

---



---

# STARTUPS IN THE ENVIRONMENTAL CONTEXT: A PRISMA-BASED ANALYSIS

Lukrécia HUNKOVÁ

Department of Management and Human Resource Development, Faculty  
 of Socio-economic Relations, Alexander Dubček University in Trenčín, Slovakia

Jarosław KORPYSA

Institute of Management, University of Szczecin, Poland

*Received: 02. June 2024    Reviewed: 25. July 2024    Accepted: 18. October 2024*

---



---

## Abstract

Startups are key drivers of environmental innovation, yet research on their role in sustainability remains fragmented. This study aims to identify areas where the link between startups and the environment can be explored, with further discussion and outlook on future research opportunities. PRISMA analysis was used to achieve the aim of the study, with data from the Web of Science (SSCI), focusing on peer-reviewed articles (2015–2024) in management, business, and economics from Q1–Q2 journals and with combination of the keywords “startup” and “environment”. The findings reveal three primary research areas: technological innovation and business models, sustainability and societal impact, and policy, regulation and financing of environmental innovation. Despite growing interest, several research gaps remain and future research should focus on the long-term impact of environmental regulations on startups, the effectiveness of government support programs for startups and the long-term impact of AI on environmental sustainability. A major limitation is the low number of scientific studies that emerged from the PRISMA analysis conducted. Future research could broaden the scope by incorporating more databases, deepening insights into startups and the environment. The results can serve as a basis for further studies and practical applications in the development of sustainable business environments, especially in the area of supporting startups focused on environmental innovation.

*Keywords: startup, environment, sustainability*

**JEL Classification: M13, Q01, Q56,**

---



---

## Introduction and theoretical background

In recent decades, startups have become a key driver of innovation, with an increasing emphasis on environmental sustainability. This shift reflects the broader concept of the Triple Bottom Line (TBL), which emphasizes that entrepreneurial activities should be evaluated not only in terms of financial performance, but also in terms of their impact on society and the environment (Elkington, 1997). Within this paradigm, startups play an important role in developing and implementing technologies that reduce negative environmental impact and support the transition to a more sustainable economy.

This study focuses specifically on the environmental dimension of TBL, i.e. the 'planet', which reflects environmental challenges through innovation, technological advances and sustainable business models. The environmental pillar requires special attention given the increasing pressure of regulations, changing investment preferences and increasing consumer demands for environmentally responsible solutions.

Startups are emerging and dynamic businesses seeking to establish themselves in the market through innovative business models. Despite high levels of risk, successful startups can deliver significant economic impact (De Bernadi and Azucar, 2020). Nowadays, environmental challenges are becoming an integral part of the business environment, and startups are increasingly responding to these challenges by implementing eco-innovations (Sheoran and Kumar, 2020). Eco-innovations play a key role in the social transformation of startups, thus contributing to their sustainability and social engagement (Ghezali and Sekkal, 2024).

Financial resources play a vital role in the implementation of eco-innovations, influencing the green processes and products of startups. While patents do not show a mediating effect, financial mechanisms are essential to promote sustainable development and stimulate green innovation in European startups (Sahili and Barrales-Molina, 2024). In the context of broader economic and social transformation, startups are seen as modern innovation vehicles that promote sustainable development (Kofanov and Zozul'ov, 2018). Moreover, environmental sustainability can provide startups with a competitive advantage when raising capital, as investors increasingly favour businesses with a strong environmental impact (Voß, et al. 2024).

The paper is a part of the project SK-PL-23-0065 Implication of TBL concept in the context of green startups management realized under the frame the Slovak research and development agency.

## Material and methods

**Aim:** The aim of this paper is to identify areas where the link between startups and the environment can be explored, with further discussion and a view on future research opportunities. In line with the stated aim of the paper, the wording of the research question is as follows:

RQ1: What are the key research areas where startups contribute to environmental sustainability and innovation?

RQ2: What are the key research gaps that hinder a deeper understanding of the role of startups in advancing environmental sustainability?

