European Commission

Addressing key challenges by Smart Specialisation in the Western Balkans

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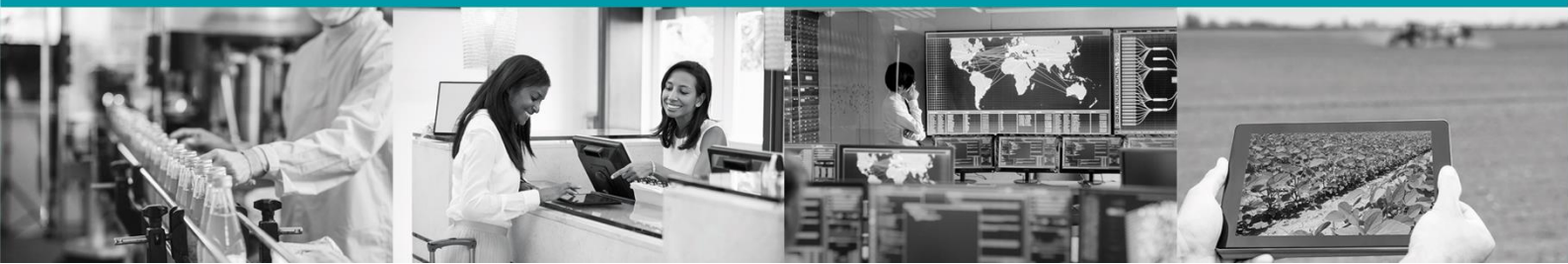
SMART SPECIALISATION



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Abstract

This paper examines the effectiveness of Smart Specialisation strategies in addressing sustainability and competitiveness challenges in the Western Balkans, a region whose innovation performance is strongly tied to EU accession efforts. Emphasizing green and digital transitions as key drivers but also situating Smart Specialisation within the New European Innovation Agenda (NEIA), the Growth Plan for the Western Balkans, and their emphasis on building connected Regional Innovation Valleys (RIVs), it highlights the need for system-level innovation focused on inclusive growth. The involvement of local players and strategic resource allocation remain crucial for practical outcomes. Evidence shows progress in digital infrastructure and sectoral initiatives, yet persistent gaps in data availability, skills and regulatory frameworks hamper uptake. In addition to environmental considerations, the paper draws attention to ICT cooperation, sectoral knowledge and innovation systems and sustainability reporting alignment as critical enablers for resilient development. Strengthening regional cooperation and stakeholder trust emerges as the key to optimising Smart Specialisation strategies for sustainable, innovation-led growth in line with EU priorities.

Executive summary

In the face of mounting modern challenges, Europe's pursuit of sustainability and resilience is critical for maintaining its competitive edge. On this journey, Europe intends to exploit its innovation and economic potential through the application of evidence-based innovation policy approach that favours transformation and efficient targeting of policy actions, such as Smart Specialisation. This paper analyses the relationship and effectiveness of Smart Specialisation strategies in addressing sustainability challenges in the Western Balkans, a region pivotal for Europe's overall progress.

Green and digital transitions have been identified as key drivers of change. These transitions are not only rapidly evolving but are essential to ensure Europe remains competitive globally. In the Western Balkan context, many new programmes and initiatives have been launched to support the actions driving these transitions. While the green and digital transitions remain important drivers, the analysis situates them within a broader EU policy frame—notably the New European Innovation Agenda (NEIA) and the Growth Plan for the Western Balkans—which emphasise connected regional innovation valleys, integration into EU industrial value chains, and stronger regional cooperation. These perspectives highlight the multiple pathways through which Smart Specialisation can foster transformation and competitiveness in the Western Balkans. The paper emphasizes the need for system-level innovation, particularly focused on inclusive growth and development, ensuring no community, region, or city is left behind. This approach aligns with the concept of a 'just transition', which is pivotal in ensuring equitable progress across diverse communities. The involvement of local players, including regions, cities, and local communities, is underscored as vital in driving innovation. Their engagement is crucial in orienting innovation towards practical and impactful outcomes. Moreover, the paper stresses the importance of mapping existing funding opportunities while identifying gaps, essential for a comprehensive understanding of the resource landscape and enabling more effective allocation and utilization of funds for sustainability initiatives. The paper also examines the linkages between various policies and strategic documents. Understanding these linkages is critical to identifying synergies and conflicts between different initiatives and directionalities. By analysing these connections, the paper aims to provide insights into optimally deploying Smart Specialisation strategies to address the unique sustainability challenges faced by the Western Balkan economies.

Smart Specialisation has shown considerable potential in enhancing regional competitiveness and fostering sustainable development. The approach can integrate environmental and social considerations into economic growth strategies, aligning closely with the United Nations Sustainable Development Goals (SDGs) and the European Green Deal. This strategic shift indicates a significant transformation in how Smart Specialisation supports sustainable development, moving from a focus primarily on economic growth to a more balanced approach that includes environmental and social sustainability goals.

The Western Balkans have made notable progress in adopting Smart Specialisation, with Montenegro and Serbia already implementing their strategies, North Macedonia and Albania recently launching its implementation, while the others are progressing fast towards the end of the strategy design phase. It has been shown that the Smart Specialisation process in these economies aim to prioritize sectors with high innovation potential but are also taking into consideration broader sustainability and societal goals, tending to make further alignment with wider European objectives in that regard. Key policy actions in the strategic documents relating to Smart Specialisation in the Western Balkan economies are linked to pursuing advancements in

digital infrastructure, renewable energy and environmental protection, among others, contributing to the region's sustainable development.

However, the paper also highlights ongoing challenges. These include digital infrastructure gaps, skills shortages, and regulatory barriers, which limit the full realisation of Smart Specialisation's benefits to addressing sustainability challenges in the region. Beyond environmental aspects, the report emphasises ICT cooperation as a horizontal enabler for both digitalisation and green transformation, and agricultural knowledge and innovation systems as a vehicle for innovation diffusion in agri-food and rural development. In addition, sustainability reporting alignment emerges as an increasingly important framework for access to EU value chains and finance. Continued efforts in resource allocation, skills development and regulatory enhancements are of crucial importance for further progress in this area. Additionally, fostering regional cooperation and building trust among stakeholders are essential for overcoming these challenges and achieving sustainable growth.

A survey was conducted to assess the impact of Smart Specialisation on sustainability issues in the Western Balkan region. The results suggested that the current policy framework, i.e. proposed methodology and related actions, could be further enhanced in order to continue supporting Smart Specialisation initiatives and that enhanced collaboration between key stakeholders, fostering innovation in green technologies and improving access to funding for sustainable initiatives are critical steps to consider moving forward. In relation to particular sustainability areas, the survey showed that clean energy, sustainable agriculture and the circular economy stood out as areas where Smart Specialisation exercises had the most significant impact. On the other side, the perceived lower impact of S3 on waste management and sustainable transport indicates that further targeted interventions might be necessary to ensure a comprehensive approach to sustainability in these areas.

This paper presents a thorough analysis of how Smart Specialisation can be a key tool in the Western Balkans' journey towards a more sustainable and resilient future. It underlines the significance of inclusive innovation, strategic resource allocation, and the integration of environmental and social dimensions into regional development strategies. By addressing these areas, the Western Balkans can enhance their competitiveness, foster sustainable development, and contribute significantly to Europe's overall progress.

1. Introduction

Smart Specialisation refers to the capability of an economic system to create new specialties by identifying untapped domains of opportunity and concentrating and clustering related resources and competencies (Foray, 2015). It embodies a participatory approach grounded in evidence for formulating innovation policy (Foray et al., 2009; Foray, 2014; Morgan, 2016; Gianelle et al., 2016; Kyriakou et al., 2016). This method relies on comprehensive analyses of economic, innovation, and scientific potential, engaging representatives from the quadruple helix in extensive discussions concerning identified promising areas for Smart Specialisation.

Over the past decade, Smart Specialisation has evolved into a fundamental strategic approach for developing and implementing research and innovation policies. It has proven to be a potent policy instrument, enhancing competitiveness and expanding opportunities within the European Union. The economies within the EU Enlargement and Neighbourhood Region have pledged to enhance their innovation policies by adopting the Smart Specialisation concept, which has proven effective in the EU over the past decade. Since 2018, all Western Balkan economies, as well as most of the countries from the Eastern Partnership and Southern Neighbourhood launched their respective Smart Specialisation processes. By 2024, most of them reached the final stages of the design process, while four economies (Montenegro, Serbia, North Macedonia and Albania) are already implementing their Smart Specialisation strategies. The advancement of the Western Balkan economies, as well as the other countries from the EU Enlargement and Neighbourhood Region, followed the execution of separate tasks and stages as envisaged in a linear framework for Smart Specialisation design (Matusiak and Kleibrink, 2018). It was managed by the designated Smart Specialisation teams who received support in terms of technical expertise by the European Commission's Joint Research Centre (Radovanovic and Bole, 2024). Recent work highlights how these processes are increasingly connected to the New European Innovation Agenda and its flagship on Regional Innovation Valleys, as well as to regional initiatives in ICT collaboration (Fabbri et al., 2025) and sustainability practices (Nukić and Selimić, 2025).

The aim of this report is to provide deeper insights into the relations between Smart Specialisation actions in the Western Balkans with the rising sustainability challenges in the region with the objective of analysing the potential of addressing these challenges by Smart Specialisation and proposing further steps in this regard. We investigated the available literature on the progress of Smart Specialisation in the Western Balkan economies, existing and planned directionalities for tackling sustainability challenges in the region and conducted a survey among the key stakeholders in the Western Balkan region on the main identified issues.

The report is structured in four main parts:

- Chapter 2 identifies sustainability challenges in the Western Balkans;
- Chapter 3 analyses main findings from the Smart Specialisation exercise in the Western Balkans;
- Chapter 4 provides insights and main results from the conducted survey on addressing sustainability challenges by Smart Specialisation in the Western Balkan region; and
- Chapter 5 provides conclusions and recommendations on the subject.

1.1. Smart Specialisation: Integrating sustainability and systemic innovation

The relationship between Smart Specialisation strategies (S3) and sustainability challenges is multifaceted and subject to ongoing debate. This complexity arises from the main objective of S3 to drive economic development with the rising needs of societies to address broader environmental and social issues concurrently, which can sometimes present conflicting priorities.

Traditionally, Smart Specialisation focused on driving regional economic growth through innovation. However, there has been intense debate on whether and how its focus might include sustainability and the SDGs. This change is part of a broader movement, evident in initiatives like the European Green Deal and other global sustainability agendas, aiming to synchronize regional development strategies with overarching sustainability objectives. This strategic shift indicates a significant transformation in how S3 supports sustainable development, moving from a focus primarily on economic growth to an approach that balances economic, environmental, and social sustainability goals. The S3 approach success is closely linked to the commitment to structural transformation and sustainability represents a key challenge addressed in many territories. This strategy aims to effectively engage all relevant stakeholders and resources to address both key economic priorities and significant regional challenges, such as environmental and digitalisation concerns. These challenges, targeted by Smart Specialisation, align closely with the United Nations Agenda 2030 and its Sustainable Development Goals (SDGs), which emphasize the interconnectedness of environmental, social, and economic dimensions of sustainable development (Bianchi et al., 2024; Reid et al., 2023; Teras et al., 2023; Miedzinski et al., 2021; Bali Swain & Yang-Wallentin, 2020).

At the core of this possible transformation seems to be a strategic reorientation of S3. Recent years have seen Smart Specialisation Strategies possibly contributing to pioneering challenge-oriented research and innovation policies. These strategies increasingly advocate for a wide array of innovations, going beyond just technological advancements, to drive comprehensive economic, environmental, and social transitions in line with the SDGs.[1]

However, the relationship between S3 and sustainability challenges is complex and debated. One critical aspect is to find an equilibrium between economic growth and environmental sustainability. While S3 focuses on fostering regional innovation and economic development through specialised areas, there is a risk that economic priorities could overshadow environmental and social considerations (Foray et al., 2012). This potential conflict requires careful balancing to ensure that economic advancements do not come at the expense of environmental degradation or social inequities. Moreover, the effectiveness of S3 in addressing sustainability challenges heavily depends on the integration of sustainability principles into innovation strategies. For instance, regions need to prioritise green technologies and sustainable practices within their S3 frameworks to truly align with the SDGs (McCann and Ortega-Argilés, 2016). This integration can be challenging given the diverse economic and industrial bases across regions, which may have varying levels of commitment and capability to adopt sustainable practices (Capello and Kroll, 2016).

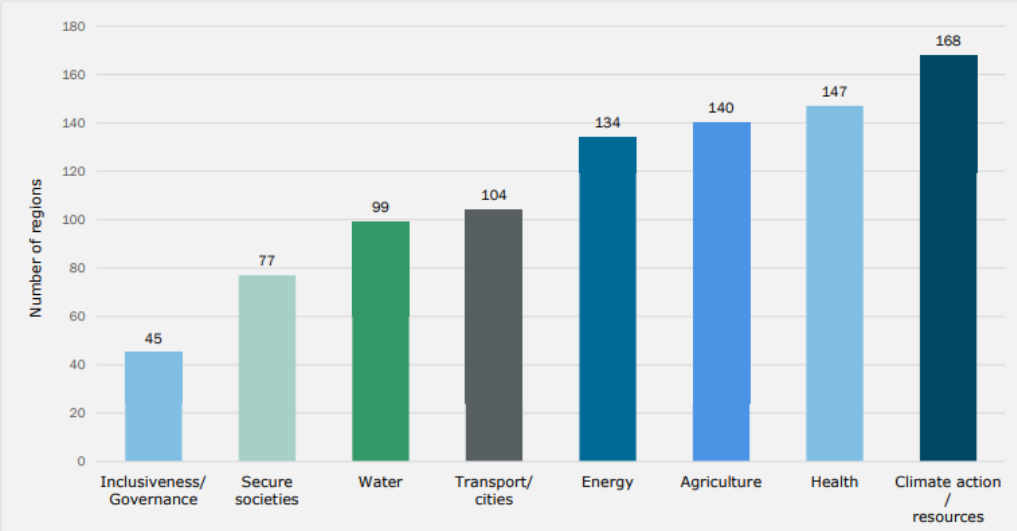
The evolution of S3 has seen a growing emphasis on sustainability, with regions increasingly recognizing the importance of incorporating environmental and social goals into their innovation strategies. This shift is reflected in recent policy developments and academic discourse, which

[1] See more under Innovation for place-based transformations, https://s3platform.jrc.ec.europa.eu/pri

highlight the necessity of a holistic approach that considers economic, environmental, and social dimensions simultaneously (Rodríguez-Pose and Wilkie, 2017; Kroll, 2019).

Smart Specialisation is now asked to embrace a more inclusive approach, integrating environmental and social transitions into its framework and extending its scope to encompass a variety of innovations for systemic change. This adaptation is vital for tackling complex, interconnected societal challenges and encourages diverse, place-based innovation pathways that respect regional differences while striving towards a shared sustainability goal (Teras et al, 2023; Miedzinski et al., 2021).

Figure 1. Number of S3 strategies in the EU that contain links to societal challenges



Note: *The illustrated topics that are linked to societal challenges are based on the challenges defined in the context of Horizon 2020. They are refined by the SDGs as well as combined with the European Innovation Partnership (EIP) areas. This was done to allow to connect the prioritisation areas of the Members States/regions more precisely to specific societal challenges and to investigate which societal challenges are focused on most.*
Source: *Prognos and CSIL (2021).*

Relationship between Smart Specialisation and addressing certain sustainability and societal challenges has been discussed in several studies. It has been shown that the elements of the Smart Specialisation process can positively impact the potential for growth through tackling sustainability issues. For example, Prognos and CSIL (2021) identified eight main topics of societal challenges based on the analysis of scientific fields and findings from previous studies in that regard (Gianelle et al, 2016; Sorvik and Kleibrink, 2015). These are:

- Inclusiveness/governance;
- Secure societies;
- Water;
- Transport/cities;
- Energy;
- Agriculture;
- Health;
- Climate action/resources.

They conducted a survey across the EU that revealed that more than 90% of all S3 strategies within the EU contain explicit reference to the societal challenge of 'Climate action/resources'. A high rate of S3 linkages with other societal challenges subgroups was noted. The results showed strong links between S3 strategies with societal challenges overall.

The sustainability-oriented approach in S3 fosters a diverse innovation ecosystem, essential for policy experimentation and learning (Bianchi et al., 2024). This allows for more nuanced and effective responses to various sustainability challenges. To maximize this potential, policy framing must recognize and embrace the need for systemic change, gradually building a comprehensive policy mix for specific missions and mobilizing multi-level governance mechanisms to scale up transformative changes.

Investing in policy learning and transformative capacities is another fundamental aspect of sustainability- oriented S3. It provides policymakers and stakeholders with the necessary tools and knowledge to effectively navigate sustainability challenges. This contributes to immediate innovation and lays the foundation for long- term, sustainable development, aligning Smart Specialisation with broader objectives of environmental sustainability and social progress (Reid et al., 2023).

Recent reports have explored aligning S3 strategies and policy processes with the SDGs, an approach termed Smart Specialisation for Sustainable Development Goals (S3 for SDGs). This involves localizing SDG targets within regional contexts and engaging a range of stakeholders in S3 processes, aiming to discover new pathways for realizing sustainability transitions through S3 strategies, from their design to implementation, monitoring, and evaluation (Teras et al, 2023).

The transformational aspects of S3 might be extended to the concept of socio-technical systems change, which views transitions as complex, multi-level processes requiring stakeholder identification, vision development, transition pathways, and scaling approaches. This method underscores the necessity of participatory processes to localize societal challenges, such as climate change, and recognizes the variable impacts across regions and stakeholders (Bianchi et al., 2024). Smart Specialisation success in fostering sustainable development hinges on balancing economic growth with environmental and social considerations, integrating sustainability principles into innovation strategies, and leveraging diverse, place-based pathways for systemic change (Foray et al., 2012; McCann and Ortega-Argilés, 2016; Capello and Kroll, 2016). This comprehensive approach facilitates the alignment of regional development with global sustainability goals, supporting resilient, adaptive, and inclusive innovation ecosystems (Rodríguez-Pose & Wilkie, 2017; Kroll, 2019). System innovation, recognized as a highly ambitious and challenging goal, could be included into the S3 framework. The combination of top-down directionality and bottom-up processes of self-discovery and experimentation equips the S3 model to manage such complex processes effectively. This approach, supported by socio-technical perspectives and resilience research, advocates for a diversity of innovation niches to foster transformative change. This not only supports regional resilience in facing societal challenges but also positions regions to capitalize on emerging opportunities (Miedzinski et al, 2021).

