul style="list-style-type: none"> <li>– Accident cost savings through proper lighting of public places</li> <li>– Time savings in transport</li> <li>– Decline in unemployment due to employment of workers</li> <li>– Generating urban development</li> </ul>		

**Figure 8.** The economic layer of sustainable development. Source: Own study based on the source [59].

Start-up activity exerts a complex impact, of various nature, on the economy {positive, neutral, negative}, of different type {direct, indirect, induced}, scale {micro, meso, macro}, duration {short-term, long-term}, intensity {small, medium, large}. The positive external effects of micro and macro innovation include the marketing of innovative products or services. At the scale of the economy, start-ups create innovative solutions that force suppliers or partners to make changes that would enable orders to be fulfilled, stimulate quality changes in suppliers' products and services in the value chain. Making changes can be the basis for creating the next generation of services and products. At the micro level, the major categories of positive impacts include: provision of employment and through the payment of remunerations and benefits increasing the household budgets, creation of added value, enabling it to survive and thrive. On a macro scale, innovative solutions used by other actors influence the innovativeness of the economy and its competitiveness on the international market. The creation of added value which is the most important component of the GDP increases the financial potential of the country, and the start-up also influences the condition of public finance through the payment of local and national taxes. The described economic dimension of sustainable development and its model provide the answer to the second research question (RQ2) and contribute to the scientific goal of the paper.

#### 4.3. The Social Layer of Sustainable Development

The social aspects of the sustainable development model analyze the ability to create value over time, the impact of the organization on the environment, and the impact on intellectual capital in its four dimensions: social, human, structural, and relational. These are issues concerning, first, the relationship between people in the organization and its immediate social environment—the organization’s internal and external stakeholders, and second, the relationship between people in the organization and the organization’s dependent external stakeholders (Figure 9).



**Figure 9.** The impact of the entity on the dependent external stakeholders of the organization. Source: author’s own development.

Examples of the entity’s impact on dependent external stakeholders of the organization is synthesized in Table 2.

**Table 2.** Description of the relationship between the segments.

Interaction	Impact Stakeholders	
Individual	customers, users, employees, employers (owners, shareholders, shareholders), suppliers, partners	
Interpersonal	families, colleagues, friends	
Organizational	employees, employers as teams, groups; trade unions, associations; organizations (various organizations from economic sectors, e.g., regulators); economic cooperation between sectors in the economy	
Social	local community, regional community	relations between societies
Public	society (national, international community)	

Source: Author’s own study.

Considering the external perspective of sustainable business in the social layer and the provision of value in a broader context, the model should demonstrate the ability to create social values for its own organization, with the interaction of the entity’s ability to create value for others (broader society). Creating a sustainable value proposition for multiple stakeholders [72] or stakeholder networks [73] in bilateral relationships between a company and B2C2B customers is the foundation of offering sustainable value. In this case, there is a triad of values and thus G2B2C inter-sectoral relationships.

Considering the recommendations for reducing direct human contact resulting from the SARS CoV-2 virus, it was necessary to plan the creation, delivery of value propositions, and actions to increase the social distance in the value chain, starting with sub-suppliers then through suppliers, lighting system manufacturers, start-ups, local government units, and contractors. In this context, the start-up strategy is about designing the technical infrastructure in the investment project’s life cycle and in the investment service’s life cycle, using ancillary digital channels. The use of digital information channels in human contact

between links in the value chain thus ensures a low level of direct face-to-face contact. In this way, sustainable investment project counteracts the health crisis of citizens and fits into the low touch economy model. The main purpose of presenting the social area of sustainable development is to demonstrate the improvement of the quality of citizens' life in society. The concept of quality of life refers to the aspect of multidimensional level of human self-actualization in the environment and the performance of social functions (life satisfaction).

Figure 10 presents the sustainable development social area model using the modified Social Business Model Canvas template.