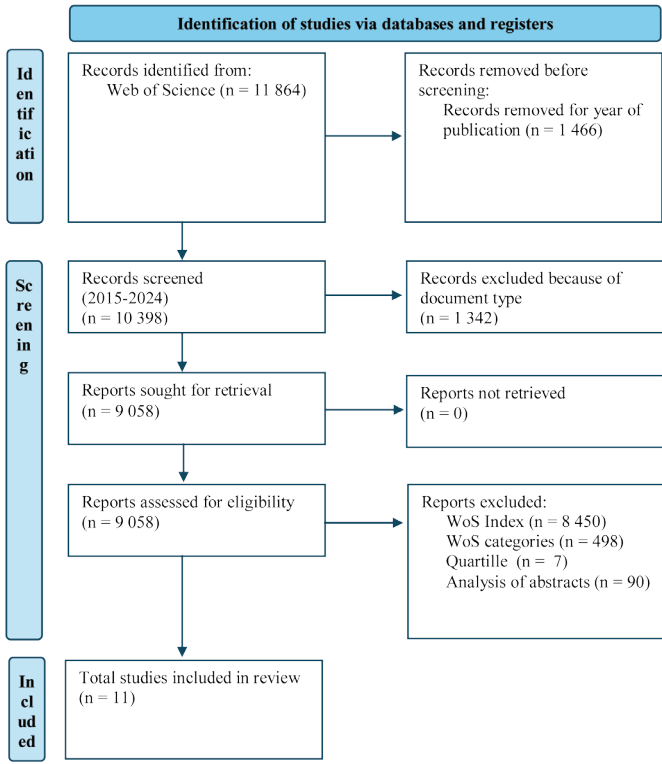
To meet the objective, we used the PRISMA four-phase flowchart, drawing on the Web of Science database. The PRISMA analysis was conducted in 2025 in the month of January. The search was based on a combination of the keywords

“startup” and “environment”. After obtaining an initial set of results, we proceeded through several stages of filtering based on predetermined criteria:

- Time period - only studies published between 2015 and 2024 were included, a choice motivated by the desire to capture the latest trends and developments in the field.
- Document type - only scientific articles were included in the analysis, thus removing other types of publications such as conference papers and books.
- Subject categorization - only articles categorized as management, business and economics were included.
- Journal quality - only articles published in Q1 and Q2 journals according to Journal Citation Reports were analysed.

Furthermore, we used analysis, which allowed us to examine the issue at hand in detail, synthesis, through which we formulated conclusions from previous research, and comparison, whereby we compared different approaches and research findings in the field of startups and the environment.

Table 1 PRISMA diagram



Source:author's processing

Based on the selected keywords “startup” and “environment”, an initial set of 11,864 scientific studies was identified through the Web of Science database. To ensure the relevance and quality of the included research, a multi-stage selection process was conducted, applying predefined inclusion and exclusion criteria.

The first filtering step involved limiting the timeframe to studies published between 2015 and 2024, leading to the exclusion of 1,466 publications that fell outside this period. This time range was chosen to capture the most recent developments in the intersection of startups and environmental concerns, reflecting current trends and emerging research directions.

Next, a refinement based on document type was applied, where only peer-reviewed journal articles were included. This step resulted in the exclusion of 1,342 publications, such as conference papers, book chapters, and reviews, to ensure that the study focused on rigorous, high-quality academic research.

To further enhance the relevance of the dataset, only articles classified under the management, business, and economics categories within Web of Science were retained. This decision was made to align the selection with the research objective, which explores the relationship between startups and environmental aspects from an economic and managerial perspective. As a result, 498 studies from unrelated disciplines, such as engineering, environmental science, or policy studies, were excluded.

Additionally, a quality filter was applied, where only articles published in Q1 and Q2 journals (according to the Journal Citation Reports) were considered. This step ensured that the selected studies met high academic standards and were published in well-regarded journals. Consequently, 7 articles from lower-ranked journals (Q3 and Q4) were excluded from the final dataset.

