

PROMOTION OF GEORGIA'S STARTUP ECOSYSTEM: IN ASPECTS OF THE GROWTH OF GREEN INNOVATIONS, THE COMPETITIVENESS OF BUSINESS MODELS, AND IMPLEMENTATION OF GREEN TECHNOLOGIES

DOI: <https://doi.org/10.52340/bal/2024.04.08>

ABSTRACT

This article examines the dynamics of fostering Georgia's startup ecosystem, focusing on the dissemination of green innovations, the competitiveness of business models, and the widespread adoption of green technologies. It investigates how innovative business models can enhance the competitive advantage of green technologies within Georgia's business ecosystem.

By analyzing current trends, policies, and directions, this study identifies the key factors that facilitate the successful integration and scaling of green innovations in Georgia's entrepreneurial landscape. Supportive government policies, access to funding, and establishing collaborative networks are crucial for developing a robust startup ecosystem. Additionally, the research underscores the collaboration between educational institutions and industry sectors in promoting sustainable business practices and technological advancement.

Through the exploration of the interplay between entrepreneurship, sustainability, and technology, this paper aims to provide a comprehensive understanding of the mechanisms underpinning the growth of green innovations in Georgia. The analysis emphasizes the economic and environmental benefits of adopting green technologies and integrating them into competitive business models to achieve higher levels of advantages, both economically and environmentally. Ultimately, the research offers strategic recommendations for policymakers, entrepreneurs, and stakeholders to enhance the competitiveness and sustainability of Georgia's startup ecosystem.



Levani Kikilashvili

PhD student, Direction of Management,
Faculty of Business and Social Sciences,
Sokhumi State University
<https://orcid.org/0009-0001-1032-7707>
E-mail: l.kikilashvili@sou.edu.ge

This paper contributes to the broader discourse on sustainable development and green entrepreneurship, providing valuable insights into how emerging economies can leverage green innovations to achieve economic growth and environmental sustainability.

Keywords: Green Innovations; Startup ecosystems; Competitive Business Models; Green Technologies; Sustainable Development.

საქართველოს სტარტაპ ეკოსისტემის ხელშეწყობა: მწვანე ინოვაციების ზრდის, ბიზნესმოდელის კონკურენტუნარიანობის და მწვანე ტექნოლოგიების დანერგვის ასპექტებში

ლევანი კიკილაშვილი

სოხუმის სახელმწიფო უნივერსიტეტი

ბიზნესისა და სოციალურ მეცნიერებათა ფაკულტეტის მენეჯმენტის მიმართულების დოქტორანტი,

<https://orcid.org/0009-0001-1032-7707>

E-mail: l.kikilashvili@sou.edu.ge

აბსტრაქტი

სტატიაში მიმოხილულია საქართველოს სტარტაპ ეკოსისტემის ხელშეწყობის დინამიკა, მწვანე ინოვაციების გავრცელება, ბიზნეს მოდელების კონკურენტუნარიანობა და მწვანე ტექნოლოგიების ფართოდ დანერგვა. გამოკვლეულია თუ როგორ შეუძლია ინოვაციურ ბიზნეს მოდელებს გაზარდონ მწვანე ტექნოლოგიების კონკურენტული უპირატესობა საქართველოს ბიზნეს ეკოსისტემაში.

მიმდინარე ტენდენციების, პოლიტიკისა და მიმართულებების შესწავლით, ეს ნაშრომი განსაზღვრავს ძირითად ფაქტორებს, რომლებიც ხელს უწყობენ მწვანე ინოვაციების წარმატებულ ინტეგრაციას და მასშტაბირებას საქართველოს სამეწარმეო ლანდშაფტში. მხარდამჭერი მთავრობის პოლიტიკა, დაფინანსების ხელმისაწვდომობა

და თანამშრომლობით-პარტნიორული ქსელების ჩამოყალიბება გადამწყვეტია ძლიერი სტარტაპ ეკოსისტემის განვითარებისთვის. გარდა ამისა, კვლევა ხაზს უსვამს საგანმანათლებლო დანესებულებებისა და დარგობრივი ინდუსტრიის თანამშრომლობას ბიზნესებთან, მდგრადი ბიზნეს პრაქტიკის მართვისა და ტექნოლოგიური წინსვლის ხელშეწყობისთვის.