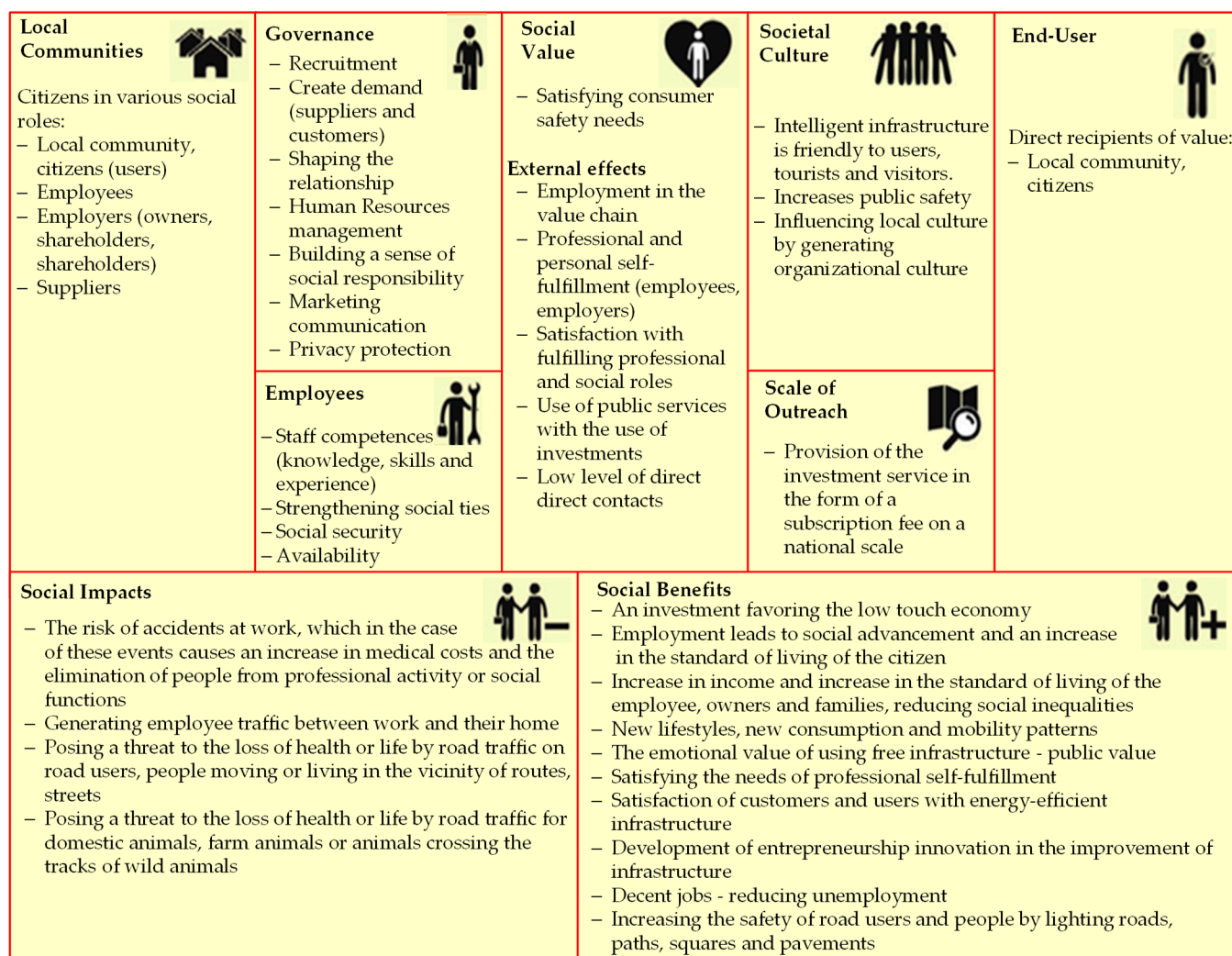


Figure 10. Social layer for sustainable development. Source: Own study based on the source [59].

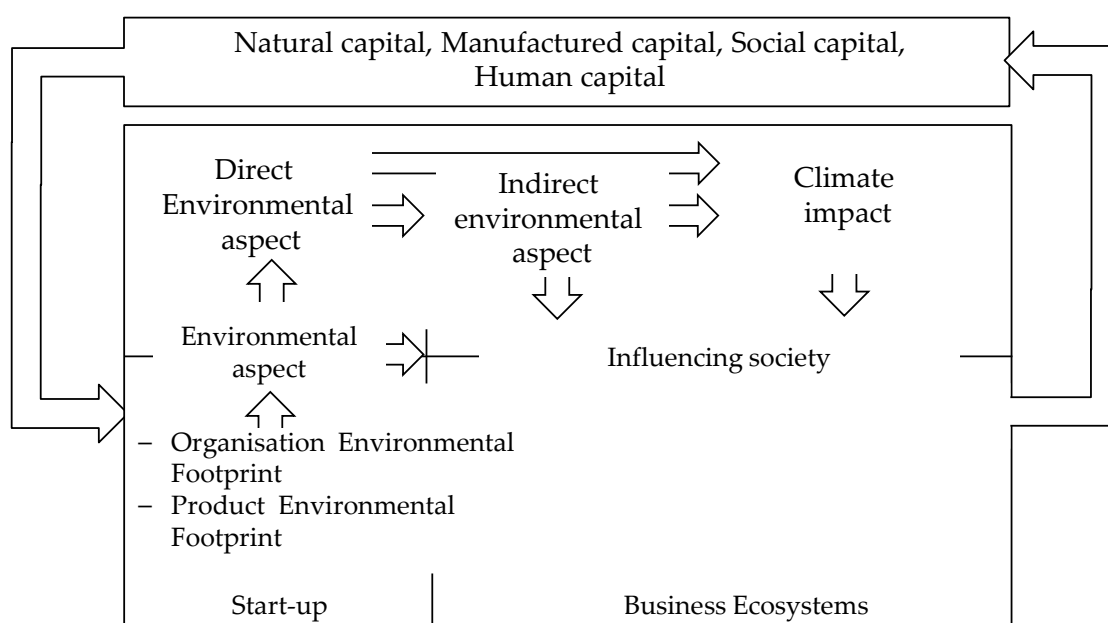
The described social dimension of sustainable development and its model provide the answer to the second research question (RQ2) and brings the scientific goal of the paper closer.