After an in-depth analysis of the abstracts, 90 studies were excluded, leaving the 11 most relevant articles which were identified as the most relevant and were selected for in-depth analysis. These studies form the foundation of the research, providing insights into the existing literature on the intersection of startups and the environment while also highlighting potential research gaps.

Although the selection process was carefully designed to ensure the quality and relevance of the included studies, there are some limitations that may have influenced the results of the research. This study drew data exclusively from the Web of Science database, specifically the Social Sciences Citation Index (SSCI). Although Web of Science is one of the most reputable academic databases, there is a possibility that relevant studies published in other databases such as Scopus, Research Gate or Google Scholar were not included. This may lead to some limitation in the breadth of research coverage.

Future studies could expand the analysis to include additional databases, a broader range of documents, and interdisciplinary linkages, thereby enhancing the comprehensiveness and depth of research on startups and environmental aspects.

## Results and discussion

In this section, we focus on the findings presented in the authors' table of findings. These findings are based on various studies that have focused on the issue of startups, with a specific emphasis on environmental aspects and innovation processes in this area. Next, we will answer what areas the authors have addressed within the studied issue, while also focusing on identifying research gaps in the current literature and areas that require further investigation.

The following table shows the authors' findings that emerged from the PRISMA analysis conducted. The table presents the key findings that were obtained from the selected and reviewed studies.

Table 2                      Results of authors

Authors	Results of authors
Jorzik, et al., 2024	Identified five main forms of AI-driven business model innovation and three archetypal patterns of their interconnection that enable green technology startups to maximize their positive environmental impact.
Noailly, et al., 2024	Higher values of the Environmental Policy Index are associated with more venture capital for cleantech startups, a decline in stock returns for high-emitting firms, and an increase in renewable energy investment according to the VAR model.
Christodoulou, et al., 2024	Identified resilience, adaptability and collaborative approach to decision making as key factors that enable sustainability-focused startups to achieve long-term value creation and maintain competitive advantage.
Lehmann, et al., 2024	The growing emphasis on ESG factors has led to the emergence of academic spin-offs focused on impact entrepreneurship, and governments can support this process by funding programmes such as the German EXIST programme.
Lago, et al., 2023	The positive impact of entrepreneurial leadership, team size, team motivation, agility, collaboration, technology orientation, and sustainability orientation on startup innovativeness.
Verma, et al., 2023	Co-created customer capital mediates the relationship between green intellectual capital and social sustainability, becoming a key organizational asset, especially for service sector startups.
Oliveira-Dias, et al., 2022	Dynamic capabilities are key drivers of innovation for sustainable business models of startups in the logistics sector.
Oliva, et al., 2022	Success factors in internationalizing startups are identified, the importance of environmental strategies is highlighted, and a model for achieving sustainable goals is proposed.
Jensen, et al., 2020	Startups that focus on environmental innovation have, on average, higher technological capabilities than other startups.
Doblinger, et al., 2019	Government organisations are promoting environmental innovation in cleantech startups, increasing the number of patents by 73.7% and private investment by 155%.
Giudici, et al., 2019	The emergence of cleantech startups is strongly influenced by the availability of scientific and technological knowledge and the environmental awareness of local governments and communities.

Source: author's processing

Authors Noailly, et al. (2024) created a unique index of U.S. environmental and climate policy based on a textual analysis of news reports from ten leading newspapers for the period 1981 to 2019. This index accurately reflects the evolution of environmental regulations and their impact on clean technology investment. Research has shown that higher index values are associated with a greater likelihood of venture capital for cleantech startups, while high-emitting firms that are more exposed to environmental regulations experience a decline in stock returns. At the macroeconomic level, VAR models show that an increase in media attention on renewable energy is associated with a higher number of investment agreements in the clean energy sector and growth in assets under management by renewable-oriented investment funds. Another important trend is the link between startups and academia, as shown by Lehmann, et al. (2024). Authors Lehmann, et al. (2024) found that the growing emphasis on ESG factors is influencing entrepreneurial universities to adapt their technologies and spin-offs (new ventures) to social impact-focused entrepreneurship. Governments can support this transition by funding programs that favor startups that leverage academic innovation with an ESG orientation, as the German EXIST program demonstrates. This approach has important implications for technology transfer policy and support for academic spin-offs.