In conclusion, these insights highlight the importance of embracing socio-technical systems change and considering sustainability challenges as complex, multi-level processes. The evolution of the S3 framework towards integrating wider system changes, including social and environmental dimensions, calls for a more holistic and participatory approach in innovation policy and regional development. This evolution aims to foster transformative change and align regional development strategies with global sustainability objectives.

1.2. Advancing innovation potential of the Western Balkans

To enhance the implementation of innovation policies and maximize their effectiveness, economies within the Western Balkans require not only technical expertise but also sustained assistance. The transformation of national research and innovation ecosystems in this region is pivotal, targeting the stimulation of a sustainable economy, effective combat against climate change, and the fostering of regional cooperation. These objectives are not only central to the Western Balkans agenda on innovation, research, education, culture, youth, and sport[2], but also resonate with the priorities of the Economic and Investment Plan for the Western Balkans[3]. Furthermore, these aims are supported by the newly proposed Growth Plan for the Western Balkans[4], signifying a concerted effort to align regional development with broader European goals.

In addition to these strategic alignments, the Smart Specialisation process is crucial for enhancing regional competitiveness. It does so by ensuring that innovation policies are in harmony with other key policies such as industrial, educational, employment, environmental, and digital policies (see Bianchi et al, 2024). The overarching aim of the Smart Specialisation initiative is to foster sustainable competitiveness within the region, referring to the ability of the region to achieve economic growth and development while simultaneously addressing social and environmental challenges, ensuring long-term prosperity. This is being pursued through the development of capacities for designing and implementing innovation policies based on the Smart Specialisation framework, with support from the European Commission. Economies in the region are not only investing in creating and reinforcing partnerships within the region and with the EU but are also increasingly applying the Smart Specialisation methodology to address specific regional challenges. These include environmental issues, in alignment with the Green Agenda for the Western Balkans[5], and digitalization, in accordance with the Digital Agenda for the Western Balkans[6]. These efforts are complemented by other relevant programs that contribute to sustainability and regional growth.

Recent years have witnessed significant strides in the Smart Specialisation process within the Western Balkan Region. Montenegro, Serbia, North Macedonia and Albania have completed the complex design stages of their S3 frameworks, reflecting a commitment to detailed planning and strategic alignment. For instance, in the Western Balkans, economies have identified priority areas for intervention, directly or indirectly addressing the environmental and digitalisation challenges mentioned earlier. These regions are now actively engaged in the implementation phase, deploying a range of policy actions and indicators specifically designed to tackle these challenges. The policy measures proposed, particularly in similar or preliminary priority areas, by Western Balkan economies lay a solid foundation for exploring opportunities for joint regional actions. Such collaborative efforts could enhance regional competitiveness and capacity, creating a synergistic effect that positively impacts the tackling of regional innovation challenges through coordinated action.

2 https://link.europa.eu/fBpPdm

3 https://ec.europa.eu/commission/presscorner/detail/en/ip_20_1811

4 https://neighbourhood-enlargement.ec.europa.eu/enlargement-policy/new-growth-plan-western-balkans_en

5 COM(2020) 641

6 https://ec.europa.eu/commission/presscorner/detail/es/ip_18_4242

This progress underscores a growing recognition of the interconnected nature of innovation, sustainability, and regional development. It highlights the potential for regional cooperation to amplify the impact of individual efforts, creating a more cohesive and effective approach to addressing the complex challenges facing the EU Enlargement and Neighbourhood Region.
The Smart Specialisation process, therefore, not only serves as a framework for individual country development but also as a catalyst for regional integration and collaboration, ultimately contributing to the broader objectives of sustainable development and economic resilience.

2. Sustainability challenges in the Western Balkans

Following the successful implementation of the Smart Specialisation exercise in the second decade of the 21st century in the EU member states and their regions, countries outside of the EU started exploring the possibility to apply the same approach for developing their first Smart Specialisation strategies as main innovation policy drivers. The first three countries to launch the process in 2016 were Serbia, Ukraine and Moldova, who expressed the need for technical assistance for this process from the European Commission services, namely from the Joint Research Centre.

Soon after, by 2018, Smart Specialisation gained traction in the entire Western Balkan region, as all economies from the region launched their respective Smart Specialisation design processes. Since then, the progress in implementing the Smart Specialisation in the region was supported by the Joint Research Centre, who provided guidance through the stages of the design process. To address these growing needs in the Western Balkan region concerning the development of Smart Specialisation strategies, DG NEAR and JRC have signed an Administrative Arrangement in July 2019, which enabled JRC to intensify expert support to Western Balkan economies in the development of Smart Specialisation strategies up until the end of 2023.

During the implementation of the project within this cooperation, the progress in Smart Specialisation became evident in the entire Western Balkan region. Montenegro adopted its Smart Specialisation strategy in 2019 and received conditionally positive assessment by the European Commission. Subsequently, the country launched the implementation phase, receiving further support by the JRC in developing operational programmes for implementation of Smart Specialisation in priority areas. Montenegro established a sound structure for the implementation of Smart Specialisation, which is governed by country's Council for innovation and Smart Specialisation and produced good results for the first two years of strategy implementation. Serbia adopted its Smart Specialisation strategy in 2020 and related action plan to the strategy in 2021. The new action plan was adopted in 2023, and the related Smart Specialisation documents are currently being assessed by the European Commission's services. In the end of 2023, North Macedonia finalised the adoption process for its own Smart Specialisation strategy, and it will soon undergo the assessment procedure by the European Commission's services. Albania finalised its Smart Specialisation strategy in 2025 and has recently launched its implementation. Kosovo* completed all stages of the design process and is currently finalising the draft of its Smart Specialisation strategy, while Bosnia and Herzegovina formally finalised its quantitative mapping exercise in 2023 and is currently defining its potential priority areas and conducting final preparatory steps for launching the stakeholder dialogue within the Entrepreneurial Discovery Process. Detailed Smart Specialisation progress in the Western Balkan economies is explained in more detail in the Chapter 3.

When Smart Specialisation was launched in the in the Western Balkan region, the focus of the exercise was on identifying true priority areas of the economies of the region based on real evidence, thorough analysis of economic, innovation and scientific potential and participatory decision-making manner, as the region sought to advance its competitiveness on true potential in the transformational context. In its knowledge and innovation-based growth, the region is facing

* This designation is without prejudice to positions on status and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence.

many challenges, some of which are common at the European or even global level, while some are more pertinent to the Western Balkan environment.

The EU Enlargement and Neighbourhood Region, which includes the Western Balkans, Eastern Partnership, and Southern Neighbourhood countries, is during significant transitions toward a knowledge-based economy. This shift aligns with their aspirations for EU integration. However, the journey is marked by a series of persistent challenges, which include high unemployment, low levels of foreign direct investment, infrastructure gaps, environmental issues and many other. These issues highlight the need for strategic frameworks like Smart Specialisation to guide economic reforms and development. The region is characterized by a diverse mix of agricultural, industrial, and service-based economies, which further complicates the landscape of transition.

Moreover, as these transformational economies implement socio-economic and legislative changes with the goal of joining the EU, they encounter specific obstacles. Key among these are 'ministerial silos', a lack of trust between stakeholders, non-inclusive decision-making, and political sensitivities. These factors make it challenging to launch cross-border and intra-regional policy actions that could benefit the entire region.

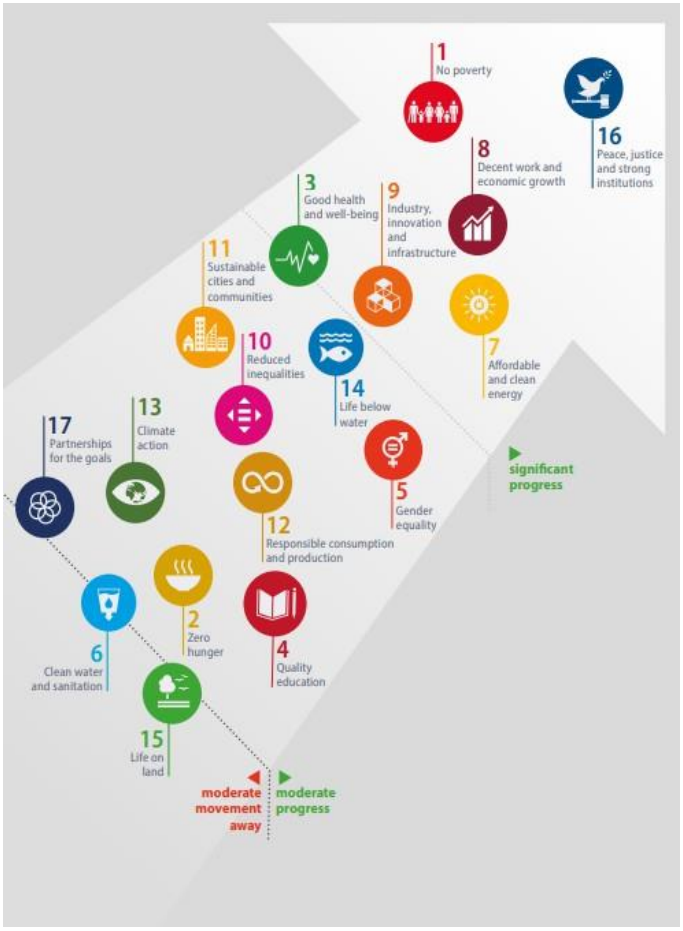
Consequently, economies tend to focus on building competitiveness based on their national economic and innovation strengths, rather than leveraging regional synergies.

Implementing an integrated innovation policy mix and engaging stakeholders in the decision-making process, particularly for neighbouring EU countries, remains a daunting task (Radovanovic and Gerussi, 2020). Additionally, ensuring continuous political commitment, maintaining motivation, and fostering stakeholder engagement are significant hurdles. This commitment demands robust and stable governance, capable of adapting to changes in mandates and strategic orientations of the countries, especially given the nature of the transformational economies in the region. Such nature is driven by ongoing and significant structural changes across economic, political and social dimensions of the economies, affected by multiple factors, such as economic reforms, EU accession, social transformation and political and institutional reforms.

2.1. Western Balkans and targeted actions for sustainable development

The United Nations Sustainable Development Goals (SDGs) are a comprehensive framework comprising 17 interrelated objectives designed to guide global efforts towards a more sustainable, equitable, and prosperous future by 2030. Established in 2015, these goals represent an ambitious global consensus to address a wide range of issues including poverty, health, education, climate change, and environmental protection. The SDGs are unique in their comprehensive nature, covering social, economic, and environmental dimensions of development. They emphasize the interconnectedness of various global challenges and underscore the need for holistic, integrated solutions (Teras et al, 2023). The Figure 1 offers an overview of all 17 goals with the advancement of the general EU progress.

Figure 2. Overview of EU progress towards the SDGs (2015-2021)



Source: *European Commission (2022), Sustainable development in the European Union: Monitoring report on progress towards the SDGs in an EU context.*

The relevance of the SDGs to knowledge-based and innovation-based development is evident in the context of S3 (Reid et al, 2023; McCann and Ortega-Argilés, 2016). These strategies are pivotal in aligning regional and local development efforts with the ambitious goals of the SDGs. S3, which focuses on fostering place-based economic transformation, provides a strategic framework well-suited to addressing the objectives of the SDGs. This alignment is rooted in key aspects of Smart Specialisation, including the pivotal role of science, technology, and innovation (STI) in development prioritization, stakeholder engagement, resource mobilization, and cooperation, making them relevant to both STI for SDGs roadmaps and S3 processes. Smart Specialisation is recognized as a suitable strategic framework for embracing and pursuing the SDGs, especially when considering green and digital transitions. This suitability stems from its focus on fostering place-based economic transformation, aligning closely with the goals and methodologies needed to realize sustainable development. This potential has been recognized internationally as a promising vehicle for advancing sustainable development (Miedzinski et al, 2021; Reid et al, 2023; Harding et al, 2021).

Innovation policy, particularly in the context of Smart Specialisation, needs to incorporate a strong sustainability- oriented directionality. This means that sustainability goals should be reflected in the policy mixes designed for regional development. Research on policy mixes for sustainability transitions, albeit still limited at the regional level, provides insights and principles that are applicable to Smart Specialisation. These include ensuring goal consistency, adjusting the comprehensiveness of

policy mixes to address specific challenges, and striving for better horizontal and vertical policy coherence. Effective policy roadmaps can improve coordination and coherence over time.

Furthermore, there is a critical need for policy learning and experimentation in the design and implementation of innovation policies aligned with the SDGs. This involves adjusting the evidence base of these policies, revising monitoring and evaluation systems, and embracing the complexities and uncertainties linked to transformative change. New dedicated metrics and indicators are essential to measure the social and environmental outcomes and impacts of Smart Specialisation, including its unintended effects. These indicators are key to tracking progress towards regional sustainability goals and assessing the regional contribution to the SDGs (Miedzinski et al, 2021).

The SDGs act as catalysts for deep, systemic changes across countries and sectors, and they encompass broad societal and economic transformations. While the SDGs provide a unified framework for integrating SDGs with a focus on environmental sustainability, their implementation varies greatly due to national priorities and contexts (EEA, 2020). Utmost importance is put on multi-level governance and stakeholder engagement in realising these goals. The SDGs necessitate collaborative efforts from all sectors of society, including government, business, civil society, and science, and require significant shifts in resource use, infrastructure, institutions, technologies, and social relations. Each country adapts these global goals to their local context, leading to varied implementation strategies and focus areas. This highlights the transformative power of the SDGs, while the variability in approaches underscores how the SDGs serve as a flexible framework, adapting to different national needs while maintaining a collective global vision towards sustainable development. The concept of 'Six Transformations' (Sachs et al, 2019) highlights the need for integrated actions across critical sectors like education, health, energy, industry, food systems, and digital innovation. These transformations underscore the requirement for an inclusive, systemic approach, engaging governments, businesses, and civil society in a cohesive movement towards global sustainability goals. There is an obvious need for accelerating transformations across multiple systems to achieve the SDGs (Allen and Malekpour, 2024). This emphasises the role of strategic interventions, the importance of understanding system dynamics, and leveraging positive tipping points to foster rapid, large-scale systemic shifts towards sustainability. Key focus areas include identifying and navigating barriers, capitalizing on enabling conditions for acceleration, and employing a deep understanding of political dynamics and policy feedback mechanisms. This analysis of Allen and Malekpour (2024) emphasises the crucial role of strategic, systemic interventions and policy reforms in accelerating progress towards the SDGs, thus contributing to transformative changes across societal, economic, and environmental dimensions.

Figure 3. Six SDGs transformations

Source: *Sachs et al, 2019.*

The UN SDGs offer a comprehensive framework for addressing global development challenges and serve as a blueprint for global transformation, encompassing diverse aspects of societal, economic, and environmental development. Their integration into knowledge-based and innovation-driven strategies, particularly through Smart Specialisation, emphasizes the critical role of regional and local actions. This approach highlights the need for innovation, multi-level governance, stakeholder engagement, and sustainable practices to align economic transformation with the goals of the 2030 Agenda. The transformative power of the SDGs lies in their ability to guide systemic changes, adapt to different national needs, and maintain a collective global vision for sustainable development.

2.1.1. Main challenges in the Western Balkans

The Western Balkans, a region rich in history and cultural diversity, currently stands at a critical juncture in its journey towards sustainable development. This path is fraught with a complex array of challenges spanning environmental, economic, and energy sectors.

At the heart of these challenges lies the issue of environmental degradation. The region grapples with significant pollution affecting its soil, water, and air. These environmental concerns are exacerbated by socio-economic factors such as recovering economies, constrained budgets for environmental initiatives, insufficient regulations, and limited public participation. Additionally, the prevalence of outdated industrial practices and restricted access to cleaner technology and environmental information further complicates the situation.

Economically, the Western Balkans have witnessed growth, yet they contend with obstacles like inflation, energy supply disruptions, and economic fragmentation. Small and medium-sized

enterprises (SMEs) emerge as vital players in this landscape, significantly contributing to the economy and sustainable development, while forming a substantial portion of private-sector employment and added value.

The energy sector presents its own set of challenges. Coal remains the primary energy source, accounting for 70% of electricity production in 2023, which underlines the region's struggle in transitioning to a low-carbon, environmentally sustainable economy. Recent analysis show that sustainability practices differ widely across sectors, with notable progress in eco-tourism, construction, and some green business practices, despite lagging energy reforms (Nukić et al., 2025). In parallel, ICT collaboration is increasingly recognised as a horizontal enabler for energy efficiency and digitalised green solutions (Fabbri et al., 2025). This transition, although initiated, progresses slowly, hampered by challenges in in aligning with waste management legislation, the circular economy, and high levels of air pollution mainly due to emissions from aging coal plants and heavy reliance on private transportation. The region's integration into the European Union and alignment with the Energy Community's methodology varies, impacting the implementation of the Green Agenda. Often perceived as an external obligation, the green transition faces delay due to incomplete legal frameworks and necessary reforms. Smart Specialisation strategies are being adopted as a new policy approach for industrial development, focusing on key economic transformation priorities and optimizing public investments to stimulate private sector engagement. However, the commitment to Sustainable Development Goals and the European Green Deal faces significant hurdles, particularly the sluggish pace of the green transition.

Agriculture, pivotal in food production, environmental protection, and climate change mitigation, faces threats from climate-induced factors. The region also falls short in protected areas, highlighting a need for enhanced environmental education and practices to foster ecological transition.

Despite these challenges, the Western Balkans have prioritized actions related to certain Sustainable Development Goals (SDGs), notably those concerning water and sanitation, clean energy, sustainable cities, climate action, and life on land. The use of multi-level governance approaches in SDG actions, encompassing national, regional, and local scales, is noteworthy. A high percentage of countries are developing national SDG indicators to monitor progress, with many submitting Voluntary National Reviews to the UN. Stakeholder engagement, involving civil society, the private sector, and academic institutions, is emphasized in the SDG policy and strategy formulation process (EEA, 2020).

The need for enhanced transnational cooperation is evident, particularly in building a network of renewable energy crucial for regional autonomy and mitigating reliance on fossil fuels. This is especially important given recent global events that have delayed investments in the energy sector. Sustainable energy supply remains a critical concern, calling for a shift towards a circular, low-carbon, and climate-resilient economy. The 'SEE 2030 Strategy' identifies key sustainable development areas, including regional trade enhancement, transport connectivity improvement, income inequality reduction, disaster risk management, and sustainable economic growth support through the financial sector. Investments in agriculture, addressing demographic trends, and improving education and health sectors are also emphasized (RCC, 2021).