#### 4.4. The Environmental Layer of Sustainable Development

The environmental aspects of the sustainable development model look at the relationship between the effects of human activity and the environment. Maintaining balance requires creating, offering, providing such values by the start-up that use the environment in a resource-efficient way, eliminating negative environmental impact of the organization throughout its life cycle. From the recipients' perspective, consumers, including customers, users, payers have the right to know the environmental impact throughout the life cycle

of the products, services they intend to purchase, use, or enjoy. Therefore, life cycle environmental performance of products or services and organizations should be analyzed and reported to parties representing private, public, or societal interests, such as business partners, investors, public authorities, or consumers. Life cycle environmental performance is a quantified measurement of the potential determination of an organization's environmental footprint (OEF) and a product's environmental footprint (PEF), taking into account all relevant stages of an organization's and product's life cycle from a supply chain perspective [74]. Determination of OEF and PEF is performed using a full life cycle (cradle-to-grave) modelling method, for OEF it refers to all activities related to goods or services that the organization provide throughout the supply chain, for PEF the environmental impacts of material flows, energy and emissions, and waste streams associated with the product or service. The determination of OEF and PEF requires the application of a number of complex steps in each environmental footprint impact category, e.g., for climate change, the Bern model (Global Warming Potentials over a 100 year time horizon) was adopted, resulting in an index expressed in kilograms of CO<sub>2</sub> equivalent [56,74].

In terms of capital flows, the operation of a start-up allows to highlight its environmental impact (OEF) and its products' environmental impact (PEF) in direct and indirect dimension, in terms of impact on climate and entire society using the following capitals: natural, productive, social, and human (Figure 11).



**Figure 11.** The entity's impact on the environment, climate and society. Source: author's own development.

The environmental aspect is the element of an organization's activities and products or services that affect or may affect the environment. Direct environmental aspect refers to the environmental issues associated with an organization's activities, products, and services over which it has direct management control. The area of indirect environmental aspects relates to an organization's relationships with third parties that can be influenced by the organization to some extent, and further impact on society as a whole. Direct and indirect environmental aspects increase the risk of global warming and climate change.

From a business modelling point of view, the environmental performance analysis of OEF and PEF is too precise, detailed, difficult to perform and specific data are difficult to access, so a simplified way of environmental impact of the organization and product/service should be adopted. In the sustainable development model, the environmental area should address the following principles:

1. A cradle-to-grave forward-thinking approach relating to the life cycle management (LCM).



2. Considering the organization's impact from a supply chain perspective (from raw material acquisition, through operation, to final waste management).
3. Considering the impact of the product or service in the flow of the spectrum of resource and environmental interventions associated with the product or service.
4. Application of the circular economy, e.g., closing supplies in logistics chains, resource recovery. Resource recovery focuses on efforts aimed at elimination of the waste status, prevention of waste generation, preparation for reuse, and transformation of waste into value through recycling and use in other economic processes.
5. Offering a multidimensional sustainable value that addresses a broad set of environmental benefits taking into account social needs related to the quality of life in the environment, the public health aspect, meeting the physical and psychological needs of humans through properly arranging their relationship with the environment.
6. Consideration of ecosystem impacts on climate.

Figure 12 presents the sustainable development environmental area model using the modified Social Business Model Canvas template.

