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Editorial Introduction

It is with great pleasure that we present the second issue of the *Journal of Regenerative Economics* (*JRE*), a publication that continues to build its reputation as a platform for rigorous, innovative, and practice-relevant research in the expanding field of regenerative economics. Since the release of our inaugural issue, the interest of authors, researchers, and professionals has grown remarkably, affirming the journal's relevance and its potential to become a cornerstone in the academic discourse on regeneration and sustainability. Submissions have spanned diverse geographic and thematic contexts, highlighting the scientific community's eagerness to address the pressing economic, ecological, and social challenges of our time through regenerative perspectives.

JRE has been well received not only by early-career researchers but also by established scholars and practitioners who recognize the need for a conceptual shift—from conventional sustainability toward regenerative systems thinking. The articles featured in this issue demonstrate our commitment to supporting high-quality research and disseminating knowledge that enhances the visibility and appeal of regenerative economics as both a scientific field and a practical framework for socio-economic transformation.

This issue showcases six papers that collectively reflect the interdisciplinary scope and depth of regenerative economics, spanning topics from biodiversity-based entrepreneurship and urban ecology to business strategies, sustainability reporting, and rural development. These contributions explore novel approaches to integrating ecological regeneration with economic innovation, advancing the current state of literature while offering actionable insights for policymakers and business leaders.

The opening paper by **Hasa, Leonetti, and Hoxha** explores the dual landscape of Pro-Biodiversity Businesses (PBBs) and Biodiversity-Based Businesses (BBBs) in protected areas of Southern Europe. Their research provides a critical categorization of these two business types and discusses how theoretical ecological frameworks—such as Island Biogeography and Landscape Ecology—can inform practical strategies for balancing biodiversity conservation with economic viability. Through case studies and conceptual grounding, the paper deepens our understanding of how businesses can either support or threaten ecosystem health, advocating for participatory conservation models and regulatory measures to harness positive synergies.

A complementary urban perspective is offered by **Lalević Filipović et al.**, who analyze the socio-economic dimensions of urban biodiversity management in Montenegro. Their study highlights how rapid urbanization, limited institutional capacity, and public disengagement undermine biodiversity in urban environments. Emphasizing the importance of integrated governance and participatory strategies, the authors make a compelling case for placing biodiversity at the core of urban policy in the Western Balkans, a region facing significant ecological pressures and urban development challenges.

Jovanović Vujatović, Krstić, and Bonić contribute a conceptual and strategic exploration of regenerative business models. Going beyond the sustainability paradigm, the authors argue that regenerative enterprises are not simply reducing

harm but actively creating socio-ecological value. They identify key principles and strategic orientations that can guide businesses toward regenerative performance, offering a robust framework for aligning profit with purpose. Their analysis contributes to a growing body of literature that redefines the role of business in fostering systemic well-being.

Shifting to empirical evaluation, the paper by **Novićevic Čečević, Janković Milić, and Nikolić** investigates whether sustainability reporting contributes to business performance in Serbia. Using statistical analysis of financial data from leading companies, the authors uncover a nuanced relationship—sustainability reporting, while increasingly adopted, appears to have a negative correlation with return on assets (ROA). This unexpected finding challenges assumptions in corporate sustainability literature and calls for deeper inquiry into how reporting practices influence financial outcomes and stakeholder engagement.

In the realm of urban ecological infrastructure, **Jano et al.**, assess the feasibility of using indigenous Albanian bulbous plants for green roofs in Mediterranean climates. Their experimental research in Tirana evaluates the performance of native species under varying irrigation regimes. The study finds that even with limited irrigation, certain species demonstrate resilient flowering and growth patterns, making them viable candidates for ecologically sound and water-efficient green roof systems. This paper fills a critical knowledge gap in Mediterranean urban ecology and promotes nature-based solutions rooted in local biodiversity.

Finally, the issue concludes with a policy-focused paper by **Petrović**, examining the role of Serbia's small and medium enterprise (SME) development strategy in fostering rural entrepreneurship. The paper underscores the strategic importance of rural enterprises for demographic stability and sustainable economic growth. Despite existing policy frameworks, the study reveals that more targeted interventions are needed to unlock the full potential of rural entrepreneurship. Recommendations include infrastructure improvements and alignment with green transition goals, reinforcing the broader vision of regenerative rural economies.

These contributions illuminate diverse pathways toward regeneration, whether through innovative business models, urban ecological design, rural revitalization, or biodiversity-oriented policy. As the *Journal of Regenerative Economics* continues to grow, we remain dedicated to fostering dialogue, collaboration, and knowledge exchange across disciplines and geographies.

JRE is grateful to our authors, reviewers, and readers for their trust and support, and we invite continued engagement as we work to increase the visibility, impact, and scientific integrity of regenerative economics.

Editor-in-Chief

Jelena J. Stanković, PhD

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BALANCING ECONOMIC ACTIVITIES AND BIODIVERSITY: CATEGORIZATION OF PRO-BIODIVERSITY AND BIODIVERSITY-BASED BUSINESSES IN PROTECTED AREAS OF SOUTHERN EUROPE

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Abstract: *Pro-Biodiversity Businesses (PBB) and Biodiversity-Based Businesses (BBB) play distinct roles in integrating economic development with biodiversity conservation. PBBs explicitly aim to conserve biodiversity while ensuring financial viability, operating in sectors such as sustainable agriculture, forestry, ecotourism, and environmental consulting. Conversely, BBBs depend on biodiversity but do not necessarily contribute to its preservation, necessitating strong regulatory frameworks to mitigate environmental risks. Theoretical foundations such as Landscape Ecology, Island Biogeography, and Metapopulation Theory offer insights into the ecological dynamics influencing biodiversity conservation. These frameworks emphasize the importance of habitat connectivity, sustainable land management, and ecological resilience to mitigate habitat fragmentation and species loss. Businesses interact with biodiversity by utilizing ecosystem services and influencing ecological changes through land use, emissions, and resource extraction. Negative impacts include habitat destruction and pollution, whereas sustainable business models can contribute positively by supporting conservation initiatives and adopting eco-friendly practices. Several case studies illustrate successful integration of economic activities with biodiversity conservation. Challenges remain in balancing economic interests with conservation goals, particularly in protected areas where regulatory restrictions may generate resistance from local communities. Fostering PBBs and implementing*

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participatory conservation strategies can bridge these gaps, ensuring that biodiversity conservation and sustainable economic development are mutually reinforcing.

Key words: *Pro-Biodiversity Businesses (PBBs), Biodiversity-Based Businesses (BBBs), Sustainable Development, Biodiversity Conservation.*

1. Introduction

Biodiversity plays a fundamental role in sustaining ecosystems and providing essential services, including climate regulation, water purification, and soil fertility. However, human activities have significantly altered natural habitats, leading to biodiversity loss and ecosystem degradation. In response, conservation strategies increasingly emphasize integrating biodiversity protection with economic activities, fostering businesses that support environmental sustainability while generating financial returns.

Pro-Biodiversity Businesses (PBBs) and Biodiversity-Based Businesses (BBBs) represent two key approaches to integrating economic activities with biodiversity conservation. PBBs actively contribute to biodiversity protection as part of their core mission, incorporating sustainable practices into sectors such as forestry, ecotourism, and organic agriculture. These businesses demonstrate that financial viability and environmental conservation are not mutually exclusive but can be mutually reinforcing.

On the other hand, BBBs rely on biodiversity as a key resource for their operations, encompassing industries such as agriculture, fisheries, and tourism. While some BBBs contribute to conservation efforts, others may deplete biodiversity unless regulated effectively. Establishing a clear distinction between these business models is crucial to designing policies that promote sustainability. Understanding how businesses interact with biodiversity and leveraging their role in conservation is essential for addressing global biodiversity challenges while ensuring long-term economic development.

The primary objective of this manuscript is to explore the role of Pro-Biodiversity Businesses (PBBs) and Biodiversity-Based Businesses (BBBs) in fostering biodiversity conservation while ensuring economic sustainability. In an era where economic development often conflicts with environmental protection, understanding how businesses can contribute positively to biodiversity is crucial. PBBs are designed to integrate conservation efforts directly into their business models, ensuring that their financial success translates into tangible ecological benefits. Meanwhile, BBBs depend on biodiversity for their operations but may not inherently prioritize its protection. By examining these business models, this manuscript seeks to highlight both the opportunities and challenges in aligning economic activities with conservation goals.

A key component of this research is the theoretical exploration of biodiversity conservation within business contexts. Concepts such as Landscape Ecology, Island Biogeography, and Metapopulation Theory provide valuable insights into how businesses can operate within fragmented ecosystems while minimizing

ecological disruption. These frameworks help illustrate the potential for PBBs to enhance habitat connectivity and contribute to ecosystem resilience. Furthermore, case studies of successful PBB initiatives, such as ECO KARST and GrassLIFE, serve as practical examples of how businesses can balance profitability with sustainability. By analyzing these cases, the manuscript aims to identify best practices and key strategies that can be replicated in other regions.

In addition to examining business models and theoretical foundations, this study also assesses the role of policy and regulatory frameworks in supporting or hindering PBBs. Government incentives, legal protections, and corporate responsibility programs are essential mechanisms for ensuring that businesses contribute to conservation rather than exploitation. By providing policy recommendations and strategic insights, this manuscript seeks to bridge the gap between economic interests and environmental stewardship. Ultimately, the manuscript aims to offer a comprehensive understanding of how PBBs can serve as a viable solution to the ongoing challenge of biodiversity loss, fostering a sustainable future for both businesses and ecosystems.

This manuscript is structured as follows: Section 2 presents an overview of PBBs and BBBs, highlighting their differences and significance in conservation. while section 3 provides a theoretical foundation by exploring key ecological concepts relevant to biodiversity conservation and business integration. Section 4 discusses case studies that illustrate successful PBB models, while Finally, Section 5 concludes with recommendations for fostering sustainable business practices that contribute to biodiversity conservation.

2. The Concept of Pro-Biodiversity & Biodiversity-Based Businesses

Pro-Biodiversity Businesses (PBB) are enterprises that generate financial returns while actively contributing to biodiversity conservation. These businesses operate with a dual purpose: achieving economic sustainability and promoting the conservation and sustainable use of biological resources (Volles et al., 2019; RSPB, 2009). PBBs encompass various sectors, including agriculture, fisheries, forestry, eco-tourism, environmental research, and advisory services, ensuring their core business both depends on and contributes to biodiversity (Dickson et al., 2007).

They are characterized by their commitment to biodiversity conservation, equitable benefit-sharing, and sustainable ecosystem management (Bishop et al., 2008; Lambooy & Levashova, 2011). Some PBBs directly enhance biodiversity and ecosystem services, making conservation an integral part of their business models (van Leenders et al., 2015). Additionally, these businesses develop products or services that benefit local natural resources, operating in sectors such as tourism, sustainable agriculture, and agroforestry (Bovarnick & Gupta, 2003).

Biodiversity-Based Businesses (BBB), on the other hand, are enterprises that rely on biodiversity for their production processes. These include industries such as agriculture, fisheries, forestry, tourism, energy, and manufacturing, which depend

on healthy ecosystems to maintain air, water, and soil quality (Earthwatch Institute et al., 2002). While some BBBs inherently support biodiversity conservation—such as ecotourism, which depends on the preservation of natural landscapes—others may pose risks to biodiversity unless managed within a strong regulatory framework (Bayon et al., 2000). In cases where a business's profitability directly depends on a thriving ecosystem, such as nature-based tourism, there is a clear financial incentive to invest in biodiversity management (Bishop et al., 2008). However, biodiversity-based businesses alone should not be the primary strategy for conservation, as broader efforts in sustainable agriculture and land management may be more effective in protecting biodiversity on a larger scale (Bayon et al., 2000).

Key differences between these two categories. PBBs and BBBs differ in their objectives, relationship with biodiversity, and conservation impact:

Objectives: PBBs explicitly support biodiversity conservation while generating financial returns, engaging in ecosystem protection and sustainable resource use (RSPB, 2009; Bishop et al., 2008). In contrast, BBBs depend on biodiversity but do not necessarily prioritize its conservation, leading to varying impacts on ecosystems.

Impact: PBBs integrate conservation into their business models, ensuring financial success benefits ecosystems directly (van Leenders et al., 2015). Conversely, BBBs rely on biodiversity without guaranteeing its preservation, as seen in sectors like agriculture and forestry, which can either support or deplete biodiversity depending on sustainability practices (Bayon et al., 2000).

Regulatory Approaches: PBBs align with conservation policies to ensure long-term biodiversity benefits (Lambooy & Levashova, 2011), while BBBs require oversight and incentives to mitigate potential ecological harm. Only some BBBs, like ecotourism, naturally support conservation (Bayon et al., 2000).

Sustainability: PBBs inherently promote biodiversity conservation as a core aspect of their success (Dickson et al., 2007). In contrast, BBBs vary in sustainability based on whether they adopt conservation practices or contribute to biodiversity loss through unsustainable resource use (Bishop et al., 2008).

Designating protected areas (PAs) is widely regarded as one of the most effective strategies for global biodiversity conservation (Dudley et al., 2014; Johnson et al., 2017; Rodrigues et al., 2004). Studies show that well-managed PAs help prevent habitat loss and sustain species populations (Watson et al., 2014). Additionally, PAs support the livelihoods of millions of people and preserve land carbon stocks, playing a crucial role in climate change mitigation and regulation (Bertzky et al., 2012).

3. Theoretical Foundations

Landscape Ecology and Habitat Fragmentation

Landscape ecology is the study of the reciprocal interactions between spatial heterogeneity and ecological processes. This discipline emphasizes how spatial patterns influence ecological functions and vice versa. The field has its roots in the European tradition of regional geography and vegetation science, with Carl Troll coining the term in 1950. A defining characteristic of landscape ecology is its focus on spatial heterogeneity—variability in environmental factors across space and time—and its impact on ecosystems (Turner, 2005).

A central issue in landscape ecology is habitat fragmentation, defined as the process of breaking up continuous habitats into smaller, isolated patches, often due to human activities (Fahrig, 2003). Fragmentation has profound effects, including loss of biodiversity, reduced species movement, and increased ecosystem instability.

Island Biogeography Theory

Island Biogeography Theory (MacArthur & Wilson, 2001) explains species distribution in isolated habitats based on immigration and extinction dynamics. It holds particular relevance for protected areas, which function as "ecological islands" due to habitat fragmentation. The theory highlights that larger, less isolated habitats support greater biodiversity and experience lower extinction rates, guiding conservation strategies that emphasize larger reserves and ecological corridors (Lomolino et al., 2010).

The number of species in an island-like habitat depends on immigration, influenced by proximity to a species source, and extinction, which is reduced in larger areas with more resources. Larger protected areas generally sustain richer biodiversity, while smaller, more isolated ones face greater species loss risks. Conservation applications of this theory prioritize habitat connectivity to support biodiversity and ecological stability (MacArthur & Wilson, 2001).

While IBT remains fundamental in ecology, modern studies have expanded beyond its simplicity, incorporating landscape ecology, metapopulation dynamics, and conservation genetics for a more comprehensive understanding of fragmented ecosystems (Laurance, 2008).

Metapopulation Theory

Metapopulation Theory, proposed by Hanski (1999), describes populations as networks of subpopulations connected through migration, emphasizing the dynamics of extinction and recolonization. This theory is essential for biodiversity conservation, particularly in fragmented landscapes where species survival relies on dispersal between habitat patches (Levins, 1970). The theory underscores the importance of connectivity in maintaining genetic diversity and ecological resilience.

Hanski developed models integrating habitat patch size, quality, and isolation to predict species persistence. These models inform conservation strategies,

suggesting that maintaining corridors and stepping-stone habitats can enhance species survival. The Incidence Function Model (IFM) has been widely applied to study various taxa, including insects, amphibians, and small mammals (Moilanen, 2002).

Metapopulation Theory also plays a role in protected area management by guiding the design of conservation reserves that prioritize habitat connectivity. It has been used to assess species viability in fragmented landscapes and inform policies aimed at mitigating habitat loss and fragmentation (Hanski & Gilpin, 1991). Furthermore, the theory's relevance extends beyond conservation; it parallels epidemiological models, offering insights into understanding disease spread (Ovaskainen & Grenfell, 2003).

Despite its significance, Metapopulation Theory assumes discrete habitat patches, which may not fully apply to continuous landscapes. Future research should refine the theory to incorporate more complex ecological interactions and habitat gradients, enhancing its applicability in conservation planning (Fahrig, 2002).

4. Businesses interaction with biodiversity

In recent years, human activities have significantly increased their impact on natural resources. Simultaneously, public investments in protecting biodiversity, landscapes, and natural resources have also risen. However, biodiversity conservation cannot rely solely on public funding—it must also involve private entities whose activities depend on these natural resources, as they should contribute to their preservation like any other production factor (Earthwatch Institute et al., 2002).

This concept drives the transition of Biodiversity-Based Economic Activities (BBEA) into Pro-Biodiversity Economic Activities (PBEA), covering sectors such as agriculture, tourism, forestry, and fisheries (Bishop et al., 2008).

- Agriculture plays a crucial role, as healthy ecosystems support soil fertility, sediment control, and clean water. Key activities include organic farming, extensive grazing, landscape maintenance, seed production, and wetland management (Lambooy & Levashova, 2011).
- Agrobiodiversity is a vital component of PBB, focusing on preserving endangered crop varieties and livestock breeds, supported by EU Rural Development Programs and IPARD initiatives (Bayon et al., 2000).
- Ecotourism generates revenue based on ecosystem health. Activities include nature-based hotels, adventure tourism, and Ho.Re.Ca. services that promote biodiversity-based food products (Bishop et al., 2008).
- Forest Management contributes to biodiversity conservation through sustainable timber production, seed collection, non-timber forest product utilization, and eco-tourism within forested areas. Forestry service providers focus on pest control, fire prevention, and ecosystem restoration (Bovarnick & Gupta, 2003).

- Biodiversity Management Services (BMS) involve consulting on nature conservation, project impact assessments, biodiversity monitoring, and environmental certification (van Leenders et al., 2015).
- Sustainable Fisheries ensure ecosystem health and respond to market demands for responsible fishing practices. Examples include organic fish farming, ecotourism-based fishing, and controlling invasive species through targeted fishing (Dickson et al., 2007).
- Sustainable Hunting helps manage invasive species and maintain ecosystem balance. It plays a role in conservation through controlled hunting and habitat management strategies (RSPB, 2009).

In summary, PBB development supports biodiversity conservation while creating economic opportunities for local communities, aligning business needs with nature preservation goals (Volles et al., 2019).

Businesses interact with biodiversity in two main ways: by using ecosystem services and by influencing changes in ecosystems. Key interactions include:

- Economic exploitation (e.g., forestry, fishing, tourism), where sustainability is essential.
- Operational impacts such as land use changes, energy use, and hydrology alterations, which need to be minimized.
- Routine and non-routine consequences, including emissions, pollution, and environmental damage, with a goal of zero impact.

Negative business impacts include land conversion, over-exploitation, greenhouse gas emissions, pollution, and the introduction of invasive species. These can be direct or indirect through supply chains. Secondary impacts, like deforestation due to infrastructure development, can be harder to control and often exceed primary impacts in scale.

On the positive side, businesses can contribute to biodiversity by sourcing sustainably, supporting conservation projects, managing land to enhance biodiversity, and investing in eco-friendly innovation. In protected areas, sustainable business models can align economic goals with conservation efforts, helping to restore ecosystems and fund preservation initiatives (Parr and Simson 2007).

In protected areas, both PBBs and well-managed BBBs can foster synergies between economic development and conservation objectives. PBBs play an active role in ecological restoration and habitat protection, while BBBs, when adopting sustainable practices, can reduce environmental harm and contribute financially to conservation initiatives (van Leenders et al., 2015). Moreover, integrating conservation principles into BBB operations—such as implementing sustainable tourism models where visitor fees support park management—illustrates how these businesses can aid biodiversity conservation in protected areas (Bovarnick & Gupta, 2003).

Overall, PBBs take a proactive approach to biodiversity conservation by embedding ecological sustainability into their core strategies, whereas BBBs can contribute when effective management and regulations promote the sustainable use of natural resources in protected areas.

5. Case Studies in Biodiversity Conservation through Economic Activities

Several studies and projects have demonstrated how economic activities can positively impact biodiversity conservation. The "Probioprise" project (Dickson et al., 2007) explored the role of pro-biodiversity enterprises, identifying their contributions to biodiversity conservation and the motivations behind them. The "Corporate Biodiversity Management Handbook" assessed various biodiversity business sectors, evaluating successful approaches, challenges, and opportunities to integrate market-based conservation efforts. Additionally, “The Business of Biodiversity” highlighted how ecosystem services remain undervalued in markets, advocating for regulatory and economic mechanisms to ensure their proper recognition and conservation.

Numerous frameworks and guidelines have been developed to help businesses integrate biodiversity conservation into their operations. The “Biodiversity Check for Companies” (Kant et al., n.d.) serves as a tool for businesses to assess and mitigate their impacts on biodiversity while aligning with international environmental standards like EMAS III and ISO 14001. Similarly, the "Development Guide for Pro Biodiversity Business" (ECO Karst project) provides structured steps for establishing successful biodiversity-friendly businesses, particularly in protected areas. The "Business and Biodiversity Handbook" offers real-world corporate case studies, illustrating successful business transitions toward biodiversity-friendly practices.