Crucially, aligning regional policies and strategies with the European Union's policies, particularly the Green Deal, is vital for sustainable development. This alignment, key for post-pandemic recovery, places people at the forefront and rethinks policies for sustainable consumption and production. The Western Balkan economies face a multifaceted sustainability challenge requiring an integrated approach. This involves enhancing regional cooperation, addressing socio-economic issues, aligning with EU policies, and implementing a strategic vision that aligns with the

Sustainable Development Goals. This comprehensive approach is essential for the region's transformation towards a greener, more sustainable future.

2.1.2. Key achievements and future directions

The Western Balkan region is actively engaged in aligning its national policies with the Sustainable Development Goals (SDGs). This endeavour reflects a commitment to addressing the myriad challenges of sustainable development through a comprehensive approach that integrates environmental, social, and economic dimensions. Each economy in the region, while displaying unique strategies and priorities reflecting their individual contexts and challenges, collectively demonstrates a focus on environmental sustainability. This focus is crucial to the overall achievement of the SDGs and encompasses a range of activities including water management, energy efficiency, climate action, biodiversity preservation, and sustainable agriculture. Despite the progress made, the region continues to grapple with persistent challenges such as financial constraints and the need for specific strategies and enhanced capacity building (EEA, 2020).

For example, Albania and Montenegro have placed significant emphasis on SDG 6 (Clean Water and Sanitation), underscoring their commitment to enhancing water management and sanitation. Similarly, SDG 7 (Affordable and Clean Energy) is a key focus, with initiatives aiming to boost energy efficiency and facilitate the transition to renewable energy sources. The region is also actively addressing climate change as part of SDG 13 (Climate Action) by working to reduce greenhouse gas emissions and adapt to climate-related impacts. The commitment to protecting and conserving terrestrial ecosystems, in line with SDG 15 (Life on Land), is evident in their efforts to preserve biodiversity and natural habitats. Sustainable agriculture, essential for food security and environmental health, ties into SDG 2 (Zero Hunger), with measures to promote sustainable agricultural practices being adopted.

Albania and Montenegro exemplify their commitment to the Sustainable Development Goals (SDGs) through targeted initiatives. Both countries emphasize SDG 6 (Clean Water and Sanitation) by improving water management and sanitation infrastructure.[7,8] They also focus on SDG 7 (Affordable and Clean Energy) by promoting renewable energy projects and improving energy efficiency, guided by their respective national renewable energy plans.[9,10] Addressing SDG 13 (Climate Action), both nations implement climate strategies to reduce greenhouse gas emissions and enhance climate resilience, aligning with regional frameworks like the Western Balkans Green Agenda. Furthermore, efforts to protect biodiversity under SDG 15 (Life on Land) and promote sustainable agriculture under SDG 2 (Zero Hunger) underscore their holistic approach to sustainable development.[11] Albania's sustainable development agenda encompasses various domains, including environmental protection and economic competitiveness. The National Strategy for Development and Integration (NSDI) for 2015-2020 aims to bridge the SDGs with its core components, showing notable alignment with SDGs related to health, energy, economic growth, and innovation, though less so with marine life preservation (SDG 14) (EEA, 2021).

7 https://albania.un.org/en/sdgs/6

8 https://sustainabledevelopment.un.org/content/documents/10695Montenegro%20-%20HLPF%20Report.pdf

9 https://faolex.fao.org/docs/pdf/mne208502.pdf

10 https://energetska-efikasnost.me/en/energy-efficiency-action-plan/

11 See EU progress reports for Albania and Montenegro for 2023

Bosnia and Herzegovina has implemented an SDG Framework, incorporating extensive stakeholder consultations to inform strategic planning across institutions. The country focuses on environmental SDGs, addressing areas like water management, sustainable consumption, climate action, marine conservation, and land ecosystems. The 'Imagine2030' initiative was launched to engage citizens with the SDGs (Bosnia and Herzegovina, 2019).

Kosovo, not a UN member, primarily aligns its SDG actions with its European integration efforts. Key steps include establishing the National Council for Sustainable Development (NCSD) and developing a National Development Strategy 2016-2021.[12] However, challenges persist due to the lack of specific strategies and financial and institutional capacities (EEA, 2021).

Montenegro has adopted a 'DPSIR' approach (Driver-Pressure-State-Impact-Response) to advance its SDG actions, identifying priority areas and strategic goals.[13] The National Strategy for Sustainable Development until 2030 aligns sectoral policies with the SDGs, focusing on natural capital preservation and introducing a green economy (Ministry of Sustainable Development and Tourism of Montenegro, 2016).

North Macedonia has prioritized environmental sustainability in its UN Partnership for Sustainable Development Strategy, integrating the 2030 Agenda for Sustainable Development with national context targets (EEA, 2021). The plan, under the vice-prime minister's cabinet, aims to mainstream the 2030 Agenda nationally.

Serbia is integrating environmental protection into various sectoral policies to support sustainable growth. It focuses on areas like clean water, affordable energy, industrial innovation, sustainable cities, climate action, and land ecosystem preservation, establishing an Interministerial Working Group to guide the achievement of the 2030 Agenda (UNECE, 2016).

The Western Balkans' participation in EU programs and initiatives related to sustainability has shown varying levels of engagement and success (Damjanovic and Windischbaur, 2023). The participation of Western Balkan economies in EU Framework Programmes such as Horizon 2020 and Horizon Europe has been substantial. For instance, in Horizon 2020, Serbia had 415 participations with a net EU contribution of €134.80 million.[14] This participation has been crucial in developing excellence and aligning national research and innovation strategies with those of the EU. The Framework Programme Horizon Europe introduced Missions to address major societal challenges, increasing the impact of public investments in R&I activities and supporting digital and resilient economies. Some Western Balkan cities have been selected for the Climate-Neutral and Smart Cities Mission under Horizon Europe. In 2022, within the Horizon Europe Missions, cities like Elbasan (Albania), Sarajevo (Bosnia and Herzegovina), and Podgorica (Montenegro) were chosen for the 100 Climate-Neutral and Smart Cities by 2030 initiative. This selection enables these cities to develop comprehensive plans for climate neutrality, showcasing the region's commitment to addressing climate change.

Western Balkan's participation in the European Partnerships is limited, due to various challenges, such as lack of strategic decisions, commitment for national funding and access to networks (Bechev, 2022; Scazzieri, 2021). Furthermore, the region faces structural issues that hinder sustained progress, including economic constraints and the complexity of meeting EU integration

12 http://unkt.org/wp-content/uploads/2017/06/Fact-sheet-SDGs-in-Kosovo-2017-Fin-.pdf

13 https://www.eea.europa.eu/soer/2015/countries/montenegro

14 European Commission | Serbia Horizon 2020 country profile: https://webgate.ec.europa.eu/dashboard/extensions/CountryProfile/CountryProfile.html?Country=RS

requirements.[15] These partnerships bring together the European Commission, EU Member States, and public and private partners to align research and innovation strategies. The new generation of European Partnerships launched with Horizon Europe focuses on generating stronger policy impacts contributing to EU policy objectives for a green, digital, and resilient Europe. For example, Bosnia and Herzegovina aims to join the European Partnership for High Performance Computing, an initiative crucial for advancing digital technologies in the region.[16] On the other hand, Western Balkan economies actively participate in EUREKA programmes, which provide opportunities for international R&D collaboration. For instance, since 2007, 294 organizations in Serbia have been involved in 149 EUREKA projects, with a total cost of 165 million Euros (Damjanovic and Windischbaur, 2023). This demonstrates the region's commitment to enhancing R&I through international collaboration.

The IPA funds are an essential source for R&I investment and capacity building in the Western Balkans. The Economic and Investment Plan for the region under IPA III aims to support the twin green and digital transition, mobilizing significant funding for the period 2021-2027, which are pivotal for economic recovery and sustainable development. In the period 2014-2020, Albania utilized €639.5 millions of IPA II funds, with significant portions allocated to sectors like environment, climate change, and energy, as well as competitiveness, innovation, agriculture, and rural development.

While Western Balkan economies have seen growth in employment and FDI, ongoing challenges include structural issues, resilience to external shocks, and demographic trends. The SEE 2030 Strategy (RCC, 2021) outlines achievements and challenges in this context, offering a framework for addressing challenges and achieving sustainable development in line with global SDGs. The strategy aims for sustainable economic growth that reduces poverty and inequality, empowers women, improves social inclusion, counters depopulation, and accelerates green and digital transitions, stressing the importance of regional cooperation and environmental sustainability.

Environmental challenges are primarily manifesting in soil, water, and air pollution. These issues stem from a combination of socio-economic factors, including recovering economies, limited environmental protection budgets, insufficient regulation and public participation, outdated industrial practices, and restricted access to cleaner technology and environmental information (Radovanovic and Stevanovic-Carapina, 2024). In addition to weak recycling performance, comparative research shows that green practices within firms vary; some have adopted certification programmes and eco-initiatives, while others still lack awareness of resource management opportunities (Nukić et al., 2025). Building sectoral innovation systems, such as AKIS in agri-food, could accelerate the uptake of circular and sustainable practices beyond waste alone.

Achievements include employment growth, with the region creating approximately 835,000 jobs between 2010 and 2019, and a notable increase in FDIs, from EUR 3.6 billion in 2010 to almost EUR 8 billion in 2019 (World Bank Group, 2019). However, structural challenges persist, such as weak resilience to external shocks, high youth unemployment, lower wages, and lagging productivity compared to the EU. Attention is needed in areas like labor markets, investment and business environments, connectivity, digitalization, human capital, research, development, and innovation (R&D&I), climate and environment, and rule of law and good governance. The COVID-19 pandemic

15 https://link.europa.eu/hCQTqH

16 https://webalkans.eu/en/country/bosnia-and-herzegovina/

has significantly impacted employment and FDI, underscoring the need for resilient reform processes and alignment with EU recovery efforts (World Bank Group, 2024).

In the realm of sustainable development, the Western Balkans is focusing on enhancing intra-regional trade and connectivity, addressing environmental concerns through policies aimed at green transitions, and improving energy efficiency. Investments in education and health sectors are recognized as vital for elevating the quality of life and economic productivity. Diversifying the economy, particularly in services and agriculture, is emphasized for enhancing efficiency and resilience. Agriculture, while essential for food production, safety, and environmental protection, also faces threats from climate change. These efforts are aligned with Sustainable Development Goals (SDGs), particularly SDG 9 (Industry, Innovation, and Infrastructure), SDG 7 (Affordable and Clean Energy), SDG 4 (Quality Education), and SDG 3 (Good Health and Well-being). Policies such as the EU Green Deal and national strategies for energy efficiency and renewable energy are critical in driving these sustainable development initiatives (World Bank Group, 2024; World Bank Group, 2019). The region's percentage of protected areas is concerning, with some economies having less than 5% of their territory under protection, falling short of the recommended 20% mark. Progress on the green transition, following the development of the Green Agenda in 2019, remains limited. Enhancing green skills, especially among younger generations, is critical for ecological transition. Addressing demographic trends such as aging populations and emigration is identified as critical for sustaining social security systems and ensuring a dynamic workforce. Alongside skills shortages, a pressing institutional challenge is the lack of alignment with European Sustainability Reporting Standards (ESRS/CSRD), which risks limiting SMEs' integration into EU supply chains (Ljutic et al., 2024). Addressing this is as crucial as traditional barriers like regulation or finance.

The Western Balkan economies lack a cohesive, unified plan for energy transition. This includes considerations for the supply and demand of various energy forms across the region and energy trade both within the region and with neighbouring countries. A significant challenge is replacing the baseload power currently generated from coal (Ignjatovic et al, 2024; Radovanovic and Stevanovic-Carapina, 2024). The OECD (2022a) suggests that to overcome these challenges, the Western Balkan economies should focus on transitioning from coal to cleaner energy sources, improving energy efficiency, reforming energy pricing to balance environmental concerns and the needs of vulnerable groups, enhancing regional energy sector integration, and mobilizing financial resources for green recovery.

In the last years, the region has made commendable progress in aligning with the EU Green Deal and the SDGs, particularly in transitioning towards a circular economy and clean industrial development. However, the region continues to face economic and structural challenges, compounded by the impacts of global events such as the COVID-19 pandemic. Environmental and climate concerns remain pressing issues, necessitating comprehensive strategies and actions for clean energy transitions, sustainable agriculture, and biodiversity protection. To successfully implement the Sofia Declaration on the Green Agenda for the Western Balkans, several key actions are necessary. These include ensuring regional ownership and cooperation, adopting a multi-stakeholder approach, fostering cross-sectoral collaboration among Western Balkan authorities, and strengthening cooperation at various levels, particularly in trade, connectivity, and cooperative environmental and energy efforts. This collaborative and comprehensive approach is essential to address the environmental challenges and promote sustainable development in the region. Education, skills development, and fostering innovation are also critical areas of progress, aligning with the objectives of the Green Agenda for the Western Balkans and the EU's innovation policies.

The results demonstrate that the Western Balkan economies are actively working towards a green transition, aligning with EU policies and global sustainability goals. Significant improvements have been made in areas like smart specialization, eco-innovation, and clean industrial development. However, the region also faces challenges related to economic structures, environmental issues and regional collaboration. While coal dependence and financing constraints remain critical, the transition is not only an externally driven agenda. Regional ICT cooperation upgraded knowledge and innovation systems in related priority areas, such as agriculture, and improved sustainability reporting capacity provide domestic levers to embed transition ownership into Smart Specialisation strategies. The continuous development of policies and strategies aimed at fostering innovation, sustainability and regional cooperation will be crucial for the Western Balkans in achieving their sustainability and green transition goals.

Additionally, the region has shown a strong commitment to renewable energy projects, with economies like Albania and Montenegro investing heavily in solar, wind, and hydroelectric power to reduce their reliance on non-renewable sources. Efforts to improve water management systems have also been prioritized, ensuring clean water and sanitation, which aligns with SDG 6. Furthermore, climate action is being addressed through national climate strategies and participation in regional frameworks such as the Western Balkans Green Agenda, targeting the reduction of greenhouse gas emissions in line with SDG 13. Biodiversity conservation and sustainable agricultural practices are being promoted to protect terrestrial ecosystems, essential for food security and environmental sustainability. The region's engagement in European research and innovation programs like Horizon Europe has facilitated the alignment of national strategies with EU goals, fostering excellence and promoting sustainable development. Investments in education and health sectors are recognised as vital for improving the quality of life and economic productivity, while efforts to diversify the economy in sectors like services and agriculture enhance resilience and efficiency. International collaboration through programs like EUREKA has been instrumental in building research and innovation capacity, demonstrating the region's commitment to adopting sustainable technologies and best practices. These comprehensive efforts underscore the proactive stance of the Western Balkans towards achieving a sustainable and green future, despite the ongoing structural and regional challenges that need to be addressed to fully realize their green transition ambitions.

2.2. Main directionalities for the sustainable development of the Western Balkans

In building sustainable future, the Western Balkan economies can benefit from several initiatives that are based on the principles of the sustainable development in Europe and are advancing the efforts of bringing the region closer to the European Union. The following section pinpoints some of the most important ones that are affecting sustainable development of the Western Balkan region and its capacities for addressing key challenges ahead.

2.2.1. The Western Balkan Agenda on Innovation, Research, Education, Culture, Youth and Sport

On October 6, 2021, at the EU-Western Balkans Brdo Summit, leaders from the European Union and its Member States, together with their counterparts from the Western Balkans, launched the

'Western Balkans Agenda on Innovation, Research, Education, Culture, Youth and Sport.'[17] This initiative is a comprehensive, long-term strategy aimed at fostering cooperation between the European Union and the Western Balkans. The strategy's primary focus is on promoting scientific excellence, reforming education systems in the region, creating opportunities for youth, and preventing brain drain. It aims to bolster the region's economic and societal development through increased investments in research, education, culture, youth, and sport.

The Western Balkans Agenda is designed to advance existing efforts in the region and facilitate crucial socio- economic transformation processes. It fosters creative solutions to stimulate economic growth and stability. The agenda sets forth several overarching objectives, including transforming national research and innovation ecosystems, stimulating a sustainable post-COVID-19 economy, counteracting climate change, nurturing knowledge-based societies, enhancing the quality of education and training, boosting human capital development, improving mobility and connectivity, creating a prosperous Western Balkans within Europe, and fostering regional cooperation. The Agenda's Action Plan is structured around three main pillars, as detailed in the Table 1.

Table 1. Three pillars of the Western Balkans Agenda on Innovation, Research, Education, Culture, Youth and Sport

THE WESTERN BALKANS AGENDA ON INNOVATION, RESEARCH, EDUCATION, CULTURE, YOUTH AND SPORT		
Political Agenda – *Towards a sustainable future by stimulating an economy that supports the recovery and helps to create jobs*	**Thematic Agenda** – *Towards closer alignment with the EU strategic priorities*	**Regional Agenda** – *Towards a closer regional economic integration through planned investments in human capital development and digital transformation*
Reflecting the strategic importance of the region and supporting its integration process through an increased EU engagement; Nurturing knowledge-based societies and evidence-informed policy making; Supporting the association to all the Union programmes covering Research.	Transforming the national research and innovation eco-systems; Counteracting climate change and supporting the digital transformation; Promoting the implementation of the EU Green Deal in the Western Balkans.	Enhancing the quality of education and training; Boosting human capital development; Reducing the gender and digital divide; Improving mobility and connectivity.
Innovation, Education, Culture, Youth and Sport; Supporting the implementation of systemic changes and reforms.		Fostering cultural and regional cooperation.

Source: *European Commission. A Western Balkans Agenda on Innovation, Research, Education, Culture, Youth and Sport, 2021.*

[17] https://link.europa.eu/fBpPdm

Within the political sphere, the Agenda's launch during the Slovenian EU Presidency at the Western Balkans Summit marks a significant milestone in regional collaboration. This is further augmented by the successful conclusion of association negotiations in various sectors such as higher education, creative arts, and student exchange programs (including Erasmus+), particularly with economies like North Macedonia and Serbia. The completion of the European Research Area (ERA) monitoring reports underscores a commitment to evaluating and enhancing the region's research and innovation capabilities.