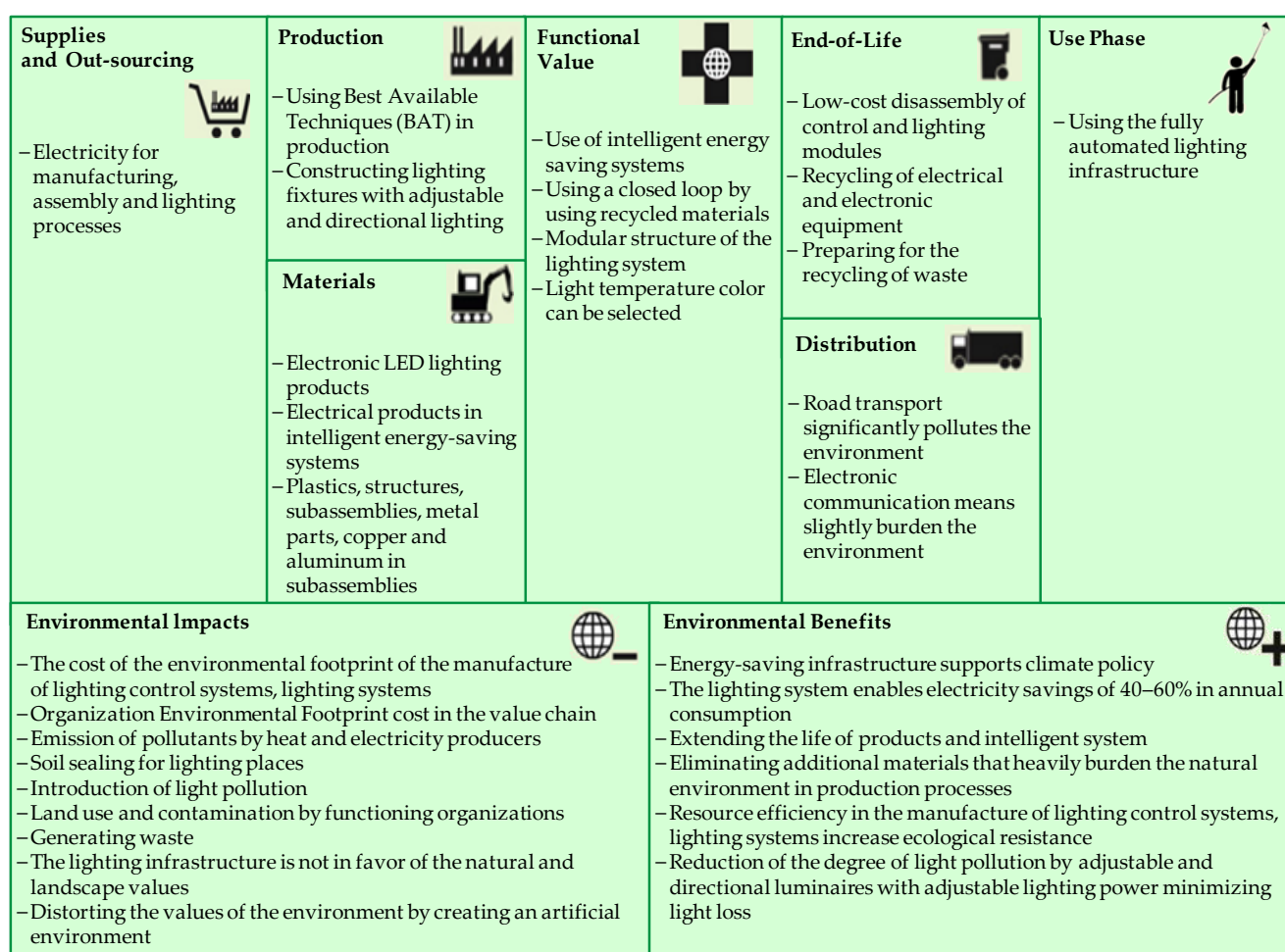


Figure 12. The environmental layer of sustainable development. Source: Own study based on the source [59].

The described environmental dimension of sustainable development and its model provide the answer to the second research question (RQ2) and brings the scientific goal of the paper closer.

## 5. Conclusions and Further Research

### 5.1. Theoretical Implications

The article deals with the implementation of innovation in a start-up business model in the provision of energy-efficient investment services related to smart lighting systems for sustainable development. An illustrative case study in the form of a graphic, synthetic representation of the sustainable business model provided the grounds for exploring the start-up's impact in the context of the sustainable development ecosystem.

The research area presented provided a conceptual framework for an example explaining the different types of organizational capabilities of the start-up's decision-makers that enhanced both internal value processes, knowledge management, and innovation as well as external stakeholder's influence in the ecosystem, to enable the organization to grow. The presentation of innovation in the start-up business model was implemented in a comprehensive way by presenting in the business models positive effects of introducing sustainable value for three groups of stakeholders from different sectors of the economy (1) communities, both by the (2) private and (3) public sector. The effect of implementing innovation in a start-up's business model is:

1. Servitization—turning an offered product into an investment service (a feature of Economy 4.0).
2. Designing the greatest possible value proposition with a sustainable value feature with the greatest possible scale of external impact (a feature of Business Sustainability 3.0).
3. The product value chain starting from sub-suppliers to investment project contractors, control of investment processes and operation processes is based on a low level of direct contacts (a feature of low touch economy).
4. Creation of a sustainable service investment proposition that is a competitive advantage with features of a hard to copy business.

The use of energy-saving products in smart lighting systems was the basis for the start-up's business strategy, on which sustainable investment project became a desired value for the local community, the citizens thus benefiting from the value delivered. The electricity savings resulting from the difference between the energy consumption before and after the lighting system upgrade are the main source of revenue for the start-up.

Innovation in the start-up business model in energy-efficient solutions for sustainable development requires more work and additional costs resulting from the selection of the best available technique and imposed restrictions on the negative environmental impact of investment projects. Creating a sustainable business model for the start-up required establishing numerous changes in terms of agreements with partners, e.g., increasing energy efficiency of components, extending product life, the possibility of easy disassembly of modules and preparing them for reuse, increasing the level of recycling of electrical and electronic equipment, removing a large number of different parts which also means less complexity, eliminating additional materials that heavily burden the environment during production processes.

Within the framework of scientific activities contributing to the achievement of the objective, the authors have developed a business model of a start-up providing a subscription fee investment service and a sustainable model, which is the result of the assembly, of three models representing three dimensions of sustainable development. Considering the conceptual elements of the research area and the models developed, the authors define the sustainable business model in cross-sector relations for organizations as: A sustainable business model describes the rationale of how an organization proposes, creates, and delivers value desired by its audiences and delivers economic, environmental, and social forms of sustainable value simultaneously for the common good and captures the benefits of value in all aspects.