Several EU-funded projects have successfully implemented biodiversity-friendly business models in Southern Europe, demonstrating that economic development and nature conservation can go hand in hand.

The Biodiversity Technical Assistance Unit (BTAU) Project aimed to integrate private-sector investments with public funding to create profitable small and medium-sized enterprises (SMEs) that contribute to biodiversity conservation, particularly in Natura 2000 sites and High Nature Value areas. This initiative, supported by the European Commission, was implemented in Bulgaria, Poland, and Hungary, where three biodiversity technical assistance units were established. These units helped identify and prioritize biodiversity-friendly businesses while facilitating investment through grants, loans, equity purchases, and microfinance agreements. As a result, the project encouraged private-sector involvement in financing and sustainably managing Natura 2000 sites, bridging funding gaps and promoting rural development RSPB (2009).

The ECO KARST Project focused on leveraging the natural heritage of seven protected karst areas in Central and Southeastern Europe as a driver for sustainable

economic development. By working in regions with unique karst landscapes and rich biodiversity, the project supported businesses that adopted sustainable management of ecosystems while raising awareness about their ecological sensitivity. One of its main achievements was promoting pro-biodiversity business opportunities, demonstrating that nature conservation and economic growth can be mutually beneficial (Gattenlöhner et al., 2018). The UNWTO "Practical Guide for the Development of Biodiversity-based Tourism Products" provided insights into sustainable tourism initiatives that contribute to biodiversity conservation, offering practical implementation tools for local businesses.

In Tuscany, the integration of organic farming and agro-tourism has revitalized rural economies while preserving biodiversity. Farmers have adopted sustainable agricultural practices that improve soil health and protect local ecosystems. One notable example is Tenute di Paganico Società Agricola, a large farm in the province of Grosseto that combines grain cultivation, vineyards, olive groves, and semi-wild livestock grazing. By offering visitors an authentic farm experience, including eco-friendly accommodations and local food tastings, this initiative supports the local economy while fostering environmental conservation (STAY project EU, 2024).

Another example is the GrassLIFE project in Latvia, which commenced in 2016. This project aimed to restore over 1,320 hectares of priority grasslands across 14 Natura 2000 sites. By collaborating with 12 farms, GrassLIFE implemented various restoration techniques and developed best practices to enhance both biodiversity and the economic viability of farming on semi-natural grasslands. These efforts have been instrumental in addressing the decline of biodiversity while supporting local agricultural economies (European Comission, 2023).

5. Concluding remarks

Balancing biodiversity conservation with sustainable economic development in Southern Europe's protected areas presents multifaceted challenges. The establishment of protected zones often imposes restrictions on resource use, leading to tensions between conservation objectives and local economic interests. This dynamic is particularly evident in regions where communities have historically depended on natural resources for their livelihoods.

One significant challenge is the perception among local populations that conservation efforts hinder economic growth. In many instances, protected areas are viewed as obstacles to development, especially when restrictions limit activities such as agriculture, forestry, and tourism. This perception can foster resistance to conservation initiatives, undermining their effectiveness. For example, in the Yancheng Biosphere Reserve in China, development activities within the reserve's zones have impacted endangered species and local waterbird communities, highlighting the complex interplay between economic development and biodiversity conservation (Ma et al., 2008).

Moreover, the implementation of conservation policies without adequate stakeholder engagement can exacerbate conflicts. Top-down approaches that

neglect the input and needs of local communities may lead to mistrust and non-compliance. Inclusive conservation strategies that involve local stakeholders are essential to reconcile biodiversity preservation with economic interests. Research indicates that interventions such as education, capacity building, and the development of sustainable livelihoods can serve as leverage points to promote positive transformations in protected areas (Cebrián-Piqueras et al., 2023).

Financial constraints further complicate the balance between conservation and development. Effective management of protected areas requires substantial investment, yet funding is often limited. This shortfall can impede the enforcement of protection measures and the development of infrastructure that supports both conservation and sustainable economic activities. A study evaluating protected area policies in the European Union found that, despite extensive land protection designations, the lack of ambitious conservation efforts and insufficient funding have limited the effectiveness of these areas in enhancing biodiversity (Grupp et al., 2024).

To address these challenges, fostering pro-biodiversity businesses (PBBs) within protected areas has emerged as a viable solution. PBBs are enterprises that generate financial returns without compromising the natural environments they depend on. In Central and South-Eastern Europe, the development of Biodiversity Investment Opportunities (BIO) maps has facilitated the identification of areas suitable for economic activities that align with conservation goals. This participatory approach has been effective in changing perceptions of both park managers and local communities towards protected areas, demonstrating that economic development and biodiversity conservation can be mutually reinforcing (Gorjanc et al., 2022).

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USKLAĐIVANJE PRIVREDNIH AKTIVNOSTI I BIODIVERZITETA: KATEGORIZACIJA PRO BIODIVERZITETNIH I NA BIODIVERZITETU ZASNOVANIH BIZNISA U ZAŠTIĆENIM PODRUČJIMA JUGOISTOČNE EVROPE

Apstrakt: *Pro-biodiverzitetni biznisi (PBB) i biznisi zasnovani na biodiverzitetu (BBB) imaju različite uloge u integraciji ekonomskog razvoja i očuvanja biodiverziteta. PBB-ovi su eksplicitno usmereni na očuvanje biodiverziteta uz obezbeđivanje finansijske održivosti, poslujući u sektorima kao što su održiva poljoprivreda, šumarstvo, ekoturizam i ekološko savetovanje. S druge strane, BBB-ovi zavise od biodiverziteta, ali ne doprinose nužno njegovom očuvanju, zbog čega je neophodno uspostaviti snažne regulatorne okvire kako bi se ublažili ekološki rizici. Teorijski okviri poput pejzažne ekologije, ostrvske biogeografije i teorije metapopulacija nude dragocene uvide u ekološku dinamiku koja utiče na očuvanje biodiverziteta. Ovi okviri naglašavaju značaj povezanosti staništa, održivog upravljanja zemljištem i ekološke otpornosti u cilju ublažavanja fragmentacije staništa i gubitka vrsta. Biznisi ostvaruju interakciju sa biodiverzitetom korišćenjem ekosistemskih usluga i uticanjem na ekološke promene putem korišćenja zemljišta, emisija i eksploatacije resursa. Negativni uticaji uključuju uništavanje staništa i zagađenje, dok održivi poslovni modeli mogu pozitivno doprineti kroz podršku konzervacijskim inicijativama i usvajanjem ekološki prihvatljivih praksi. Nekoliko studija slučaja prikazuje uspešnu integraciju ekonomskih aktivnosti i očuvanja biodiverziteta. Ipak, izazovi i dalje postoje u usklađivanju ekonomskih interesa i ciljeva očuvanja, naročito u zaštićenim područjima gde regulatorna ograničenja mogu izazvati otpor lokalnih zajednica. Podsticanje razvoja PBB-ova i sprovođenje participativnih konzervacionih strategija mogu prevazići ove prepreke i doprineti međusobnom jačanju očuvanja biodiverziteta i održivog ekonomskog razvoja.*

Ključne reči: *Pro-biodiverzitetni biznisi (PBB), biznisi zasnovani na biodiverzitetu (BBB), održivi razvoj, očuvanje biodiverziteta.*

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SOCIO-ECONOMIC ASPECTS OF URBAN BIODIVERSITY MANAGEMENT – STATUS AND CHALLENGES IN MONTENEGRO

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Abstract: *Urban biodiversity plays a crucial role in maintaining ecological balance, enhancing the quality of life, and supporting sustainable urban development. However, rapid urbanization, economic activities, and inadequate management strategies pose significant challenges to biodiversity conservation in Montenegro's cities. This paper examines the current state of urban biodiversity in Montenegro, analyzing key socio-economic aspects that influence its management. It explores the impact of urban expansion, economic policies, and community engagement on biodiversity preservation, highlighting both the benefits and challenges associated with sustainable governance. Additionally, the paper provides recommendations for improving biodiversity management through institutional reforms, economic incentives, and increased public awareness. By addressing these socio-economic dimensions, the study aims to contribute*

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to the development of integrated policies that balance urban growth with environmental sustainability.

Key words: *Urban biodiversity, socio-economic aspects, sustainable development, Montenegro, biodiversity management.*

1. Introduction

Urban biodiversity refers to the variety of living organisms, including flora, fauna, and microorganisms, that inhabit urban and peri-urban areas (Elmqvist et al., 2013). It encompasses green spaces such as parks, gardens, rivers, and urban forests, as well as smaller ecological niches that support wildlife within the built environment. Urban biodiversity plays a crucial role in ecosystem services, including air and water purification, climate regulation, and mental well-being, all of which are essential for sustainable urban living (MEA, 2005).

The conservation of biodiversity within urban settings is increasingly recognized as a key component of sustainable development. Rapid urbanization and infrastructural expansion often lead to habitat fragmentation, loss of native species, and ecological degradation (McDonald, Kareiva, & Forman, 2008). Therefore, integrating biodiversity management into urban planning and governance is essential to maintaining ecological resilience and ensuring long-term socio-economic benefits.

The relationship between socio-economic factors and biodiversity conservation is complex and multifaceted. Economic development, population growth, and land-use changes significantly influence urban biodiversity. Socio-economic variables such as income levels, education, and public awareness determine the extent to which biodiversity-friendly policies and conservation strategies are implemented and supported by local communities (CBD, 2020).

Urban biodiversity contributes directly to economic stability by enhancing ecosystem services that reduce municipal costs associated with flood control, air pollution mitigation, and cooling effects in densely populated areas (Tzoulas et al., 2007). Furthermore, green infrastructure, including urban parks and ecological corridors, has been linked to increased property values, improved public health, and greater recreational opportunities, all of which contribute to a higher quality of life (Fuller & Gaston, 2009).

Montenegro, as a country constitutionally defined as an ecological state (Constitution of Montenegro, 2007), faces particular challenges in balancing urban development and biodiversity conservation. Intensive urbanization, especially in coastal regions, leads to the degradation of natural ecosystems and threatens unique biological diversity (NSSD Montenegro, 2016). In this context, socio-economic factors play a crucial role in shaping conservation policies and integrating ecological standards into urban development.

Montenegro has adopted several national strategic documents to address biodiversity conservation, including the National Strategy for Sustainable Development (NSSD) and the National Biodiversity Strategy and Action Plan

(NBSAP), which align with international commitments (Government of Montenegro, 2016). Furthermore, Montenegro is a signatory to the Convention on Biological Diversity (CBD), a global treaty aimed at conserving biodiversity, ensuring its sustainable use, and promoting fair and equitable sharing of benefits derived from genetic resources (CBD, 1992). These policy frameworks provide a basis for harmonizing urban development with biodiversity protection.

Despite its constitutional commitment to environmental protection, urban biodiversity management in Montenegro remains an underdeveloped and often neglected area. Many strategic documents, including the National Biodiversity Strategy and Action Plan (NBSAP), are outdated or insufficiently implemented, leading to a gap between policy objectives and practical outcomes. Additionally, there is a general lack of public and institutional awareness regarding the socio-economic benefits of biodiversity conservation, which limits efforts to integrate it into urban planning and sustainable development strategies.

The neglect of urban biodiversity has significant implications for economic and sustainable development. The degradation of natural habitats and green spaces in urban areas reduces ecosystem services, leading to increased costs for air pollution control, flood prevention, and climate adaptation. Moreover, the absence of biodiversity-conscious urban planning results in diminished quality of life, lower property values, and fewer economic opportunities linked to eco-tourism and green infrastructure investment. Addressing these challenges requires a comprehensive approach that aligns biodiversity conservation with Montenegro's broader economic and sustainable development goals, ensuring that urban ecosystems are recognized as vital assets rather than expendable resources.

Urban biodiversity in Montenegro remains a largely undervalued and overlooked area, despite its crucial role in economic and sustainable development. According to the *Montenegro: The Economic Value of Biodiversity and Ecosystem Services* report (Emerton, 2013), the country faces significant gaps in integrating biodiversity valuation into economic planning. While national policies reference the importance of ecosystem services, their economic benefits remain largely unquantified, leading to weak financial and institutional support. The lack of systematic data collection and outdated strategic frameworks hinder efforts to align biodiversity conservation with national development goals. As a result, Montenegro risks missing opportunities for sustainable urban planning, eco-tourism expansion, and green infrastructure investment. Strengthening biodiversity management through updated policies, improved valuation methods, and integration into economic planning would not only enhance environmental resilience but also unlock new economic benefits, particularly in sectors like tourism, agriculture, and energy.

Within Chapter 27, the EU supports decisive measures for climate action, sustainable development, and environmental protection. Its regulations cover issues related to climate change, water and air quality, waste management, nature protection, industrial pollution, chemicals, noise, and civil protection. In the European Commission's 2024 report on Montenegro, it is stated that by

November 2023, Montenegro had made very little progress, implementing only 9 out of 116 activities within this chapter (8%). In the biodiversity segment, it is highlighted that progress has been made in establishing the Natura 2000[2] network, with approximately 60% of habitats mapped so far. However, further identification and designation of the remaining locations are still required.

This paper aims to analyze the socio-economic aspects of urban biodiversity management in Montenegro, identify key challenges, and propose strategies for sustainable biodiversity governance in urban environments. The specific objectives include: assessing the current state of urban biodiversity in Montenegro; analyzing the impact of socio-economic factors on biodiversity conservation strategies; and identifying policies and practices that can enhance sustainable urban development.

The research is significant as it provides a foundation for developing better-informed urban ecosystem management policies, with a particular focus on aligning economic interests with ecological principles. Given Montenegro's constitutional commitment to being an ecological state, it has the potential to become a regional model for sustainable urban development—provided that biodiversity management strategies are adapted to socio-economic realities and integrated into broader urban planning frameworks. The findings will also contribute to global discussions on urban biodiversity conservation within the framework of the Convention on Biological Diversity (CBD) and the United Nations Sustainable Development Goals (SDGs).

2. Status and trends of urban biodiversity in Montenegro

Montenegro's urban ecosystems are characterized by a unique interplay of natural and anthropogenic elements, including coastal zones, riverine systems, and green spaces such as parks and urban forests. These ecosystems provide critical habitats for native species and deliver essential ecosystem services, including climate regulation, water purification, and recreational opportunities (Elmqvist et al., 2013). However, rapid urbanization, particularly in coastal cities like Podgorica, Budva, and Bar, has led to significant ecological pressures. Key challenges include habitat fragmentation, loss of native species, and the spread of invasive species, which threaten the resilience of urban biodiversity (Government of Montenegro, 2016).

Urban expansion often prioritizes infrastructure development over ecological considerations, resulting in the degradation of natural habitats and green spaces. For instance, the construction of tourism-related infrastructure along Montenegro's coastline has led to the destruction of sensitive ecosystems, such as wetlands and dune systems, which are vital for biodiversity (Emerton, 2013). Additionally, inadequate waste management and pollution further exacerbate the challenges faced by urban ecosystems, undermining their ability to support diverse flora and fauna.

[2] Natura 2000 is a network of nature protection areas in the territory of the EU.

To summarize, several trends indicate a continued decline in urban biodiversity in Montenegro:

- Urbanization and Land-Use Change: The expansion of urban areas, particularly along the Adriatic coast, has led to significant habitat loss and fragmentation, reducing green space availability for wildlife.
- Pollution and Environmental Degradation: Air and water pollution from industrial activities, traffic, and waste disposal negatively impact biodiversity and ecosystem services.
- Climate Change Impacts: Rising temperatures, altered precipitation patterns, and extreme weather events pose additional stress on urban ecosystems, affecting species composition and ecosystem stability.
- Limited Policy Implementation: While Montenegro has adopted various national strategies, their implementation remains weak due to insufficient financial and human resources.

Montenegro has established several policy frameworks aimed at biodiversity conservation, including the National Strategy for Sustainable Development (NSSD) and the National Biodiversity Strategy and Action Plan (NBSAP). These documents align with international commitments, such as the Convention on Biological Diversity (CBD), and emphasize the importance of integrating biodiversity conservation into urban planning (Government of Montenegro, 2016). By adopting the NBSAP, Montenegro reaffirms its strategic commitment to the conservation and sustainable use of biodiversity. The document highlights key issues related to biodiversity protection in the sectors of tourism, spatial planning, and infrastructure, as well as the threats and factors endangering biological diversity. It also defines the vision of Montenegro for 2050, in which functional ecosystems and rich biodiversity serve as the foundation for the sustainable and harmonious development of the country and its inhabitants. However, the implementation of these policies remains inconsistent, with limited enforcement and monitoring mechanisms in place.

One of the key shortcomings of existing policies is their lack of specificity regarding urban biodiversity. While the NBSAP acknowledges the importance of ecosystem services, it does not provide detailed guidelines for managing biodiversity in urban areas. Furthermore, the absence of a comprehensive urban biodiversity action plan limits the effectiveness of conservation efforts. For example, urban green spaces are often underutilized as tools for biodiversity conservation, and their potential to serve as ecological corridors remains largely untapped (Tzoulas et al., 2007).

Urbanization and economic activities, particularly tourism and real estate development, have had profound impacts on Montenegro's urban biodiversity. The rapid growth of coastal cities has led to the conversion of natural habitats into built environments, reducing the availability of resources for native species and disrupting ecological processes (McDonald et al., 2008). For instance, the

construction of hotels and resorts along the Adriatic coast has resulted in the loss of critical habitats for migratory birds and marine species.

Economic activities also contribute to pollution, which further degrades urban ecosystems. For example, untreated wastewater and solid waste from urban areas often find their way into rivers and coastal waters, affecting aquatic biodiversity and reducing the quality of ecosystem services (Emerton, 2013). Additionally, the lack of green infrastructure in urban planning exacerbates the impacts of climate change, such as increased temperatures and flooding, which disproportionately affect urban biodiversity.

Despite these challenges, there are opportunities to mitigate the negative impacts of urbanization through sustainable planning and policy interventions. For example, integrating green infrastructure, such as urban parks, green roofs, and ecological corridors, into urban development plans can enhance biodiversity while providing socio-economic benefits, including improved public health and increased property values (Fuller & Gaston, 2009). Furthermore, raising public awareness about the value of urban biodiversity and promoting community engagement in conservation efforts can help bridge the gap between policy and practice.

Without effective intervention, the decline of urban biodiversity will continue, leading to increased environmental risks, economic costs, and reduced quality of life. Strengthening policy enforcement, increasing investment in green infrastructure, and enhancing public engagement are essential steps toward reversing biodiversity loss and promoting sustainable urban ecosystems in Montenegro.

3. Socio-economic aspects of urban biodiversity management

The economic development of every country largely depends on biodiversity and ecosystem services, which provide the foundation for stable economic growth and the sustainable use of natural resources. Many developing countries do not adopt a sustainable approach and, in this context, rely on the exploitation of natural wealth, often failing to adequately assess its long-term ecological and economic value.

In light of modern environmental challenges, the conservation and sustainable management of ecosystems are essential for poverty reduction and improving the quality of life. The regulation and protection of ecological systems, along with their integration into development policies, contribute to socio-economic progress and enhance resilience to climate change. At the global level, regulators aim to prevent ecological disasters through various measures and to direct the activities of individuals and institutions towards promoting environmental awareness and preserving primary biodiversity.

This is particularly relevant because biodiversity plays a vital role in various economic sectors, including agriculture, fisheries, forestry, and tourism. These

sectors not only generate economic revenues but also ensure ecological stability and the long-term sustainability of resources.

As previously highlighted, Montenegro, with its rich natural landscapes and diverse ecosystems, attracts a large number of tourists. National parks, protected areas, and coastal ecosystems are key attractions that contribute to the economy through tourism revenue. However, unregulated development in this sector can lead to habitat degradation, pollution, and excessive resource exploitation. Sustainable tourism requires the implementation of strategies that balance economic growth with biodiversity protection.

Agriculture is a key pillar of food security and a significant economic factor, particularly in rural areas. Sustainable agriculture involves food production with minimal environmental impact while preserving natural resources and biodiversity. Montenegro, especially its northern region, has significant potential for the development of sustainable agriculture, including the preservation of fertile soil and the reduction of pesticide use.

The Ministry of Agriculture, Forestry, and Water Management[3] implements various support measures aimed at improving organic production and expanding it to a larger scale. However, challenges such as rural depopulation, limited access to modern technologies, and insufficient investment in sustainable production remain obstacles to the further development of this sector in Montenegro.

Forests represent an invaluable natural resource, providing a wide range of ecological and economic benefits. They play a crucial role in protecting water resources, mitigating climate change effects, controlling erosion, storing carbon dioxide, and preserving biodiversity. In addition to their ecological significance, forestry in Montenegro also has an important economic role. However, its long-term sustainability is threatened by excessive logging, illegal exploitation, and the degradation of forest ecosystems.

Aware of these challenges, the Government of Montenegro has adopted the Forestry Development Strategy (2024–2028), which, through its Action Plan, defines concrete measures to ensure the sustainable management of forest resources. The application of modern and sustainable forestry practices, including reducing deforestation and enhancing afforestation, is essential for preserving natural wealth and improving environmental quality.

The marine and freshwater ecosystems are vital sources of food and income for local communities. Sustainable fisheries management is crucial to preventing overfishing and the degradation of aquatic ecosystems. In Montenegro, fishing and fish processing are significant economic activities, but it is necessary to ensure the rational use of resources through regulatory measures such as quotas and the protection of spawning grounds.