Regionally, important actions include the initiation of the Western Balkans Horizon Europe Twinning, which aims to strengthen policymaking through grants. Complementing this is the EIT Cross-KIC program, focused on promoting the circular economy in the Western Balkans. A significant intellectual contribution from this period is the Foresight Study, projecting the future of research and innovation in the Western Balkans by 2035. Enhanced cooperation with international organizations such as EUREKA and COST is evidenced by the full membership of Albania and Bosnia and Herzegovina in EUREKA and active participation in the Global Innovation Summit. Additionally, Kosovo* connection to the GEANT network and the launch of Horizon 2020 Green Deal projects represent major advances in digital connectivity and environmental sustainability.

Efforts to improve quality assurance in vocational education and training, highlighted by initiatives such as dialogues on teacher and trainer assessments and the ETF Quality Assurance Platform, have been a focal point. Environmental and public health improvements are evident in actions like the scenario analysis of air quality impacts until 2050 and the publication of a report on the status of air pollutants and greenhouse gases in the region. Other thematic actions encompass the launch of various projects and programs, including the Horizon Europe support project, discussions about the governance structure of the European Education Area, the FINNO- Access2Finance and Innovation platform, and an exploratory study on Impact Investment for skills innovation. The completion of the EU4TECH PoC technology transfer program, the expansion of the ETF ENE Centres of Excellence network, and the development of a toolkit for skills aligned with Smart Specialisation Strategies have been instrumental in advancing the region's scientific and technological capabilities.

The Western Balkans Agenda on Innovation, Research, Education, Culture, Youth & Sport represents a comprehensive approach to addressing sustainability challenges in the region. It encompasses a series of well- coordinated political, regional, and thematic actions, significantly contributing to the region's sustainable development goals by enhancing research, innovation, education, and cultural cooperation.

2.2.2. Economic and Investment Plan for the Western Balkans

The Economic and Investment Plan (EIP) for the Western Balkans, structured around ten investment flagships across six priority areas, is designed to catalyse the region's long-term recovery and foster regional cooperation and alignment with the European Union. It targets the acceleration of a green and digital transition and aims to mobilize up significant investments through the Western Balkan Guarantee Facility. This ambition is contingent on the Western Balkan partners' commitment to accelerate reforms, particularly in the realms of rule of law and anti-corruption measures. At its core, the EIP seeks to stimulate long-term economic recovery and regional economic integration in the Western Balkans. Its goals are multifold: to support a transition to green and digital economies, implement necessary reforms for progression on the EU path, and bring the region closer to the EU Single Market. Achieving these objectives is anticipated to lead to sustained economic growth and job creation.

The priorities of the Economic and Investment Plan are diverse and strategically important:

- Infrastructure Projects: A significant package of infrastructure projects was frontloaded for funding in 2021-22, aiming to unlock substantial investments.
- EU Digital Strategy: Serving as a guiding principle, this strategy focuses on a human-centric digital transformation of economies and societies.
- Common Regional Market: This initiative serves as a steppingstone for integrating the region more closely with the EU Single Market.
- Human and Entrepreneurial Capacity: Emphasizing innovation and the development of unique economic niches.
- European Green Deal: Providing a blueprint for collective action to address the challenges of the green transition.
- Good Governance and Rule of Law: Focusing on fundamental rights, democratic institutions, and public administration functionality.

The EIP categorizes its investment priorities into six areas:

1. **Clean Energy:** The energy sector, characterized by aging infrastructure and a heavy reliance on fossil fuels, is undergoing a dual transition towards open markets and decarbonization.
2. **Environment and Climate:** Addressing environmental challenges like urban sprawl and pollution, the EIP emphasizes sustainable management of water supply, waste, and wastewater.
3. **Digital Future:** Incorporating digital infrastructure as a response to the Multi-annual Action Plan for a Regional Economic Area, the focus is on interconnecting administration, research, and education networks, alongside high-performance computing.
4. **Private Sector:** Enhancing the competitiveness of SMEs is crucial for the region's socio-economic development and integration. Initiatives include improving access to financing and supporting PPPs.
5. **Human Capital:** Promoting fairness and inclusiveness, the EU is committed to developing human capital, emphasizing education, skills, employment, social protection, and inclusion. The focus also includes youth, health, culture, and sport.
6. **Sustainable Transport:** Transport, constituting a significant part of the WBIF portfolio, requires network rehabilitation and upgrading. Efforts are aimed at implementing EU technical standards and promoting low pollution, multimodal transport solutions.

EIP represents a holistic approach to fostering the Western Balkans' socio-economic development, regional integration, and alignment with EU standards. The plan encompasses ten major investment flagship initiatives aimed at bolstering key areas of economic development, including sustainable transport and energy connectivity, green and digital transformation, private sector competitiveness, and support for health, education, and social protection.[18] This includes a youth guarantee designed to generate employment opportunities for young people.

[18] https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_1819

Table 2. Ten Flagships of the Economic and Investment Plan for the Western Balkans

FLAGSHIP 1 – CONNECTING EAST TO WEST	FLAGSHIP 2 – CONNECTING NORTH TO SOUTH	FLAGSHIP 3 – CONNECTING THE COASTAL REGIONS
Finalising the 'Peace Highway' (linking Pristina with Niš). Modernising the parallel rail corridor to Corridor X and advancing the rail Corridor VIII, linking the Western Balkans and EU Member States. Demining of the Sava River and addressing bottlenecks on the Danube river.	Completion of 75% to motorway standards of the main north-south road corridor linking central Europe capitals through Sarajevo to the port of Ploče on the Adriatic coast and upgrading the rail connection along the same corridor. Rehabilitation of the Rail Route 4 and further advancing the parallel road corridor. Enhancing the Sarajevo to Podgorica connection. Upgrading of the railway route connecting Belgrade with Pristina.	Rehabilitation of the Rail Route 2. Completion of the 'Blue Highway' (Croatia to Greece).
FLAGSHIP 4 – RENEWABLE ENERGY	**FLAGSHIP 5 – TRANSITION FROM COAL**	**FLAGSHIP 6 – RENOVATION WAVE**
Rehabilitation of the Fierza Hydro Power Plant, advancing construction of the Skavica Hydro Power Plant. Start of the construction of the Komarnica Hydro Power Plant. Preparations for the construction of the Ibër-Lepenc Hydro System Phase II. Advancing wind park and solar power plant investments in North Macedonia.	Completion of the construction of the Fier-Vlora gas pipeline. Work on the gas-interconnectors between the Western Balkan economies themselves and with the EU Member States. Completion of the Trans-Balkan Electricity Transmission Corridor.	Assist the Western Balkans in decarbonisation of public and private building stock, with a strong emphasis on digitalisation and taking into account energy poverty. Support to the Western Balkans partners to triple the current renovation rate and energy savings in existing buildings and achieving nearly-zero energy and emission standard in new buildings.
FLAGSHIP 7 – WASTE AND WASTEWATER MANAGEMENT	**FLAGSHIP 8 – DIGITAL INFRASTRUCTURE**	**FLAGSHIP 9 – INVESTING IN THE COMPETITIVENESS OF THE PRIVATE SECTOR**
Completion of the construction of wastewater treatment plants in Skopje and Pristina. The implementation of an environmental investment programme in Serbia, comprising modernised waste water treatment projects for large and medium sized towns. Establishing integrated regional waste management systems in Albania, Montenegro, North Macedonia and Serbia. Support for the establishment of proper air and water monitoring systems and pollution prevention measures.	Development and roll-out of national broadband infrastructure in the six Western Balkans partners. Setting up secure, energy-efficient and trustworthy data centres, edge and cloud infrastructures while ensuring alignment with EU's rules and fundamental values, including data protection, as well as linking to EU initiatives on high performance computers, digital incubators and innovation hubs. Exploring synergies with other connectivity areas such as transport and energy in the context of infrastructure-sharing. Providing support for adapting to the rapid transformative technological development. Promoting cooperation in digital education globally through the renewed Digital Education Action Plan (DEAP) and promote equality in access, in particular for disadvantaged groups, including Roma.	Plan to increase the grant amount to support the private sector under the Western Balkan Investment Framework, whereas 50% of EU private sector funding should be dedicated to innovation and green growth. Plan to increase the guarantee capacity supporting investments to, primarily to strengthen the competitiveness of SMEs and enhance employment creation, particularly catering to young people, through the Western Balkans Guarantee Facility. Mobilise assistance for sustainable transformation of agri-food systems and rural development in the region.

FLAGSHIP 10 – YOUTH GUARANTEE
The Youth Guarantee is an activation scheme to ensure that all young people receive a good quality offer of employment, continued education, apprenticeship or traineeship within a period of four months of becoming unemployed or leaving formal education. The Youth Guarantee flagship should be implemented by Western Balkan governments in line with the EU Youth Guarantee. It is proposed to implement it in four phases, which could all potentially benefit from EU support.

Source: *Authors, based on the European Commission, Economic and Investment Plan for the Western Balkans, 2020.*

The plan is clearly targeting pivotal sectors such as transport, energy, digital infrastructure, and environmental management, aligning with broader EU initiatives like the Green Deal. It combines infrastructure development with human capital investment, underpinned by a commitment to sustainable and inclusive growth. Each flagship initiative represents a strategic investment in the region's future, emphasizing not only infrastructural upgrades but also environmental sustainability, digital transformation, and socio-economic empowerment.

The European Union (EU) has demonstrated a significant financial commitment to the Western Balkans through the Economic and Investment Plan. The EU approved €4.29 billion in grants, which is anticipated to trigger a total investment of approximately €15.9 billion. This investment package includes 54 flagship initiatives under the Western Balkans Investment Framework (WBIF). Additionally, the EU plans to utilize the Western Balkan Guarantee Facility, which is designed to further attract investments, potentially mobilizing up to €20 billion over the next decade. In the current programming period of 2021-2027, the EU aims to allocate up to €9 billion from the Instrument for Pre-Accession (IPA III). This funding is intended to support the economic convergence of the Western Balkans with the EU, focusing primarily on investments that bolster competitiveness, inclusive growth, sustainable connectivity, and the green and digital transitions. Furthermore, the EU intends to provide guarantees to decrease financing costs for both public and private sector investments and to mitigate investment risks. The Western Balkans Investment Framework (WBIF), inclusive of its private sector arm, the Western Balkans Enterprise Development and Innovation Facility (WB EDIF), and the Western Balkans Guarantee Facility, will serve as the principal mechanism for the rapid deployment of these investment initiatives. It has been noted that the success and impact of these investments are dependent on the Western Balkans' commitment to implementing fundamental reforms.[19] One of the very important WBIF initiatives in this regard is the Regional Energy Efficiency Programme, which comprises more than 600 million EUR of investments from the EBRD and KfW Banking Group, starting from 2023. This support is combined with grants from the WBIF, with the overarching purpose of supporting the region in achieving sustainable energy objectives, creating a sustainable market for energy efficiency, and promoting renewable energy and energy efficiency.

[19] COM(2020) 641 final.

The Economic and Investment Plan for the Western Balkans is closely aligned with the European Green Deal and the twin green and digital transition. The Commission is committed to thoroughly assessing the costs, benefits, and impacts of various priority investment flagships, aiming for their active and expedient advancement. The Plan encompasses a wide array of measures designed to foster a green and digital development path tailored to the Western Balkans, mirroring the European Union's approach.

This Plan includes investments in sustainable infrastructure, particularly in the areas of transport and clean energy. It also puts forward specific proposals to enhance environmental protection, reduce carbon dioxide emissions, and support the energy transition, articulated in the Green Agenda for the Western Balkans. Digitalization is highlighted as a crucial enabler across these areas, supporting the concept of a dual green and digital transition. Additionally, the Plan seeks to boost investment in digital infrastructure, like ultra-fast broadband, and enhance the competitiveness of the private sector.

2.2.3. Common Regional Market

The Action Plan for 2021-2024 of the previously mentioned Common Regional Market (CRM) is an ambitious initiative designed to enhance economic integration and cooperation among Western Balkan economies. As a strategic move towards regional economic integration, the CRM serves as a critical pathway for these economies to integrate into the European Union (EU) Single Market.[20] This integration process, encompassing four pivotal areas, is aimed at harmonizing the regional market with EU standards, stimulating growth, and expanding employment opportunities.

- **Regional Trade Area:** The focus here is on facilitating the seamless movement of goods, services, capital, and people. Efforts include the establishment of Green Lanes to expedite the movement of goods, mutual recognition of professional standards and qualifications, and the liberalization of service trade. By aligning with EU Internal Market principles, the region aims to create a more fluid, dynamic trade environment, bolstering growth and job creation.
- **Regional Investment Area:** This component aims to align investment policies with EU criteria and attract foreign investors by showcasing the region's market potential. Strategic measures are being implemented to enhance the attractiveness for Foreign Direct Investment (FDI), capitalizing on regional market size and interconnected production networks. The objective is to establish the Western Balkans as a lucrative and stable destination for global investors.
- **Regional Digital Area:** The integration into a broader European digital market is pivotal. This includes improving broadband internet access, reducing roaming charges, and fostering digital literacy and skills. The digitalization drive is not just about technology adoption but also aims to transform the market, making it more accessible, efficient, and competitive on a global scale.
- **Regional Industrial and Innovation Area:** Targeting a modernized industrial sector and optimized value chains, this area focuses on nurturing start-ups, encouraging green and women-led entrepreneurship, and integrating regional supply chains into European and global markets. The emphasis is on shifting towards a productivity-based, export-oriented economic model, fostering growth and employment through innovation and industry development.

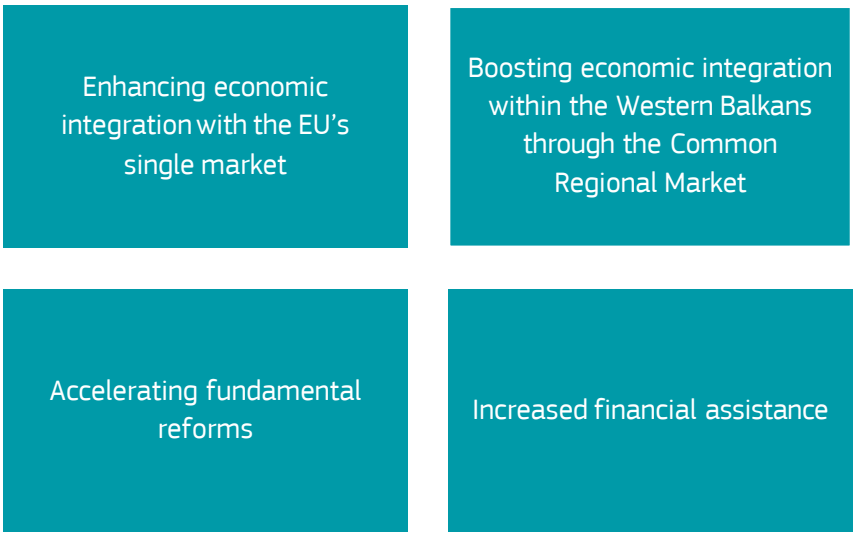
[20] https://www.wb6cif.eu/2020/11/11/summit-in-sofia-declarations-on-common-regional-market-and-green-agenda/

Furthermore, the CRM Action Plan underlines the necessity of effective governance, coordination, and monitoring to ensure its successful execution. Aligning with EU standards in trade, investment, digital economy, and industrial innovation is seen as pivotal for strengthening the economic foundations of the Western Balkan economies and their sustainable development. These measures are designed to bolster regional resilience and expedite the integration into the broader European market. The anticipated outcome of this comprehensive plan is a transformative impact on the region, propelling sustainable growth and development, and paving the way for a more integrated and prosperous Western Balkans.

2.2.4. Growth Plan for the Western Balkans

The New Growth Plan for the Western Balkans, announced in November 2023, is a comprehensive strategy to boost the region's socio-economic convergence with the European Union (EU) and accelerate EU reforms.[21] The plan, built on four pillars, aims to enhance economic integration with the EU's Single Market, deepen regional economic cooperation within the Western Balkans, speed up fundamental reforms, and provide increased financial assistance.

Figure 4. Four pillars of the New Growth Plan for the Western Balkans



Source: *Authors, based on European Commission, New Growth Plan for the Western Balkans, 2023.*

Enhancing Economic Integration with the EU's Single Market: The plan includes opening specific areas of the EU Single Market to the Western Balkan partners before their accession to the EU. This measure aims to bring tangible benefits to the region's citizens and requires the Western Balkans to undertake fundamental reforms and align with the EU acquis. Priority areas include the free movement of goods and services, workers, access to the Single Euro Payments Area, road transport facilitation, integration and decarbonization of energy markets, the Digital Single Market, and integration into industrial supply chains.

21 COM 2023 691

Boosting Economic Integration within the Western Balkans through the Common Regional Market: This aspect of the plan focuses on unlocking the economic potential of the region to create opportunities for businesses and workers and make it an attractive destination for European investors. Implementation of the Common Regional Market is expected to add 10% to regional GDP and serves as a steppingstone to the EU Single Market.

Accelerating Fundamental Reforms: Each Western Balkan partner is expected to prepare a Reform Agenda detailing priority reforms, with specific milestones acting as 'payment conditions' for the release of funds from the Growth Plan. These reforms are intended to improve economic growth, attract foreign investments, and strengthen regional stability, thereby aiding the Western Balkans in moving towards EU membership.

Increased Financial Assistance: A new financing instrument, the €6 billion Reform and Growth Facility for the Western Balkans, combining grants and concessional loans, is proposed. This instrument is expected to complement the current financial assistance under the Instrument for Pre-accession Assistance (IPA III). The Facility will provide €2 billion in grants and €4 billion in concessional loans for the period 2024-2027.

In terms of sustainable development and sustainability challenges, the plan aligns with the EU's agenda in areas like free movement of goods, services, and workers, digital single market integration, liberalization of road transport, and integration and decarbonization of energy markets. The plan also includes initiatives like boosting agricultural trade, promoting innovation through access to the European Innovation Council pre-accelerator, and building digital resilience. Importantly, the plan highlights full participation of the Western Balkan economies in EU programs related to the Single Market, Customs, Digital Europe, and Horizon Europe.

By promoting the free movement of goods, services, and workers, the plan aims to create a more integrated and efficient regional market in the Western Balkans. This integration is pivotal for sustainable economic development, as it facilitates better resource allocation, encourages the sharing of best practices, and fosters a dynamic labour market. Additionally, it supports environmental sustainability by promoting efficient distribution of goods, reducing unnecessary transport emissions, and encouraging cross-border collaboration in environmental initiatives. This strategy aligns closely with the plan's focus on integrating into the EU's Digital Single Market, crucial for sustainable development through adopting digital technologies that enable more efficient business processes, reduced resource use, and less environmental impact. Digital resilience, a key component of this integration, refers to the ability of economies to adapt and thrive amidst digital challenges and opportunities, including sustainability.