მენარმეობის, მდგრადობისა და ტექნოლოგიებს შორის ურთიერთქმედების შესწავლით, ეს ნაშრომი ასახავს იმ მექანიზმების სწორ გაგებას, რომლებიც საფუძვლად უდევს მწვანე ინოვაციების ზრდას საქართველოში. ანალიზის მეშვეობით ხაზს ვუსვამთ მწვანე ტექნოლოგიების მიღებას და კონკურენტუნარიან ბიზნეს მოდელებში მათ ინტეგრაციას ეკონომიკურ და გარემოსდაცვით უპირატესობების კიდეც უფრო მაღალ დონეზე წარმოსაჩენად. საბოლოო ჯამში, კვლევა საშუალებას იძლევა, რომ სტრატეგიულ რეკომენდაციები შესთავაზოს პოლიტიკის შემქმნელებს, მენარმეებს და დაინტერესებულ მხარეებს, რათა გაზარდონ საქართველოს სტარტაპ ეკოსისტემის კონკურენტუნარიანობა და მდგრადობა.

ეს ნაშრომი ხელს უწყობს უფრო ფართო დისკურსს მდგრადი განვითარებისა და მწვანე მენარმეობის ირგვლივ, სთავაზობს ღირებულ შეხედულებებს იმ გზების შესახებ, რომლითაც განვითარებადი ეკონომიკის ქრილში შეუძლიათ გამოიყენონ მწვანე ინოვაციების მიმდევარმა ბიზნესებმა, ეკონომიკური ზრდისა და გარემოს მდგრადობის მისაღწევად.

საკვანძო სიტყვები: მწვანე ინოვაციები; სტარტაპ ეკოსისტემა; კონკურენტული ბიზნეს მოდელები; მწვანე ტექნოლოგიები; მდგრადი განვითარება.



INTRODUCTION

Green innovation and the growth of the startup ecosystem in Georgia represent a multifaceted and diverse spectrum. From renewable energy and waste management to sustainable agriculture and ecotourism, Georgian startups are pioneering new solutions to age-old challenges, leveraging technology at the grassroots level to promote sustainable development. This extensive article will delve into the current state, trends, success factors, challenges, and future perspectives of green innovations in Georgia's startup ecosystem.

THE CURRENT STATE OF GREEN INNOVATION IN GEORGIA RENEWABLE ENERGY

Developing renewable energy sources such as solar, wind, and biomass is a primary trend in Georgia. Companies like "Solarium Energy" are revolutionizing the energy sector with innovative solar solutions. Georgia's geographical and climatic conditions are favorable for the expansion of solar and wind energy projects. The government and private sector have been increasingly investing in these areas, recognizing the long-term benefits of sustainable energy sources.

Circular economy models are becoming increasingly prevalent, emphasizing the importance of resource optimization and waste reduction. Companies like "AMP Robotics," which utilize artificial intelligence and automation to simplify recycling processes, have shown significant results in waste management. This approach not only reduces environmental impact but also creates economic opportunities through the recycling and repurposing of materials. Scaling up circular economy practices, such as product-as-a-service models and closed-loop recycling systems, will reduce resource consumption and waste —collaborative efforts. (Nugroho Soebandrija, 2018)

The circular economy model focuses on reducing waste and maximizing the use of resources. Initiatives like composting organic waste, upcycling materials, and creating

products designed for longer life cycles are gaining traction in Georgia.

Sustainable Agriculture and Food Systems

Precision agriculture and smart farming techniques are transforming Georgia's agricultural sector. Technologies such as IoT, drones, and AI are being employed to enhance crop yields and reduce resource usage. Vertical farming and greenhouses are also gaining popularity, allowing for year-round production with minimal environmental impact. (Evans et al. 2017).