Globally, fisheries subsidies amount to between $15 and $35 billion annually, with a dual impact—while some forms of support promote sustainable sector

[3] https://www.gov.me/clanak/organska-proizvodnja

management, many subsidies contribute to overfishing and the depletion of fish stocks.[4]

Beyond its general ecological importance, biodiversity plays a particularly significant role in urban areas. Given the fast pace of life and high population density, preserving and enhancing urban biodiversity can greatly contribute to improving quality of life, strengthening ecological stability, and fostering socio-economic development. Green spaces, urban forests, and ecosystem services provided by biodiversity are key factors in reducing stress, improving microclimatic conditions, and enhancing urban resilience to environmental challenges.

Ecosystem services of urban biodiversity include: air and water purification, temperature and microclimate regulation, increased resilience to climate change, and reduction of cities' ecological footprint.

However, the unequal distribution of green spaces can lead to social and environmental inequality. Studies show that wealthier urban areas have greater biological diversity and better-maintained ecosystems, while poorer city districts often have fewer green spaces and lower environmental quality.[5] In Montenegro, unsustainable urban development, pollution, and habitat degradation pose challenges to the preservation of urban biodiversity.

To protect urban biodiversity, it is necessary to implement integrated urban planning policies, improve legal frameworks and protection mechanisms, and encourage active citizen and community participation in managing natural resources. As one of Europe's ecological states, Montenegro possesses exceptionally rich flora and fauna, with over 3,250 recorded plant species, making it one of the most biodiverse countries in the region. Its natural habitats, ranging from high mountain areas to coastal ecosystems, provide a home for numerous endemic and protected species.

However, the key challenges in biodiversity protection in Montenegro include the inadequate implementation of environmental laws and regulations, increasing pressure from urbanization and infrastructure projects, the negative impact of climate change on ecosystems, and a lack of financial resources for the conservation and restoration of endangered areas, all of which will be further discussed in the following sections.

3.1. Economic benefits and costs of biodiversity conservation

A key challenge in financing biodiversity conservation in Montenegro is ensuring long-term revenue sources and actively involving the private sector through market-based incentives. Mechanisms such as payments for ecosystem services,

[4] Convention on Biological Diversity. (2010) Biodiversity, Development and Poverty Alleviation: Recognizing the Role of Biodiversity for Human Well-being. pg. 29

[5] Leong, M., Dunn, R. R., & Trautwein, M. D. (2018). Biodiversity and socioeconomics in the city: a review of the luxury effect. *Biology Letters*, *14*(5), 20180082, pg. 2. http://dx.doi.org/10.1098/rsbl.2018.0082

sustainable certifications, and green bonds can help secure the financial sustainability of natural resource protection. Investments in biodiversity not only contribute to ecological stability but also open new economic opportunities and strengthen the country's sustainable development.

A systematic assessment of the economic value of biodiversity and ecosystem services has not yet been conducted for Montenegro. In recent years, some studies have evaluated the value of ecosystems and services related to the Tara River[6] and protected areas[7]. Additionally, the Environmental Protection Agency[8] has conducted numerous studies on protected areas, analyzing the socio-economic impact of conservation measures. However, a comprehensive and systematized overview is still lacking. The most significant attempt at a national biodiversity and ecosystem services assessment in Montenegro was presented in the 2013 report by the Ministry of Sustainable Development and Tourism[9]. The study estimated that the total value of ecosystem services in Montenegro for 2011 was €982 million, distributed as follows:[10]

- Provisioning services (e.g., timber biomass, livestock fodder) – €169 million (17%)
- Regulation and maintenance services (e.g., soil fertility, pollination, coastal protection) – €276 million (28%)
- Cultural services (e.g., landscape and nature-based recreation) – €537 million (55%)

However, public funding for biodiversity protection in Montenegro remains low. For example, in 2015, the annual budget for managing protected areas was only €2 million (€1,800 per km²), which is insufficient for effective ecosystem conservation and enhancement. Increasing investments in natural capital would require a larger public funding commitment but would also bring long-term economic benefits.

According to available analyses, between 2011 and 2020, as much as 77% of the benefits derived from biodiversity and ecosystem services came from the direct added value in the agriculture, livestock, fisheries, and forestry sectors, while the remaining 23% consisted of avoided costs related to hydropower protection, water supply, settlement, and infrastructure development.

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[6] Freyhof, J., Weiss, S., Adrović, A., Ćaleta, M., Duplić, A., Hrašovec, B., ... & Zabric, D. (2015). The huchen (Hucho hucho) in the Balkan region: distribution and future impacts by hydropower development. In *"12. Hrvatski biološki kongres s međunarodnim sudjelovanjem"*, pg. 15-16.

[7] Emerton, L. (2011). The economic value of protected areas in Montenegro. UNDP Montenegro, Podgorica

[8] https://epa.org.me/

[9] Government of Montenegro. (2015). National biodiversity strategy with an action plan for the period 2016-2020. Podgorica.

[10] Emerton, L. (2013). *Montenegro: The economic value of biodiversity and ecosystem services.* UNDP/GEF.

The cumulative economic gains from implementing the revised National Biodiversity Strategy and Action Plan (NBSAP) were estimated at €150 million by 2014, €328 million by 2017, and €541 million by 2020. These figures highlight that investments in natural resource protection yield substantial financial returns and enhance the economy's resilience to environmental and climate challenges. Additionally, estimates suggest that for every €1 invested in biodiversity conservation, Montenegro can generate up to €29 in economic benefits through ecotourism and ecosystem services, demonstrating a high return on investment in this sector.[11]

The economic value of biodiversity in Montenegro is best understood through its impacts on ecotourism, public health, and climate and air quality regulation. Urban areas that integrate green spaces and preserved natural resources attract nature-focused tourists, boosting the economy through increased spending on accommodation, food, and services. The presence of parks and green spaces improves both physical and mental well-being, reducing healthcare costs and increasing productivity. Green areas help mitigate the urban heat island effect and improve air quality, reducing economic losses associated with pollution-related health issues. On the other hand, the costs of maintaining biodiversity primarily involve the upkeep and management of urban green spaces, requiring funding for planting, irrigation, maintenance, and the protection of plant and animal species. Additionally, land dedicated to green areas could be used for more profitable purposes, such as residential or commercial development, which represents a potential economic loss for investors.

3.2. Role of institutions, local communities, and the private sector

The conservation of biodiversity and sustainable management of natural resources require synergy and coordinated collaboration between governmental institutions, local communities, and the private sector. National and local authorities play a key role in creating and implementing legal regulations and nature protection strategies, while communities and the private sector contribute through practical initiatives and investments in sustainable development.

In Montenegro, biodiversity protection is regulated through the actions of the Ministry of Ecology, Spatial Planning, and Urbanism, which enacts laws and strategies for nature conservation, and the Environmental Protection Agency, which monitors ecosystem conditions and implements protection measures. National strategies, such as the National Sustainable Development Strategy until 2030 (NSOR) and the National Biodiversity Management Strategy (NSUB), aim to integrate biodiversity conservation principles into sectoral policies, including agriculture, tourism, and energy.

Furthermore, adopting a legal framework that encourages sustainable resource use, pollution control, and protection of natural habitats is crucial for long-term

[11] Government of Montenegro. (2015). National biodiversity strategy with an action plan for the period 2016-2020. Podgorica.

ecological stability. The Government of Montenegro also relies on international organizations, such as UNDP, the World Bank, and the European Union, which provide financial and technical support through various biodiversity protection projects.

Local communities, especially those dependent on natural resources, possess valuable traditional knowledge and practices that can contribute to ecosystem conservation. Their inclusion in decision-making and natural resource management increases the effectiveness of protective measures. For example, models of joint forest management and compensation through Payments for Ecosystem Services (PES) allow communities to economically benefit from nature conservation.

However, one of the key limitations for local communities in Montenegro is the lack of financial capacities, which often leads to dependence on state and international donations. Therefore, it is important to strengthen local ecological funds, where they exist, and encourage the development of economically sustainable initiatives such as ecotourism and organic farming.

The private sector can play a crucial role in biodiversity protection through sustainable business practices, ecological innovations, and funding nature conservation projects. For instance, ecotourism, based on the conservation of natural landscapes and ecosystems, can significantly contribute to local economies while simultaneously protecting natural resources.

In Montenegro, the potential of the private sector in this area is still not fully realized. Many companies still do not integrate ecological standards into their operations, while investments in green infrastructure and renewable energy sources are limited. Encouraging the private sector to adopt socially responsible business practices through tax incentives and subsidies could significantly increase their contribution to biodiversity conservation.

One key aspect is also the inclusion of green spaces in urban planning, where companies and investors could contribute to the development of sustainable residential and business zones, thus increasing the attractiveness of real estate and improving microclimatic conditions in cities.

Despite existing strategies and laws, coordination between different stakeholders in Montenegro still poses a challenge. It is necessary to strengthen inter-sectoral cooperation, better integrate scientific research into decision-making processes, and raise public awareness of the importance of biodiversity.

3.3. Key challenges in financing and implementing policies

Biodiversity financing in Montenegro and around the world often faces a lack of long-term revenue sources. While international organizations and governments invest significant funds in nature conservation, these resources are often insufficient to cover all the needs for ecosystem protection and the implementation of sustainable policies.

In Montenegro, budgetary constraints at the national and local levels further complicate the financing of urban biodiversity conservation projects. Investments are redirected towards infrastructure projects and economic growth, while nature protection remains a secondary priority. The National Biodiversity Management Strategy (NSUB) proposes the introduction of clearly marked budget items for biodiversity conservation financing, as well as the establishment of a specific Biodiversity Fund or a designated sub-account for collecting funds from various sources.

Although the Biodiversity Fund has not yet been established, the Eco Fund[12] provides certain incentives for nature conservation. For example, in 2025, in cooperation with the Ministry of Ecology, Sustainable Development, and Northern Development, through the "Integrating Biodiversity into Sectoral Policies and Practices and Strengthening Key Biodiversity Points (GEF7)" project, a Public Call for implementing support measures was announced. These measures include the conservation of endangered breeds and varieties of domestic animals and plants, as well as the preservation of biodiversity in grasslands and arable lands, i.e., the protection of landscape features.

One of the key challenges in implementing biodiversity conservation policies in Montenegro is the insufficient integration of ecological goals into sectoral strategies such as agriculture, energy, urban planning, and tourism. Biodiversity is often treated as an isolated issue, rather than being a key element when creating development plans. It is evident that in Montenegro, conflicts of interest between various institutions often occur, reducing the efficiency of nature protection. For example, urban planners and ecologists do not collaborate enough in creating sustainable strategies, while the lack of clear regulatory requirements leads to the neglect of biodiversity data in spatial plans.

National parks and nature reserves often lack stable funding sources, which makes their long-term conservation difficult. In Montenegro, as in many other countries, there is a need for the development of alternative financing mechanisms, such as eco-tourism fees, public-private initiatives, and payments for ecosystem services. The introduction of these models could enable the self-sustainability of protected areas, reducing their dependence on budgetary constraints.

Although Montenegro has laws regulating biodiversity protection, their implementation is limited due to the lack of oversight, political pressures, and inadequate penal mechanisms. In this context, one of the problems is the low level of inspection control, which leads to non-compliance with the law, illegal logging, and degradation of natural habitats. Strengthening the legal framework and improving the capacity of institutions to enforce laws are crucial steps for improving biodiversity protection.

Furthermore, the growth of urban areas and the increased need for new residential and business spaces lead to the reduction of green spaces and the loss of biodiversity. This problem is particularly pronounced in the coastal and central

[12] https://www.eko-fond.co.me/konkurs-template?id=140

parts of Montenegro, and these areas are also the most critical in terms of biodiversity conservation.

The challenges mentioned above are just some of the key issues that Montenegro faces on its path to biodiversity conservation. Addressing these challenges requires innovative financing approaches and stronger international cooperation to ensure a long-term financial foundation for biodiversity conservation and the integration of biodiversity preservation into economic and development strategies. It is also important to introduce fiscal incentives for nature protection, such as tax breaks for companies investing in ecosystem protection, as well as ecological taxes and ecosystem services.

4. Recommendations for sustainable management and future development

Conservation of Biodiversity and Sustainable Management of Natural Resources in Montenegro requires an integrated approach that includes institutional reforms, economic incentives, and educational initiatives. Key steps include decentralization of resource management, reform of property rights, and alignment of national biodiversity strategies with Montenegro's sustainable development policies. More efficient law enforcement, strengthening inspection capacities, and stricter penalties for environmental violations are necessary for the long-term protection of the country's natural ecosystems.

Looking at Montenegro, the following recommendations for sustainable biodiversity development in the near future can be made:[13]

- Integration of Biodiversity into Sectoral Policies: It is essential for nature conservation to become an integral part of national development strategies, particularly in sectors such as agriculture, tourism, energy, and infrastructure.
- Strengthening Institutional Capacities: The Agency for Nature and Environmental Protection should continue improving its capacity to enforce laws and monitor biodiversity status. The establishment and management of an environmental information system, which includes a registry of protected areas, represents a step in the right direction.
- Development of Local Action Plans for Biodiversity: Municipalities should adopt local action plans for biodiversity, in accordance with the Nature Protection Law, to ensure the implementation of protection measures at the local level.

There are several examples of good practices and economic incentives that contribute to biodiversity conservation, such as:[14]

[13] http://prirodainfo.me/

[14] Convention on Biological Diversity. (2010) Biodiversity, Development and Poverty Alleviation: Recognizing the Role of Biodiversity for Human Well-being.

- Payments for Ecosystem Services: Mechanisms such as financial compensation to local communities for forest, waterway, and other environmental protection efforts. For example, farmers and forest workers can receive financial incentives for preserving natural habitats, reducing pesticide use, and applying agroecological practices.
- Sustainable Tourism: Models that show how tourism can contribute to local development and ecosystem protection, ensuring economic benefits for local communities. For example, tourism in national parks can involve local guides, crafts, and eco-friendly accommodations.
- Ecological Certifications and Market Incentives: Programs that allow consumers to recognize products that come from sustainable sources, thereby encouraging sustainable practices.
- Renewable Energy and Energy Efficiency: The use of renewable energy sources, such as solar and wind power, reduces pressure on ecosystems and helps in the fight against climate change.

In addition, incentives such as:[15] a) Sustainable urbanism and b) Financial taxes can also be implemented. Cities around the world are adopting models based on the integration of nature into urban environments, such as "green roofs," vertical gardens, and the regeneration of degraded areas into parks. Introducing ecological taxes on polluters and redistributing the revenue into ecological projects can contribute to the long-term sustainability of urban ecosystems.

Montenegro provides a good example of integrating agriculture and biodiversity conservation through the support program of the Ministry of Ecology and the Eco-Fund, as already highlighted. At the same time, the development of ecotourism and the improvement of national park management can further contribute to the economic development of local communities while preserving natural resources.

As already mentioned, education at all levels and raising public awareness are of crucial importance for the long-term conservation of biodiversity in Montenegro, and schools and universities play an important role in promoting ecological literacy through practical projects and educational programs. Informing citizens through the media, digital platforms, and public initiatives contributes to creating ecological awareness and active engagement in the protection of natural resources. Through volunteer actions, sustainable agriculture, and ecological projects, local communities can directly participate in preserving ecosystems and strengthening ecological responsibility in Montenegro.

[15] Leong, M., Dunn, R. R., & Trautwein, M. D. (2018). Biodiversity and socioeconomics in the city: a review of the luxury effect. *Biology Letters*, *14*(5), 20180082. http://dx.doi.org/10.1098/rsbl.2018.0082

5. Conclusion

The preservation and enhancement of urban biodiversity in Montenegro represent a key challenge in the context of rapid urbanization, economic development, and institutional limitations. Although Montenegro is constitutionally defined as an ecological state and committed to international agreements on nature protection, there remains a significant gap between strategic goals and their implementation in practice.

A lack of financial resources, weak law enforcement, and limited institutional coordination contribute to the degradation of urban ecosystems. At the same time, urban development and tourism activities often have a negative impact on natural habitats, leading to the loss of native species and a decline in the quality of life for residents.

Improving sustainable biodiversity management requires the integration of ecological principles into sectoral policies, strengthening institutional capacities, and introducing economic incentives for nature conservation. In this context, it is crucial to enhance local action plans and ensure their proper implementation, increase investments in green infrastructure, and encourage greater involvement of the private sector and local communities in ecosystem conservation.

More effective biodiversity protection would not only contribute to ecological stability but also bring economic benefits through sustainable tourism, agriculture, and improved urban living conditions. Montenegro, as a country with exceptional natural wealth, has the potential to become a model for sustainable urban development, but this requires the urgent alignment of ecological policies with economic and urban planning strategies.

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SOCIOEKONOMSKI ASPEKTI UPRAVLJANJA URBANIM BIODIVERZITETOM – STANJE I IZAZOVI U CRNOJ GORI

Apstrakt: *Urbani biodiverzitet ima ključnu ulogu u očuvanju ekološke ravnoteže, unapređenju kvaliteta života i podršci održivom urbanom razvoju. Ipak, ubrzana urbanizacija, intenzivne ekonomske aktivnosti i neadekvatne strategije upravljanja predstavljaju značajne izazove za očuvanje biodiverziteta u gradovima Crne Gore. Ovaj rad analizira trenutno stanje urbanog biodiverziteta u Crnoj Gori, sa fokusom na ključne socioekonomske aspekte koji utiču na njegovo upravljanje. Poseban akcenat stavljen je na uticaj urbanog širenja, ekonomskih politika i uključivanja lokalnih zajednica na očuvanje biodiverziteta, uz isticanje koristi i izazova koji prate održivo upravljanje. Takođe, rad daje preporuke za unapređenje upravljanja biodiverzitetom kroz institucionalne reforme, ekonomske podsticaje i povećanje javne svesti. Sagledavanjem ovih socioekonomskih dimenzija, cilj istraživanja je doprinos kreiranju integrisanih politika koje će uskladiti urbani razvoj sa principima ekološke održivosti.*

Ključne reči: *Urbani biodiverzitet, socioekonomski aspekti, održivi razvoj, Crna Gora, upravljanje biodiverzitetom.*

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KEY ASPECTS OF REGENERATIVE BUSINESS MODEL: CONCEPT, PRINCIPLES AND STRATEGIES

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Abstract: *Regeneration is an innovative conceptual approach to sustainability, as well as an innovative business model. This approach goes beyond conventional sustainability which is focused on resource efficiency and technology in order to minimize damage to society and the environment. The idea of a regenerative business model is not just about avoiding degeneration, it is about aims to surpass traditional sustainability concept. It is an approach that makes it possible to meet current needs without compromising the ability to meet future needs. In the regenerative business strategy, sustainable business practice is no longer satisfactory - it requires more than conservation at the current level. In addition, a new business model is emerging that combines the concepts of sustainability and regeneration - regenerative sustainability. In accordance with the above, the aim of this paper is to identify the key principles of regenerative business, to review the key determinants of a successful regenerative business strategy and to discover the role of this innovative business model in modern enterprises.*

Key words: *Regenerative business, innovative business model, regenerative strategy, principles, enterprise.*

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1. Introduction

A regenerative business model is an innovative model and approach to the relationship that exists between an enterprise and the socio-ecological system within which it operates. It goes beyond the requirements of business sustainability that is based on the minimization of environmental damage in the long term. However, the regenerative model includes a sustainable business model. It is recognized that all systems and their elements are part of one overall socio-ecological system. In this system, there is mutual feedback and mutual dependencies between all elements.

The concept of business sustainability still highlights the enterprise and its strategy, aiming at strategies for less harmful social and environmental practices to achieve sustainable competitive advantage (Domanović et al., 2020) and preserve existing human well-being (Marković et al., 2020). Nevertheless, in the regenerative business strategy, sustainable practices and initiatives are no longer sufficient. Enterprises must move to "giving back", by building jobs and infrastructure that create the conditions for the renewal and flourishing of life. It highlights a necessity of new economic thinking, originally in the field of urban planning and the urban environment - attuned to the principles of nature and its relevance to financial, economic and industrial systems.

In addition, a new business model has evolved - regenerative sustainability. It can be seen as a creative partnership with nature for the restoration and regeneration of the global socio-ecological system. Regenerative sustainability is focused on transforming worldviews. It recognizes that communities and stakeholders determine whether a system thrives or declines. Places are constantly changing, and fostering the ability to evolve and regenerate through adaptation, self-organization, and healthy decision-making is key to supporting long-term well-being. This approach sees the world as a dynamic system in constant transition, rather than as a series of problems and solutions. It also emphasizes the importance of both inner and outer dimensions (personal and environmental factors) in driving transformational change towards thriving systems, an aspect often overlooked by traditional sustainability models.