The authors Jorzik, et al. (2024) identify five main ways in which AI startups innovate their business models to improve environmental sustainability. Based on the analysis of case studies, they established archetypal patterns of relationships between the different elements of the business model. In addition, they defined three broad categories of linkages between the businesses studied that reflect different approaches to integrating AI into green technologies. The results of the study provide new insights into how startups can effectively use AI to maximize their positive environmental impact. They also highlight the importance of AI in shaping innovative business models that can contribute to long-term environmental sustainability. At the same time, the authors Oliveira-Dias, et al. (2022) find that dynamic capabilities are key intrinsic factors that stimulate innovation in sustainable business models of startups in the Brazilian logistics sector. These capabilities support processes from design to change and diffusion of innovation. Research has revealed different types of innovation in sustainable business models and different activities associated with the three dynamic capabilities studied (Oliveira-Dias, et al. 2022).

Authors Christodoulou, et al. (2024) examined the key factors in the business models of sustainability-focused startups that support long-term value creation. Based on a literature review, they identified resilience as a key element of sustainable decision-making, with its effectiveness enhanced by adaptability and customer convenience. Startups that emphasize resilience and flexibility are able to maintain a competitive advantage while meeting environmental and social goals. The authors also propose a collaborative approach to decision-making that promotes long-term value through sustainable strategies.

Authors Dobliger, et al. (2019) find that government organizations play an important role in fostering innovation in cleantech startups, particularly in the technology sector. Each additional collaboration with the government increases the number of startup patents by 73.7%. Government partnerships also help cleantech startups attract more private investment, with the number of licenses obtained from the government increasing investment by 155%.

These findings show that governments are a key partner in fostering environmental innovation and developing the cleantech sector. Cleantech startups have also been studied by Jensen, et al. (2020), who found that those that focus on

environmental innovation have on average higher technological capabilities than other startups. These startups often focus on combining existing technologies in new ways, leading to innovations that provide environmental benefits. According to Giudici, et al. (2019), the emergence of cleantech startups in a particular geographic area is influenced by two key factors: the availability of scientific and technological knowledge and environmental awareness. These factors are crucial for promoting cleantech entrepreneurship. The results show that these factors are important in the formation of cleantech startups and may be key for policies that want to promote this type of entrepreneurship (Giudici, et al., 2019).

Lago, et al. (2023) confirmed the positive impact of entrepreneurial leadership, team size, team motivation, agility, collaboration, technology orientation, and sustainability orientation on the innovativeness of startups. Oliva, et al. (2022) examined the internationalization strategies of Brazilian startups, focusing on their social, environmental, and economic impacts, and analyzed Asel-Tech, a technology startup that specializes in pipeline leak detection. The study identified the risks and critical success factors in the internationalisation of 'born global' startups and proposed a model to analyse these factors. The authors' findings highlight the importance of environmentally responsible strategies in digital manufacturing and show how the institutional environment influences startups' strategic decisions (Oliva, et al., 2022). This approach, focused on innovation and sustainability, can also be supported by the use of green intellectual capital, which, as shown by Verma, et al. (2023), plays a key role in transforming environmental goals into concrete social actions. Green intellectual capital has a significant impact on social sustainability through co-created customer capital. The components of green intellectual capital (human, relational and structural capital) contribute to positive societal outcomes, provided there is active customer participation, knowledge sharing and engagement in value co-creation. Thus, co-created customer capital serves as a mediator that transforms green intellectual capital into sustainable social actions, becoming a key organisational asset, especially for start-ups and small firms in the service sector (Verma, et al., 2023).

Based on the analysis of the scientific studies and the authors' findings, we can answer research question RQ1: What are the key research areas where startups contribute to environmental sustainability and innovation?

The areas of research where the link between startups and the environment can be observed are as follows:

- Technological innovation and business models
- Sustainability and societal impact
- Policy, regulation and financing of environmental innovation

Based on the above, one can answer RQ2: What are the key research gaps that hinder a deeper understanding of the role of startups in advancing environmental sustainability?