The plan also stresses the importance of liberalizing and modernizing road transport and the energy sector. This includes a transition towards low-emission transport systems and renewable energy sources, essential for decarbonizing the energy sector, addressing climate change, and fostering sustainable economic growth. These initiatives are instrumental in reducing dependence on fossil fuels and enhancing the use of sustainable energy resources, thereby contributing to the overall reduction of greenhouse gas emissions. Simultaneously, strengthening agricultural trade by aligning with EU standards can lead to more sustainable farming practices and efficient food production systems. Importantly, the inclusion of the Western Balkans in the European Innovation Council (EIC) pre-accelerator aims to foster innovation in deep technology sectors. Access to the EIC enables Western Balkan countries to develop and deploy innovative technologies for addressing sustainability challenges, notably in areas of clean energy, sustainable agriculture, and waste management.

Finally, the plan highlights the importance of Western Balkan economies' full participation in various EU programs like the Single Market Programme, Customs and Fiscal programmes, Digital Europe, and Horizon Europe. Participation in these programs enables the Western Balkans to benefit from EU expertise, funding, and networks in areas critical for sustainable development. For instance, Horizon Europe focuses on research and innovation projects that include sustainable development goals, while the Digital Europe program aims to drive digital transformation, a key component for modern sustainable economies.

The proposed Reform and Growth Facility for the Western Balkans serves as the centrepiece of the Growth Plan, significantly increasing financial assistance based on an ambitious agenda. The new facility aims to allocate a minimum of €3 billion (€2 billion in grants and €1 billion in favourable loans) to investments through the Western Balkans Investment Framework (WBIF). The remaining €3 billion in favourable loans will benefit governments in the Western Balkans, contingent upon their fulfilment of the Reform Agendas. It introduces strong conditionality by establishing a payment mechanism based on the achievements of these reforms, which differs from currently available external assistance instruments. The facility complements the Instrument for Pre- Accession (IPA III) by focusing on specific determinants for social and economic growth. The investments, delivered through the Western Balkans Investment Framework (WBIF), will target sectors key to socio-economic development: connectivity (including transport, energy, green and digital transitions), education, and skills development. The projects or programs will be implemented in cooperation with international financial institutions, EU Member States development banks, and private sector investments.

Key sustainability-related objectives of the facility[22] include:

- Accelerating the transition to sustainable and inclusive economies.
- Boosting green transition in line with the 2020 Green Agenda for the Western Balkans, covering energy transition towards a climate-neutral, resilient, and circular economy.
- Promoting digital transformation as an enabler for sustainable development and inclusive growth.
- Reinforcing environmental protection, contributing to climate change mitigation, increasing resilience to climate change, and accelerating the shift towards a low-carbon economy.
- Ensuring that measures funded under the facility are in line with the Beneficiaries' National Energy and Climate Plans and their ambition to reach climate neutrality by 2050.
- The facility emphasizes that all investments should be based on the principles of 'do no harm' and 'leave no one behind', contributing to the broader objective of transitioning the region towards a green, climate-neutral, digital, and inclusive economy aligned with EU rules and standards.

The New Growth Plan for the Western Balkans represents a strategic and targeted approach to integrate the region more closely with the EU, encouraging economic growth, stability, and prosperity through targeted reforms and financial support. It aims to build stronger economies in the Western Balkans and bring tangible economic benefits to their citizens, setting a solid foundation for their eventual EU accession. The New Growth Plan for the Western Balkans

[22] Regulation (EU) 2024/1449 of the European Parliament and of the Council of 14 May 2024 on establishing the Reform and Growth Facility for the Western Balkans.

integrates sustainability into its core objectives, addressing environmental, economic, and social aspects of sustainable development. By aligning with the EU's framework and participating in EU programs, the Western Balkans are set to advance their sustainability agenda, addressing challenges such as climate change, digital transformation, and economic modernization in a comprehensive manner. The Reform and Growth Facility for the Western Balkans was adopted by the European Council on May 7, 2024 and published in the EU Official Journal on 24 May 2024. The six Western Balkan partners are now expected to submit their individual reform agendas, laying out the socio-economic and fundamental reforms they will undertake to spur growth and convergence under the Growth Plan during the period of 2024 - 2027.

2.2.5. Green transition in the Western Balkans

The Green Agenda for the Western Balkans supports the region's transition to a sustainable and climate-resilient future. This initiative aligns with the European Union's Green Deal, aiming to facilitate the Western Balkans' integration into the EU's ambitious climate and environmental policy framework. It addresses recent crises, including the COVID-19 pandemic and the war in Ukraine, highlighting the need for green and digital transitions to drive sustained growth and diversification. The EU's support, through the Economic and Investment Plan, includes financing for 40 flagship projects totaling €5.7 billion, with €1.8 billion in EU support.

The Green Agenda for the Western Balkans is not only an environmental initiative but also a socio-economic one. It aims to spur economic growth, create jobs, and improve the quality of life in the region, all while ensuring the protection and sustainable use of natural resources. It reflects a comprehensive and balanced approach to development, prioritizing environmental sustainability alongside economic and social factors.

Green Agenda's five pillars are: climate action (including decarbonisation, energy and mobility), circular economy, biodiversity, fighting pollution of air, water and soil, and sustainable food systems and rural areas. Digitalization is emphasized as a key enabler for these pillars.[23]

The Western Balkans are significantly impacted by climate change. The agenda aligns with the Paris Agreement, aiming for climate neutrality by 2050 and proposing a 55% reduction in greenhouse gas emissions by 2030. It addresses the heavy reliance on coal in the region, emphasizing a transition to clean energy, and regional energy market integration. A shift to smart and sustainable mobility, revitalizing rail networks, and promoting greener transport modes is also proposed.

The implementation report for the Green Agenda for the Western Balkans in 2022 prepared by the RCC (2023) points out the following developments in the seven areas, as shown in the Table 3:

[23] COM (2020) 641

Table 3. Implementation of the Green Agenda for the Western Balkans

AREA AND DESCRIPTION	PERFORMANCE AND ACHIEVEMENTS (AS OF 2022)
Climate Action: Enhancing climate resilience and reducing greenhouse gas emissions in line with the Paris Agreement goals. The agenda encourages Western Balkan countries to adopt and implement policies that aim for climate neutrality by 2050.	Efforts are being made to align with the EU Climate Law, with various WB economies at different stages of implementing climate-related legislation. Energy and climate targets have been set within Nationally Determined Contributions, and efforts to develop integrated Energy and Climate Plans are ongoing. Albania and North Macedonia have adopted integrated National Energy and Climate Plans (NECPs), Montenegro is preparing a new law to transpose elements of the EU Climate Law, while Serbia adopted the Law on Climate Change and three by-laws for operationalization.
Energy Transition: Shifting towards cleaner, renewable energy sources and improving energy efficiency. This involves reducing the dependency on fossil fuels, particularly coal, and promoting sustainable energy production and consumption.	Progress includes increasing renewable energy usage, implementing the Clean Energy Package, particularly in renewable energy and energy efficiency directives, and addressing the socioeconomic impacts of decarbonization.
Sustainable Transport: Developing greener, more efficient, and interconnected transport systems. This includes improving public transport, promoting electric mobility, and developing infrastructure that reduces the environmental impact of transportation.	Advances in rail electrification and the implementation of intelligent transport systems and the European Rail Traffic Management System are notable. However, the alternative fuel infrastructure remains underdeveloped, and climate proofing of infrastructure requires further attention.
Circular Economy: Encouraging a shift from the traditional 'take-make-dispose' economic model to one where resources are reused, recycled, and kept in use for as long as possible. This approach aims to reduce waste and promote more sustainable consumption and production patterns.	Montenegro and Serbia have adopted circular economy roadmaps, followed by strategic plans and programs, while other economies are developing their roadmaps. There has been a progress at the regional level to address waste management and plastic pollution, including banning single-use plastics, but significant challenges remain.
Depollution: Tackling pollution of air, water, and soil to safeguard public health and the environment. This involves implementing measures to reduce emissions, improve waste management, and clean up contaminated sites.	Urgent goals set for improving air quality and the need for better air quality monitoring systems, along with progress in harmonization of water management legislation. Commitment to integrated soil protection through the signing of a Communiqué/Memorandum of Understanding on Soil Partnership.
Sustainable Agriculture and Rural Development: Promoting sustainable agricultural practices and rural development to enhance food security, preserve biodiversity, and ensure the sustainable use of natural resources.	Alignment with EU food quality and safety policies is progressing, with efforts towards developing sustainable rural development roadmaps.
Biodiversity Protection and Nature Conservation: Protecting and restoring natural habitats and ecosystems, conserving biodiversity, and promoting the sustainable use of natural resources.	Strategies and targets for nature protection are being developed, but restoration planning and integration into conservation strategies require enhancement. Nature-based solutions to increase ecosystem and community resilience are being explored.

Source: *Authors, based on RCC (2023).*

The Western Balkan economies demonstrated enhanced cooperation and alignment with EU standards and policies, as well as increased engagement in the EU research and innovation programs, contributing to the region's sustainable development. These achievements reflect the concerted efforts of Western Balkan economies to align with the EU's environmental and sustainability goals. They represent significant steps in the region's transition to sustainable and inclusive economies, although challenges remain in terms of uniformity of progress and integration of sustainability measures across all sectors.

While there are positive developments in implementing the Green Agenda, significant challenges remain, particularly in harmonizing efforts across the region and addressing the varied stages of economic development and EU integration. Data gaps and quality issues hamper effective monitoring and reporting. Also, there is a need for greater regional coordination and stakeholder inclusion in policy dialogue.

The Western Balkan economies are navigating a critical phase in their journey towards a sustainable future, making notable progress in aligning with the EU's Green Agenda. Their efforts are primarily directed at fostering sustainable economic growth through innovation and specialisation in environmentally friendly sectors, underpinned by significant initiatives in promoting circular economy approaches (Radovanovic and Stevanovic- Carapina, 2024). This strategic move towards circular economy has been demonstrating both economic and environmental benefits, indicating that investment in green innovation is not only viable but also beneficial in the long term. Moreover, their commitment to the Green Agenda for the Western Balkans is evident in their ongoing efforts to adopt sustainable practices across various sectors, including energy, transportation, agriculture, and waste management. Despite challenges such as inflation and energy outages, the region has recently shown resilience in investments, and with few exceptions, employment levels have remained stable or grown, highlighting the region's capacity to adapt to green transition pressures.

However, this path is not without its challenges. A prevalent perception among governments in the Western Balkans views the green transition and decarbonization as obligations imposed by the EU, rather than opportunities for strengthening their economies and improving living conditions. This mindset needs a shift to view the green transition as a chance for economic and social enhancement. The region's economies are hindered by a lack of a unified energy transition plan, including strategies to replace baseload power currently generated from coal. The implementation of the Green Agenda is lagging due to incomplete legal frameworks and the need for substantial reforms, coupled with a heavy reliance on coal and the fragmented, small-scale nature of these economies. These factors collectively pose challenges to growth and competitiveness, particularly in transitioning to a low-carbon, environmentally sustainable economy (Radovanovic and Stevanovic-Carapina, 2024).

To address these challenges, a multi-faceted approach would be beneficial. Strengthening administrative and legal frameworks at both national and local levels is important, including enhancing law enforcement and public administration to support the green transition. Ensuring the socio-economic impact of the green transition is just and inclusive, especially for vulnerable employment groups, is also important. There is a need for upskilling and reskilling across sectors, particularly in corporate settings, to facilitate a just transition, along with increasing public awareness and shifting mentalities. Integrating environmental protection into other policies and development programs is essential to establish a green economy with low carbon emissions and efficient resource utilization. Furthermore, the implementation of the GAWB requires a multi-stakeholder approach and enhanced regional cooperation, involving authorities, communities, and

various sectors at different levels. While the Western Balkan economies have made strides in their green transition, their ability to embrace these challenges as opportunities for sustainable growth and development will be pivotal in determining the success of their green transition.

2.2.6. Digital transition in the Western Balkans

The Digital Agenda for the Western Balkans, developed in collaboration between the European Commission and the Western Balkan economies, serves as a strategic blueprint, merging the principles of digitalisation with the broader goals of sustainable development. It envisions a transformational overhaul of the region's digital infrastructure, aligning it seamlessly with the expansive European digital ecosystem. Central to this ambitious agenda is a notable investment in broadband infrastructure, viewed as essential for the widespread dissemination of high-speed internet across the Western Balkans. This initiative, backed by a €30 million EU grant through the Western Balkan Investment Framework, aims not only to establish a robust and interconnected digital network but also to act as a catalyst for socio-economic growth within the region. A specific embodiment of this investment is the targeted technical assistance package designated for Albania, signifying concrete progress in achieving these lofty objectives.

The five main areas to be covered by the Digital Agenda for the Western Balkans are[24]:

1. Lowering the cost of roaming based on a roadmap to facilitate such a goal.
2. The deployment of broadband.
3. The development of eGovernment, eProcurement, eHealth, and digital skills.
4. Capacity building in trust and security, and digitalisation of industries, to ensure that all sectors benefit from digital innovations.
5. The adoption, implementation and enforcement of the acquis in the digital single market.

In broadening the Digital Agenda's scope, significant attention is placed on enhancing cybersecurity measures and developing a foundation of digital trust. Focused activities in this domain are aimed at building the capacity necessary to protect critical digital assets and infrastructure. This emphasis on cybersecurity is a deliberate effort to create a secure, trustworthy online environment, thereby fostering a sustainable trajectory of digital growth and resilience. Moreover, the agenda integrates key activities that target both the enhancement of public digital services and the upliftment of digital literacy and skills. Initiatives such as implementing eGovernment, eProcurement, and eHealth tools are directed towards streamlining governmental services, thereby boosting efficiency, ensuring transparency, and lessening administrative burdens. Alongside these, initiatives like Digital Opportunity Traineeships and EU Code Week are specifically designed to enhance digital literacy, particularly among the youth, equipping them to effectively address environmental challenges using technological solutions.[25]

Another pivotal aspect of the Digital Agenda is the support for research and innovation through the establishment of national research facilities and state-of-the-art e-infrastructures. This strategic move aims to fully integrate the Western Balkans into the digital European Research Area, fostering the emergence of a new generation of skilled researchers and engineers. Complementing this, the agenda also places emphasis on nurturing the startup ecosystem, with initiatives such as the

[24] SWD(2018) 360

[25] WD(2018) 360

Startup Europe Summit designed to encourage entrepreneurial endeavours, particularly those focused on sustainability-driven innovation. Moreover, continuous assessment of the region's digitalisation progress is highlighted as a critical component of the agenda, ensuring effective and comprehensive implementation.

While these initiatives target digital growth, they inherently contribute to sustainability. Enhanced broadband connectivity enables broader access to essential services like education and healthcare, thereby supporting sustainable economic development. Additionally, digitising governmental services aligns with environmental sustainability goals by minimizing paper usage and optimizing resource management practices. Since its unveiling on February 6, 2018, the Digital Agenda has progressively gained momentum, receiving endorsements at various significant summits and dialogues. This underscores its critical role in the Regional Economic Area's Multiannual Action Plan (RCC, 2019), encompassing a multifaceted approach that addresses both technological advancements and sustainability challenges. By deploying digital infrastructure and promoting digital governance, the agenda significantly contributes to the United Nations Sustainable Development Goals.

Nevertheless, the region faces several challenges, including ensuring uniform implementation across the diverse Western Balkan economies and achieving alignment with European standards. Realising the full potential of the digital economy in the Western Balkans requires addressing key issues such as financial constraints, limited public awareness, and a shortage of skilled human resources. Strengthening IT associations and focusing on workforce development are paramount. Enhanced regional collaboration, aligned with European Union standards and initiatives, is fundamental to addressing these challenges. Such cooperation allows for the sharing of collective strengths and resources, harmonizing strategies across the region and thereby expediting progress in the realm of digital transformation (Zivkovic et al, 2024).

In terms of sustainable development, the ICT sector plays a dual role: not only as a driver of growth but also as an enabler of green transformation. Integrating ICT solutions across diverse sectors, such as energy, agriculture, and healthcare, paves the way for the adoption of sustainable practices and technologies. This dual focus on digitalisation and sustainability is crucial for ensuring long-term prosperity and resilience in the Western Balkans.

In conclusion, the Digital Agenda for the Western Balkans presents a forward-looking perspective on the region's technological journey. The ICT sector, with its dynamic growth and untapped potential, is set to lead the way in digital and sustainable development. Addressing challenges in education, infrastructure, and collaboration is key to harnessing this potential, ensuring the region not only keeps pace with global technological advancements but also contributes significantly to them. Beyond the regional cooperation platform and the establishment of a regional fund for Smart Specialisation (S3) implementation, launching various knowledge exchange events, developing regional ICT education programs, promoting the Western Balkans as an IT destination, harmonising the legal framework for ICT and supporting cross-border innovation centres are recommended to bolster the sector's growth. The authors of this study suggest that these initiatives will be instrumental in shaping a resilient, inclusive, and sustainable future for the Western Balkans in the digital age.