2. Key determinants of the regenerative sustainability concept

Business sustainability is focused on holistic thinking and concerning the problem of environmental damage (Bojović, 2011; Brozovic, 2020; Haar, 2024). It highlights a systemic approach and places business activity within the ecological limits of the natural biosphere in order to maintain the functionality of the general socio-ecological system. In this way, vitality and longevity are not provided only to individual enterprises and individuals, but to the entire system socio-ecological system, and for which the requirement that each individual organization and individual contributes to the goal of sustainability, is necessary, in order to achieve it (Hahn & Figge, 2011; Antikainen & Valkokari, 2016; Ludeke-Freund et al., 2019). This reflects the key

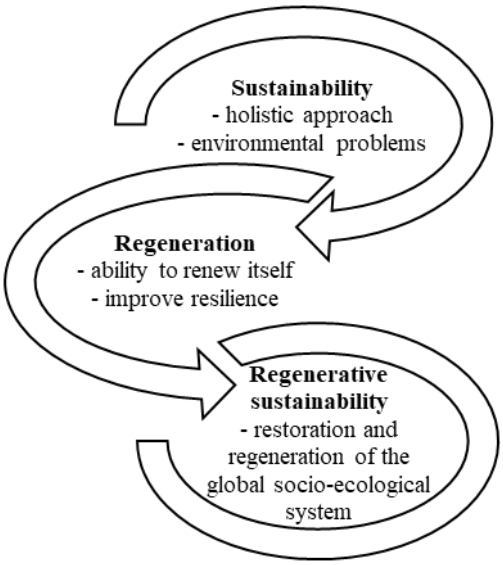
connection with the concept of regeneration. Namely, sustainability is focused on relationships that enable not only life-supporting conditions, but also a healthy ecosystem at the global level (Zucchella & Previtali, 2019).

Researchers increasingly highlight the importance of businesses in transitioning toward a sustainable and regenerative economy, particularly in restoring ecological and social systems. Some businesses, referred to as "regenerative," are leading this shift by integrating natural and business systems in a way that promotes the co-evolution and health of socio-ecological systems. Namely, regenerative businesses thrive through the health of socio-ecological systems and require co-creative partnerships with nature aimed at restoring the global system. Although empirical research on regenerative business models is limited, it suggests that these businesses focus on restoring nature, climate, biodiversity, and indigenous communities, while also honoring cultural heritage. This requires a value proposition that addresses both customers and the environment. Core principles of regenerative business models emphasize co-evolution and co-creation, with human and natural systems at the center (Drupsteen & Wakkee, 2023).

Regeneration is relative to the ability of a socio-ecological system to renew its elements continuously (Lyle, 1996, p. 12; Dake, 2018; Andreucci et al., 2021). The concept originates from natural sciences, referring to the ability of ecosystems and organisms to be restored (Munoz & Branzei, 2021). Later, this term was used in architecture, tourism and the environment to indicate the need to preserve certain structures and systems. In the context of enterprises, regeneration is used to emphasize the importance of preserving and rebuilding ecosystems to improve their resilience (Das & Bocken, 2024; Young & Nash, 2020; Emanuelsson et al., 2021; Du Plessis, 2012). Accordingly, regeneration is based on business operations that are limited by the ability to improve living systems (Ryan et al., 2023; Jain, 2021) The concept of regeneration is focused on the restoration and regeneration of ecosystems and societies as well as on ecological health, biodiversity, and community resilience including transformations and nature-based solutions at different levels (Khan, 2024). It can be said that the concept of regeneration goes one step further concerning the concept of sustainability because it includes human well-being in addition to the economy and nature (Walls & Vogel, 2023). This means that this concept does not ignore the economic goals of the business, but there is a limitation imposed by nature and the social community for business activities, and the achievement of an economic goal is also a prerequisite for the enterprise's investment in the socio-ecological system within which the enterprise operates (Lovins, 2019).

A regenerative business is described as purpose-driven and retrospective, incorporating circular flows, seeking dynamic balance, generating net-positive impacts, and fostering mutuality and participation among stakeholders (Popović & Radivojević, 2022). The concept of regeneration is often linked to the circular economy, which is seen as an upgrade to the traditional "take–make–dispose" model. Regeneration is gaining interest in a circular economy, with regenerative organizing principles being highlighted. Regeneration is more than a symbolic term with limited practical application in circular systems. However, restoration, rather than regeneration, should be the core principle of the circular economy, as regeneration may not be universally applicable across all economic sectors (Yadav & Yadav, 2024).

Figure 1. The concept of regenerative sustainability



Source: Authors

The key differences between the previously mentioned concepts are reflected in: 1) dominant systems view, 2) main goals, and 3) dominant design approach (Konietzko et al., 2023). On the one hand, the sustainable business model is focused on socio-technical systems, on the other hand, the regenerative business model is based on socio-ecological systems. In addition, the main goals within the sustainable concept include economic, social and environmental value creation (Marković et al., 2020), while the goals of the regenerative business model relate to planetary health. Sustainable concept refers to design for the technical cycle, while regenerative concept is focused on design for biological cycle.

Gibbons (2020) differentiates three sustainability paradigms. The first one refers to the traditional approach to sustainability, which since the 17th century advocates the need to preserve natural resources to ensure social well-being without endangering the needs of future generations and designates this sustainability as conventional sustainability. This paradigm is aimed at a minimum of social well-being, efficiency, management of people and resources, economic development and growth, while only mitigating the damage created by society. The second, contemporary sustainability focuses on social justice, solving problems based on multidisciplinarity and indicates the entanglement of social, ecological and technical systems, which is why it represents a more advanced approach compared to the previous one. Further development of the idea of sustainability led to the development of regenerative sustainability, with its holistic approach to the world. This paradigm requires transformational changes to develop living systems to achieve more advanced systems. This means that this paradigm combines the previous two with the introduction of additional requirements for achieving sustainability goals.

Table 1. Key characteristics of regenerative sustainability

Regenerative + Sustainable	
Procedural	Process-oriented approach considering the dynamic nature of systems
Systemic	Focus on the resilience and adaptive capacity of the system
Network-positive	Positive impact on human well-being and environmental indicators
Relational	Human beings and nature are in a co-evolution relation
Collaborative	The necessity for cooperation between various stakeholders

Source: Authors

The concept of regenerative sustainability (Fig. 1) is developed within the area of urban planning (Sagendorf & Wilkerson, 2020; Hes & Du Plessis, 2014). This concept interweaves the ideas of ecology, living systems theory and systems thinking. It suggests the necessity to face the problem of dysfunctionality between humans and nature. As a result, it will be created various ecological designs and engineering practices aligned with the socio-ecological context, aiming at the restoration and regeneration of the global socio-ecological system (Robinson & Cole, 2015; Caldera et al., 2022; Tabara, 2023).

The idea of regenerative sustainability goes beyond a narrow view of the concept of sustainability (East, 2020; Buckley, 2022), which is primarily focused on environmental protection issues (Table 1). Namely, the concept of regenerative sustainability arises due to the insufficient capacity of the concept of sustainability to support transformational changes, because it is not enough to just stop harming the environment, it is necessary to start implementing actions aimed at strengthening human well-being and positively influencing health and the planet in general (Roosen, 2022).

3. Key principles of regenerative business model

Key principles of a regenerative business model include the following (Drupsteen & Wakkee, 2024; Gervais et al., 2024):

Environmental regeneration: The business works to restore natural systems, such as soil health, biodiversity, and water quality. This could involve practices like regenerative agriculture, renewable energy use, and circular economy principles (e.g., using waste as a resource);

Social and community impact: The model fosters social equity and well-being, supporting fair labor practices, local communities, and diverse stakeholder

involvement. It prioritizes long-term benefits for communities and society, rather than short-term profits;

Economic resilience: A regenerative business aims for sustainable, long-term profitability while also ensuring that economic activity contributes to overall ecological and social well-being. This could include local economic development, job creation, and reinvestment in regenerating resources;

Systems thinking: Regenerative businesses often adopt systems thinking, recognizing the interconnections between various aspects of the environment, society, and economy. This holistic approach helps the business understand and manage its impact across multiple dimensions.

The principles, based on which the performance of the regenerative business model can be measured, are as follows (Fath et al., 2019):

1) Provide cross-scale circulation of critical flows of different types of resources;

2) Collective learning - effective organizational learning is considered a central survival strategy for an enterprise, especially important for long-term vitality in regenerative concept;

3) Regenerative re-investment - it primarily refers to investments in human capital to ensure higher labor productivity, loyalty, and continuous learning and to strengthen the capacities and infrastructure of the ecosystem;

4) Secure reliable inputs and outputs - How much damage do flows create within the ecosystem?;

5) Secure a balance of small, medium, and large organizations;

6) Achieve a balance of resilience and efficiency;

7) Secure diversity - it includes human beings, enterprises and communities;

8) Encourage mutually-beneficial relationships;

9) Encourage constructive processes/discourage speculative processes - constructive activities create economic capital and capacities.

According to one approach, the regenerative business model is based on the following principles (Konietzko et al., 2023): 1) Value proposition (it refers to societal well-being), 2) Value creation and delivery (it requires regenerative leadership), 3) Partnerships with nature (for example, natural capital investment), 4) Justice and fairness (including responsible sourcing, diversity and inclusion), and 5) Value capture (it includes net positive impact).

The nature of regenerative business is based on the following key principles (Drupsteen & Wakkee, 2024):

1) The focus is not only on the preservation of resources, but also on their renovation;

2) The net positive impact on nature and society is mandatory;

3) It is a business model based on a holistic approach;

4) It requires going significantly beyond "zero effect" and creating positive value even if there are no direct incentives;

5) In a regenerative business model, each business strategy includes three dimensions - economic, social and environmental;

6) It provides a net-positive impact on the socio-ecological system regarding material usage;

7) A regenerative business model has the capacity to innovate in order to face with difficult challenge;

8) It suggests making a profit with clean processes and helping others to become more sustainable.

By adopting these principles and developing innovative regenerative business models, the enterprise can contribute to the problems of biodiversity loss, global pandemics, inequalities, and mass migration, which will enable the fundamental changes that are necessary considering the current situation of the socio-ecological system (Seefeld, 2024).

4. Possible strategies for regenerative businesses

The regenerative business strategy can be implemented with the prior fulfillment of the following conditions and steps (Siahaan et al., 2024):

1) Engagement at the policy level - it suggests collaboration with business associations, non-governmental organizations, and governments to impact policy changes in order to support regenerative business models;

2) Employee education and training - the aim is to change organizational culture and create regeneration awareness of employees (through training programs, workshops, and campaigns);

3) Development of regenerative leadership -organizational leaders have a dominant role in the successful implementation of regenerative practices and actions;

4) Partnerships with sustainable organizations - collaboration with organizations that have successfully adopted regenerative business models;

5) Transparency and continuous reporting - secure transparency in regenerative practices based on regular reports on the achieved results in that area for external stakeholders.

Regenerative leadership plays a key role in the successful implementation of a regenerative strategy. It is based on awareness and knowledge, design and planning, collaboration, eco-systemic vision, and relationships. Regenerative leaders adopt new ways of thinking that enable the creation of innovations in order to have a positive impact on the ecosystem and encourage employees' awareness of the regenerative idea. Design and planning imply that these leaders are able to translate their knowledge and awareness into real actions for the benefit of the planet, including the development of new business models. They are ready for their inner transformation in order to change their values to embrace regenerative changes. The relationship refers to greater

solidarity and connection for the environment and the acceptance that there is a close connection between business operations and the functioning of the ecosystem. Eco-systemic vision implies the adoption of the understanding of interconnectedness in the ecosystem, the accepted broader responsibility of the enterprise, the complexity and cyclicality of the system, and the adoption of the limits set by the ecosystem for the business. Regenerative leaders develop a culture of collaboration, including as wide a group of stakeholders as possible and respecting their goals (Aoustin, 2023; Hardman, 2013).

Table 2. Key differences between regenerative business strategies

Strategy	**Business approach**	**Impact on ecosystem**	**Business practices**
Restore	Maximum yield and optimal exploitation of the existing ecosystem	There are harmful activities, but the need to remediate the damage is recognized and actions are taken in this regard	Economic activity is carried out regardless of the harmful effects, however, there is timely remediation of the resulting damages
Preserve	Businesses limit their economic activities by harmonizing them with the need to preserve the ecosystem	The goal is zero impact on the socio-ecological system (the existing state is maintained)	Businesses implement available practices that protect the environment and the focus is on prevention
Enhance	The enterprise sees itself only as a part of the socio-ecological system, the functioning of which depends on the functioning of the enterprise itself	Enterprises only adapt to the conditions that best suit the socio-ecological system in cooperation with other stakeholders	Enterprises develop their own practices that improve the existing socio-ecological system

Source: Hahn & Tampe (2021); Caldera et al. (2022)

Three strategies can be singled out for conducting regenerative business, which are designated as: 1) restore, 2) preserve, and 3) enhance (Table 2). The differentiation was made on the basis of the degree of regeneration achieved by the implementation of the strategy (Hahn & Tampe, 2021; Caldera et al., 2022).

The lowest level of regeneration is provided by the restoration strategy. The goal of these strategies is not only to minimize and compensate for the negative effects of the enterprise's business, but also to secure the exploitation and maximize yield from the ecosystem. The essence is in the accurate and timely action of the enterprise, which distinguishes this strategy from business sustainability (it is aimed at reducing the impact on the socio-ecological system, which can be a "late" business activity).

The strategy of preservation is relative to securing the status quo within the socio-ecological system. This means that this strategy results in a significantly higher level of regeneration, considering that it respects the close interdependence of the socio-ecological system and the enterprise's operations. The enterprise's activities are limited by the requirements of preserving natural reserves and the health of the entire system.

This strategy aims to preserve the dynamic balance of this system, at the global level, so cooperation at all levels and sectors is necessary.

Unlike the previous strategy, which requires zero impact on the socio-ecological system, the enhance strategy aims at a net positive impact, improving the functioning capacities of that system. This includes adaptive management based on experimentation aiming at developing practices to improve life in the existing socio-ecological system. All participants of the system strive towards this goal, while respecting the synergy that exists between the actors. The strategy even proposes unusual alliances in order to jointly achieve the goal of improving the resilience and vitality of the existing system, which simultaneously improves the resilience of the enterprise, which is dominantly dependent on the system in which it operates.

Enhance strategies are key to improving life in the socio-ecological system, while respecting the cyclical process of life on earth. In this way, sustainable functioning is supported both for enterprises and for society as a whole (Caldera et al., 2022).

According to the second approach, it is possible to derive the following regenerative strategies for modern enterprises (Das & Bocken, 2024):

1) Regenerative leadership - These strategies are the basis of regeneration in the enterprise in a broader sense. For example, reinvestment of realized profit in nature and society, requiring suppliers to accept regenerative practices, and greater consumer awareness of regenerative practices of enterprises.

2) Nature regeneration - These strategies are aimed at improving health in the socio-ecological system in order to ensure the ecosystem to grow stronger over time (for example, through forest protection, flora and fauna conservation, and regenerative farming practices.)

3) Social regeneration - The focus of this strategy is on the regeneration of the human ecosystem by providing conditions for the smooth development of the community, equal conditions for education and work, equal conditions for making profits in supply chains, and greater involvement in the decision-making process. Such strategies can be implemented in trade, supply chains, production processes, etc.

4) Responsible sourcing - These strategies involve strengthening suppliers and their communities, in order to support small businesses in supply chains, through improving equity and thereby creating added value in the supply chain. In this way, the number of intermediaries between the consumer and the producer will be reduced, allowing the consumer to pay the “appropriate” price for the product.

5) Human health and well-being focus - The strategies are based on the creation of products and services with natural, organic inputs, which enable a safe product for the customer, in order to preserve their health and well-being.

6) Employee-level focus - The goal of the strategy is to improve the living and working conditions of employees, through fair wages, appropriate conditions in which employees work, their greater involvement in the decision-making process, and fairly rewarded for their contribution to the enterprise's performance.

Gibbons (2024) suggests five categories of regenerative development strategies:

1) Strategies focused on regenerative consciousness - ecological design, integrated ecologies, holistic strategies, strategies aimed at the design of systems, strategies based on developing and implementing indigenous knowledge and practices, strategies that include conscious and intentional actions, developmental processes, goals and outcomes.

2) Strategies focused on regenerative actions - strategies aimed at bringing together diverse viewpoints to address complex problems; collaborative strategies aimed at creation of solutions where all participants contribute their regenerative ideas, fostering regenerative innovation through joint effort; strategies that encourage active, meaningful involvement of stakeholders in decision-making, with open and ongoing communication to foster regeneration understanding; strategies aimed at continuous exchange within the community to reflect on actions, share knowledge, and learn from experiences, enabling growth and adaptation; citizen science (involving the public in scientific research, allowing them to contribute data, observations, or analysis in partnership with professional scientists); collaborative research that bridges academic disciplines and engages practitioners and stakeholders to address complex real-world problems; structured experiments that evolve over time, incorporating feedback to refine approaches and solutions based on ongoing results; co-production (joint creation of knowledge and solutions between scientists, community members, and other stakeholders, ensuring relevance and shared ownership).

3) Strategies focused on culture transformation – strategies aimed at promoting well-being and natural cycles and local environments; strategies aimed at ensuring fairness in both social and environmental aspects; strategies aimed at inclusivity and diversity; strategies aimed at supporting businesses and initiatives that are rooted in and serve the local community, fostering economic resilience and self-sufficiency; strategies aimed at promoting purposeful work that aligns with personal well-being and contributes to the greater good; strategies aimed at fostering physical, mental, and emotional well-being, ultimately leading to greater happiness and fulfilling life for all.

4) Strategies focused on regenerative governance – strategies aimed at involving full-cost accounting that takes into account not just direct financial costs, but also the environmental and social impacts of decisions (including externalities) are considered in economic calculations; strategies focused on preventive action when there is a risk of harm to human health or the environment, even when scientific evidence is not fully established; strategies aimed at polycentric and subsidiary governance (polycentric refers to a system of multiple, overlapping centers of decision-making that allows for localized control while coordinating across levels; on the other hand, subsidiarity is the principle that decisions should be made at the most local level possible); strategies aimed at transparency (the practice of being open and clear about processes, decisions, and information, allowing stakeholders to access and understand how decisions are made, ensuring that actions are visible and understandable).

5) Strategies focused on health – strategies aimed at increasing human health/happiness and ecological health.

Regenerative strategies can be applied in different areas as well as at different levels, such as agriculture, travel, health, finance, waste, energy consumption, supply chain and inclusivity. By implementing such strategies, enterprises help solve problems at the level of local communities, contributing at the global level through encouraging responsible production/consumption and social equality, promoting climate action, etc. (Marković et al., 2022; Chhabra, 2023).

5. Conclusion

The regenerative concept refers to systems, practices, or approaches that go beyond sustainability by actively restoring and renewing the health of ecological, social, and economic systems. Unlike sustainability, which focuses on minimizing harm and maintaining balance, regeneration seeks to improve and enhance the systems involved, ensuring that they thrive and become more resilient over time.

In the context of business and the economy, the regenerative concept emphasizes the idea of co-evolution between human and natural systems. It involves practices that not only reduce harm but also contribute positively to the restoration and rejuvenation of the environment and society. Regenerative businesses, for example, aim to integrate natural systems into their operations in a way that enhances biodiversity, addresses climate change, supports indigenous communities, and promotes long-term health and well-being.

The regenerative approach is often linked with concepts like the circular economy, where materials, resources, and energy are continually cycled and replenished rather than extracted and discarded. Regeneration emphasizes principles such as balance, reciprocity, and interdependence, with a focus on creating positive, long-term impacts for all stakeholders, including the environment, communities, and businesses themselves.

A regenerative business model integrates natural and business systems in ways that promote the co-evolution of both. Key characteristics include: 1) Circularity - The model operates with a focus on circular flows, where resources are reused, recycled, and restored instead of following a linear "take-make-dispose" pattern. It ensures that waste is minimized and that products are designed for longevity, repair, or reuse; 2) Co-creation and co-evolution - Regenerative businesses recognize the interconnectedness of human, social, and ecological systems. They foster partnerships and collaborative approaches that enhance both human well-being and environmental health; 3) Net-positive impact - These businesses aim to generate more value than they consume or take from the planet. This includes improving ecosystems, increasing biodiversity, and restoring social equity, with an emphasis on creating positive impacts for all stakeholders, not just profit; 4) Mutuality and stakeholder participation - Regenerative business models prioritize the mutual well-being of all stakeholders (including employees, customers, local communities, and the environment) and encourage active participation in decision-making processes; 5) Systems thinking - The approach considers the broader ecological and social systems in which the business operates, recognizing the importance of balance, reciprocity, and interconnectedness.

A regenerative business strategy outlines how the business will operationalize its regenerative goals, incorporating the following key elements: 1) Sustainability as a foundation: Sustainability is no longer just about minimizing harm; regenerative strategies focus on improving systems through active restoration, supporting biodiversity, and contributing to social well-being; 2) Innovation in products and processes: Regenerative strategies often involve innovative approaches to product design and manufacturing processes. This can include the use of renewable resources, designing for product life extension, and creating closed-loop systems where materials are continually cycled back into the economy; 3) Community engagement and empowerment: A regenerative strategy fosters strong relationships with local communities and seeks to empower them through collaboration. This could involve supporting indigenous practices, enhancing local economies, or promoting social justice; 4) Dynamic balance: Businesses employing a regenerative strategy strive for a dynamic balance in their operations, ensuring they adapt to changing environmental and social conditions rather than relying on fixed practices; 5) Value creation beyond profit: A regenerative strategy considers the long-term health of ecological and social systems as critical to business success. Value is not only measured in financial terms but also environmental and social well-being.