INTERNET OF THINGS (IOT) AND SMART SOLUTIONS

The Internet of Things (IoT) revolutionizes various sectors, including energy, agriculture, and waste management. IoT-enabled devices and systems provide real-time data and analytics, improving efficiency and sustainability. For instance, IoT can monitor and manage energy consumption, optimize irrigation systems, and streamline waste collection processes.

IoT-enabled smart grids improve the efficiency and reliability of electricity distribution. They allow real-time monitoring and management of energy flow, reducing losses and integrating renewable energy sources more effectively.

Biotechnology

Biotechnology is playing a crucial role in developing sustainable solutions. Startups like „Materiom“ are pioneering the development of biodegradable materials derived from natural sources. These innovations help reduce reliance on petroleum-based plastics and other non-renewable resources, contributing to a more sustainable future.

Renewable Energy Storage

Advancements in energy storage technologies are critical for the widespread adoption of renewable energy. Efficient and cost-effective storage solutions enable the integration of renewable energy sources into the grid, ensuring a reliable and stable energy supply. This is particularly important for

intermittent sources like solar and wind energy.

Blockchain Technology

Blockchain technology is being explored for its potential to enhance transparency and traceability in supply chains. By providing a decentralized and immutable ledger, blockchain can ensure the integrity and authenticity of products, from farm to table or from manufacturer to consumer. This is especially valuable for organic and fair-trade products.

Success Factors for Green Startups in Georgia, Access to Funding

Access to funding is a critical factor for the success of green startups. Initiatives like the “Green Growth Fund” provide financial support and technical assistance to green startups, helping them scale operations and increase impact. Additionally, international grants and investment from venture capitalists focused on sustainability play a significant role.

Regulatory Support

Government policies and regulations play a pivotal role in fostering a conducive environment for green innovation. Supportive regulations, tax incentives, and subsidies for renewable energy projects, waste management initiatives, and sustainable practices encourage startups to invest in green technologies.

Government incentives and subsidies for renewable energy projects, waste management initiatives, and sustainable practices are crucial for supporting green innovation. These policies reduce the financial burden on startups and encourage investment. (Ciasullo et al. 2020)

Collaboration and Partnerships

Collaboration between government agencies, industry associations, academic institutions, and civil society organizations is essential for overcoming challenges and driving green innovation. Joint efforts in policy development, research, and capacity building help create a robust ecosystem for sustainable entrepreneurship. Collaboration with academic institutions and research organizations is vital for advancing green technologies. These partnerships can provide access to cutting-edge research, technical expertise, and testing facilities. (Foss & Saebi, 2017)

Challenges Facing Green Startups, Financial Barriers

Despite the availability of some funding sources, financial barriers remain a significant challenge. Green startups often require substantial initial capital for research and development, technology acquisition, and market entry. Access to affordable financing options and investment is crucial for their growth and sustainability.

Regulatory Hurdles

Regulatory barriers can impede the progress of green startups. Complex and inconsistent regulations, bureaucratic red tape, and lack of clarity in policy implementation can create hurdles for startups. Streamlining regulatory processes and providing clear guidelines are essential to supporting green innovation.

Complex and inconsistent regulations can create significant barriers for green startups. Navigating regulatory

requirements can be time-consuming and costly, particularly for small companies with limited resources.

Market Acceptance

Market acceptance is another challenge. Consumers and businesses may be hesitant to adopt new and unfamiliar green technologies. Education and awareness campaigns highlighting the benefits of green products and services are necessary to drive demand and foster acceptance.

Consumer awareness and acceptance of green products and technologies are crucial for market success. Education and awareness campaigns highlighting the benefits of green solutions can drive demand and foster acceptance.

Future Perspectives, Technological Advancements

The future of green innovation in Georgia is promising, with rapid advancements in technology paving the way for new opportunities. Continued investment in research and development, coupled with technological advancements, will drive the creation of innovative solutions to environmental challenges.

International Collaboration

International collaboration and partnerships are crucial for scaling green innovations and transferring knowledge. Collaboration with international organizations, research institutions, and green tech companies can accelerate the adoption of best practices and innovative technologies in Georgia.