We have identified several research gaps and suggest the following implications for further research:

- Long-term impact of environmental regulations on startups - Noailly, et al. (2024) have shown a link between environmental policy and startup funding, but a deeper analysis of the long-term impact of regulations on the survival, growth and adaptability of cleantech startups is lacking.

- Effectiveness of government support programs for startups - Doblinger, et al. (2019) and Lehmann, et al. (2024) have highlighted the importance of government support, and there is insufficient research on which policy and financing instruments are most effective in supporting environmental startups in different regions.
- Long-term impact of AI on environmental sustainability - as Jorzik, et al. (2024) suggest, AI-driven innovation models can contribute significantly to improving the environmental performance of startups, but research in this area has mainly focused on technological aspects, while the environmental implications of the long-term impact of AI on startups have not yet been sufficiently explored.

## Conclusion

Startups play an important role in fostering environmental innovation, and the results of this literature search point to three main areas of research: technological innovation and business models, sustainability and societal impact, and policy, regulation and financing of environmental innovation. The findings of the studies highlighted the key role of factors such as dynamic capabilities, technology orientation, environmental strategies and collaboration with government institutions in promoting innovative solutions and the environmental sustainability of startups.

On the other hand, the search identified several research gaps, such as a lack of understanding of the long-term impact of environmental regulations on startups, the effectiveness of government support programs, and the role of artificial intelligence in sustainability. These gaps represent an important challenge for future research that could contribute to a deeper understanding of this issue and to support effective environmental innovation strategies.

Finally, startups offer significant potential for addressing environmental challenges through innovative technologies and sustainable business models. However, their success depends on their ability to use available resources efficiently and engage with governments, academic institutions and communities. In this way, start-ups can play a key role in the transition to a sustainable economy and contribute to solving global environmental problems.

## Bibliography

1. Christodoulou, I. P., Rizomyliotis, I., Konstantoulaki, K., Alfiero, S., Hasanago, S., & Paolone, F. (2024). Investigating the key success factors within business models that facilitate long-term value creation for sustainability-focused start-ups. *Business Ethics, the Environment & Responsibility*, beer.12681. <https://doi.org/10.1111/beer.12681>
2. De Bernardi, P., & Azucar, D. (2020). Startups and Knowledge Sharing in Ecosystems: Incumbents and New Ventures. In P. De Bernardi & D. Azucar, *Innovation in Food Ecosystems* (pp. 161-188). Springer International Publishing. [https://doi.org/10.1007/978-3-030-33502-1\\_6](https://doi.org/10.1007/978-3-030-33502-1_6)
3. Doblinger, C., Surana, K., & Anadon, L. D. (2019). Governments as partners: The role of alliances in U.S. cleantech startup innovation. *Research Policy*, 48(6), 1458-1475. <https://doi.org/10.1016/j.respol.2019.02.006>