Every enterprise should find practices, initiatives and actions, in accordance with internal and external business factors, that it could implement to accept the concept of regeneration, which sets new requirements, that can be marked as a step forward concerning the requirements of business sustainability. In the new business conditions, it is necessary to recognize that there is a strong interdependence between the functioning of the socio-ecological system and the business system. If this approach is ignored, in the long term, the success of the enterprise and the sustainability of its processes and activities cannot be expected.

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KLjUČNI ASPEKTI REGENERATIVNOG POSLOVNOG MODELA: KONCEPT, PRINCIPI I STRATEGIJE

Apstrakt: *Regeneracija je inovativni konceptualni pristup održivosti, kao i inovativni poslovni model. Ovaj pristup prevazilazi konvencionalnu održivost koja je fokusirana na efikasnost resursa i tehnologiju kako bi se minimizirala šteta po društvo i životnu sredinu. Ideja regenerativnog poslovnog modela nije samo da ne bude degenerativan, već i da prevaziđe pristup održivosti. To je način da se zadovolje trenutne potrebe bez ugrožavanja sposobnosti budućih generacija da učine isto. U regenerativnoj poslovnoj strategiji, održiva poslovna praksa više nije zadovoljavajuća – ona zahteva više od očuvanja na sadašnjem nivou. Pored toga, pojavljuje se novi poslovni model koji kombinuje koncepte održivosti i regeneracije – regenerativna održivost. U skladu sa navedenim, cilj ovog rada je da se utvrde ključni principi regenerativnog poslovanja, da se sagledaju ključne determinante uspešne regenerativne poslovne strategije i da se otkrije uloga ovog inovativnog poslovnog modela u savremenim preduzećima.*

Ključne reči: *Regenerativni biznis, inovativni poslovni model, regenerativna strategija, principi, preduzeće.*

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CAN SUSTAINABILITY REPORTING BE A FACTOR OF BUSINESS SUCCESS? THE CASE OF SERBIA

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Abstract: *The aim of this paper is to examine the factors that influence business improvement by assessing company performance, measured as return on assets (ROA). The research sample consists of 99 companies listed among the most successful enterprises according to data from the Serbian Business Registers Agency. The data were collected for the period from 2020 to 2023. To achieve the defined research objective, statistical methods such as correlation analysis and multiple linear regression were applied. The research results indicate that sustainability reporting has a statistically significant negative impact on company performance. Additionally, both company leverage and size have a statistically significant negative impact, whereas sales have a positive effect on ROA.*

Keywords: *Performance, profitability, company indebtedness, sustainability reporting, sales revenue.*

1. Introduction

The goal of a company's operations is to efficiently utilize its tangible, intangible, and financial resources. Companies may sometimes acquire financial resources externally, all with the aim of maximize profit, maintain current liquidity, and

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ensure a healthy financial structure. The extent to which companies successfully use resources to achieve their objectives can be assessed based on various groups of indicators. A widely used measure of business performance is the evaluation of profitability, measured through return on assets, return on equity, net profit margin, and similar indicators. Consequently, managers and researchers face the challenge of identifying and considering factors that may influence long-term profitability.

In today's business environment, companies face an additional requirement related to allocating resources and reporting on sustainability. Through sustainability reporting, companies can manage and mitigate social and environmental risks associated with their regular activities. By publishing such reports and addressing sustainability issues, companies strengthen stakeholder trust in their operations, ultimately leading to an improved reputation and increased corporate value.

Following the introduction, the paper presents the Theoretical Framework, which provides an overview of previous research on the given topic and defines the research hypothesis. The next section outlines the applied research methodology, followed by an analysis of the research results and their discussion. The conclusions drawn from the study are presented at the end of the paper.

Theoretical Framework

The assessment of business performance, as well as the factors determining a company's success under different business conditions, has always been a subject of interest for numerous authors. One of the key measures of business success and sustainability is profitability, which reflects a company's ability to achieve stable performance in the future. The literature identifies various factors influencing business success and the achievement of a better performance. For the purposes of our research, we have selected sustainability reporting, company leverage (debt), achieved sales, company size, and tangibility.

Sustainability Reporting

Brewer et al. (2012) examined various indicators of financial efficiency (profitability, liquidity, and capital structure) to determine how these factors influence the financial health of agricultural enterprises. The authors concluded that large agricultural enterprises with higher levels of debt are more vulnerable to financial crises. Additionally, although small agricultural enterprises operate more securely, they did not achieve business improvement through increased activity, as was the case with larger enterprises. Profitability can be measured in various ways, such as Return on Assets (ROA), Return on Equity (ROE), net profit margin, and similar indicators.

Corporate social responsibility is now a key prerequisite for sustainable development and the enhancement of credibility, both for the state and for the companies operating within it. The importance of sustainable development was further emphasized with the adoption of the 2030 Agenda by the United Nations in 2015. This document, which came into effect in 2016, defines 17 Sustainable Development Goals (SDGs)**,** providing guidelines for member states and their

citizens over a 15-year period. Although not being a member of the European Union, the Republic of Serbia has committed to implementing these goals. In this context, the Accounting Law (*Official Gazette of the Republic of Serbia, No. 73/2019 and 44/2021*), as amended in 2021, prescribes that:

"*The analysis of the development and business results of a legal entity, as well as its position, should include financial and, where necessary, key non-financial performance indicators relevant to the specific industry, including information related to environmental and workforce issues. As part of this analysis, the annual business report includes references to the amounts presented in the regular annual financial statements, along with additional explanations of these amounts*."

Consequently, companies are faced with an additional requirement to operate both economically sustainably and socially responsibly. Although reporting is mandated, the specific format for compiling these reports is not strictly defined. As a result, sustainability reporting can either be incorporated into the annual business report or published as a separate document. In the Republic of Serbia**,** companies operating within a corporate group typically publish sustainability reports as standalone documents, publicly available on the group's website. Some companies have chosen to integrate sustainability reporting within their business reports. However, there are still companies that, despite the reporting obligation, do not disclose this information in any form.

Spence & Gray (2007) emphasize that sustainability reporting is a way for companies to present the social and environmental impacts of their economic activities to stakeholders and the broader community. Additionally, they viewed sustainability reporting as a means of ensuring organizational legitimacy, a tool for managing stakeholder relationships, or a process for creating a positive image (Usman, 2024).

Ariswari & Damayanthi (2019) and Werastuti et al. (2021) concluded in their research that sustainability reporting effectively moderates the relationship between profitability and company value. They also emphasize that comprehensive sustainability reporting can enhance company value when profitability is high.

The significance of sustainability reporting in moderating the relationship between profitability and company value has been explored by Juliana & Sembiring (2025). They concluded that transparent and comprehensive ESG reporting, including reports aligned with global standards such as GRI, can help companies in the coal sector mitigate the negative perception of their environmental impact. Aligning short-term profitability with a long-term sustainability strategy can be one way to attract investors and enhance competitive positioning.

Company Leverage

Company managers prefer using internal sources of financing, as noted by Hung & Albert (2002), borrow money from the money, and capital markets is a secondary option. However, research indicates that profitable companies tend to achieve positive business results through external financing sources. A statistically significant negative correlation between company leverage and profitability has been

demonstrated in studies by Rajan & Zingales, (1995), Goddard et al. (2005), and Rao et al. (2007).

Akhtar (2012) and Sarkar & Zapatero (2003) found in their research that there is a positive relationship between profitability and company leverage. Profitable companies are less likely to resort to borrowing, yet they achieve better business results. However, some studies have not identified a connection between leverage and company profitability. Long & Malitz (1986) and Fama & French (1998) concluded that there is no correlation between financial structure and company profitability. Moreover, they demonstrated that companies with the lowest leverage ratios also tend to prefer financing through equity issuance.

Sales

In their study on the relationship between capital structure and company performance, Dada & Ghazali (2016) concluded that there is a statistically significant positive relationship between sales and achieved performance. Specifically, an increase in sales leads to a rise in return on assets (ROA). This conclusion is logical, as higher sales results in increased net profit, thereby improving ROA, and vice versa. It is important to consider operating expenses as a key component in calculating net profit.

Company Size

Company size can be represented by various indicators such as asset value, number of employees, total sales, or business volume. The most commonly used determinant of size in the literature is the natural logarithm of total assets. Large companies use their size to increase efficiency, expand markets, and exploit economies of scale. Simnett (2012) emphasizes that management in large companies is more inclined to prepare sustainability reports. Companies use this opportunity to demonstrate corporate social responsibility and their commitment to environmental protection through sustainability reporting. Examining the impact of various factors on sustainability report verification, Shinta et al. (2023) conclude that profitability (ROA) and company size have a statistically significant positive effect on sustainability reporting. However, as companies grow larger, they may face inefficiencies that could impact their financial performance (Limonya et al., 2023).

Tangible Assets

Tangible assets represent the core assets that companies use to conduct their operations. This refers to physical resources owned by the company, such as equipment, buildings, inventory, and similar assets. The value of this variable is obtained by dividing tangible assets by the company's total assets. A higher proportion of tangible assets reduces risk for creditors, increasing asset value in the event of bankruptcy or liquidation. Therefore, the more tangible company’s assets, the greater ability to secure debt and disclose information about future profits (Dada & Ghazali, 2016).

In her study, Milošević (2023) established a weak, positive, and statistically significant relationship between tangible assets and profitability. However, Stančić

et al. concluded that in manufacturing companies, tangible assets have no impact on profitability. On the other hand, in the service sector, there is a relationship between tangible assets and profitability, but it is not statistically significant.

Based on the aforementioned considerations, we have defined the following hypothesis:

Hypothesis 1: Sustainability reporting, corporate leverage, sales, company size, and tangible assets have a statistically significant impact on the business performance of companies in the Republic of Serbia, measured by ROA.

2. Methodology of empirical research

The aim of this study is to examine whether factors such as sustainability reporting, corporate debt, sales, company size, and tangibility represent determinants that influence corporate profitability, measured through ROA (Return on Assets).

The initial basis for forming the sample was the list of 100 most successful companies by revenue in 2022. The list was compiled and published by the Serbian Business Registers Agency. The data for the analysis were collected for the period 2020–2023 from publicly available documents on the Agency's website and other official websites that assess corporate creditworthiness.

Table 1 Some Characteristics of the sample

Variables	Frequency	Valid %	Cumulative %
Type of Business Entity			
DOO	82	82,82 %	82,82
JP	5	5,05 %	87,87
AD	12	12,12 %	100
Region			
Belgrade	55	55.6%	55.6
Central Serbia	8	8.1%	63.6
Vojvodina	22	22.2%	85.9
Southern Serbia	4	4.0%	89.9
Western Serbia	7	7.1%	97.0
Eastern Serbia	3	3.0%	100.0
Sector			
Information and communication	4	4.0%	4.0
Wholesale and retail trade	34	34.3%	38.4
Transport	7	7.1%	45.5
Agriculture	1	1.0%	46.5
Processing industry	35	35.4%	81.8
Construction	7	7.1%	88.9
Electricity	7	7.1%	96.0
Mining	3	3.0%	99.0
Arts and entertainment	1	1.0%	100.0

Source: authors

Since the data for the last year of operation were unavailable for one company due to business closure, this company was excluded from the analysis. Consequently, the final sample consists of 99 companies, with a total of 396 observations.

Table 1 presents the structure of the observed sample based on the type, territorial affiliation, and business sector of the selected companies.

The enterprises analyzed in this study belong to the category of large enterprises. The ownership structure shows that limited liability companies dominate the sample, with a total of 82 out of 99 enterprises, accounting for nearly 83%. Joint-stock companies make up 12% of the sample, while the share of public enterprises is 5%.

The analysis of the sample based on the region where the enterprise is headquartered, indicates that the majority of enterprises are from the Belgrade region, with a total of 55, accounting for 55.6%. Twenty-two enterprises in the sample are headquartered in Vojvodina (22.2%), eight in Central Serbia (8%), and seven in the Western region (7%). The fewest enterprises are from Southern Serbia (four) and Eastern Serbia (three).

The majority of business entities analyzed operate in the manufacturing industry, with 35 companies (35.1%), and the wholesale and retail trade, with 34 companies (34.3%). The sample includes 7 companies from the transportation, construction, and electricity sectors. The information and communication sector comprises 4 companies, the mining sector 3, while the arts and entertainment and agriculture sectors each have 1 company.

The collected data was analyzed using the statistical software package IBM SPSS Statistics 21.0 (Statistical Package for the Social Sciences - SPSS, Version 21.0). The dependent variable is Return on Assets (ROA). Given that the objective of the research is to examine the impact of selected factors (sustainability reporting, corporate debt, sales, company size, and tangibility) on corporate profitability, the model definition included the following independent variables: the presence/absence of a sustainability report, corporate debt, sales, company size, and tangibility. These variables are among the most commonly used financial indicators influencing corporate profitability. The following table presents the variable used, their acronyms, and the method of calculation.

Table 1 Description of analysis variables

Variable	Acronym	Description
Return to assets	ROA	The ratio of net income to total assets
Sustainability reporting	SusRep	1 if reported, 0 if not
Debt	Dept	The ratio of total debt to total assets
Log of Sales	LOS	Natural logarithm of Total sales
Company size	Size	Natural logarithm of Total asset
Tangibility	Tang	Ratio of tangible assets to total asses

Source: authors

The empirical analysis of the selected variables consists of descriptive statistics, correlation analysis, and multiple regression analysis. The sample used in the analysis includes 100 companies operating in the territory of the Republic of Serbia, or 99 companies, as data for one company was not available for the observed period.

Based on previous research and with the aim of determining the factors that significantly influence the profitability of companies, the following model has been proposed:

$$ROA_{i,t} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon_{i,t}$$

$ROA_{i,t}$ – Dependent variable (ROA);
β_0 – Model constant;
βi – Regression coefficients;
X_1 – Sustainability reporting;
X_2 – Dept;
X_3 – Log of Sales;
X_4 – Company size;
X_5 – Tangibility;
$\varepsilon_{i,t}$ – Error term;
i – Company (i = 1, . . . , N);
t – Period (year from 2020 to 2023).

3. Research results and discussions

The descriptive statistics of the dependent and independent variables used in the analyzed model are presented in Table 3.

Table 2 Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ROA	396	- 0.60	0.79	0.06	0.110
SusRep	396	0	1	0.45	0.499
Dept	396	0.08	1.00	0.60	0.216
LOS	396	11.49	19.94	17.05	0.931
Size	396	13.63	20.79	16.98	1.175
Tang	396	0.00	1.00	0.38	0.236
Valid N (listwise)	396				

Source: Author's calculation

The average ROA value is 0.06, with a minimum value of -0.6 and a maximum of 0.79. The negative ROA value indicates that some companies experienced negative financial results in certain years.

Since the sustainability report does not have a strictly prescribed format, some companies have chosen to prepare it as a separate report, while others disclose sustainability and non-financial information within their business reports. Despite the reporting obligation on sustainability in the Republic of Serbia, some companies in the sample do not address any aspect of sustainability. Regarding the companies on the list, we found sustainability reports for 54 companies, either as part of a group or as independently prepared reports. Fifteen companies disclose sustainability and non-financial data within their business reports, while for 30 companies, we could not find any data proving that they address sustainability issues.

The debt ratio indicator has an average value of 0.60, meaning that 60% of total assets are financed through debt. The range of this indicator varies from 0.08 to 1.00, indicating that there are no companies in the observed sample where debts significantly exceed the value of total assets. The average value of LOS for the observed sample is 17.05, with a range from 13.63 to 20.79. The average company size value was 19.98, without significant deviations.

The average value of Tangibility is 0.38, indicating that nearly 40% of total assets in the observed companies consist of tangible assets. The maximum Tangibility value is 1, which occurs in companies where the entire asset base is composed of tangible assets.

Through the correlation analysis, we examined whether there is a relationship between the selected variables for the study, as well as the strength and direction of that relationship. Table 3 presents the correlation coefficient matrix.

Table 3 Correlation matrix

	ROA	SusRep	Dept	LOS	Size	Tang
ROA	1	-0,126 (0,006)	- 0,243 (0,000)	0,087 (0,042)	-0,072 (0,018)	-0,006 (0,454)
SusRep		1	-0,009 (0,429)	-0,153 (0,001)	-0,12 (0,008)	0,002 (0,488)
Dept			1	0,009 (0,426)	0,311 (0,000)	-0,380 (0,000)
LOS				1	0,255 (0,000)	-0,034 (0,250)
Size					1	0,424 (0,000)
Tang						1

Source: Author's calculation

The dependent variable ROA positively correlates with the variable LOS, while it has a negative correlation with the other variables in the model. However, the correlation established with the variable Tangibility is not statistically significant ($p > 0.05$), so this variable was excluded from further research.

To test for the multicollinearity, i.e., the potential interconnection between independent variables, we examined the variance inflation factor (VIF) for the independent variables and tolerance.

Tolerance indicates how much of the variance of a given independent variable is not explained by the variances of other independent variables in the model. When this value is very low, it suggests a high correlation with other variables, indicating multicollinearity.

VIF is the reciprocal of tolerance and shows how high correlation increases the instability of defined variables. Acceptable tolerance values are greater than 0.10, while VIF should not exceed 10. Table 4 presents the results of the multicollinearity test.

Table 4 Variance impact factors of variables (VIF).

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	SusRep	.968	1.033
	Dept	.894	1.119
	LOS	.912	1.097
	Size	.829	1.206
a. Dependent Variable: ROA			

Source: Author's calculation

For all variables that exhibit a statistically significant correlation with the dependent variable ROA, the tolerance and VIF values fall within acceptable limits. The obtained results of the multicollinearity test suggest that a further analysis with the selected variables can proceed.

Tab 5. Model Summary

Model	R	R Square	Adjusted R Square	Change Statistics	
				R Square Change	Sig. F Change
1	.345[a]	.119	.110	.119	.000
a. Predictors: (Constant), SusRep, Dept, LOS, Size					
b. Dependent Variable: ROA					

Source: Author's calculation

Based on Table 5, we can conclude that the proposed model is representative, with Sig = 0.0000, $p < 0.05$. The calculated coefficient of determination indicates that the independent variables explain 11% of the variance in ROA, while the F-statistic confirms the relevance of the independent variables in this model.

Table 6 Multiple regression model

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.302	.120		2.513	.012
SusRep	-.030	.011	-.136	-2.813	.005
Dept	-.159	.026	-.312	-6.222	.000
LOS	.015	.006	.124	2.501	.013
Size	-.020	.005	-.217	-4.158	.000
a. Dependent Variable: ROA					

Source: Author's calculation

After conducting the analysis, the model can be presented as follows:

$$ROA = 0{,}302 - 0{,}030 * \text{SusRep} - 0{,}159 * \text{Dept} + 0{,}015 * \text{LOS} - 0{,}020 * \text{Size} + \varepsilon\_$$

The first variable in the model, sustainability reporting, has a statistically significant negative impact on the ROA of enterprises in the observed sample ($p < 0.05$). Sustainability reporting is a tool for informing the wider social community about the social, economic, and environmental aspects of their operations (Spence, 2007). Usman (2024), in his research, showed that 51% of the variance in sustainability reporting can be predicted by the combined effect of company size, board size, and profitability.

The variable Debt has a statistically significant negative impact on profitability growth measured by ROA ($p < 0.05$). This indicates that the higher level of company debt leads to lower ROA. Such results are in accordance with the research of Abor (2005) and Pradhan (2017), who also found a negative impact of leverage on company profitability.

Positive and statistically significant impact on profitability has variable Sales. Sales are one of the key parameters for improving company's operations. Consequently, numerous authors have studied its significance for corporate profitability. Positive relationship between sales and profitability was found in the models of Akinlo (2012) and Ramnoher (2020).

Firm size**,** as a variable in the presented model, has a statistically significant negative impact on achieved ROA ($p < 0.05$). the firm size is represented as the logarithm of total assets, indicating that companies with lower total assets achieve a higher return on assets. The obtained results are consistent with the research of Shepherd (1972) and Schneider (1991), who found that larger firms achieve lower profitability levels. However, numerous studies have shown that an increase in the firm size leads to an increase in ROA (Voulgaris & Lemonakis, 2014).

Given the initial research hypothesis, the obtained results indicate that it has been confirmed, except for the part related to tangibility. Namely, the correlation analysis established that there is no statistically significant relationship between tangibility and ROA, so this variable was excluded from further analysis, i.e., from the set of independent variables in the estimated regression model. Other independent variables — sustainability reporting, company dept, revenue, and company size — have a

statistically significant impact on ROA. The estimated model determined that sustainability reporting and company debt variables have a negative impact on profitability measured by ROA. For sustainability reporting and company debt variables, the identified direction of impact aligns with the previous research in this field. Regarding the variable company size, the literature presents varying results concerning the direction of its impact on profitability. The regression analysis led to the conclusion that the achieved revenue, as expected, has a significantly positive impact on company profitability, given that it is one of the elements for calculating net profit.

4. Conclusion

Measuring business performance, both in the Republic of Serbia and globally, represents a significant challenge in the modern business environment. The focus of this paper is to examine the factors that influence business success by applying appropriate statistical methods, such as correlation analysis and multiple linear regression. By analyzing publicly available financial reports and relevant literature, we have selected the most commonly used and relevant variable for assessing business performance, namely profitability: return on assets (ROA). Given that corporate social responsibility and sustainability reporting have been prominent topics in theory and practice in recent years, one of the variables certainly addresses this area. Through data analysis, we obtained information on whether companies, in addition to the existing legal obligation, prepare sustainability reports, report on non-financial performance within their business reports, or do not report at all. In addition to this, the independent variables include corporate leverage, company size (measured by the logarithm of total assets), sales revenue, and tangibility.