2.3. Addressing societal and transformational sustainability challenges by Smart Specialisation approach

Based on the previous analysis of the sustainability challenges and main related directionalities for the Western Balkan region elaborated in this report, as well as the nature and characteristic of the Smart Specialisation approach for supporting transformational efforts and achieving sustainable development, we identified several groups of challenges that Smart Specialisation could address. The next section briefly explains these groups and the potential of Smart Specialisation in addressing them. These are the following:

- **Environmental Degradation and Pollution.** The Western Balkan region grapples with significant pollution affecting soil, water, and air, exacerbated by socio-economic factors, outdated industrial practices, and limited access to cleaner technology. The Smart Specialisation concept can prioritise investment in technologies and industries that mitigate environmental impact. By fostering innovations in clean technology, waste management, and pollution control, S3 strategies can drive the development of eco-friendly practices and technologies that reduce pollution in soil, water, and air.
- **Energy Transition and Dependence on Coal.** A slow transition to low-carbon, environmentally sustainable energy, with coal still accounting for a major part of electricity production. Challenges include aligning with waste management legislation and high levels of air pollution. S3 strategies can promote the development and adoption of renewable energy technologies. This includes investing in research and innovation in solar, wind, hydro, and other renewable energy sources, as well as in energy efficiency technologies. By focusing on energy transition, S3 can help reduce dependence on coal and facilitate the shift towards a low-carbon economy.
- **Green Transition and Circular Economy.** While there is progress in Smart Specialisation, eco- innovation, and clean industrial development, the region faces challenges in economic structures, environmental issues and regional collaboration. Smart Specialisation can support the development of a circular economy by identifying and nurturing sectors that contribute to sustainable economic practices. This includes incentivizing recycling, remanufacturing, and other circular business models, as well as supporting eco-innovation in product design and production processes.
- **Economic Structural Challenges.** Issues include inflation, energy supply disruptions, economic fragmentation, and the impact of global events such as the COVID-19 pandemic. Through targeted support for sectors that offer high growth potential and resilience, S3 can help mitigate the impacts of economic challenges like inflation and supply disruptions. This includes bolstering sectors that are less sensitive to global economic fluctuations and promoting diversification to reduce dependency on a few industries.
- **Demographic Trends and Aging Populations.** Addressing aging populations and emigration is critical for sustaining social security systems and ensuring a dynamic workforce. S3 can support sectors that create jobs for diverse age groups and skill levels, thereby addressing workforce challenges related to aging and emigration. It can also focus on innovation in healthcare and assistive technologies to address the needs of an aging population.

- **Agricultural Vulnerability.** Agriculture faces threats from climate change and needs sustainable practices for food production, safety, and environmental protection. By identifying and supporting innovations in sustainable agriculture, S3 can enhance food security and environmental protection. This includes technologies for efficient water use, sustainable crop management, and climate-resilient agriculture practices.
- **Educational and Skills Development.** Enhancing green skills, especially among younger generations, is vital for ecological transition and sustainable economic growth. S3 can align education and training programs with the needs of emerging sectors, particularly those related to green skills and eco- innovation. This involves collaborating with educational institutions to develop curricula that prepare the workforce for the green economy.
- **Digital Transition and Technological Development.** Promoting digital transformation as an enabler for sustainable development, and addressing challenges in digital literacy, cybersecurity, and capacity building in the ICT sector. S3 strategies can promote the digitalization of the economy by supporting sectors and technologies that enable digital transformation. This includes investments in digital infrastructure, cybersecurity, and the development of digital skills among the workforces.
- **Regional Cooperation and Integration with the EU.** There is a need for enhanced regional cooperation and alignment with EU policies, particularly in trade connectivity and cooperative environmental and energy efforts. S3 can facilitate collaboration across the Western Balkans and with EU counterparts, promoting the sharing of best practices, joint ventures, and cross-border initiatives. This helps in aligning with EU policies and standards, particularly in areas related to environmental and energy collaboration.
- **Governance and Rule of Law.** Strengthening administrative frameworks, enhancing law enforcement, and ensuring the socio-economic impact of the green transition is just and inclusive. Effective implementation of S3 requires strong governance and adherence to the rule of law. This means ensuring that S3 strategies are developed and implemented transparently, inclusively, and in accordance with legal frameworks, which can help ensure that the socio-economic impacts of the green transition are just and equitable.

3. Findings from the Smart Specialisation exercise in the Western Balkans

By 2018, the entire Western Balkan region embraced the Smart Specialisation approach in developing their innovation strategies. The economies from the region established their respective teams that would manage and monitor the progress in conducting specific tasks within the Smart Specialisation exercise. These teams have organised the adequate resources and efforts for applying such participatory and evidence-based approach that requires continuous commitment and engagement by the quadruple helix stakeholder fora. In conducting their activities, the economies were following the tailor-made frameworks for designing and implementing Smart Specialisation, developed in an organised effort by the European Commission's Joint Research Centre. The JRC was also providing technical expertise to these teams during the entire process. Such organisation of activities advanced the Western Balkan economies in finalising this process and launching (or preparing for launch) of their first Smart Specialisation strategies.

3.1. Smart Specialisation design framework

The Smart Specialisation process, known for its transformative impact, has led to the creation of a specialised framework tailored for the EU Enlargement and Neighbourhood Region. This framework is developed out of a need to address unique innovation ecosystem characteristics in these areas and the gathered experiences from applying Smart Specialisation strategies across EU Member States and regions. Its primary purpose is to provide a structured pathway for economies and regions within the EU enlargement and neighbourhood to develop and implement their Smart Specialisation strategies effectively.

The framework stands out for its user-friendly design, which significantly simplifies the process of guiding through the stages of Smart Specialisation. It includes features that assist in both navigating through the process and monitoring progress. One of the key aspects of this framework is the incorporation of a phase-gate process. This approach ensures that managing authorities in these regions systematically meet all necessary conditions in one phase before progressing to the next, effectively using the achievements of each stage as a foundation for the subsequent one. Such approach made the reception of this framework by the Smart Specialisation working groups in the EU Enlargement and Neighbourhood Region to be overwhelmingly positive (Radovanovic and Bole, 2024a). This is particularly significant as these groups are navigating through various stages of initiating or advancing their Smart Specialisation strategies.

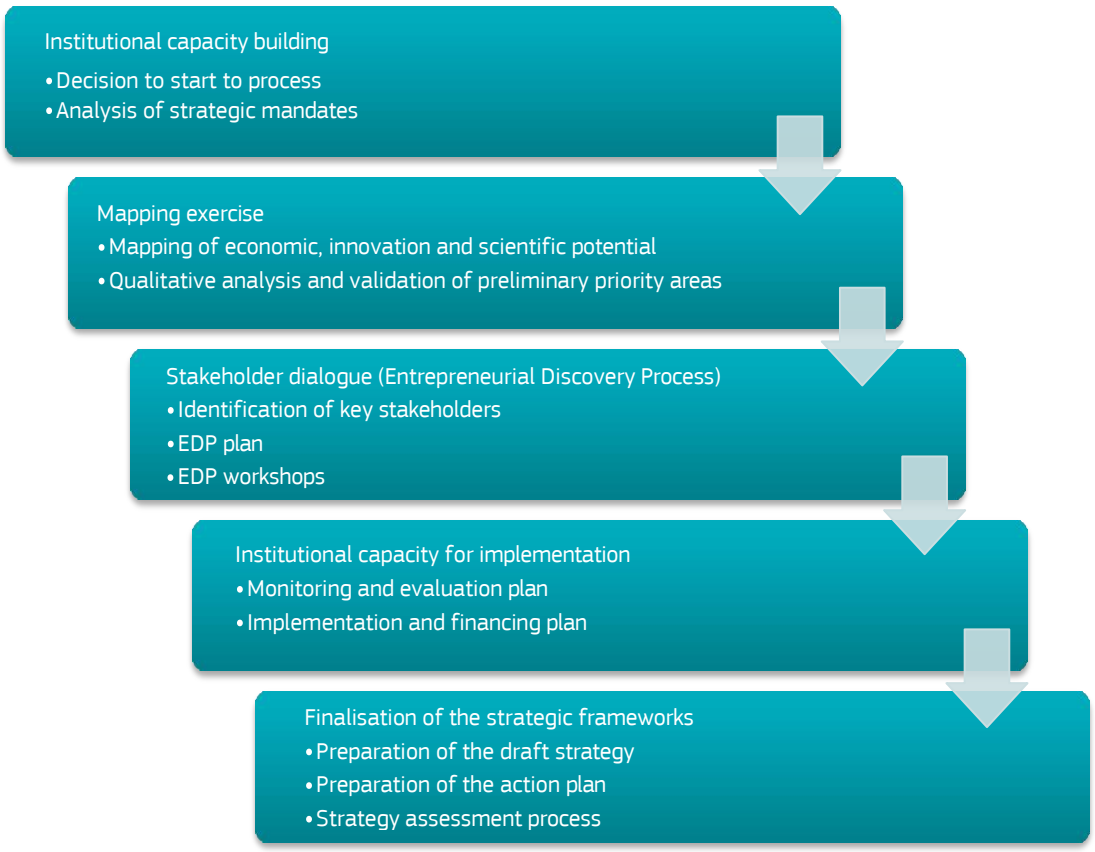
To provide a clear structure, the framework is divided into five distinct phases:

- **Building Institutional Capacity:** This phase focuses on developing the capabilities and resources of institutions to support the Smart Specialisation process.
- **Mapping Exercise:** In this stage, a thorough analysis and mapping of the region's resources, strengths, and innovation potentials are conducted.
- **Stakeholder Dialogue:** This involves engaging with various stakeholders to gather insights and foster collaboration.
- **Institutional Capacity for Implementation:** This phase ensures that there are adequate resources and mechanisms in place for the successful implementation of the strategy.

— **Finalisation of the Strategic Framework:** This final stage involves the completion and formal approval of the Smart Specialisation strategy, launching its subsequent implementation.

Each of these phases plays a crucial role in ensuring a comprehensive and effective Smart Specialisation strategy, tailored to the specific needs and characteristics of the EU Enlargement and Neighbourhood Region. This entire process is illustrated in Figure 5 below.

Figure 5. Smart Specialisation design process for the EU Enlargement and Neighbourhood Region



Source: *Authors, based on Matusiak and Kleibrink (2018).*

The process of building institutional capacity is a critical step in implementing Smart Specialisation strategies. This phase requires the formation of a dedicated team, tasked with initiating, developing, and monitoring the Smart Specialisation progress. The composition of this team is diverse, drawing expertise from various ministries, research institutes, business support associations, and academic institutions. It's divided into two main groups: the analytical team and the operational team.

The analytical team's role is crucial. Its members need to have access to and the ability to interpret various data from national institutions such as statistical and intellectual property offices. This access facilitates a targeted quantitative analysis of potential priority areas. Meanwhile, the operational team's focus is more on engaging with key stakeholders, which includes identifying significant developments in the field and organising relevant working groups to drive the Smart Specialisation process. A vital component of this stage is conducting awareness events. These events play a significant role in informing stakeholders about the advantages of Smart Specialisation and are instrumental in identifying key participants for future phases. Effective

planning and robust communication strategies are essential from the very beginning to ensure the success of these initiatives.

Furthermore, the Joint Research Centre offers specialised training sessions to national authorities involved in the process. These sessions are designed to provide a comprehensive understanding of the different phases and requirements of the Smart Specialisation process. It is crucial for these authorities to understand where their upcoming Smart Specialisation strategy fits within the national or regional innovation ecosystem, ensuring alignment with other strategic documents and coherence with parallel national programs. This alignment is key for effectively mobilising funds and resources for ensuing implementation.

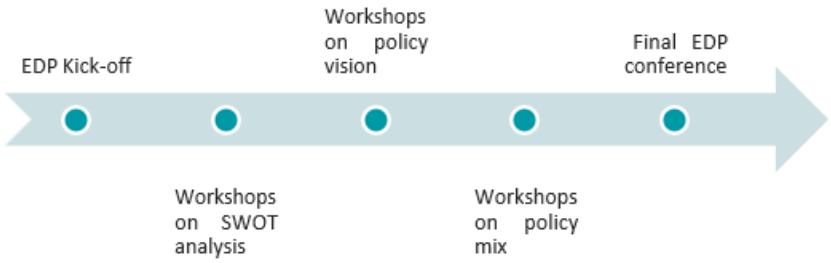
Following the completion of the institutional capacity-building phase, the working group embarks on an evidence-based 'mapping exercise'. This exercise is a methodical analysis aimed at identifying the country's or region's specialisations in various domains. It considers a wide array of economic, innovation, and scientific data, including employment figures, wage data, value added, export statistics, patents, and more, focusing on identifying specific sub-sectors contributing to the economy at the NACE 3-digit level.

The analytical team, ideally including at least one expert from statistical offices, is responsible for navigating the available data and determining the appropriate methods for analysis. This stage may also incorporate additional analyses, like international benchmarking, value chain analysis, and assessments of comparative advantages. Once this comprehensive analysis is complete, the team proposes preliminary priority areas for the next step - the qualitative analysis. This next step is highly important for several reasons. It goes beyond traditional industry and scientific classifications to uncover real sectors and value chains. This involves conducting in-depth interviews, focus groups, or case studies with a wide range of experts, including representatives from innovative businesses, sector specialists, researchers, and civil organization representatives. A minimum of 10-15 interviews per preliminary priority domain is recommended, with a significant portion involving business sector participants. The outcome of this qualitative mapping is a finalized list of priority domains, setting the stage for the Entrepreneurial Discovery Process or 'EDP' (Radovanovic and Bole, 2024b).

The EDP phase is intricate and aims to achieve consensus among a diverse group of stakeholders on priority domains, sub-domains, policy actions, and other vital components of the Smart Specialisation strategy. Managing authorities play a key role in identifying relevant stakeholders and developing engagement rules and procedures. It is important to ensure that this phase is inclusive and open to potential new stakeholders. A clear communication plan, detailing the value proposition and vision of the EDP, is essential.

Appointed 'EDP teams' are responsible for organising and coordinating the activities during this phase. The composition of working groups reflects the identified priority domains, with a significant representation from the business community. These groups engage in various activities, including SWOT analysis workshops, policy vision workshops, and discussions on policy measures and goals (see Figure 6). While online participation is accommodated, onsite engagement is preferred to foster stronger connections among stakeholders.

Figure 6. Chain of EDP workshops



Source: *Authors.*

The Entrepreneurial Discovery Process stage often heralds heightened engagement from senior government officials in the Smart Specialisation initiative. This stage is crucial for reaffirming and bolstering political backing and commitment, making it a linchpin in the success of the overall process. The support at this level underscores the importance of the Smart Specialisation strategy to regional development and innovation.

Following the EDP, the focus shifts to developing a comprehensive plan for monitoring, evaluating, and implementing the strategy. This preparation is essential for the finalization of the Smart Specialisation strategy. The objective of this phase is to ensure that there is sufficient institutional capacity to effectively implement the strategy. Key activities include reviewing and possibly revising current policy measures considering the identified priority areas. Policy measures should encapsulate the findings and decisions from the EDP workshops but should also reflect realistic initiatives that can be implemented once the strategy is launched. This review often necessitates extensive discussions with the stakeholders, but also across various ministries and agencies to secure the necessary funding and support. Moreover, this stage entails the creation of a robust governance structure. Such structure is fundamental to overseeing the strategy's implementation and ensuring its success. Additionally, it involves formulating detailed rules for monitoring and evaluation, which are critical for tracking progress and adjusting as needed.

The design framework aims at facilitating an intricate, multifaceted endeavour, such as the development of a comprehensive Smart Specialisation strategy, that demands meticulous planning, a wide range of expertise, and the involvement of various stakeholders. It emphasises the collaborative nature of the process, with each phase laying the groundwork for the next. Ultimately, it should lead to a well-crafted strategy that resonates with the specific economic and innovation characteristics of an economy or a region. Such strategic approach not only enhances their development but also fosters a culture of innovation and growth.

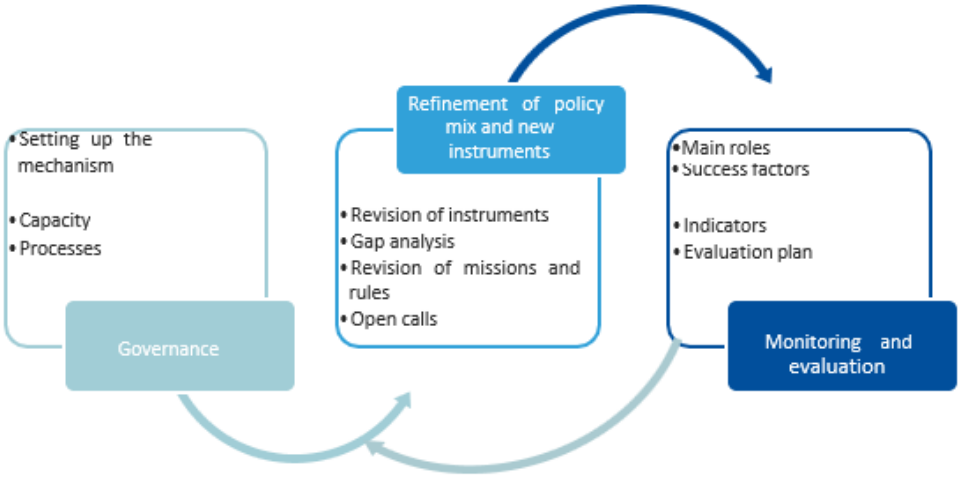
3.2. Smart Specialisation implementation framework

The development of a specific framework for implementing Smart Specialisation strategies in the EU Enlargement and Neighbourhood Region emerged from a recognition of the unique needs and experiences of this diverse area. This need became apparent as economies within the region progressed in formulating their own first Smart Specialisation strategies. Apart from experiencing distinct achievements and challenges in the Smart Specialisation design phase, they also highlighted various aspects of innovation policy development and implementation unique to their contexts. The framework was envisioned as a tool to incorporate lessons learned from

the implementation of Smart Specialisation strategies in EU Member States and regions, tailored to the specific realities of the EU E&N Region (Matusiak et al, 2022).

To realize this vision, the Joint Research Centre spearheaded the development of the framework, working in close partnership with a team of experts. This collaborative approach ensured that the framework was both comprehensive and flexible to the nuanced requirements of the region. The framework is structured as a dynamic, cyclical process, reflecting the evolving nature of Smart Specialisation. It starts with establishing the governance structure, which is critical for overseeing the entire process. This is followed by revising policy actions, ensuring they are aligned with the identified priorities and challenges. The next stage involves a rigorous evaluation process, assessing the effectiveness and impact of the implemented policies. This assessment then feeds back into the governance stage, allowing for continual refinement and revision of the strategy. This cyclical approach ensures that the framework remains adaptable and responsive to the changing needs and circumstances of the region.

Figure 7. The S3 implementation framework



Source: *Authors, based on Matusiak et al. (2022).*

The governance guidelines serve as a foundational component in the implementation of the Smart Specialisation Strategy (S3) framework. A critical element in this initial phase is the establishment or definition of an effective governance mechanism, which should engage different organisational levels for optimal functioning. According to the framework, a strategic structure should be put in place. This includes the appointment of a steering group charged with high-level strategic decision-making regarding S3 strategy implementation, a management body tasked with the operational aspects of implementation, and a strategic advisory council responsible for collating and interpreting feedback from various stakeholders within the innovation ecosystem. The governance block is essential for providing comprehensive guidelines that manage various resources efficiently, including funding, human resources, and IT infrastructure. It also lays down the protocols and procedures for revising the strategy and modifying implementation actions as necessary.