Education and Skill Development

Education and skill development are essential for building a workforce capable of driving green innovation. Integrating sustainability into educational curricula and providing training programs in green technologies will equip the next generation of entrepreneurs and professionals with the necessary skills and knowledge.

Renewable Energy, Solar Energy:

Georgia’s geographical and climatic conditions are ideal for the expansion of solar energy projects. Companies like “Solarium Energy” are innovating within the energy sector by developing advanced solar technologies that can be integrated into both urban and rural settings. The government has been supportive, providing subsidies and incentives to encourage investment in solar energy.

Wind Energy:

Wind energy is another promising area. Several wind farms have been established, particularly in the mountainous regions, where wind speeds are optimal. These projects are part of Georgia’s strategy to diversify its energy sources and reduce dependency on imported fossil fuels.

Hydropower:

Georgia has a long history of hydropower development, which continues to be a significant part of its renewable energy mix. New small-scale hydroelectric projects are being developed to provide clean energy to remote areas.

Biomass Energy:

Biomass energy is emerging as a sustainable alternative, particularly in rural areas where agricultural waste can be converted into energy. This not only provides a renewable

energy source but also helps manage waste more effectively.

Recycling Innovations:

Startups like “AMP Robotics” are using artificial intelligence to improve recycling processes, making them more efficient and effective. These technologies help sort and process recyclables faster and with higher accuracy, contributing to a more effective circular economy.

Government Initiatives:

The Georgian government has introduced policies to promote waste reduction and recycling. Programs aimed at educating the public about the benefits of recycling and providing infrastructure for waste separation are crucial to these efforts.

Precision Agriculture:

Precision agriculture technologies, such as IoT devices and drones, are transforming the agricultural landscape in Georgia. These technologies enable farmers to monitor crop health, optimize irrigation, and reduce pesticide use, leading to more sustainable farming practices.

Vertical Farming:

Vertical farming is gaining popularity as a means to produce food in urban areas with limited space. These systems use less water and land than traditional farming methods and can produce food year-round.

Organic Farming:

There is a growing movement towards organic farming in Georgia, driven by consumer demand for healthier and more sustainable food options. Organic farms avoid synthetic pesticides and fertilizers, which help protect the environment and improve soil health.

Agroecology:

Agroecology combines traditional farming practices with modern science to create sustainable and resilient food systems. This approach emphasizes biodiversity, soil health, and the integration of crops and livestock.

Ecotourism and Sustainable Hospitality, Eco-Friendly Lodging:

Ecotourism initiatives in Georgia promote eco-friendly lodging options that minimize environmental impact. These lodges often use renewable energy sources, recycle waste, and source food locally. Ecotourism and sustainable hospitality are integral components of Georgia’s green innovation growth. Sustainable tourism practices include eco-friendly lodging, waste reduction programs, and conservation initiatives. These practices not only attract environmentally conscious tourists but also help preserve Georgia’s rich natural and cultural heritage.

Conservation Efforts:

Ecotourism also supports conservation efforts by raising awareness about environmental issues and generating funds for protected areas. Initiatives such as guided nature tours and wildlife conservation programs are integral to these efforts. (Boons and Lüdeke-Freund 2013)

Community-Based Tourism:

Community-based tourism initiatives involve local communities in the tourism industry, providing them

with economic benefits while preserving their cultural heritage and environment. This approach helps ensure that tourism development is sustainable and inclusive.

Key Trends in Green Technologies

Smart Agriculture:

IoT devices in agriculture provide real-time data on soil moisture, weather conditions, and crop health. This information helps farmers make informed decisions, optimize resource use, and increase yields.

Smart Waste Management:

IoT solutions in waste management include smart bins that signal when they need to be emptied and sensors that monitor waste levels in real-time. These technologies improve waste collection efficiency and reduce costs.

Biotechnology Biodegradable Materials:

Startups like “Materiom” are developing biodegradable materials from natural sources, which can replace conventional plastics. These materials decompose naturally, reducing pollution and the environmental impact of plastic waste.