The data collection was based on the list "Top 100... Business Entities in 2022." This list ranked business entities in the Republic of Serbia according to four criteria: operating revenue, net profit, total assets, and equity. In our empirical research, we opted for the list of companies ranked by operating revenue. The correlation analysis indicated a certain degree of alignment between the dependent variable ROA and the independent variables, except for tangibility. Although a relationship was observed, it was not statistically significant. Based on this finding, the tangibility variable was excluded from further research.

The research results indicate that the sustainability reporting factor negatively affects the profitability of the companies in the sample. The companies with higher levels of debt have lower profitability, while those with lower levels of debt lead to better performance. In this regard, managers' attention should be focused on balancing internal financing sources and external borrowing. The sales revenue has a positive impact on the return on assets (ROA) of companies. This is also the only variable in the model that positively influences ROA. The companies with a higher amount of assets in our sample achieve a lower level of profitability.

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DA LI IZVEŠTAVANJE O ODRŽIVOSTI MOŽE BITI FAKTOR POSLOVNOG USPEHA? SLUČAJ SRBIJE

Apstrakt: *Cilj ovog rada jeste da ispita faktore koji utiču na unapređenje poslovanja kroz ocenu performansi preduzeća, merene pokazateljem povraćaja na imovinu (ROA). Istraživački uzorak čini 99 kompanija koje se nalaze među najuspešnijim preduzećima, prema podacima Agencije za privredne registre Republike Srbije. Podaci su prikupljani za period od 2020. do 2023. godine. Radi postizanja definisanog cilja istraživanja, primenjene su statističke metode, kao što su korelaciona analiza i multipla linearna regresija. Rezultati istraživanja ukazuju na to da izveštavanje o održivosti ima statistički značajan negativan uticaj na performanse preduzeća. Pored toga, kako zaduženost preduzeća, tako i njegova veličina, imaju statistički značajan negativan uticaj, dok prodaja pozitivno utiče na ROA.*

Ključne reči: *Performanse, profitabilnost, zaduženost preduzeća, izveštavanje o održivosti, prihodi od prodaje.*

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EVALUATING INDIGENOUS ALBANIAN BULBOUS PLANTS ON GREEN ROOFS FOR URBAN ECOSYSTEM ENHANCEMENT IN MEDITERRANEAN CLIMATES

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Abstract: *Green roofs offer ecological and functional benefits in urban environments, yet plant resilience remains a challenge, particularly in Mediterranean climates. In Albania, and specifically in rapidly urbanizing Tirana, green roofs could mitigate environmental issues such as air pollution, urban heat islands, and limited green space. Despite these benefits, no studies to date have assessed the suitability of indigenous Albanian plant species for green roofs in this region. This study aims to evaluate the resilience of native bulbous plants under varying irrigation regimes and provide recommendations for plant selection and watering practices to enhance the ecological and functional performance of green roofs in Mediterranean urban environments. This research examines five indigenous Albanian bulbous plant species interplanted with other native annual and perennial vegetation under two distinct irrigation regimes on*

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six experimental green roof plots in Tirana. We evaluate the suitability of these species for green roof applications, analyze the effects of low (twice-weekly) versus high (daily) irrigation on plant growth, and offer recommendations for species selection and watering practices that can improve green roof performance. The primary question addressed is how different irrigation regimes impact the growth and performance of indigenous Albanian plants on green roofs. Preliminary findings indicate that both irrigation regimes result in comparable flowering timing, flowering duration, and vegetative growth across all bulb species, with the exception that Crocus tommasinianus and Tulipa sylvestris exhibited differences. The paper concludes with a discussion on how the findings suggest that irrigation practices have minimal impact on overall plant growth, with low irrigation potentially extending the flowering period for certain species.

Key words: *Green roofs, Indigenous plants, Irrigation regimes, Mediterranean climate.*

1. Introduction

Urban areas in Mediterranean climates are increasingly adopting green roofs as solutions to urban heat islands, stormwater management, and biodiversity enhancement. Green roofs offer substantial benefits, including improved air quality, reduced building energy demands, and added habitat for urban wildlife, making them a valuable asset for sustainable urban development (Oberndorfer *et al*., 2007; Fioretti *et al*., 2010; Francis & Lorimer, 2011; Gagliano *et al*., 2012). In Mediterranean cities like Tirana, Albania, rapid urbanization has exacerbated environmental challenges such as air pollution, the urban heat island effect, and diminishing green space. This has intensified the need for green infrastructure solutions that leverage native flora adapted to local climatic stresses, particularly drought.

Green roofs in Mediterranean climates are often subject to long dry seasons, which can limit plant survival and ecosystem functioning if the species are not adapted to water scarcity. Research indicates that selecting drought-tolerant and resilient native plants can improve green roof performance and reduce irrigation demands, making them a sustainable option for cities with limited water resources (Dunnett & Kingsbury, 2008; Thuring & Dunnett, 2014). However, most research has focused on commonly used species with Mediterranean origins (such as *Sedum* spp.), and studies examining native species beyond these conventional choices are limited (Savi *et al*., 2014).

This study is among the first to investigate the resilience and performance of indigenous Albanian bulbous plant species on green roofs in Tirana. Albania's diverse flora includes species with significant potential for green roof applications, but their suitability and resilience under varying irrigation conditions remain largely unexplored. Previous studies suggest that bulbous plants – known for their adaptation to Mediterranean climate stressors – could be ideal candidates due to their water-storing abilities and adaptability to fluctuating moisture levels (Köhler, 2008; Papafotiou *et al*., 2013).

In this research, five native Albanian bulbous species were evaluated alongside other native annual and perennial plants to assess their suitability for green roof applications under two irrigation regimes. By examining the growth, flowering, and overall performance of these species, the study seeks to inform practical, resource-efficient planting strategies for green roofs in Mediterranean urban environments.

2. Methodology

Conducted on the terrace of a five-story building in central Tirana, Albania, the experiment utilized six green roof plots containing a mix of bulbous and other native plant species. The methodological approach focused on creating conditions representative of extensive green roof environments, allowing for the assessment of plant resilience and performance under typical urban climate stressors. This approach helped to evaluate the resilience and suitability of the selected bulbous plants by observing their performance under two distinct irrigation regimes. While other parameters (e.g., soil nutrient levels, pest incidence) were monitored during the experiment, this paper presents results and discussion focused only on plant performance under the different irrigation systems. Methodologically, two main variables were considered in the experimental design, each described as follows.

2.1. Plot Design and Composition

Six experimental plots were constructed for this research. Each plot measured 125 cm by 80 cm, with a substrate depth of 15 cm (bulbs were planted at approximately 10 cm depth). The substrate was a lightweight, well-draining mix of expanded clay, perlite, and compost, specifically formulated for green roofs to ensure uniform soil composition across all plots. Each plot covered 1 m² in area and contained roughly 150 liters of substrate, providing adequate support for root growth and effective drainage.

The plant composition in each plot included a mixture of indigenous Albanian bulbous and herbaceous species. The plots contained five bulbous species (*Allium schoenoprasum*, *Allium sphaerocephalon*, *Allium aflatunense*, *Crocus tommasinianus*, and *Tulipa sylvestris*), with each species planted in groups of ten bulbs. These bulbous plants were interplanted with nine native annual and perennial species, including *Cistus incanus*, *Achillea millefolium*, *Salvia officinalis*, *Linaria vulgaris*, *Armeria* spp., *Hyparrhenia hirta*, *Eryngium amethystinum*, *Origanum vulgare*, and *Melica ciliata*. This diverse planting palette aimed to simulate a natural Mediterranean ecosystem, allowing evaluation of plant interactions and resilience in an urban green roof setting.

2.2. Irrigation Regimes and Treatments

Two distinct irrigation regimes were tested during the hottest summer months (June, July, and August) using a drip irrigation system to deliver controlled amounts of water to each plot:

- **Low Irrigation Regime:** Plots were watered twice a week, with each plot receiving approximately 10–15 liters of water per irrigation session.
- **High Irrigation Regime:** Plots were watered daily, with each plot receiving about 7–8 liters of water per session.

This variation in watering frequency and quantity was designed to assess the effects of limited water availability on the growth and flowering of the bulbous plants, as well as on the overall ecological performance of the green roof.

For experimental rigor, the six plots were evenly divided between the two irrigation regimes, with three replicate plots per treatment. Plots 1a, 1b, and 1c were assigned to the low-irrigation regime, and plots 2a, 2b, and 2c to the high-irrigation regime. The location of each plot on the terrace was randomized to minimize microclimatic differences such as variations in wind exposure, sunlight, or heat reflection from surrounding surfaces.

Throughout the study period, plant performance was monitored through regular observations, recording data on flower counts, flowering duration, and vegetative growth for each bulb species. The data were analyzed to determine if irrigation regime had a significant impact on these performance metrics. Overall, there were no statistically significant differences in growth or flowering output between the two irrigation regimes, with the exception that *Crocus tommasinianus* and *Tulipa sylvestris* in the low-irrigation plots tended to flower approximately 5–6 days longer than those in the high-irrigation plots.

3. Literature Review

Albania's flora is rich in bulbous geophytes (plants with underground storage organs) such as *Gagea*, *Muscari*, *Allium*, *Crocus*, and *Tulipa* species. These indigenous bulbs have evolved under Mediterranean seasonality and are hypothesized to be strong candidates for green roof planting. Their potential resilience to drought and contributions to ecosystem functions merit review. This literature review examines the adaptive traits of these native bulbous plants, evaluates their contributions to biodiversity (particularly pollinators), and discusses the ecosystem services they can enhance (water retention, air quality improvement, thermal regulation). Additionally, current knowledge gaps in research and practice are identified, to guide future studies and the integration of native Albanian bulbous flora into sustainable green roof designs.

3.1. Plant Traits and Drought Adaptations

Indigenous Albanian bulbous plants share key morphological and physiological traits that confer resilience in a Mediterranean rooftop environment. As geophytes, they survive adverse seasons by storing resources in underground organs (bulbs, corms, or tubers). This trait allows them to withstand prolonged dry periods by going dormant during summer drought, then re-sprouting when wetter, cooler conditions return (Pignatti, 2002; Hesse et al., 2019). In Mediterranean climates, many geophytes (and annuals) avoid summer desiccation by completing their life

cycle during the spring rainy season and remaining quiescent through the dry months (Thompson, 2005).

For example, *Muscari* (grape hyacinths) and *Gagea* spp. emerge and bloom in early spring, taking advantage of soil moisture from winter rains, then die back completely by summer – an adaptive phenology aligning with regional rainfall patterns. Similarly, wild *Allium* species native to Albania (e.g. *Allium sphaerocephalon*, *A. carinatum*) have bulbs that accumulate water and nutrients, enabling them to endure extended drought in a dormant state and re-grow when conditions improve. These bulbs are inherently drought-tolerant. Previous studies note that bulbous plants are well adapted to Mediterranean climate stressors, possessing water-storing organs and the ability to tolerate fluctuating moisture availability (Köhler, 2008; Papafotiou et al., 2013).

In the context of a green roof, this means indigenous bulbs can endure the sparse summer irrigation or even temporary drought without permanent damage, by drawing on their stored reserves. In effect, they behave as drought avoiders: remaining dormant (and not losing water via transpiration) when moisture is scarce, and rapidly activating growth and flowering when water becomes available.

Another important trait is their efficient water use strategy. Green roof plants ideally should use water when it is plentiful (to maximize stormwater capture) but restrict water loss during drought (Farrell et al., 2013). Many native bulbous species naturally fulfill this profile – they are active in wetter periods, consuming water for growth, and then sharply reduce water use during dry periods by shedding their foliage. Moreover, the typically small stature and narrow or waxy leaves of bulbs (e.g. the fine grassy leaves of *Crocus* or cylindrical leaves of some *Allium*) help minimize transpiration and heat stress. Their shallow but fibrous root systems allow quick uptake of rainwater from thin substrates.

Collectively, these morphological and physiological features enable indigenous bulbs to thrive on extensive green roofs: they can complete their growth cycles in step with seasonal rainfall, tolerate the roof's extreme summer drought by retreating underground, and rebound with new growth annually – thus showing a form of perennial resilience well-suited to Mediterranean urban climates.

3.2. Biodiversity Contributions of Native Bulbs

Beyond their drought endurance, indigenous bulbous plants can significantly enhance biodiversity on green roofs. Unlike the monocultural carpets of sedums often seen on roofs, a planting palette that includes native bulbs adds floral diversity and structural heterogeneity, which in turn supports a wider range of urban wildlife. Diverse green roofs have been shown to attract more arthropods and even birds, functioning as habitat islands in the city (Oberndorfer et al., 2007).

In particular, flowering bulbs contribute nectar and pollen resources that are highly beneficial for pollinators. Many Albanian bulbs bloom in late winter or spring when few other flowers are available in the urban landscape – for instance, early spring blooms of *Crocus tommasinianus* or *Gagea lutea* can provide an important food source for awakening bees. The globular purple inflorescences of

wild *Allium* species and the fragrant spikes of *Muscari* are known to be pollinator magnets, attracting bees, butterflies, and other insects in search of nectar (Bretzel et al., 2022).

By integrating such species, green roofs can offer a sequence of blooms from late winter through early summer, sustaining pollinator populations in urban areas where floral resources are often patchy. Empirical research confirms that green roofs planted with a variety of flowering natives support greater pollinator abundance and diversity. For example, a survey of green roofs in Vienna recorded 90 wild bee species over one season, with bee diversity strongly linked to the availability of floral resources on the roofs (Tonietto et al., 2011). When wildflower cover was high, bee abundance increased, and even during midsummer lulls, flowering sedums still provided some forage. This underscores that providing a continuous supply of blooms (through a mix of species with different flowering times) is crucial for sustaining pollinators.

Native plants seem to have an edge in this regard: a recent experiment in Córdoba, Argentina found that green roof sections planted with native species supported significantly higher insect abundance (across multiple taxa) than sections with exotic ornamental species (Madre et al., 2014). Not only was total insect abundance greater with natives, but most insect groups (including pollinating orders like Hymenoptera) were more numerous on native-planted roofs. The composition of the insect community also shifted with native plants, indicating that local flora may attract a more characteristic and specialized fauna.

Translating these findings to Albania, using indigenous bulbous plants on green roofs could similarly boost urban biodiversity. By conserving a piece of Albania's native flora in the built environment, these roofs can act as micro-refuges for native pollinators and other invertebrates. The extended or sequential flowering of different bulb species (e.g. *Crocus* in February, *Muscari* in March, *Allium* in May) provides a steady supply of pollen and nectar over an extended period, which is especially valuable in dense urban areas where such resources are limited.

Moreover, bulbs interplanted with native grasses and herbs can create a semi-natural meadow on the roof, supporting not just bees and butterflies but potentially beetles, spiders, and birds that prey on insects or use the vegetation for shelter. Overall, incorporating indigenous bulbous plants markedly increases the ecological complexity of green roofs – moving them beyond mere aesthetic landscaping toward functional biodiversity hotspots in the city.

3.3 Stormwater Retention and Runoff Reduction

Green roofs are widely recognized for their ability to retain rainfall and reduce stormwater runoff, thereby lessening urban flooding and easing the load on drainage systems. Plant selection influences the degree of water retention: species with deep or fibrous roots and those that actively transpire can enhance water uptake from the substrate (Berndtsson, 2010). While succulents (like sedums) have moderate water needs and intercept some rain, research suggests that using a mix

of plant forms (including forbs, grasses, and geophytes) can improve overall rainfall capture (Lundholm et al., 2010).

In one comparative study, an aromatic Mediterranean herb (*Origanum onites*), a drought-tolerant subshrub, achieved higher runoff reduction than a sedum under the same roof conditions (Papafotiou et al., 2013). At a substrate depth of 8 cm, roofs planted with *Sedum sediforme* retained ~50% of rainfall, whereas roofs with *Origanum* retained about 63%. With a deeper 16 cm substrate, retention increased for both (to ~60% for sedum vs over 80% for the *Origanum*). This indicates that drought-adapted forbs can utilize available water more fully, likely through higher transpiration, thus capturing more stormwater.

Bulbous plants can complement this function. During the wet season, actively growing bulbs will absorb water from the substrate to fuel their growth and flowering. Their presence thereby increases evapotranspiration and frees up soil pore space for subsequent rain events. Conversely, in dry periods, these plants naturally curtail water use by going dormant, which helps them survive but also means they won't demand water when it's scarce. This dynamic aligns well with stormwater management goals: heavy winter rains are taken up by the bulbs (mitigating runoff), whereas in summer the need for irrigation is minimal.

While dormant bulbs themselves may not transpire in summer, in practice they would be part of a plant community – for instance, bulbs can be underplanted beneath shallow-rooted grasses or sedums that provide some continuous groundcover. Over time, the root networks of all these species improve the substrate's structure, enhancing its water-holding capacity. The overall effect is a green roof that significantly attenuates runoff peaks and delays drainage. Studies have shown that a diverse plant community can intercept and evapotranspire more water than a monoculture (Lundholm et al., 2010), especially when plants have complementary root depths and water use patterns. Therefore, integrating Albanian geophytes into green roofs can be expected to maintain or improve stormwater retention performance, while also requiring less supplemental watering – a win-win for water sustainability in Mediterranean cities**.**

3.4. Ecosystem Services of Bulbous Green Roofs

In addition to biodiversity gains, vegetated roofs featuring resilient native plants contribute to various ecosystem services in urban areas. Key services enhanced by green roof vegetation include stormwater regulation, thermal moderation, and air quality improvement. Indigenous bulbous plants, by virtue of their seasonal growth and physiological activity, can play a significant role in each of these services when used on extensive green roofs in Mediterranean climates.

Green roofs are well documented for their ability to retain rainfall and reduce stormwater runoff, thus easing pressure on urban drainage infrastructure and mitigating flood risks (Berndtsson, 2010). Vegetation contributes to this retention through water uptake and transpiration, while the substrate increases infiltration and slows runoff. Species selection plays a crucial role: drought-tolerant plants with fibrous roots, such as geophytes, improve the substrate's capacity to retain and

gradually release water. Indigenous bulbous plants like Allium and Gagea absorb water during their active spring phase, increasing evapotranspiration and pore space for subsequent rainfall. In summer, when dormant, their minimal water demand aligns with irrigation constraints.

Economically, the stormwater management benefits of green roofs have been estimated at €4–€11 per m² annually (TEEB, 2010). City-wide adoption can reduce long-term infrastructure investments; for example, Copenhagen projected savings of up to €500 million over 40 years by integrating green roofs (COWI, 2012).

Thermal Regulation and Energy Savings

Vegetated roofs provide insulation and cooling via evapotranspiration and shading, helping regulate rooftop and indoor temperatures. Seasonal plants like bulbous geophytes contribute during their growth phase, particularly in spring and autumn. Though dormant in summer, their presence supports a staggered phenology when combined with perennials and grasses, ensuring year-round vegetation cover. This stratification helps maintain consistent thermal regulation and energy efficiency (Castleton et al., 2010).

Empirical studies show green roofs can lower rooftop temperatures by 20–40°C (Alexandri and Jones, 2008), with potential energy savings of €5–€10 per m² annually, depending on building type and climatic conditions (Saiz et al., 2006). Such reductions are particularly relevant in Mediterranean cities facing prolonged summer heatwaves.

Air Quality Improvement

Green roof vegetation filters airborne pollutants, capturing particulates on leaf surfaces and absorbing gaseous compounds like NOx and SO2. While small in stature, native bulbous plants contribute during their active phase by offering surface area for deposition and moderating microclimates that reduce pollutant formation. Studies in urban areas have recorded reductions of up to 6% in PM and 37% in SO2 post-green roof installation (Currie and Bass, 2008).

Air quality improvement benefits have been valued at €1–€3 per m²/year in health-related cost savings, with broader impacts seen at scale (European Commission, 2013).

Biodiversity and Habitat Provision

Green roofs that incorporate native bulbous plants enhance ecological complexity and provide habitat for a variety of organisms, particularly pollinators. Staggered flowering from Crocus (February) to Allium (May) supplies continuous nectar and pollen, supporting urban pollinator populations during critical early-season periods (Gallai et al., 2009). This contribution extends to birds, beetles, and spiders, enriching urban ecosystems.

The value of pollination services in the EU alone exceeds €14 billion annually (Gallai et al., 2009). By mimicking natural Mediterranean habitats, bulb-planted roofs act as biodiversity corridors, offering refuge and resources in fragmented

urban landscapes. Non-market assessments of biodiversity value estimate ecosystem service benefits at €5–€8 per m²/year (TEEB, 2010).

Extended Roof Lifespan and Property Value

Green roofs shield waterproof membranes from UV exposure and thermal stress, extending their service life. Conventional roofs last 15–20 years, whereas vegetated roofs can exceed 40 years (Kosareo and Ries, 2007). This longevity results in maintenance savings of €2–€6 per m²/year. In addition, aesthetic and environmental upgrades can increase property values by up to 7% (Dunnett and Kingsbury, 2004).