Extended captured value refers to capturing from the customer tangible economic values from the model's business formula, capturing additional sustainable value benefits from the customer's own organization and from the environment with extended economic,

social, and environmental needs of society in addition to capturing measurable economic value from the model's business formula.

Success in creating a sustainable business model is to ensure that all stakeholders in the ecosystem provide and capture value from the sustainable value exchange transaction. There are two interrelated aspects of sustainable value—value created, proposed, delivered for:

- Internal and external stakeholders of the entity, which was made visible in the start-up's business model;
- The general public—dependent stakeholders external to the entity, the broad public, which has been made visible by the sustainability model.

The capture of sustainable value benefits occurs by all internal, external, and dependent stakeholders. Referring to the ecosystem, all stakeholders in the ecosystem obtain direct benefits from the organization's goals and at the same time indirect and induced benefits of economic, social, and environmental significance. Awareness of the acquisition of obtaining direct and indirect benefits by all ecosystem participants increases accountability and attention to the capital base (intellectual capital in its four dimensions: social, human, structural and relational; financial capital, productive capital; natural capital and knowledge of the interdependencies that bind them).

The highest benefits beyond the immediate ones include:

- Cheaper realization of local government unit's own tasks;
- Increasing the availability of public services and information for inhabitants, citizens,
- Improve environmental quality by planning all processes in accordance with the circular economy, low contact direct risk, waste management;
- Improving the quality of life for the local community and the quality of life for all citizens, including citizens who transit or visit the territories of local government unit;
- Increase in employment in the value chain of the collaborating organizations;
- Gaining additional political capital for incumbent local authorities.

The aforementioned non-exhaustive benefits and impacts of the innovation ecosystem on the economy, society, and the natural environment, which meet social needs, are the evidence of the relevance of the sustainable investment issues as demonstrated in four partial models. The integration of the equivalent partial models into the sustainable business model of the start-up allowed to achieve the scientific objective of the paper in designing a sustainable value that meets the economic, social, and environmental needs of the society. In this sense, there has been the promotion of integrated thinking tense the multifaceted nature of sustainability in an external perspective in the creation of value for the common good.

The developed reference sustainable business model including the business model and the sustainability model can be applied not only for start-ups but for organizations from different economic sectors, regardless of type, kind, maturity level or their size.

## 5.2. Further Research

The authors are aware that the conclusions of the ESV study may be affected by the incompleteness of the data, as they are based on an in-depth case study of one start-up business model for providing investment services in Poland. This implies the need for further research to improve ESV and to develop new elements, e.g., related to the risk of achievement of goals and operationalization of the business model. After 2 years of operation, the owner of Formaco Consulting Piotr Dresler perceives risks in various areas of the company's activity, which arise from taking into account the stakeholders of the three sectors of the economy and the limitations related to the SARSCoV-2 virus. The risks to achieving business goals and the impact on the company may involve consequences. Risks and the consequences of risk events will be the subject of other studies. Another aspect in further formalization of operations of Formaco Consulting Piotr Dresler is the process of transforming the conceptual model, which is the subject of the article as a

research object, into concrete indicators and variables that can be measured empirically, i.e., quantification of the company's achievements for the control of its operations. This also involves the presented concept of extended sustainable value, which will be empirically verified by operationalization of the sustainable business model into the form of a computer program—a managerial dashboard.

The illustrative case study of a start-up business model focused on servitization and the presentation of a sustainability model that is the result of the assembly of three models representing the three dimensions of sustainable development and is not a closed system of the context of the ecosystem presented. The developed methodical approach to elaborate a reference model of sustainable business can be extended to further areas and models corresponding to these areas, e.g., including legal, technical, philanthropic, ethical, trust, cultural dimensions. The development of new model dimensions will require equivalence with the developed models, i.e., consistency of the level of concretization and abstraction as well as equal graphic notation of all models.

**Author Contributions:** Problem definition, research design: B.W. and P.D.; data collection (shared): P.D.; modelling and validation: B.W. and P.D.; management and checks: A.S.-S. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Conflicts of Interest:** The authors declare no conflict of interest.