Bioenergy:

Biotechnology is also being used to produce bioenergy from organic waste. Processes such as anaerobic digestion convert waste into biogas, which can be used for heating, electricity, or as a vehicle fuel.

Sustainable Agriculture:

Biotechnology in agriculture includes the development of drought-resistant crops, biofertilizers, and biopesticides. These innovations help reduce the environmental impact of farming and increase food security.

Battery Technologies:

Advancements in battery technology are crucial for storing renewable energy and ensuring a stable supply. Lithium-ion batteries are commonly used, but research is ongoing into alternatives such as solid-state batteries and flow batteries.

Grid Integration:

Energy storage systems are essential for integrating renewable energy sources into the grid. They help balance supply and demand, store excess energy for later use, and provide backup power during outages.

Microgrids:

Microgrids are localized energy grids that can operate independently from the main grid. They are particularly useful in remote areas and can integrate various renewable energy sources, enhancing energy security and resilience.

Energy Trading:

Blockchain can facilitate peer-to-peer energy trading, allowing individuals and businesses to buy and sell renewable energy directly. This decentralizes the energy market and empowers consumers to participate in the energy transition.

Carbon Credits:

Blockchain technology can streamline the management and trading of carbon credits, making it easier to track emissions reductions and ensure the credibility of carbon offset projects.

Success Factors for Green Startups in Georgia, Access to Funding, Green Growth Fund:

Initiatives like the “Green Growth Fund” provide financial and technical assistance to green startups, helping them scale operations and increase impact. This funding is essential for startups to develop and commercialize innovative technologies.

Venture Capital:

Venture capital firms focused on sustainability are increasingly investing in green startups. These investors not only provide capital but also bring expertise and networks that can help startups grow.

Crowdfunding:

Crowdfunding platforms are another source of funding for green startups. They allow startups to raise small amounts of money from a large number of people, often attracting early adopters and advocates for sustainability.

Clear Regulations:

Clear and consistent regulations are essential for providing a stable and predictable environment for green startups. Governments need to streamline regulatory processes and eliminate bureaucratic red tape that can hinder innovation.

Public-Private Partnerships:

Public-private partnerships can leverage the strengths of both sectors to drive green innovation. Governments can provide funding and regulatory support, while private companies bring expertise and market knowledge.

Industry Associations:

Industry associations can facilitate collaboration between startups, established companies, and other stakeholders. They can also advocate for favorable policies and provide networking opportunities.

Civil Society Organizations:

Civil society organizations play a crucial role in promoting green innovation by raising awareness, advocating for sustainable policies, and supporting grassroots initiatives.

Challenges Facing Green Startups

Financial Barriers and High Initial Costs:

Green startups often face high initial costs for research and development, technology acquisition, and market entry. These costs can be a significant barrier, particularly for small and early-stage companies.

Access to Affordable Financing:

Access to affordable financing is a major challenge for green startups. Traditional financing options, such as bank loans, may not be available or suitable for startups with unproven technologies and business models.

Long Payback Periods:

Green technologies often have long payback periods, which can deter investors looking for quick returns. Startups need to demonstrate the long-term value and impact of their solutions to attract investment.

Bureaucratic Red Tape:

Bureaucratic red tape can delay the approval and implementation of green projects. Streamlining regulatory processes and providing clear guidelines are essential to

supporting green innovation.

Lack of Policy Clarity:

Lack of clarity in policy implementation can create uncertainty for startups. Governments need to provide clear and consistent policies that support green innovation and provide a stable environment for investment.

Supply Chain Integration

Integrating green products into existing supply chains can be challenging due to compatibility issues and logistical complexities. Collaboration with supply chain partners and demonstrating the value of sustainability throughout the supply chain can help overcome these challenges.

Competitive Pricing

Competing with established, non-green alternatives on price can be difficult for green startups. Innovating to reduce production costs, leveraging economies of scale, and accessing subsidies or incentives can help make green products more competitive in the market.