Cumulative Economic Value

Taken together, the ecosystem services offered by green roofs featuring indigenous bulbous species amount to significant annual value:

Table 1. Total Economic Value Estimate of Green Roofs

Service €/m²/year (Estimate)	€/m²/year (Estimate)
Stormwater management	€4–11
Energy Savings	€5–10
Air quality improvement	€1–3
Biodiversity + pollination	€5–8
Roof lifespan/maintenance	€2–6
Total Estimated Value	€17–38 per m²/year

Source: Authors

These estimates, drawn from peer-reviewed literature and urban case studies, underscore the economic rationale for integrating native Albanian geophytes into sustainable green roof designs. By doing so, cities not only gain climate resilience and ecological integrity but also unlock financial and public health co-benefits across urban systems.

4. Experimentation and Results

4.1 Growth and Blooming Outcomes

Plant growth across both irrigation regimes showed minimal variation in vegetative development, indicating a high level of resilience among all species. However, *Crocus tommasinianus* and *Tulipa sylvestris* did exhibit a moderately longer flowering period (by about 5–6 days) in the low-irrigation plots, suggesting a nuanced physiological response to reduced water availability.

4.2 Flower Production and Bloom Longevity

All five bulbous species demonstrated consistent flower production and bloom duration under both irrigation treatments. This indicates that the lower irrigation frequency was not detrimental to flowering or overall plant vigor, highlighting the inherent drought tolerance and resilience of these indigenous species.

4.3 Irrigation Effect on Performance

Statistical analysis showed no significant difference in plant growth or flower output between the high- and low-irrigation treatments ($p > 0.05$), although slight morphological adaptations (such as reduced leaf size or thicker leaves) were noted under the reduced water conditions.

Figure 1-4: Process of implementing roof gardening

Source: S. Jano, 2021

5. Conclusions and Discussion

This study provides valuable insights into the potential for using indigenous Albanian bulbous plants to enhance the sustainability of green roof systems in Mediterranean urban environments. By evaluating the performance of these native species under two distinct irrigation regimes, the research offers practical guidance for improving the ecological resilience and water efficiency of green roofs in cities like Tirana. Below, we discuss the broader implications of the findings, particularly in terms of the adaptability of native flora to green roof conditions, the viability of low-irrigation maintenance practices, and recommendations for implementing resilient plantings on urban rooftops.

5.1 Implications for Mediterranean Green Roofs

The findings from this study demonstrate that native Albanian bulbous plants can exhibit robust performance on green roofs, even under low-irrigation conditions. In Mediterranean climates where water scarcity is a prominent challenge, the ability to maintain green roof vegetation with minimal irrigation is critical for urban greening efforts. The resilience of species such as *Allium schoenoprasum*, *Allium sphaerocephalon*, and *Allium aflatunense* suggests that these plants can withstand the prolonged dry periods typical of Mediterranean summers, thereby reducing the need for frequent watering while still providing reliable green cover and aesthetic value.

In addition, the extended bloom periods observed in *Crocus tommasinianus* and *Tulipa sylvestris* under low-irrigation conditions point to a potential adaptive mechanism of native flora for coping with water stress. Prolonged flowering under drier conditions could benefit urban biodiversity by offering a steady supply of pollen and nectar for pollinators over an extended season – a valuable trait in densely built city environments where floral resources are often limited.

5.2 Significance of Low-Irrigation Regimes

The results underscore the feasibility of implementing low-irrigation green roofs in Tirana and similar Mediterranean cities with minimal adverse effects on plant health or growth metrics for most bulb species. By showing that significantly reduced watering regimes can achieve vegetative growth and flowering durations comparable to those under frequent irrigation, this study highlights the potential for water-saving green roof designs that align with sustainable urban development goals.

This aspect is particularly relevant in urban areas where water resources are increasingly strained. Adopting plant palettes and irrigation practices that require less water allows cities to expand green infrastructure while conserving vital water supplies (Razzaghmanesh *et al*., 2014). In the case of Tirana this would be the most desirable outcome in terms of ecosystem service provision.

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EVALUACIJA AUTOHTONIH ALBANSKIH LUKOVIČASTIH BILJAKA NA ZELENIM KROVOVIMA ZA POBOLJŠANJE URBANIH EKOSISTEMA U MEDITERANSKIM KLIMATSKIM USLOVIMA

Apstrakt: *Zeleni krovovi donose ekološke i funkcionalne prednosti u urbanim sredinama, ali otpornost biljaka ostaje izazov, posebno u mediteranskim klimatskim uslovima. U Albaniji, a naročito u brzo urbanizujućoj Tirani, zeleni krovovi mogu ublažiti ekološke probleme poput zagađenja vazduha, urbanih toplotnih ostrva i nedostatka zelenih površina. Uprkos ovim prednostima, do sada nisu sprovedene studije o pogodnosti autohtonih albanskih biljnih vrsta za primenu na zelenim krovovima u ovom regionu. Ova studija ima za cilj da proceni otpornost domaćih lukovičastih biljaka u različitim režimima navodnjavanja i da pruži preporuke za odabir biljnih vrsta i strategije zalivanja kako bi se unapredile ekološke i funkcionalne performanse zelenih krovova u urbanim sredinama sa mediteranskom klimom. Istraživanje obuhvata pet autohtonih albanskih lukovičastih biljnih vrsta, koje su sađene zajedno sa drugim domaćim jednogodišnjim i višegodišnjim vrstama u okviru dva različita režima navodnjavanja na šest eksperimentalnih zelenih krovova u Tirani. Analizirana je pogodnost ovih vrsta za upotrebu na zelenim krovovima, uticaj niskog (dva puta nedeljno) i visokog (svakodnevnog) režima navodnjavanja na rast biljaka, kao i mogućnosti optimizacije izbora vrsta i strategija zalivanja za poboljšanje efikasnosti zelenih krovova. Ključno istraživačko pitanje odnosi se na uticaj različitih režima navodnjavanja na rast i performanse autohtonih albanskih biljaka na zelenim krovovima. Preliminarni rezultati pokazuju da oba režima navodnjavanja daju slične rezultate u pogledu vremena cvetanja, trajanja cvetanja i vegetativnog rasta kod svih analiziranih lukovičastih vrsta, osim kod Crocus tommasinianus i Tulipa sylvestris, kod kojih su primećene određene razlike. Studija zaključuje da režimi navodnjavanja imaju minimalan uticaj na ukupni rast biljaka, pri čemu niži nivo navodnjavanja može potencijalno produžiti period cvetanja kod pojedinih vrsta.*

Ključne reči: *Zeleni krovovi, autohtone biljke, režimi navodnjavanja, mediteranska klima.*

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ENHANCING RURAL ENTREPRENEURSHIP IN SERBIA: THE ROLE OF SMALL AND MEDIUM ENTERPRISE DEVELOPMENT STRATEGY

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Abstract: The development of rural entrepreneurship represents one of the significant factors for achieving sustainable economic growth in rural areas of the Republic of Serbia. The Strategy for the development of small and medium enterprises provides a framework for improving business conditions in rural areas through various support measures, including financial assistance, education, and infrastructure enhancement. Although rural areas face numerous challenges, such as reduced economic activity and a high rate of migration to urban centers, rural entrepreneurs can significantly contribute to mitigating these issues. Recommended measures, such as improving physical infrastructure and implementing a green agenda, could facilitate better integration of rural entrepreneurs into broader economic flows. However, current strategic documents fail to recognize the full potential of rural entrepreneurship, indicating a need for greater focus on this sector in order to fully utilize its opportunities for economic development and demographic stability in rural communities.

Keywords: Small and medium enterprises, rural entrepreneurship, development strategy, Republic of Serbia.

1. Introduction

Rural entrepreneurship represents a significant segment of economic development, contributing to employment, the preservation of local resources, and the improvement of quality of life in rural areas. In the Republic of Serbia, the development of this form of entrepreneurship has gained increasing importance, particularly in the context of enhancing the economic structure of rural areas and reducing migration from rural to urban centers. The Strategy for the Development of Small and Medium Enterprises, developed by the Government of the Republic of Serbia, aims to create an enabling environment for the establishment and growth

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of enterprises in these areas, while also facilitating the sustainable development of local economic activities through various support measures.

The Strategy for the Development of Small and Medium Enterprises is a policy document that defines key measures and activities aimed at fostering entrepreneurship in the Republic of Serbia, including specific initiatives to enhance the position of rural areas within the entrepreneurial sector. This Strategy seeks to improve entrepreneurs' access to financial resources, provide adequate support in the form of education and mentorship, and streamline the legal and regulatory framework in which businesses operate.

This study examines the impact of the aforementioned Strategy on the promotion of rural entrepreneurship, with a particular focus on financial support programs, entrepreneurial education and training, and the development of the necessary business infrastructure in rural areas. By analyzing past achievements and identifying challenges, this research aims to highlight both the potential and the limitations of the Strategy in achieving long-term economic development goals in rural areas.

Rural entrepreneurship plays a crucial role in the economic and social development of rural regions, as it contributes to job creation, the economic empowerment of local communities, and demographic stability. In the Republic of Serbia, rural areas face numerous challenges, including reduced economic activity, a high rate of youth migration to urban centers, and limited infrastructure, all of which further emphasize the need to stimulate local entrepreneurship. In this context, the Strategy for the Development of Small and Medium Enterprises serves as a key instrument for creating a supportive environment for the establishment, growth, and expansion of enterprises in rural areas. This Strategy offers a range of measures and programs, including financial support, entrepreneurial education and training, and infrastructure improvements, with the ultimate goal of making rural areas more attractive for entrepreneurial activities.

2. The Concept of Rural Entrepreneurship

Rural entrepreneurship represents a specific type of economic activity that develops in rural areas and contributes to the sustainable development of local communities. The activities of rural entrepreneurship contribute to the economic empowerment of rural areas and help reduce migration to urban centers, preserve cultural and natural heritage, and improve the quality of life.

Rural entrepreneurship plays a role in the implementation of innovations, the preservation and development of communities, job creation, and the establishment of a balance between agriculture, land use, community, and economic development (Newbery et al., 2017). Rural entrepreneurship encompasses entrepreneurial activities conducted in rural environments, including production, processing, services, and craft activities that contribute to the improvement of the local economy. "...Rural entrepreneurship has emerged as a dynamic concept. It is generally defined as entrepreneurship occurring at the village level and can take

place in various sectors, such as entrepreneurship, industry, agriculture, and acts as a significant factor in economic development" (Das, 2014, p. 178).

Unlike urban entrepreneurship, rural entrepreneurship is often focused on the use of natural resources, agricultural production, and tourism. Unlike traditional economic forms, rural entrepreneurship requires special flexibility, strong connections with local communities, and adaptation to local conditions, making it a specific form of business activity with its unique characteristics. "...Rurality is defined as a territorially specific entrepreneurial environment that possesses unique physical, social, and economic characteristics. Entrepreneurial activity in rural areas is influenced by various factors, including location, natural resources and landscape, social capital, rural governance, business and social networks, as well as information and communication technologies. Rural entrepreneurship can be described as a process occurring in multiple stages, where specific territorial characteristics are significant for this development" (Stathopoulou et al., 2004, p. 406).

Entrepreneurship has become an active field of research in recent decades, but rural entrepreneurship remains neglected. Research has mainly focused on organizational characteristics, policy measures, and institutional frameworks, while the theoretical shaping of rural entrepreneurship remains underdeveloped. This indicates that the theoretical framework of rural entrepreneurship is still in its early stages, making it difficult to define its boundaries (Pato & Teixeira, 2016, p. 3). In the literature, rural entrepreneurship is often defined as an economic venture that utilizes local resources—land, natural resources, as well as human capital from rural areas—with the goal of improving the living standard and economic structure of those areas. Particularly significant is the fact that rural entrepreneurship can support the sustainable development of local communities by promoting social responsibility and ecology, while providing opportunities for the development of innovative business models tailored to the specific needs of rural populations. "...The development of entrepreneurship in rural areas is increasingly recognized as an alternative to traditional economic development because it enables local residents to create jobs and meet local needs and markets. Rural entrepreneurship represents a specific field with its unique opportunities and challenges and does not always follow the principles of traditional entrepreneurship" (Fortunato, 2014, p. 390).

Rural entrepreneurship significantly influences economic development on both national and local levels. Primarily, it enables the creation of new jobs in rural environments, which directly contributes to reducing unemployment and migration to larger cities. Additionally, the development of rural entrepreneurship promotes greater utilization of local resources and improves the economic structure of villages, which has long-term positive effects on the sustainability of these areas.

Within the research on rural entrepreneurship, it is essential to define the concept of the rural economy, which is characterized by specific success factors and challenges. Identifying these factors enables an understanding of how entrepreneurs in rural areas can achieve success while simultaneously recognizing the obstacles they face. Additionally, examining strategies that entrepreneurs can implement to overcome these obstacles can contribute to the development of

practical solutions. Understanding the attitudes and motivations of rural entrepreneurs, particularly in terms of environmental awareness, can further clarify their business decisions and approaches (McElwee & Atherton, 2021, p. 565). Researching the motivation and attitudes of rural entrepreneurs can contribute to the development of policies that encourage sustainable development in rural areas. Through the analysis of the economic and social impacts of rural entrepreneurship, opportunities for improving infrastructure and support can be identified, enabling entrepreneurs to more easily overcome challenges specific to rural areas and contribute to the long-term development of communities.

Rural entrepreneurs differ from other types of entrepreneurs. They utilize local resources to which they have access while simultaneously developing them, thereby contributing to the growth of the local economy. This synergy between the use and development of local resources creates new business and employment opportunities in rural areas, promoting overall economic progress in communities (del Olmo-García et al., 2023, p. 3). There are two ideal types of entrepreneurship in rural environments. The first type includes entrepreneurs who are not deeply rooted in the local community and operate based on mobility and profit-driven logic. In contrast, the second type relies on utilizing local resources. Although both types contribute to the development of the local environment, rural entrepreneurship has a greater potential for the optimal utilization of resources in rural areas, with such businesses being significantly less likely to relocate, even if economically justified (Korsgaard et al., 2015, p. 12). The advantages of rural entrepreneurship are reflected in its ability to generate lasting economic effects and stability within the community. While the first type of entrepreneur can respond more quickly to market changes, the second, community-oriented type ensures stability by investing in long-term development and resource preservation. This approach enhances the economic opportunities of rural areas and contributes to the creation of sustainable local economies that rely on local resources and employment, strengthening social cohesion and retaining the population in rural regions.

The impact of rural entrepreneurship is also reflected in improving the standard of living in rural areas through the enhancement of public services, infrastructure, and the overall quality of life. Successful rural entrepreneurs often invest in their communities, contributing to the development of education, healthcare services, and infrastructure. Ultimately, rural entrepreneurship plays a significant role in preserving cultural and natural resources, thereby maintaining heritage and sustaining the unique values present in rural areas.

The advantages of rural entrepreneurship include the following (Das, 2014, p. 180):

Providing employment opportunities: Rural entrepreneurship is labor-intensive and offers a clear solution to the growing problem of unemployment. The development of entrepreneurial initiatives in rural areas holds great potential for job creation and income generation.

Reducing rural population migration: Rural entrepreneurship can bridge significant income gaps between rural and urban populations, motivating people to remain in these areas.

Balanced regional development: Rural entrepreneurship can reduce the concentration of entrepreneurial activities in urban areas and promote regional development in a more balanced manner.

Promotion of artistic activities: The preservation of the rich cultural heritage of rural areas can be supported by protecting and promoting arts and handicrafts through rural entrepreneurship.

Reduction of social issues: The development of rural entrepreneurship can help mitigate social problems such as poverty, the expansion of impoverished settlements, and urban pollution.

Engaging the younger population**:** This type of entrepreneurship can raise awareness among young people in rural areas by exposing them to various opportunities and promoting entrepreneurship as a potential career path.

Improving the standard of living: Rural entrepreneurship can contribute to increasing literacy and education levels among rural population. Their education and self-employment can enhance community prosperity, thereby improving their overall standard of living.

3. The Position of Rural Entrepreneurship in the Republic of Serbia

Rural entrepreneurship contributes to the empowerment of local communities, the preservation of demographic structures, and the improvement of the quality of life in rural areas. The Republic of Serbia has significant potential for economic development through rural entrepreneurship but simultaneously faces numerous challenges that limit its growth and stability. "At least two significant reasons justify paying special attention to rural entrepreneurship. The first reason is theoretical, focusing on sociological and related analyses that examine the factors of rural development. In this context, the models of rural area development are considered, and the forces that drive and facilitate the progress of rural communities are defined. The second reason pertains to the practical aspect, which includes defining strategic measures and activities for improving the rural economy and its long-term sustainable development" (Čikić et al., 2011, p. 223).

In the Republic of Serbia, entrepreneurship aimed at rural development represents a crucial segment of economic growth, without which other development factors would remain ineffective. However, entrepreneurship alone is not sufficient; a stimulating environment is also necessary, which depends on policies focused on supporting rural entrepreneurship. Successful strategies can significantly contribute to economic development and the retention of the population in rural areas (Gajić, 2014, p. 11).

Rural entrepreneurship in the Republic of Serbia plays an important role in employment, economic empowerment, and social stabilization of rural areas. The development of this form of entrepreneurship allows local communities to generate additional income, thereby improving their living standards and encouraging the population to remain in rural environments.

The aspect of retaining the population in rural areas is of utmost importance for the Republic of Serbia, which faces significant challenges related to migration from rural to urban environments. Additionally, rural entrepreneurship can play a significant role in preserving cultural heritage and traditions, enriching the social structure of communities, and promoting local identity.

The economic significance of rural entrepreneurship in the Republic of Serbia is based on principles that imply a close connection between entrepreneurial activity and the specific characteristics of a given rural environment. This type of entrepreneurship utilizes natural, human, cultural, and historical resources as unique factors in developing market offerings, creating added value that benefits the entrepreneur while also fostering local economic development (Josipović, 2019, p. 75).

Rural entrepreneurship contributes to the development of agribusiness, craftsmanship, and ecotourism. By leveraging local resources and human capital, entrepreneurs in rural areas can establish stable sources of income and create new employment opportunities. In the Republic of Serbia, rural entrepreneurship often relies on food production, sustainable agriculture, and tourism services, which, given the growing global demand for environmentally friendly products, presents a significant opportunity for development.

Although rural entrepreneurship has great growth potential, in the Republic of Serbia, it encounters numerous obstacles that limit its competitiveness and sustainability. "Rural entrepreneurs face various challenges daily, which may vary depending on the industry, market conditions, and other factors. Understanding their impact on business operations is crucial for developing strategies to overcome obstacles and foster sustainable growth" (Das, 2014, p. 180).

One of the fundamental problems is the poor infrastructural equipment of rural areas, which includes inadequate road networks, weak energy supply, and the lack of access to modern information and communication technology. These limitations make doing business in rural areas difficult and costly, often rendering it unprofitable. "…The development of infrastructure in rural areas, including communication networks and services, serves as a foundation for their economic progress. By providing more services and encouraging various forms of business associations, such as cooperatives, favorable conditions are created for new business opportunities. The rise of remote work and the growing interest in rural living open new niches, particularly attractive to young and highly educated individuals. The experience and resources of older entrepreneurs can also significantly contribute to identifying market opportunities in these areas" (del Olmo-García et al., 2023, p. 12).

Financial constraints represent a significant obstacle to the development of rural entrepreneurship. Entrepreneurs in rural areas often face difficulties in accessing financial resources and loans, which limits their ability to invest in modern technologies and improve production capacities. Additionally, the absence of adequate support in the form of subsidies and financial incentives makes them vulnerable to economic changes and reduces their competitiveness in the market.

The lack of educational and training programs tailored to the needs of rural entrepreneurs is another important factor that slows their development. Education and training in management, marketing, and the application of new technologies are essential for rural entrepreneurs to improve their business operations and expand the market for their products and services. However, access to such programs in rural areas is limited, restricting entrepreneurs' capacities and diminishing their ability to adapt to modern market demands.

Despite these challenges, rural entrepreneurship in the Republic of Serbia has great potential for development. One of its greatest advantages is the growing demand for organic and locally produced goods, presenting an opportunity for rural entrepreneurs to position themselves in the market with high-quality products. Additionally, the development of ecotourism and cultural tourism can be a significant source of income for rural communities, which possess natural and cultural resources suitable for these types of tourism.

To support the development of rural entrepreneurship, it is recommended that the government establish a special financial fund to assist rural entrepreneurs, and that the competent ministry provides the necessary infrastructural benefits. Furthermore, organizing specialized training programs for rural entrepreneurship can significantly contribute to strengthening the competencies of local entrepreneurs. It is also important to reward the most successful rural entrepreneurs to encourage their active participation in local economic development. Moreover, rural entrepreneurs should strive for greater competitiveness and efficiency in both local and international markets. In this regard, inviting successful rural entrepreneurs from other countries can bring new knowledge and experiences that will contribute to the advancement of rural entrepreneurship (Das, 2014, p. 182). Government and international organization support may be crucial in improving the status of rural entrepreneurship. Various support programs and subsidies can facilitate access to financial resources for rural entrepreneurs, while adequate education and professional assistance can enhance their competitiveness.