## References

- Boons, F. *Creating Ecological Value. An Evolutionary Approach to Business Strategies and the Natural Environment*; Edward Elgar Publishing: Cheltenham, UK, 2009.
- Carrillo-Hermosilla, J.; del Río, P.; Könnölä, T. Eco-Innovation. In *When Sustainability and Competitiveness Shake Hands*; Palgrave Macmillan: London, UK, 2009. [CrossRef]
- Carrillo-Hermosilla, J.; del Río, P.; Könnölä, T. Diversity of eco-innovations: Reflections from selected case studies. *J. Clean. Prod.* **2010**, *18*, 1073–1083. [CrossRef]
- Henry, M.; Bauwens, T.; Hekkert, M.; Kirchherr, J. A typology of circular start-ups: An Analysis of 128 circular business models. *J. Clean. Prod.* **2020**, *245*, 118528. [CrossRef]
- Bocken, N. Sustainable venture capital—Catalyst for sustainable start-up success? *J. Clean. Prod.* **2015**, *108*, 647–658. [CrossRef]
- Regulation (EU) No 549/2013 of the European Parliament and of the Council of 21 May 2013 on the European System of National and Regional Accounts in the European Union; EUR-Lex: Brussels, Belgium, 2013.
- Jiang, S.R.; Qiao, H.; Zhang, S.; Liu, Y.; Hu, Y.; Xu, Y.M. The frontiers of value co-creation research: Ecosystem and business model innovation. *Manag. Rev.* **2020**, *32*, 3–17.
- Osterwalder, A.; Pigneur, Y. *Business Model Generation: A Handbook for Visionaries, Game Changers and Challenges*; John Wiley & Sons: Hoboken, NJ, USA, 2010.
- Elkington, J. *Cannibals with Forks: The Triple Bottom Line of 21st Century Business*; Capstone Publishing: Oxford, UK, 1997.
- Dyllick, T.; Muff, K. Clarifying the meaning of sustainable business: Introducing a typology from business-as-usual to true business sustainability. *Organ. Environ.* **2016**, *29*, 156–174. [CrossRef]
- Evans, S.; Vladimirova, D.; Holgado, M.; Van Fossen, K.; Yang, M.; Silva, E.A.; Barlow, C.Y. Business Model Innovation for Sustainability: Towards a Unified Perspective for Creation of Sustainable Business Models. *Bus. Strat. Environ.* **2017**, *26*, 597–608. [CrossRef]
- Pieroni, M.; Pigosso, D.; McAloone, T. Sustainable Qualifying Criteria for Designing Circular Business Models. *Procedia CIRP* **2018**, *69*, 799–804. [CrossRef]
- Blank, S.G.; Dorf, B. *The Startup Owner's Manual—The Step-by-Step Guide for Building a Great Company*, 1st ed.; K&S Ranch: Pescadero, CA, USA, 2012.
- The Act of May 20, 2016 on Energy Efficiency (Journal of Laws of 2016, Item 831). Available online: <http://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20160000831&SessionID=5A4AA8A11A3CACB98CABBAB0F2B3303F0A8BD6A3Aem0028> (accessed on 19 October 2020).
- Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on Energy Efficiency, Amending Directives 2009/125/EC and 2010/30/EU and Repealing Directives 2004/8/EC and 2006/32/EC; EUR-Lex: Brussels, Belgium, 2012.
- Communication (COM (2010) 2020 Final)—Europe 2020: A Strategy for Smart, Sustainable and Inclusive Growth. Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM%3Aem0028> (accessed on 19 October 2020).