4. Elkington, J. (1997). Cannibals with forks: The triple bottom line of 21st century business. Capstone.
5. Ghezali, N., & Sekkal, H. (2024). Eco-Innovation and Corporate Social Responsibility in Algerian Environmental Startups. *Economics and Finance*, 65-75. <https://doi.org/10.51586/2754-6209.2024.12.3.65.75>
6. Giudici, G., Guerini, M., & Rossi-Lamastra, C. (2019). The creation of cleantech startups at the local level: The role of knowledge availability and environmental awareness. *Small Business Economics*, 52(4), 815-830. <https://doi.org/10.1007/s11187-017-9936-9>
7. Jensen, F., Löff, H., & Stephan, A. (2020). New ventures in Cleantech: Opportunities, capabilities and innovation outcomes. *Business Strategy and the Environment*, 29(3), 902-917. <https://doi.org/10.1002/bse.2406>
8. Jorzik, P., Antonio, J. L., Kanbach, D. K., Kallmuenzer, A., & Kraus, S. (2024). Sowing the seeds for sustainability: A business model innovation perspective on artificial intelligence in green technology startups. *Technological Forecasting and Social Change*, 208, 123653. <https://doi.org/10.1016/j.techfore.2024.123653>
9. Kofanov, O., & Zozul'ov, O. (2018). Successful development of startups as a global trend of innovative socio-economic transformations. *International and Multidisciplinary Journal of Social Sciences*, 7(2), 191. <https://doi.org/10.17583/rimcis.2018.3576>
10. Lago, N. C., Marcon, A., Ribeiro, J. L. D., Olteanu, Y., & Fichter, K. (2023). The role of cooperation and technological orientation on startups' innovativeness: An analysis based on the microfoundations of innovation. *Technological Forecasting and Social Change*, 192, 122604. <https://doi.org/10.1016/j.techfore.2023.122604>
11. Lehmann, E. E., Otto, J. M., & Wirsching, K. (2024). Entrepreneurial universities and the third mission paradigm shift from economic performance to impact entrepreneurship: Germany's EXIST program and ESG orientation. *The Journal of Technology Transfer*, 49(6), 2184-2199. <https://doi.org/10.1007/s10961-024-10080-y>
12. Noailly, J., Nowzohour, L., Van Den Heuvel, M., & Pla, I. (2024). Heard the news? Environmental policy and clean investments. *Journal of Public Economics*, 238, 105190. <https://doi.org/10.1016/j.jpubeco.2024.105190>
13. Oliva, F. L., Teberga, P. M. F., Testi, L. I. O., Kotabe, M., Giudice, M. D., Kelle, P., & Cunha, M. P. (2022). Risks and critical success factors in the internationalization of born global startups of industry 4.0: A social, environmental, economic, and institutional analysis. *Technological Forecasting and Social Change*, 175, 121346. <https://doi.org/10.1016/j.techfore.2021.121346>
14. Oliveira-Dias, D., Kneipp, J. M., Bichueti, R. S., & Gomes, C. M. (2022). Fostering business model innovation for sustainability: A dynamic capabilities perspective. *Management Decision*, 60(13), 105-129. <https://doi.org/10.1108/MD-05-2021-0590>
15. Sahili, S., & Barrales-Molina, V. (2024). Analyzing How European Startups Generate Eco-Processes and Eco-Products: Eco-Innovation Implementation, Financial Resources, and Patents. *Sustainability*, 16(22), 10028. <https://doi.org/10.3390/su162210028>
16. Sheoran, M., & Kumar, D. (2020). Role of Environmental Concerns on the Startups Networking: A Study of Indian Startups. *International Journal of Mathematical, Engineering and Management Sciences*, 5(6), 1300-1311. <https://doi.org/10.33889/IJMEMS.2020.5.6.096>

17. Verma, R., Arya, V., Thomas, A., Bolognesi, E., & Mueller, J. (2023). Does startup culture in the emerging country grow around societal sustainability? An empirical study through the lens of co-creational capital and green intellect. *Journal of Intellectual Capital*, 24(4), 1047–1074. <https://doi.org/10.1108/JIC-07-2022-0162>
18. Voß, L., Cordes, H., & Lueg, R. (2024). The impact of environmental sustainability on willingness to invest in startups: A survey among private investors. *Sustainable Development*, sd.3254. <https://doi.org/10.1002/sd.3254>

---



---

**Correspondence address:**

Ing. Lukrécia Hunková, Department of Management and Human Resource Development, Faculty of Socio-economic Relations, Alexander Dubček University in Trenčín, Študentská 3, 911 50 Trenčín, Slovakia, [lukrecia.hunkova@tnuni.sk](mailto:lukrecia.hunkova@tnuni.sk)

ORCID: <https://orcid.org/0009-0003-6940-939X>

prof. Jarosław Korpysa Ph.D., D.Sc., Institute of Management, University of Szczecin, Cukrowa 8, 71-004 Szczecin, Poland [jaroslaw.korpysa@usz.edu.pl](mailto:jaroslaw.korpysa@usz.edu.pl)

ORCID: <https://orcid.org/0000-0002-2400-3308>