4. Strategic Framework for the SME and Rural Entrepreneurship Development in the Republic of Serbia

Given the economic and social challenges facing the Republic of Serbia, particularly in rural areas, the development of rural entrepreneurship should be one of the key priorities of state policy in the coming period. The strategic framework for the development of rural entrepreneurship should represent a comprehensive plan aimed at ensuring conditions for sustainable development through support for small and medium-sized enterprises, infrastructure improvement, and the creation of a favorable business environment for entrepreneurs in rural areas. The Strategy for the Development of Small and Medium-Sized Enterprises for the period 2023-2027 lays the foundation for improving the position of entrepreneurs in the business sector and encouraging their active participation in the economy. This framework is based on an analysis of the existing challenges and needs of entrepreneurs, as well as alignment with international standards and best practices in this field.

Unfortunately, the mentioned Strategy does not place significant focus specifically on rural entrepreneurship but does foresee measures that can be directed toward this type of entrepreneurship. The following sections will present measures specifically related to rural entrepreneurship, as well as general measures that can serve as a framework for its implementation.

The Strategy for the Development of Small and Medium-Sized Enterprises aims at creating an innovative, competitive, and sustainable sector resilient to external challenges. The vision of the Strategy involves building an SME sector that follows the principles of the green economy, efficiently utilizes resources and finances, and relies on innovation and digitalization to remain competitive in both domestic and global markets. The general objective is for the SME sector to become a driver of sustainable economic, social, and inclusive development in the Republic of Serbia through support for dynamic and resilient economic growth (Government of the Republic of Serbia, 2023).

Measure 1.2, within Specific Goal I, which refers to the "improvement of small and medium-sized enterprises' access to key infrastructure," has significant implications for the development of rural entrepreneurship in the Republic of Serbia. Since many rural areas have limited access to essential infrastructure, such as roads, energy networks, and the internet, this measure provides opportunities for rural entrepreneurs to integrate more effectively into economic flows and utilize local resources to improve their businesses.

Increasing funds for infrastructure support and tailored programs in the least developed local government units creates more favorable conditions for rural entrepreneurship, enabling easier access to markets and greater economic activity. Additionally, this measure facilitates the development of businesses in rural areas that rely on local resources, contributing to the diversification of the local economy and the creation of new jobs, thus giving rural areas greater importance in the overall economic development of the country.

Measure 2.2, which supports small and medium-sized enterprises in implementing a green agenda in their operations, opens up significant opportunities for rural entrepreneurship in the Republic of Serbia to shift toward sustainable and environmentally conscious business practices. The green agenda represents a strategy and action plan aimed at achieving sustainable development through environmental protection, reducing gas emissions, and promoting renewable energy sources. This Measure 2.2 includes financial and advisory support that can help rural businesses adopt renewable energy sources, improve energy efficiency, and develop services and products that attract environmentally conscious tourists.

The implementation of this measure in rural tourism can significantly contribute to the preservation of natural resources and promote the circular economy in tourist facilities and rural destinations. The transition to green business practices in rural areas allows entrepreneurs to reduce costs through energy efficiency while positioning themselves as environmentally responsible, which increasingly attracts both domestic and foreign tourists. In this way, rural tourism in the Republic of Serbia will be able to meet ecological standards while responding to the global

market demand for sustainable business practices, thereby stimulating long-term local economic growth and environmental protection.

Measure 3.1, within the special objective III (Competitive SME sector – Strengthened competitiveness of SMEs in domestic and foreign markets), which supports the strengthening of human capital management capacities in small and medium-sized enterprises, provides significant opportunities for rural entrepreneurship, especially in the context of retaining personnel. In rural areas, entrepreneurs often face the challenge of workforce outflow, particularly young people, toward urban areas or abroad. This measure offers support to rural enterprises in attracting and retaining employees through educational and training activities, as well as participation in dual education, which will improve the local qualification level and create career opportunities in rural areas.

The informational and educational aspects of this measure, along with a commitment to improving employees' skills and knowledge, contribute to the development of a more stable and competitive entrepreneurial ecosystem in rural areas. This can encourage the workforce to remain in these regions, where they are provided with opportunities for professional advancement and career growth. By integrating small and medium-sized enterprises into the dual education model and actively working on the development and retention of a skilled workforce, rural entrepreneurs can retain existing employees and motivate young people to stay in local communities, contributing to their economic development.

The Strategy for the Development of Small and Medium-Sized Enterprises for the period 2023–2027 provides fundamental guidelines for supporting rural entrepreneurs, although it does not place sufficient focus on this sector. Nevertheless, the proposed measures, such as improving access to infrastructure and implementing the Green Agenda, represent important steps toward enhancing business conditions in rural areas. Improving physical infrastructure, such as roads, will significantly facilitate the integration of rural entrepreneurs into broader economic flows and enable them to use local resources more efficiently.

The implementation of the measures outlined in the Strategy can help improve the position of rural entrepreneurship and stimulate broader economic changes. Creating an environment in which rural entrepreneurs can successfully operate requires continuous support and engagement from all stakeholders, including the government, local administrations, and entrepreneurs. This approach ensures stable and sustainable development of rural entrepreneurship in the Republic of Serbia, which is crucial for all aspects of social and economic life in rural areas.

The Agricultural and Rural Development Strategy of the Republic of Serbia for the period 2014–2024 includes Priority Area 12, which focuses on "improving the social structure and strengthening social capital." Within this priority, Operational Goal 12.9 aims to promote entrepreneurship among women and youth in rural areas, with the goal of improving the economic situation and supporting the development of entrepreneurial initiatives in these regions.

The development of rural areas in the Republic of Serbia, as indicated by the results of the SWOT analysis within the Strategy, largely depends on strengthening

the social structure and promoting entrepreneurship. Although rural areas possess natural resources and cultural heritage, they face challenges related to negative demographic trends, leading to economic stagnation and poverty. Current economic activity, primarily focused on the exploitation of natural resources, limits opportunities for the development of quality jobs and additional income generation. Increasing the attractiveness of rural areas as places for young families to live is essential. This involves improving physical infrastructure and social services, which are directly linked to support for rural entrepreneurship development. Enhancing entrepreneurial conditions would attract new investors and provide local populations with employment and self-employment opportunities (Government of the Republic of Serbia, 2014).

Disregard for the specific needs of rural communities, as well as the lack of coordinated activities among various stakeholders, can contribute to deepening the development gap between rural and urban areas. It is crucial to support entrepreneurship in rural areas through the availability of IPARD funds and strengthening social capital. Establishing an efficient system for the transfer of knowledge, technologies, and information, as well as innovative use of the potential of cultural heritage and biodiversity, represents significant development opportunities for the rural economy and contributes to its sustainable development.

"Specifically, economic development strategies in rural areas can be better focused on entrepreneurs who are starting and growing businesses, rather than attracting large firms. Employment growth can come from two sources: through the expansion of existing businesses and the creation of new businesses" (Deller et al., 2019, p. 30). It is unclear why the Agricultural and Rural Development Strategy of the Republic of Serbia for the period 2014-2024 did not include any component focused solely on the development of rural entrepreneurship, which represents a significant flaw in recognizing the potential that rural areas offer.

Rural entrepreneurship can be a key driver of economic growth, employment, and social stability in these areas, but without a specific focus and strategy, it remains underutilized. This lack indicates an inadequate understanding of the importance of fostering local initiatives and innovations, as well as a missed opportunity in leveraging the potential arising from the wealth of natural resources, cultural heritage, and entrepreneurial spirit in rural environments. Including rural entrepreneurship in the Strategy would significantly contribute to sustainable development and improve the quality of life in these communities.

Development Strategy through the Perspective of Rural Entrepreneurship Small and Medium-Sized Enterprise Development Strategy in the Republic of Serbia aims to enable a stable and sustainable environment for entrepreneurs through the improvement of various aspects and the application of measures. The Action Plan for the implementation of the Strategy is an operational tool that defines specific steps, activities, and resources for achieving these goals.

The Action Plan, viewed through the perspective of rural entrepreneurship, aims to create favorable conditions for the development of entrepreneurial activity in rural areas. The main objectives include promoting employment, preventing migration from rural to urban areas, and increasing economic activity in rural regions.

The Action Plan, through Measure 1.1, which relates to "improving the overall legal, administrative, and tax framework for starting and developing businesses and 'second chance' for SMEs," foresees a range of activities, some of which can be linked to rural entrepreneurship. The Law on Stimulating Entrepreneurship Development (1.1.1) represents a fundamental step in creating a legal and economic framework that encourages entrepreneurship in rural areas.

This law can attract new investors and enable existing businesses to grow, thereby reducing unemployment and increasing the employment opportunities for the local population. Additionally, creating a more favorable business environment affects the retention of the workforce in rural areas. As part of the amendments to the Law on Financial Support for Families with Children (1.1.2), the focus is on improving the position of women entrepreneurs, which is particularly important for rural areas. Supporting women in entrepreneurship encourages them to establish and lead businesses in their communities, reducing migration and contributing to local economic development. This approach also creates additional support for local families, positively impacting the social structure.

The analysis and monitoring of the improvement of the position of female entrepreneurs (1.1.3) is an activity that can be directed towards identifying the specific challenges they face in rural areas. Through analysis and monitoring, the needs for business development support can be determined, contributing to the creation of programs that promote the retention and development of human resources in rural communities.

Furthermore, preparing recommendations for including cooperatives in SME support programs (1.1.8) represents an important step toward the development of rural entrepreneurship. Cooperatives can play a key role in creating platforms for cooperation and supporting local businesses. By including cooperatives in support programs, new opportunities for employment and staff retention are created, which is crucial for the economic recovery of rural areas.

All these activities, if implemented effectively, can significantly contribute to the development of rural entrepreneurship. Improving the legal framework, supporting women entrepreneurship, and including cooperatives are essential elements in creating a favorable environment for entrepreneurs in rural regions. Measure 1.2, which relates to improving SMEs' access to key infrastructure, represents an important step toward the development of small and medium-sized enterprises in rural areas. Key infrastructure, including transportation, public services, and digital infrastructure, plays a role in facilitating business operations and stimulating entrepreneurship in rural regions.

Improving access to infrastructure can directly influence the growth and development of rural entrepreneurship. When businesses in these areas have easier access to basic services such as roads, electricity, and internet, their ability to provide products and services is significantly enhanced. Furthermore, quality infrastructure stimulates the local economy, creates new jobs, and reduces the migration of young people. Through the action plan, it is planned to allocate a significant amount of funds for the development of business infrastructure, with an initial value of 826,657,000 dinars in 2022, aiming to reach 4,000,000,000 dinars by 2027.

Although the action plan represents a comprehensive approach to entrepreneurship development, its implementation faces certain challenges. One of the key challenges is the administrative complexity and inefficiency of the support system. Entrepreneurs in rural areas often have difficulty becoming familiar with all available measures and subsidies, which makes their utilization difficult. Improving administrative transparency and simplifying the application process for support are crucial steps to overcome this challenge.

Another significant challenge is the limited market in rural areas, which restricts opportunities for the growth and development of rural businesses. The local market often lacks sufficient demand for products and services, which makes it necessary to develop mechanisms for accessing broader markets. This could include support for exports or the development of cooperation with urban areas.

Additionally, the migration of young and working-age populations to cities presents a long-term challenge for the sustainability of rural entrepreneurship. If rural communities fail to retain young and educated people, there is a risk of reduced potential for entrepreneurial development. Providing attractive conditions for doing business and developing careers in rural areas, as well as supporting the employment of young people, should be priorities within the action plan.

By implementing the action plan for the development of small and medium-sized enterprises, through the perspective of rural entrepreneurship, a mild positive impact is expected on the economic and social development of rural areas in the Republic of Serbia. Increasing the number of entrepreneurial initiatives in rural communities would contribute to the growth of employment and overall income, improving the quality of life in these areas. Moreover, these measures would contribute to reducing economic disparities between urban and rural areas, thus striving for a more equitable and sustainable economic development of the Republic of Serbia.

5. Opportunities and Challenges for the Development of Rural Entrepreneurship in the Republic of Serbia

Rural entrepreneurs significantly reduce the financial dependency of rural population by providing a sustainable solution for economic stability and long-term financial support for entire families (Yu & Artz, 2019, p. 650). In the context of economic migration and the outflow of people from rural to urban areas, encouraging the development of local businesses enables employment and reduces dependence on large urban centers. Rural entrepreneurship is primarily associated with agriculture, food production, and services utilizing local resources. By fostering rural entrepreneurship, local communities can establish a stable income source, contribute to economic growth, and retain population in rural areas.

The Republic of Serbia has approximately 4,200 villages, and according to the latest available data, more than half of them are facing the consequences of demographic depopulation and an aging population (Republic Statistical Office, 2024). A large number of young people are leaving rural areas in search of better opportunities in cities, further accelerating the depopulation process. Along with

increasing poverty, limited infrastructure, and underdeveloped economies in these regions, these conditions make the development of rural entrepreneurship crucial for improving the quality of life in rural communities and promoting sustainable development.

Rural areas in Serbia are rich in diverse resources, ranging from natural and agricultural resources to cultural heritage and traditions. Investing in agricultural production facilities, as well as in crafts relying on traditional methods and local resources, can significantly contribute to the creation of new jobs and income generation in rural environments. At the same time, the rich biodiversity provides opportunities for tourism development, particularly in the form of sustainable tourism models that promote the preservation of natural resources and provide new income sources for local populations.

The development of rural entrepreneurship in Serbia offers broad opportunities for economic advancement, strengthening local communities, and preserving cultural heritage. Organic production, encompassing the cultivation of fruits, vegetables, meat, and dairy products, has great potential due to the growing demand for healthy food, both domestically and internationally. Furthermore, value-added products such as juices, jams, and cheeses could increase the profitability of small rural businesses and open new export opportunities. Similarly, the production of medicinal herbs and natural cosmetics offers a chance for innovative products that are becoming increasingly popular in the market for natural cosmetics and medicinal products.

Ethno and cultural tourism, based on the promotion of traditional crafts and ethno villages, also holds a significant potential. Visitors seeking authentic experiences are often interested in the customs and culture of local communities, which can contribute to the development of small family businesses offering accommodation, workshops, and souvenirs. Additionally, ecotourism and active tourism in rural areas, such as hiking and cycling, can enrich the tourist offer and further enhance the attractiveness of rural regions.

Livestock farming, with a particular emphasis on indigenous breeds, can offer high-quality products in demand on the market and serve as a basis for the development of specialized family farms. At the same time, beekeeping and honey production provide stable opportunities for rural households, given the favorable conditions for beekeeping and the high demand for honey and other bee products, such as propolis.

The production of artisanal alcohol, particularly brandy and wine with geographical origin, considering Serbia's long tradition in this field, represents an additional source of income and a potential for attracting tourists interested in authentic local products. The development of these and other activities can contribute to the creation of quality jobs in rural areas, improving the quality of life, and preserving the population, which is essential for the long-term sustainability of Serbian villages.

For the development of rural entrepreneurship, it is important to focus on the production of finished products, rather than just the sale of raw materials and semi-

finished products. Products with higher processing levels, such as organic milk cheeses, artisanal alcohol with protected geographical indications, natural cosmetics, and processed fruit products like jams and juices, enable higher market prices and the creation of recognizable brands that are more competitive.

The prospects for the development of rural entrepreneurship in Serbia are significant but require a comprehensive approach that will recognize and adequately utilize local resources. Support in the form of subsidies and educational programs, along with investments in physical infrastructure and market connections, can enable rural entrepreneurs to be more economically competitive. The development of rural entrepreneurship is an economic and social process that can ensure a sustainable future for rural areas. Such an approach provides an opportunity to change the development paradigm, where rural communities will no longer just be a source of agricultural products but dynamic and sustainable communities capable of independent economic growth and development.

The development of rural entrepreneurship in the Republic of Serbia faces numerous constraints that slow progress and limit the potential of entrepreneurs. Financial accessibility is one of the most significant limitations to rural entrepreneurship development. Small and medium-sized enterprises often face difficulties in accessing financial resources. Banks and other financial institutions frequently perceive rural businesses as high-risk, limiting their ability to secure the necessary funds to start or expand their operations. This situation prevents entrepreneurs in rural areas from investing in innovations, new technologies, and marketing, placing them at a disadvantage compared to competitors from urban environments.

In addition to financial challenges, the lack of developed infrastructure presents a significant barrier to development. Poor road networks, limited access to utility services, and insufficient digital infrastructure make rural areas less attractive for investment. Roads leading to rural businesses are often in poor condition, which hinders the transportation of products and reduces business competitiveness. Digital infrastructure is also underdeveloped, limiting opportunities for e-commerce and modern marketing strategies. These limitations slow business development and demotivate potential investors and entrepreneurs when starting operations in rural areas.

The absence of adequate education and training programs for entrepreneurs in rural areas represents another limitation, and there is often a lack of knowledge about modern business practices, management, and marketing. The lack of entrepreneurial skills and knowledge on how to successfully manage a business can lead to the failure of new initiatives.

Moreover, the education system in the Republic of Serbia often fails to provide the necessary support for the development of entrepreneurial skills, with the existing programs being more focused on theory than on practical application. This creates a gap between theoretical knowledge and the practical skills required for successful entrepreneurship development.

Appropriate measures need to be taken, including improving financial accessibility, developing infrastructure and educational programs, and providing education on modern business systems. Removing these barriers could lead to significant improvements in rural entrepreneurship and contribute to the economic development and social stability of rural areas in the Republic of Serbia.

6. Conclusion

The development of rural entrepreneurship represents one of the key factors in creating a sustainable economic environment in the rural areas of the Republic of Serbia. In the context of the Strategy for the Development of Small and Medium Enterprises, the importance of rural entrepreneurship lies in its potential to stimulate employment, enhance the local economy, and reduce migration from rural to urban areas. The Strategy, through various measures of financial support, education, and infrastructure development, provides the necessary support to entrepreneurs and local communities, thus contributing to the creation of a more favorable business environment.

Given the complexity of rural entrepreneurship, it is essential to further explore the motivation and attitudes of rural entrepreneurs and to encourage policies that will contribute to the development of this sector. By supporting rural entrepreneurship, the Republic of Serbia can enhance local economies, preserve demographic stability, and improve the quality of life in rural communities.

An analysis of the Strategy for the Development of Small and Medium Enterprises for the period 2023-2027 highlights the importance of providing support to entrepreneurs, although the Strategy does not sufficiently emphasize the significance of rural entrepreneurship specifically. The proposed measures, such as improving infrastructure and implementing a green agenda, represent crucial steps in enhancing the business conditions in rural areas. Improving physical infrastructure, such as roads, will facilitate the integration of rural entrepreneurs into economic flows, enabling more efficient use of local resources.

In the context of the Agricultural and Rural Development Strategy, rural entrepreneurship is mentioned only in relation to entrepreneurship among women and youth in rural areas. While rural areas have natural resources and cultural heritage, they face demographic challenges and economic underdevelopment, which makes it necessary to attract new investors and stimulate the local economy by improving conditions for entrepreneurship.

The lack of focus on rural entrepreneurship in current strategies indicates a significant oversight in recognizing the potential that these areas offer. Rural entrepreneurship could become a major factor in economic growth, but without adequate support, it remains underutilized. Including rural entrepreneurship in development strategies would significantly contribute to sustainable development and improved quality of life in rural communities.

Entrepreneurial training programs must be carefully designed to address the current knowledge and skills required in areas such as e-commerce and marketing.

The training should be tailored to the real needs of participants, avoiding content related to activities for which entrepreneurs lack adequate technical infrastructure or basic knowledge. Instead, the focus should be on developing competencies that will enable entrepreneurs to successfully use available tools and platforms, as well as encouraging innovation in line with market trends. With this approach, the training will not only be relevant but also useful, ensuring a higher likelihood of success in the competitive e-commerce environment.

Considering all the perspectives and challenges faced by rural entrepreneurship, it can be concluded that without an appropriate strategic framework, it is not possible to fully implement activities that promote this type of entrepreneurship. A strategic approach is key to identifying the specific needs, resources, and potential crucial for the development of rural entrepreneurship. Only by directing efforts towards creating an integrated and coordinated support system can sustainable progress and economic growth in rural areas be ensured, thereby contributing to the development of local communities and the overall economic stability of the region.

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PODSTICANJE RURALNOG PREDUZETNIŠTVA U SRBIJI: ULOGA STRATEGIJE RAZVOJA MALIH I SREDNJIH PREDUZEĆA

Apstrakt: Razvoj ruralnog preduzetništva predstavlja jedan od značajnih faktora za ostvarivanje održivog ekonomskog rasta u ruralnim područjima Republike Srbije. Strategija za razvoj malih i srednjih preduzeća pruža okvir za unapređenje poslovnih uslova u ruralnim oblastima kroz različite mere podrške, uključujući finansijsku pomoć, edukaciju i unapređenje infrastrukture. Iako se suočavaju sa brojnim izazovima, kao što su smanjena ekonomska aktivnost i visoka stopa migracije ka urbanim sredinama, ruralni preduzetnici mogu značajno da utiču na smanjenje tih problema. Preporučene mere, kao što su poboljšanje fizičke infrastrukture i implementacija zelene agende, mogu da doprinesu boljoj integraciji ruralnih preduzetnika u šire ekonomske tokove. Ipak, trenutna strateška dokumenta ne prepoznaju potpuni potencijal ruralnog preduzetništva, što ukazuje na potrebu za većim fokusom na ovu oblast, kako bi se iskoristile sve mogućnosti za ekonomski razvoj i demografsku stabilnost ruralnih zajednica.

Ključne reči: Mala i srednja preduzeća, ruralno preduzetništvo, strategija razvoja, Republika Srbija.

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