17. Decision of the European Parliament and of the Council on a General Union Environment Action Program to 2030, Brussels, 14.10.2020 COM (2020) 652 Final; EUR-Lex: Brussels, Belgium, 2020.
18. United Nations. Available online: <https://sdgs.un.org/goals> (accessed on 8 January 2021).
19. Environmental Strategies and Actions Plans. Available online: [https://ec.europa.eu/environment/strategy\\_en](https://ec.europa.eu/environment/strategy_en) (accessed on 18 January 2021).
20. Transforming Our World: The 2030 Agenda for Sustainable Development. Available online: <https://sdgs.un.org/2030agenda> (accessed on 18 January 2021).
21. Ibarra, D.; Ganzarain, J.; Igartua-Lopez, J. Business model innovation through Industry 4.0: A review. *Procedia Manuf.* **2018**, *22*, 4–10. [CrossRef]
22. Haseeb, M.; Hussain, H.I.; Ślusarczyk, B.; Jermisittiparsert, K. Industry 4.0: A solution towards technology challenges of sustainable business performance. *Soc. Sci.* **2019**, *8*, 154. [CrossRef]
23. Schaltegger, S.; Freund, F.L.; Hansen, E.G. Business cases for sustainability: The role of business model innovation for corporate sustainability. *Int. J. Innov. Sustain. Dev.* **2012**, *6*, 95. [CrossRef]
24. Boons, F.; Lüdeke-Freund, F. Business models for sustainable innovation: State-of-the-art and steps towards a research agenda. *J. Clean. Prod.* **2013**, *45*, 9–19. [CrossRef]
25. Jacobides, M.; Cennamo, C.; Gawer, A. Towards a Theory of Ecosystems. *Strateg. Manag. J.* **2018**, *39*. [CrossRef]
26. Low Touch Economy. Available online: <https://www.boardofinnovation.com/low-touch-economy> (accessed on 9 January 2021).
27. Hansen, E.G.; Grosse-Dunker, F.; Reichwald, R. Sustainability Innovation Cube—A Framework to Evaluate Sustainability-Oriented Innovations. *Int. J. Innov. Manag.* **2009**, *13*, 683–713. [CrossRef]
28. Jabłoński, A.; Jabłoński, M. *The Conceptualization and Operationalization of Public Business Models in the Context of Public Trust. Trust Management in Public Organizations New Concepts and Contemporary Trends*; Kożuch, B., Jabłoński, A., Eds.; Nova Publishers: New York, NY, USA, 2018; pp. 1–36. ISBN 978-1-53613-614-2.
29. Mezger, F. Toward a capability-based conceptualization of business model innovation: Insights from an explorative study. *RD Manag.* **2014**, *44*, 429–449. [CrossRef]
30. Oskam, I.; Bossink, B.; de Man, A.P. The interaction between network ties and business modeling: Case studies of sustainability-oriented innovations. *J. Clean. Prod.* **2018**, *177*, 555–566. [CrossRef]
31. Xiao, Y.; Watson, M. Guidance on Conducting a Systematic Literature Review. *J. Plan. Educ. Res.* **2019**, *39*, 93–112. [CrossRef]
32. Martín-Martín, A.; Orduña-Malea, E.; Thelwall, M.; López-Cózar, E.D. Google Scholar, Web of Science, and Scopus: A systematic comparison of citations in 252 subject categories. *arXiv* **2018**, arXiv:1808.05053. [CrossRef]
33. Journal of Business Models. Available online: <http://journalofbusinessmodels.com> (accessed on 3 February 2021).
34. Marczevska, M.; Kostrzewski, M. Sustainable Business Models: A Bibliometric Performance Analysis. *Energies* **2020**, *13*, 6062. [CrossRef]
35. Social Enterprises and Their Ecosystems in Europe. Comparative Synthesis Report. Available online: <https://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=8274> (accessed on 11 January 2021).
36. National Rural Programme of Social Economy Development to 2023. Available online: <https://mcps.com.pl/ekonomia-spoleczna/dokumenty-strategiczne/krajowy-program-rozwoju-ekonomii-spolecznej-do-2023-ekonomia-solidarnosci-spolecznej/> (accessed on 11 January 2021).
37. Krawczyk-Sokolowska, I.; Piersceniak, A.; Caputa, W. The innovation potential of the enterprise in the context of the economy and the business model. *Rev. Manag. Sci.* **2019**, *15*, 103–124. [CrossRef]
38. Han, J.; Heshmati, A.; Rashidghalam, M. Circular Economy Business Models with a Focus on Servitization. *Sustainability* **2020**, *12*, 8799. [CrossRef]
39. Yang, M.; Vladimirova, D.; Rana, P.; Evans, S. Sustainable value analysis tool for value creation. *Asian J. Manag. Sci. Appl.* **2014**, *1*, 312. [CrossRef]
40. Di Foggia, G. Energy-Efficient Products and Competitiveness in the Manufacturing Sector. *J. Open Innov. Technol. Mark. Complex.* **2021**, *7*, 33. [CrossRef]
41. Thurner, T.W.; Roud, V. Greening strategies in Russia's manufacturing—From compliance to opportunity. *J. Clean. Prod.* **2016**, *112*, 2851–2860. [CrossRef]
42. Xu, Y.; Ahokangas, P.; Reuter, E. EaaS: Electricity as a service? *J. Bus. Models* **2018**, *6*, 1–23.
43. Zhang, Y.; Xiao, C.; Zhou, G. Willingness to pay a price premium for energy-saving appliances: Role of perceived value and energy efficiency labeling. *J. Clean. Prod.* **2020**, *242*. [CrossRef]
44. Lucassen, G.; Brinkkemper, S.; Jansen, S.; Handoyo, E. Comparison of Visual Business Modeling Techniques for Software Companies. In *Software Business*; ICSOB 2012 Lecture Notes in Business Information Processing; Cusumano, M.A., Iyer, B., Venkatraman, N., Eds.; Springer: Berlin/Heidelberg, Germany, 2012; Volume 114. [CrossRef]
45. Szromek, A.R. Model of Business Relations in Spa Tourism Enterprises and Their Business Environment. *Sustainability* **2020**, *12*, 4941. [CrossRef]
46. Timmers, P. Business Models for Electronic Markets. *Electron. Mark.* **1998**, *8*, 3–8. [CrossRef]
47. Board of Innovation. Available online: [www.boardofinnovation.com](http://www.boardofinnovation.com) (accessed on 19 October 2020).
48. Elkington, J. Accounting for the triple bottom line. *Meas. Bus. Excel.* **1998**, *2*, 18–22. [CrossRef]