The process of revising the strategy implementation entails the refinement of the policy mix and the design of specific policy instruments. Refining the policy mix involves critical actions such as reviewing and aligning existing policy instruments with the objectives of the process. Changes in findings or objectives may necessitate a revision of the policy mix, which could include modifying or

introducing new instruments, or even discontinuing ineffective ones. The management team plays a pivotal role in this stage, analyzing, and updating intervention logic, budgeting, and resource allocation. Additionally, designing specific instruments is a distinct activity that focuses on practical measures, such as preparing to roll out new instruments, revising existing ones, and establishing directives and regulations for current structures, such as clusters or technology centres.

In both the governance and revision stages, as well as in the monitoring system, stakeholder involvement is a key aspect, ensuring that a diverse range of perspectives are considered in decision-making processes.

For a robust monitoring and evaluation process, the framework recommends the establishment of a dedicated body responsible for these activities, reporting back to both the management team and the steering group. The monitoring and evaluation plan should include detailed reporting procedures, define the periodicity of reports, and specify stakeholder involvement. It's crucial that the monitoring is carried out by competent bodies equipped with sufficient analytical skills and a deep understanding of the strategy's design process. Similarly, evaluation activities should be conducted by external, independent evaluators to ensure objectivity and impartiality.

The Smart Specialisation framework for the EU Enlargement and Neighbourhood Region represents a dynamic, tailored tool designed to guide and enhance the region's innovation policy development. Integral components of this framework should ensure that the Smart Specialisation Strategy is implemented effectively, with the flexibility to make necessary adjustments and improvements. The framework not only allows for continual assessment and optimization of its impact for the benefit of the innovation ecosystem but also reflects a collaborative effort that draws from a variety of experiences. This adaptability is crucial to meeting the evolving economic and innovation needs of the region. Serving as an essential instrument for the region's managing authorities, the framework provides a structured approach that facilitates the effective implementation and continuous improvement of Smart Specialisation strategies.

3.3. Smart Specialisation progress in the Western Balkans

Smart Specialisation (S3) represents the European Union's strategic response to fostering place-based, territorial innovation policies. It is a policy approach embraced by all EU Member States and has been gaining recognition globally. The essence of Smart Specialisation lies in directing public investment in research, development, and innovation towards a select number of priority domains tailored to each country, thereby maximizing impact.

Although the Smart Specialisation policy framework within the EU was a prerequisite for receiving Cohesion Policy funding, such conditionality does not exist in the context of the EU Enlargement economies. However, the principles of Smart Specialisation, such as the quadruple-helix Entrepreneurial Discovery Process, evidence- based policymaking and prioritisation were expected to modernise innovation policies in these economies as well.

The European Commission's Western Balkans Strategy of February 2018[26] played a significant role in this process, reaffirming the region's future within the EU and recognising their advancements in reforms and overcoming past conflicts. At the EU-Western Balkans summit in Sofia in May 2018, EU leaders expressed strong support for the Western Balkans' EU aspirations and called for more substantial reforms in key areas such as rule of law, fighting corruption and organised crime,

[26] COM(2018) 65 final

economic competitiveness, and regional cooperation. The European Commission has advocated for increased political, technical, and financial support for the region, including EUR 11.7 billion in pre-accession funding for 2014-2020 and six flagship initiatives. Among these flagship initiatives, one focuses on socio-economic development, emphasising economic reforms, support for start-ups, SMEs, research, and innovation. The importance of political commitment from the region's leaders to engage in these initiatives is highlighted, underlining their strategic significance.

Serbia became the first economy from the Western Balkans to launch its Smart Specialisation process in 2016, piloting the process in the EU Enlargement and Neighbourhood Region together with Ukraine and Moldova.

Following initial successes in the EU Enlargement and Neighbourhood Region, all economies in the Western Balkans had initiated their Smart Specialisation processes by 2018. A significant milestone in the process came with the EU Western-Balkan Summit held on October 6, 2021. At this summit, the European Union and the six Western Balkan economies agreed to enhance cooperation in areas such as research, innovation, and education. This cooperation is not only about promoting scientific excellence and education reform in the Western Balkans but also aims to tackle the issue of brain drain in these regions, as detailed in a study by Radovanovic et al. (2023).

Smart Specialisation is now a key element of the Western Balkan Agenda on Research, Innovation, Education, Culture, Youth, and Sport, as noted by the European Commission in 2021. Furthermore, it features prominently in other EU policy documents concerning the region, including the 2021 Communication on EU Enlargement Policy and the Economic and Investment Plan for the Western Balkans. Integration of Smart Specialisation actions in the Western Balkans into the New Growth Plan for the Western Balkans is currently being discussed.

As of now, nearly 200 regions within the EU have developed their own Smart Specialisation strategies. A notable study by Gianelle et al. (2020) revealed diverse implementation methods of S3, though sharing common characteristics. These insights have led to the development of a specific S3 structure designed to assist policy makers in the EU Enlargement and Neighbourhood region, as outlined in the S3 design and implementation framework previously described (Figures 5 and 6). The frameworks support these economies in creating strategies that align with EU standards for innovation policy, as well as implementing them.

Considering the unique aspects of the S3 concept, it becomes apparent that this approach offers a novel policy direction for the six Western Balkan economies. S3 presents significant opportunities for these economies to enhance the innovative capabilities of their private sectors, encouraging collaboration between public and private entities, as highlighted by Radovanovic and Benner in 2019.

In support of Smart Specialisation strategies, the Joint Research Centre (JRC) of the European Commission has been providing guidance and assistance since 2013, particularly through its Smart Specialisation Platform (S3P). This support was intensified in 2019 with a project focused on the EU Enlargement and Neighbourhood Region, managed collaboratively by the JRC and DG NEAR. Currently, all six Western Balkan economies are in various stages of preparing, adopting, or implementing S3 with JRC's support. Montenegro led the way by adopting its RIS3 in June 2019, followed by Serbia in 2020 and North Macedonia in 2023. The other economies are actively engaged in developing their S3 strategies. The following section discusses some of the key milestones of the Smart Specialisation process in the Western Balkan economies.

Albania

Albania joined the JRC Smart Specialisation Platform in 2017. It launched its Smart Specialisation process in 2018 by nominating coordinators of the exercise. The JRC has been providing technical support to the Albanian S3 team since the launch of the process. The development of the Smart Specialisation strategy of Albania has been carried out by following the EC methodological framework for Smart Specialisation in the EU Enlargement and Neighbourhood Region. The analysis of strategic mandates was completed in 2018 and the economy started preparing for the mapping exercise. The quantitative analysis was completed in 2021, and it was followed by a qualitative analysis which refined the quantitative mapping's results, leading to the identification of six preliminary priority domains for the Smart Specialisation Strategy (Fabbri et al, 2022):

- Agriculture, Fisheries, and Aquaculture;
- Manufacturing;
- Energy;
- Accommodation, and Support Service Activities;
- Information and Communication;
- Administrative and Support Service Activities.

Albania completed the stakeholder dialogue phase in late 2023 with a series of EDP workshops, subsequently devised the monitoring and implementation mechanism, and finalised the Smart Specialisation strategy in 2024, covering the period from 2025-2030. The final list of priority areas grouped previously identified domains in the following manner:

- Renewable Energy and Natural Resources;
- Sustainable and Diversified Tourism;
- Healthy and Sustainable Food Chain.

Bosnia and Herzegovina

The initial effort to prepare a Smart Specialisation (S3) strategy in Bosnia and Herzegovina commenced in 2020, initiated by the country's Council of Ministers. This followed the formation of a working group and the appointment of the Directorate for Economic Planning (DEP) as the coordinator for the S3 process. In drafting the Smart Specialisation strategy, Bosnia and Herzegovina has aligned with the European Union's initiative, which introduces a novel approach to economic development at both the regional and national levels. The S3 of Bosnia and Herzegovina takes into account the economy's unique governance structure, including the state level, the two entities – the Federation of Bosnia and Herzegovina (FBiH) and its ten cantons, Republika Srpska (RS), as well as the Brčko District. The S3 team of Bosnia and Herzegovina is developing the Smart Specialisation strategy based on the S3 frameworks for the EU Enlargement and Neighbourhood Region and with the support by the JRC. The mapping exercise was completed in 2023, consisting of the quantitative mapping of economic, innovation and scientific potential, which was done in 2022, and qualitative mapping of economic, innovation and scientific potential, which was finalised the year after, but the preliminary priority areas for entering the Entrepreneurial Discovery Process are yet to be confirmed.

The main sectors identified through the quantitative and qualitative analysis, yet to be officially confirmed in view of the subsequent EDP phase, include:

- ICT;
- Metal and Electrical Industry;
- Production and Processing of Plastics;
- Production and Processing of Food and Beverages / Food industry;
- Wood Industry;
- Tourism Industry.

Following the completion of the mapping phase, Bosnia and Herzegovina will prepare for the launch of its EDP exercise. It is envisaged that the EDP will take place in multiple cities starting in 2024.

Kosovo*

Kosovo* initiated its Smart Specialisation process in 2018 by joining the Smart Specialisation Platform and launching the strategy design with the support of the JRC. In 2020, a dedicated Smart Specialisation team was formed, operating under the guidance of the Office for Strategic Planning within the Prime Minister's Office. Since its inception, Kosovo* has been diligently working on creating a National Strategy for Smart Specialisation. This effort is supported by the European Commission (EC) and follows the methodological framework provided in the Smart Specialisation frameworks for the EU Enlargement and Neighbourhood Region. The process involved quantitative mapping, which began in October 2020 and concluded in August 2021. Following this, qualitative mapping commenced in November 2021 and was completed by May 2022, as reported by Hollanders and Rexhebeqaj (2023).

The qualitative analysis confirmed five areas with the greatest potential:

- Wood processing;
- Food processing;
- Green energy;
- ICT;
- Creative industries.

The report emphasised the importance of the automation of processes, digitalisation, new digital frontiers (artificial intelligence, IoT sensors, and machine learning), and energy transition (use of renewable sources). Kosovo* finalised its EDP phase in 2023. The draft of the Smart Specialisation strategy of Kosovo* is currently being prepared.

Montenegro

Montenegro launched its Smart Specialisation process in 2017 and formed a working group to oversee the process and coordinate the tasks for the strategy development. It finalised the mapping exercise in 2018 revealing the following preliminary priority areas:

- Sustainable agriculture,
- Processing industry,
- Energy,
- ICT,
- Health and quality of life,
- Construction and tourism.

Subsequently, Montenegro launched a series of EDP workshops to further develop the priority areas for Smart Specialisation. In 2019, after the finalisation of the EDP, the S3 working group proposed the list of final priority areas, which are the following:

- Energy and sustainable environment;
- Sustainable agriculture and food value chain;
- Sustainable and health tourism;
- ICT.

The priority area of ICT is also seen as a horizontal priority providing business and technological support to other priority areas.

The working group developed the monitoring and implementation mechanism and finalised the strategy in 2019, adopting it in June 2019. The strategy was later submitted to the European Commission services for formal assessment. The strategy received conditionally positive assessment marks in early 2020. Since then, the implementation of the S3 of Montenegro is under the Council for Innovation and Smart Specialisation, which was established in August 2019.

Montenegro emerged as a regional leader, with its S3 strategy receiving high-level political support. The economy's success is attributed to its robust governance system and operationalization of continuous EDP, setting a benchmark for others in the region (Radovanovic and Bole, 2024). In 2024, Montenegro launched the design process of the second round of the strategy, successfully completing the mapping phase and preparing for stakeholder dialogue activities.

North Macedonia

North Macedonia's journey towards Smart Specialisation strategy began in March 2018, marked by the government's commitment to develop a National Research and Innovation Strategy for Smart Specialisation, communicated to the Joint Research Centre. The strategy's development is spearheaded by North Macedonia's Smart Specialisation team and involves collaborative coordination between the Ministry of Economy and the Ministry of Science and Education.

The initial phase of this process involved a thorough quantitative analysis in 2019, focusing on mapping the country's economic, innovation, and scientific capacities. This analysis uncovered several sectors with considerable potential. Subsequent qualitative analysis and the Entrepreneurial Discovery Process (EDP), completed in 2022, led to the identification of key priority areas, as noted by Radovanovic et al. (2022). These areas include:

- Smart agriculture and food with higher added-value;
- ICT;
- Electro-mechanical industry - Industry 4.0;
- Sustainable materials and smart buildings.

Following this phase, efforts were intensified towards finalizing the strategy. By the end of 2023, North Macedonia had officially adopted its Smart Specialisation strategy. The final priority list, as given in the strategy, includes the following:

- Smart agriculture and food with higher added value;
- ICT;
- Sustainable materials and smart buildings;
- Electromechanical industry - Industry 4.0;
- Energy for the future and tourism (as horizontal priorities).

North Macedonia, who adopted the Smart Specialisation strategy in December 2023, showcased an effective EDP implementation strategy amidst the COVID-19 pandemic (Radovanovic and Bole, 2024). The economy's persistence in finalizing its S3 strategy under challenging conditions was noteworthy. The strategy, representing a significant milestone in the country's development, is now awaiting assessment by the services of the European Commission. The adoption of this strategy signifies North Macedonia's dedicated effort to align with EU standards and improve its research and innovation landscape.

Serbia

Serbia embarked on its Smart Specialisation (S3) journey in 2015, officially joining the S3 platform. The actual process commenced in late 2016 and early 2017, spearheaded by the Ministry of Education, Science and Technological Development, which established an inter-ministerial working group dedicated to developing the Research and Innovation Strategy for Smart Specialisation (RIS3). With support and guidance from the Joint Research Centre, and adhering to the European Commission's methodological framework tailored for Smart Specialisation in the EU Enlargement and Neighbourhood Region, Serbia conducted a comprehensive mapping phase. As identified in the research by Radovanovic et al. (2021), this phase led to the initial identification of several priority

areas in 2019. These areas were later affirmed during the stakeholder dialogues within the Entrepreneurial Discovery Process (EDP) in the same year:

— Food for Future;

— Information and Communication Technologies (ICT);

— Future Machines and Manufacturing Systems;

— Creative Industries.

By April 2021, Serbia had successfully completed the formal adoption of its Smart Specialisation framework, including a detailed action plan. This plan underwent a revision in 2023, and the entire documentation is currently under the review of the European Commission services. This marks a significant step in Serbia's ongoing efforts to align its research and innovation sectors with European standards and practices, potentially leading to new opportunities for development and international collaboration.

Serbia's journey in S3 was marked by early adoption and a focus on effective qualitative analysis and EDP. The support from alternative resources played a crucial role in Serbia's ability to navigate the S3 process effectively (Radovanovic and Bole, 2024).

Figure 8. Smart Specialisation priorities in the Western Balkans

ALBANIA	BOSNIA AND HERZEGOVINA	KOSOVO*
• Renewable energy and natural resources • Sustainable and diversified tourism • Healthy and sustainable food chain	• ICT • Metal and electrical industry • Production and processing of plastics • Production and processing of food and beverages / Food industry • Wood industry • Tourism industry	• Wood processing • Food processing • Green energy • ICT • Creative industries
MONTENEGRO	**NORTH MACEDONIA**	**SERBIA**
• Sustainable agriculture and food value chain • Energy and sustainable environment • Sustainable and health tourism • ICT	• Smart agriculture and food with higher added value • ICT • Electro-mechanical industry – Industry 4.0 • Sustainable materials and smart buildings	• Food for future • ICT • Future machines and manufacturing systems • Creative industries

Note: *For ME, RS, MK and AL – S3 adopted; for XK – EDP finalised; for BA – mapping to be finalised and priorities confirmed.* ***Source:*** *Authors.*

It is foreseen that the identification of such priority areas revealed that not only common priority areas are being identified, but also particular strengths and challenges that the economies are facing for using their full potential are likely to be similar (Radovanovic et al, 2023). As these Smart Specialisation processes were coordinated at the national level, it was important to share such strengths and challenges, as well as main characteristics and drivers of the identified priority areas for the benefit of the entire region.

By embarking on a transformative innovation policy journey, marked by the adoption of Smart Specialisation strategies, the Western Balkan region, including Türkiye, initiated the shift that signaled a commitment of these economies to a more structured and comprehensive approach to innovation, one that is grounded in evidence and strategic planning. As noted by Radovanovic and Bole (2024), the S3 process in these economies commenced with critical initial steps such as defining strategic mandates, which then progressed to in-depth quantitative and qualitative analyses, and the all-important Entrepreneurial Discovery Processes. Despite the varied pace at which different economies moved, their collective dedication to this evidence-based approach to innovation policy development was apparent.

The journey, however, was not without its challenges. Throughout the S3 process, the Western Balkan economies confronted numerous obstacles, including limited resources, the impact of the COVID-19 pandemic, and the need for consistent technical support. Despite these hurdles, their resilience and adaptability were remarkable. Particularly notable was the implementation of Entrepreneurial Discovery Processes during the pandemic, demonstrating the region's capacity for innovation. These processes, along with the development of governance structures tailored to each country's unique political and economic context, exemplified the customised approach adopted by these economies.

Table 4. Main benefits of the S3 process, as identified by the Western Balkan economies

	Engagement of stakeholders	Satisfaction of stakeholders with EDP	New capacities built	New general awareness regarding the collaboration of key stakeholders
Montenegro	4,0	4,0	5,0	5,0
Serbia	4,5	3,5	4,5	4,5
North Macedonia	5,0	5,0	4,0	5,0
Albania	5,0	5,0	4,0	5,0
Kosovo*	4,0	4,0	3,0	4,0
BiH	3,0	2,0	3,0	3,0
Türkiye - Trakya	4,0	3,0	5,0	5,0
AVERAGE	**4,2**	**3,8**	**4,1**	**4,5**
STANDARD DEVIATION	**0,7**	**1,1**	**0,8**	**0,8**

Source: *Radovanovic and Bole (2024).*

Table 5. Main challenges of the S3 process, as identified by the Western Balkan economies

	Lack of resources for the design	Lack of resources for implementation	Top level government commitment	Recognition of S3 in the government sector	Recognition of S3 in the industry & academia	Lack of time
Montenegro	4,0	3,0	1,0	3,0	3,0	2,0
Serbia	2,5	5,0	5,0	5,0	3,0	4,0
North Macedonia	5,0	5,0	5,0	5,0	5,0	1,0
Albania	3,0	-	3,0	4,0	4,0	1,0
Kosovo*	5,0	4,0	5,0	5,0	5,0	4,0
BiH	3,0	5,0	5,0	5,0	5,0	5,0
Türkiye - Trakya	2,0	5,0	2,0	3,0	3,0	5,0
AVERAGE	**3,5**	**4,5**	**3,7**	**4,3**	**4,0**	**3,1**
STANDARD DEVIATION	**1,2**	**0,8**	**1,7**	**1,0**	**1,0**	**1,8**

Source: *Radovanovic and Bole (2024).*

In guiding the Western Balkan economies through the complexities of S3, the Joint Research Centre (JRC) of the European Commission played a critical role. The JRC provided invaluable assistance through its tailored frameworks, workshops, and technical aid, significantly contributing to the advancement of S3 implementation in these economies. This support, as outlined by Radovanovic and Bole (2024), was integral to the progression and success of the S3 strategies in the region.