Future Perspectives Technological Advancements Advanced Materials

Continued advancements in materials science, such as biodegradable polymers and nanomaterials, will enable the development of more sustainable products. These materials offer enhanced performance while minimizing environmental impact.

Artificial Intelligence and Machine Learning

AI and machine learning technologies will play a larger role in optimizing resource use, predicting environmental impacts, and enhancing the efficiency of green technologies. These technologies can enable more precise decision-making and automation in various sectors.

Next-Generation Energy Storage

Research into next-generation energy storage technologies, such as solid-state batteries and hydrogen storage systems, will improve the reliability and scalability of renewable energy sources. These advancements are critical for transitioning to a renewable energy-based economy.

Across industries and sectors is essential for achieving circularity on a larger scale.

Policy and Regulatory Frameworks Global Standards

Developing global standards and frameworks for sustainable development and green technologies will facilitate international cooperation and trade. Harmonizing regulations and aligning incentives globally can accelerate the adoption of green innovations.

Climate Resilience Adapting to Climate Change

Increasing resilience to climate change impacts through innovative technologies and adaptive strategies will be crucial. Solutions such as climate-smart agriculture, resilient infrastructure, and disaster preparedness measures will help communities and ecosystems adapt to a changing climate (Nugroho Soebandrija 2018).

Education and Awareness of sustainable practices

Integrating sustainability into education curricula and raising awareness among consumers, businesses, and policymakers about the benefits of sustainable practices will

drive demand for green innovations. Building a culture of sustainability from an early age is essential for long-term behavioral change.

CONCLUSION

The promotion of green innovations in Georgia's startup ecosystem plays a crucial role in enhancing the competitiveness of business models and encouraging the adoption of green technologies. By leveraging the country's natural resources, cultural heritage, and entrepreneurial spirit, Georgia can pave the way for a more sustainable, equitable, and economically prosperous future. Georgia's burgeoning green innovation ecosystem exemplifies a commitment to sustainable development and environmental stewardship. From renewable energy advancements to circular economy initiatives and technological innovations, green startups play a pivotal role in addressing global challenges while fostering economic growth and social well-being. Overcoming financial barriers, navigating regulatory complexities, and enhancing market acceptance are critical for unlocking the full potential of green technologies and achieving a sustainable future for generations to come.

BIBLIOGRAPHY

1. Boons, Frank, and Florian Lüdeke-Freund. 2013. „Business Models for Sustainable Innovation: State-of-the-Art and Steps Towards a Research Agenda“. *Journal of Cleaner Production* 45:9–19. <https://doi.org/10.1016/j.jclepro.2012.07.007>;
2. Ciasullo, Maria Vincenza, Orlando Troisi, Mara Grimaldi, and Daniele Leone. 2020. „Multi-Level Governance for Sustainable Innovation in Smart Communities: An Ecosystems Approach“. *International Entrepreneurship and Management Journal* 16 (4): 1167–95. <https://doi.org/10.1007/s11365-020-00641-6>;
3. Evans, Steve, Doroteya Vladimirova, Maria Holgado, Kirsten Van Fossen, Miying Yang, Elisabete A. Silva, and Claire Y. Barlow. 2017. „Business Model Innovation for Sustainability: Towards a Unified Perspective for Creation of Sustainable Business Models“. *Business Strategy and the Environment* 26 (5): 597–608. <https://doi.org/10.1002/bse.1939>.
4. Foss, Nicolai J., and Tina Saebi. 2017. „Fifteen Years of Research on Business Model Innovation: How Far Have We Come, and Where Should We Go?“ *Journal of Management* 43 (1): 200–227. <https://doi.org/10.1177/0149206316675927>;
5. Nugroho Soebandrija, Khristian Edi. 2018. „Green Innovation and Sustainable Industrial Systems within Sustainability and Company Improvement Perspective“. In *IOP Conference Series: Earth and Environmental Science*. Vol. 109. Institute of Physics Publishing. <https://doi.org/10.1088/1755-1315/109/1/012003>.