49. Kravchenko, M.; Pigosso, D.C.; McAloone, T.C. Towards the ex-ante sustainability screening of circular economy initiatives in manufacturing companies: Consolidation of leading sustainability-related performance indicators. *J. Clean. Prod.* **2019**. [CrossRef]
50. AndiRoberts. Available online: <https://andiroberts.com/canvascollection> (accessed on 19 October 2020).
51. Täuscher, K.; Abdelkafi, N. Visual tools for business model innovation: Recommendations from a cognitive perspective. *Creat. Innov. Manag.* **2017**, *26*, 160–174. [CrossRef]
52. Lüdeke-Freund, F.; Carroux, S.; Joyce, A.; Massa, L.; Breuer, H. The Sustainable Business Model Pattern Taxonomy—45 Patterns to Support Sustainability-Oriented Business Model Innovation. *Sustain. Prod. Consum.* **2018**, *15*, 145–162. [CrossRef]
53. Upward, A. Towards an Ontology and Canvas for Strongly Sustainable Business Models: A Systemic Design Science Exploration. Master's Thesis, Masters of Environmental Studies Graduate Program in Environmental Studies, York University, Toronto, ON, Canada, 2013.
54. Upward, A.; Jones, P.H. An ontology for strongly sustainable business models: Defining an enterprise framework compatible with natural and social science. *Organ. Environ. Spec. Issue Bus. Models Sustain. Entrep. Innov. Transform.* **2016**, *29*, 1–27. [CrossRef]
55. Hoveskog, M.; Norris, N.; Ostuzzi, F. Improving the flourishing business canvas through design: Experiments in Belgium, Sweden and Canada. In Proceedings of the 5th International Online Conference on New Business Models, Nijmegen, The Netherlands, 1–2 July 2020; pp. 357–368.
56. Joyce, A.; Paquin, R.L. The triple layered business model canvas: A tool to design more sustainable business models. *J. Clean. Prod.* **2016**, *135*, 1474–1486. [CrossRef]
57. Martins, H.; Paulo, M.J.; Marini, C. Business models in the public domain: The public governance canvas. *Cad. EBAPEBR* **2019**, *17*, 49–67. [CrossRef]
58. Sergio, S. The Case for a Socially Oriented Business Model Canvas: The Social Enterprise Model Canvas. *J. Soc. Entrep.* **2019**, *10*, 232–251. [CrossRef]
59. Wit, B.; Pylak, K. Implementation of triple bottom line to a business model canvas in reverse logistics. *Electron. Mark.* **2020**, *30*, 679–697. [CrossRef]
60. Biloslavo, R.; Bagnoli, C.; Edgar, D. An eco-critical perspective on business models: The value triangle as an approach to closing the sustainability gap. *J. Clean. Prod.* **2018**, *174*, 746–762. [CrossRef]
61. Kozłowski, A.; Searcy, C.; Bardecki, M. The reDesign Canvas: Fashion design as a tool for sustainability. *J. Clean. Prod.* **2018**, *183*, 194–207. [CrossRef]
62. Garcia-Muiña, F.; González-Sánchez, R.; Ferrari, A.; Settembre-Blundo, D. The Paradigms of Industry 4.0 and Circular Economy as Enabling Drivers for the Competitiveness of Businesses and Territories: The Case of an Italian Ceramic Tiles Manufacturing Company. *Soc. Sci.* **2018**, *7*, 225. [CrossRef]
63. Qastharin, A.R. Business model canvas for social enterprise. *J. Bus. Econ.* **2016**, *7*, 627–637. [CrossRef]
64. Brehmer, M.; Podoynitsyna, K.; Langerak, F. Sustainable business models as boundary-spanning systems of value transfers. *J. Clean. Prod.* **2018**, *172*, 4514–4531. [CrossRef]
65. Foxon, T.J.; Bale, C.S.; Busch, J.; Bush, R.; Hall, S.; Roelich, K. Low carbon infrastructure investment: Extending business models for sustainability. *Infrastruct. Complex.* **2015**, *2*, 1–13. [CrossRef]
66. Hąbek, P.; Villahoz, J.J.L. Socially Responsible Supplier Development. Practices of Automotive Industry. *Multidiscip. Asp. Prod. Eng.* **2020**, *3*, 707–719. [CrossRef]
67. Żelazna, A.; Bojar, M.; Bojar, E. Corporate Social Responsibility towards the Environment in Lublin Region, Poland: A Comparative Study of 2009 and 2019. *Sustainability* **2020**, *12*, 4463. [CrossRef]
68. Durst, S.; Zieba, M. Knowledge risks inherent in business sustainability. *J. Clean. Prod.* **2020**, *251*, 119670. [CrossRef]
69. Clark, T.; Osterwalder, A.; Pigneur, Y. *Business Model You: A One-Page Method for Reinventing Your Career*; John Wiley & Sons: Hoboken, NJ, USA, 2012.
70. Grabowska, M. Innovativeness in business models. *Procedia Comput. Sci.* **2015**, *65*, 1023–1030. [CrossRef]
71. Seroka-Stolka, O.; Surowiec, A.; Pietrasieński, P.; Dunay, A. Sustainable business models. *Zesz. Nauk. Politech. Częstochowskiej Zarządzanie* **2017**, *27*, 116–125. [CrossRef]
72. Vladimirova, D. Building Sustainable Value Propositions for Multiple Stakeholders: A Practical Tool. *J. Bus. Models* **2019**, *7*, 1–8. [CrossRef]
73. Baldassarre, B.; Calabretta, G.; Bocken, N.M.P.; Jaskiewicz, T. Bridging sustainable business model innovation and user-driven innovation: A process for sustainable value proposition design. *J. Clean. Prod.* **2017**, *147*, 175–186. [CrossRef]
74. Commission Recommendation of 9 April 2013 on the Use of Common Methods to Measure and Communicate the Life Cycle Environmental Performance of Products and Organisations, 2013/179/UE. Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013H0179> (accessed on 19 October 2020).