Moreover, the adoption of S3 strategies in the Western Balkans has resulted in a significant accumulation of knowledge and best practices. These learnings are invaluable for future policy development, not only within the region but also beyond. The commitment of these economies, coupled with the collaborative efforts and support of the European Commission, particularly through the JRC, has set the Western Balkans on a promising path towards enhanced innovation and economic development.

As the Western Balkan region continues to navigate the S3 process, the need for ongoing commitment and coordination remains critical. The experiences of these economies underscore the importance of strong government commitment and stakeholder engagement for the effective implementation of S3 strategies. Moreover, there is a growing recognition of the need to address persistent challenges such as resource constraints and governance effectiveness, as well as to enhance the understanding and recognition of S3 principles across various sectors. These efforts are vital for the sustained success and effectiveness of the S3 strategies in the region.

3.4. Smart Specialisation policy actions relevant to sustainability challenges

Smart Specialisation strategies have increasingly emphasised the importance of addressing sustainability and societal challenges. They are not only designed to enhance economic growth but also to ensure that such growth is environmentally sustainable and socially inclusive. This chapter analyzes and discusses the Smart Specialisation policy actions implemented by the Western Balkan economies, focusing on how these actions address sustainability and societal challenges. In doing so, it is taking into account the level of advancement in the Smart Specialisation process and the stage reached by each economy.

By exploring the tailored approaches, this session offers insights on how each country leverages its unique strengths and innovation potentials to promote sustainable development and societal well-being. Through targeted measures, collaborative efforts, and innovative practices, the Western Balkan economies aim to create resilient and forward-thinking economies that are better equipped to meet the future challenges.

Montenegro

Initially, Montenegro's Smart Specialisation strategy listed five primary objectives, accompanied by policy instruments tailored to its priority areas. These objectives included improving scientific research excellence, strengthening human resources in research and innovation, enhancing collaboration within the innovation system, supporting innovative activities in the business sector, and improving the framework conditions for the innovation ecosystem. The four priority areas of the strategy were: Sustainable agriculture and food value chain; Energy and sustainable environment; ICT; and Sustainable and health tourism.

Key policy instruments addressing sustainability and societal challenges included R&D tax incentives, a support scheme for digital transformation of companies, an environment protection and waste management program, and a support scheme for innovative health tourism services. These instruments foster investment in research and development, bridge the digital divide, manage waste effectively, and promote health tourism, thus contributing to both sustainability and societal development.

The evolution of the Smart Specialisation objectives and Montenegro's economic shift can be observed through the initial general policy directions and their subsequent modifications into more targeted actions. For example, in the Sustainable agriculture and food value chain domain, directions included development of centres of excellence, genetic research programs and grant schemes for organic agriculture and industrial processing. In Energy and sustainable environment, there were programs for energy efficiency and renewable energy sources. For the ICT area, support schemes for digital transformation and e-government services were introduced. Sustainable and health tourism saw support schemes for innovative health tourism services and health technology assessments.

Box 1. Centre of Excellence FoodHub in Montenegro

The Centre of Excellence for the Digitalization of Risk Assessment in Food Safety and Precise Certification of Food Product Authenticity, or FoodHub, was formed within the University of Donja Gorica (UDG) in January 2020. With a budget of 1.2 million EUR, including 0.92 million EUR from the Ministry of Science of Montenegro, FoodHub focuses on developing scientifically based solutions to mitigate food safety risks, create digital tools for risk assessment, and certify product authenticity.

FoodHub's achievements over the past three years are substantial. In human capacity building, the centre has conducted over 30 training sessions and workshops, supported two doctoral researchers in Vienna, and facilitated the completion of three doctoral dissertations and five master's theses. These efforts enhance the scientific and practical knowledge required for food safety and authenticity.

Laboratory capacity has also been significantly improved. FoodHub has accredited numerous methods for honey and wine analysis, acquired a third-generation sequencer for whole genome sequencing, and developed methodologies for testing genetically modified organisms. Research at FoodHub includes analyzing 560 isolates from food products using advanced techniques like MALDI-TOF and genetic identification, providing comprehensive insights into food safety risks and authenticity.

Additionally, FoodHub has developed the 'MontEat' mobile application to promote Montenegrin gastronomy, published 17 research papers, and conducted the largest study on Montenegro's dietary habits. Educational efforts include creating online informational packages for industry staff and the public, along with training sessions, a food safety manual, and awareness campaigns. These activities collectively enhance FoodHub's role in advancing food safety and authenticity in Montenegro and beyond.

Source: *Report on the S3 action plan implementation in Montenegro, 2024.*

As implementation began and initial results emerged, some actions required revision, while the others necessitated more focused approach. The COVID-19 pandemic also significantly impacted Montenegro's economic and innovation activities. The revised S3 action plan published in 2024 included more precise and targeted actions in each priority area. For instance, in agriculture, the Genetic Resources Conservation Programme was introduced to preserve biodiversity and promote commercial breeding of local species. In energy and environment, new training programs for energy efficiency were established. In ICT, support for digital transformation and startup acceleration was enhanced. Sustainable tourism saw the development of a digital application for visitor management in Kotor.

Table 6. Selected policy actions per priority areas in Montenegro focused on sustainability and societal challenges

	PRIORITY AREA			
	Sustainable agriculture and food value chain	**Energy and sustainable environment**	**ICT**	**Sustainable and health tourism**
POLICY ACTION	Support for centres of excellence	Support for centres of excellence	Improvement of human resources for the digital economy	Support for centres of excellence
	Genetic Resources Conservation Programme	Training for energy efficiency in buildings	Support to the cluster organisation within the ICT priorities	Improving the visibility of Montenegro as a destination for sustainable and health tourism
	Support for a grant scheme for innovative activities in organic agriculture	Financing projects in the field of renewable energy production and other environmental projects	Support for digitalization of MSMEs	Financing projects in sustainable and health tourism
	Financing projects in agriculture and the food value chain	Energy efficiency in hotels	Financing ICT projects	Pilot project of the digitalisation of visitors' management in Kotor in the goal of sustainable cruising tourism
	Support for introducing innovations in the agriculture	Promotion of the significance of primary selection and recycling of packaging waste	Promotion of the representative Digital Transformation programme	Support for the circular economy
	Support for the circular economy	Support for the circular economy	Support to pre-acceleration of startups	
			Support to early development phase of startups	
			Improvement of open data ecosystem and promotion of data reuse at www.data.gov.me	
			Activation of the youth office of Podgorica for uniting all stakeholders from the youth policy system and improvement of cooperation with the civil society for innovation enhancement	

Source: *Authors, based on 'Status Overview of the Action Plan for the Implementation of the Operational Program for the Smart Specialization Strategy (2021-2024)'.*

Serbia

Serbia identified four priority areas in its Smart Specialisation strategy: Food for Future, Information and Communication Technology, Future Machines and Manufacturing Systems, and Creative Industries. It set the following five objectives for the strategy: 1) to have research and development activities focused on the S3 priorities; 2) to support economic growth through R&D and collaboration among the quadruple helix participants; 3) to focus education on innovations and entrepreneurship; 4) to improve business environment through optimisation and digitalisation of procedures in the priority areas; and 5) to internationalise its economy through involvement in regional and global value chains in the priority areas. All these objectives were given under the umbrella of the general goal, which stated that the development of the Republic of Serbia should be directed towards a highly competitive economy through research, development, innovation, and entrepreneurial initiatives in the Smart Specialisation priority areas.

Just like in the case of Montenegro, the policy measures within the strategy were laid out to encapsulate the scope of all necessary actions that were foreseen when the strategy was being developed. After the first experiences with the strategy implementation and taking into account new realities, Serbia adopted the new action plan for the implementation of the Smart Specialisation strategy for the period 2023-2025 that was more focused on particular actions in the identified priority areas. These policy actions were also better shaped to address sustainability challenges within the exploitation of the Smart Specialisation potential that the country is exhibiting.

The action plan brings several joint measures in that regard. These include regulatory and administrative enhancements for evidence-based research development and excellence in research activities, trainings for researchers, legal frameworks for industrial Ph. Ds, targeted funding (e.g. by innovation vouchers) of innovative projects and cooperation between science and industry (including the Green Programme for science-industry cooperation), increased use of R&D tax incentives, and digital transformation support programme.

Majority of the policy actions and measures addressing sustainability appear in relation to the Food for Future and ICT priority areas, which in general have the biggest share of the total policy actions that relate to one priority area in the S3 action plan. In the Food for Future domain, Serbia intends to further develop its potential within the areas of biomedicine, biotechnology, bioinformatics and biodiversity (BIO4 areas).[27] With the intention of bringing the BIO4-oriented activities together, Serbia launched a project of establishing a specialised research institution, called BIO4 Campus, that would bring together researchers, scientists and businesses from these fields to pursue innovation together. In advancing its sustainable agriculture, the country aims to provide incentives for R&D in agriculture and food industry and to provide support to agricultural holdings. It also launched the measures concerning the educational improvements in these areas, through integrating master programmes in bioinformatics and AI in BIO4 areas.

In the ICT domain, the action plan provides several measures aiming at exploiting the potential in AI through R&D incentives and support programmes. The actions that tackle sustainability issues also include setting up Smart City centres that focus on improving sustainability and quality of services to population and digitalisation. Concerning the Future machines and manufacturing systems priority area, Serbia intends to enhance research infrastructure for renewable energy sources, energy efficiency, and eco-smart solutions, through establishing a centre of excellence at the Faculty of

[27] Biomedicine, biotechnology, bioinformatics and biodiversity pertain to the Food for Future priority area as they are closely related to advancing agricultural practices, improving food production, and ensuring sustainability within the food value chain.

Mechanical Engineering in the southern city of Nis by 2025, while in relation to the Creative industries domain, the aim is to build a multifunctional creative hub 'Lozionica' that will be focused on activities in the field of creative industries, innovation, and knowledge-intensive economy. Please find the related policy measures from the S3 action plan 2023-2025 in the table below.

Table 7. Selected policy actions per priority areas in Serbia focused on sustainability and societal challenges

	PRIORITY AREA			
	Food for future	**ICT**	**Future machines and manufacturing systems**	**Creative industries**
POLICY ACTION	Competitive calls in S3 priority areas within the Green Program for science-industry cooperation	Competitive calls in S3 priority areas within the Green Program for science-industry cooperation	Competitive calls in S3 priority areas within the Green Program for science-industry cooperation	Competitive calls in S3 priority areas within the Green Program for science-industry cooperation
	Research infrastructure for biomedicine, biotechnology, bioinformatics, and biodiversity	Support program for R&D projects in artificial intelligence	Research infrastructure for renewable energy sources, energy efficiency, and eco-smart solutions	Creative Hub – Ložionica
	Incentives for R&D in agriculture and the food industry	Support program for collaboration with top international experts in artificial intelligence	Digital transformation support program	Digital transformation support program
	Support of agricultural holdings (investments in physical assets and diversification)	Support program for AI training		
	Investments in processing and marketing of agricultural and fishery products	Support program for innovative entrepreneurship in AI-based technologies		
	Development of interdisciplinary master's programs for bioinformatics studies and for AI application in BIO4 areas	Support program for regional innovation startup and smart city centres		
	Organizing bioinformatics trainings	Support program for innovation and digital transformation		

Source: *Authors, based on the 'Action plan for 2023-2025 to the Smart Specialisation Strategy of Serbia'.*

North Macedonia

The Smart Specialization Strategy (S3) of North Macedonia, adopted by the end of 2023, also aimed to addresses certain societal and sustainability challenges through strategic directions and concrete measures. The general vision of the strategy is to fostering green and sustainable growth through imbedding knowledge, innovation and technology based. Contribution to the general vision comes from the vision of priority domains that include sustainable development through knowledge transfer, digitalisation, circular economy, innovative materials, and smart buildings that contribute to sustainable living. This vision highlights the importance of integrating green growth, the circular economy, and innovative building practices to ensure a sustainable future.

The strategy sets forth several strategic objectives aimed at building strong partnerships, modernizing education, strengthening scientific excellence, fostering competitive and environmentally sustainable companies, improving the business environment, and opening new markets. To achieve these objectives, the strategy focuses on measures that support development of sustainable materials and smart buildings, increasing energy efficiency, enhancing safety and resilience and tackling environmental issues.

The digital and green transformation feature among the crucial aspects of the strategy across the priority domains. The potential of the domain 'Smart agriculture and food with higher added value' for addressing sustainability and transitions is significant, as it directly contributes to the attainment of all 17 Sustainable Development Goals (SDGs). By leveraging digitalisation and ICT tools, such as precision agriculture, IoT, drones, robotics, and AI, this domain can significantly increase productivity while reducing greenhouse gas emissions and waste. Aligning with the EU Green Deal and the Green Agenda for the Western Balkans, the Smart Agriculture domain can drive economic development, create green jobs, and ensure food security, making it central to sustainable growth and resilience in agri-food systems. By encouraging the use of digital solutions such as Building Information Modelling (BIM) and IoT devices, the strategy aims to enhance the efficiency of design, construction, and maintenance processes within the 'Sustainable Materials and Smart Buildings' domain. These technologies help monitor and regulate energy consumption and other environmental parameters, contributing to sustainable building practices.

The strategy also stipulates contributions to sustainable development through directions for exploiting potential in the 'Industry 4.0' priority domain. The actions in this domain involve implementing digital solutions that open new business opportunities, promote trusted technologies, and enhance process interconnectivity, sustainability, and competitiveness. It has been pointed out that digitalisation can steer companies further towards innovative solutions and additive manufacturing, fostering rapid prototyping and new product development. The industry needs to adopt resource-efficient production and clean technologies to combat climate change and environmental degradation, thereby improving air and water quality, energy efficiency, and the longevity of products through recycling and reuse. Investing in green technologies, such as renewable energy and clean production methods, will significantly benefit SMEs, aligning with SDGs related to clean energy, economic growth, industry innovation, and climate action.

Finally, the ICT priority domain plays a key role in the Smart Specialisation strategy for addressing sustainability challenges and facilitating green and digital transitions. ICT serves as both a contributor and an enabler, offering solutions like IoT and cloud-based services for precision agriculture, intelligent transportation, and energy management across various sectors. By fostering green networking and optimized IT resource usage through cloudification and virtualization, the strategy recognises the potential of the ICT to significantly reduce carbon footprints. This domain promotes institutional cooperation, life-long learning in novel technologies, and aligns directly with

several SDGs, including clean energy, climate action, industry innovation, and sustainable communities, while indirectly supporting a broader range of SDGs through its foundational role in data-driven transformation and connectivity.

The strategy lists certain financial incentives, including loans, guarantees, and grants, for encouraging green and digital investments. Vouchers for certifications and business advisory services help companies enhance productivity and comply with environmental standards. Additionally, the strategy supports the introduction of new business practices and innovations, such as energy management and eco-labelling, to promote sustainability. When discussing cross-domain synergies, the strategy aims to enhance energy efficiency and waste utilization through integrating smart building technologies with the agricultural and energy sectors. For example, agricultural waste can be used to create innovative sustainable materials and generate energy, demonstrating the interconnectedness of different sectors in achieving sustainability goals.

The strategy emphasizes energy efficiency and the use of renewable energy. By encouraging the adoption of renewable energy sources and sustainable materials in building projects, the strategy aims to develop energy-independent buildings and smart grids that manage energy consumption effectively. The circular economy is a central theme in the strategy, promoting the recycling and reuse of construction and demolition waste. Green and digital skills development is also prioritised to ensure that the workforce is equipped to meet the demands of a sustainable future, while some academic programs would be enhanced to focus on sustainability and digitalisation.

Table 8. Selected policy actions per priority areas in North Macedonia focused on sustainability and societal challenges

	PRIORITY AREA			
	Smart agriculture and food with higher added value	**ICT**	**Electro-mechanical industry – Industry 4.0**	**Sustainable materials and smart buildings**
POLICY ACTION	Support for use of innovative solutions for sustainable resources management (eco-efficiency, water management, renewable energy sources, waste management, circular economy, etc.)	Support SMEs to adopt digital operation (e.g. digitalisation vouchers, regulatory improvements)	Introduce government-funded educational programs to improve managerial skills and access to information on new technologies, standards, and industry trends	Support cooperation for improved environmental protection and treatment of waste as a secondary raw material
	Mitigating and adapting to the adverse effects of climate change Improving digital literacy of farmers and other actors in the chain	Support development of specific ICT solutions aimed at digitalization of industry, agribusiness and construction, as well as other sectors	Support for the development of key technologies and services for decarbonisation of the energy system and industry	Support the innovations and patents for reducing CO_2 footprint
	Improving digital literacy of farmers and other actors in the chain	Increase the digital skillset of the population	Increased competitiveness through automation of production processes, implementation of advanced technologies and industry standards	Reducing energy consumption (by ICT solutions, sustainable materials, renewables, smart buildings)
	Digitalisation and automation, better farm and processing companies' management and development of digital e-services for all actors in the chain	Digitalization of the public sector (public procurement for digital innovation, government body for digitalisation, etc)	Support of industrial projects for digitalization of industrial processes	Support of companies that use secondary raw materials in line to the concept of circular economy
	Stimulating local development and improving the quality of life in rural areas by ICT technologies			Supporting legislative enhancements in the areas of waste disposal, circular economy and recycling, energy efficiency and renewable energy sources, and smart buildings

Source: *Authors, based on the Smart Specialisation Strategy of North Macedonia 2024-2027.*

Albania

In 2025, Albania adopted its first Smart Specialisation strategy for the period 2025-2030 and launched its implementation phase. The strategy builds on the earlier mapping and Entrepreneurial Discovery Process, which identified key economic and innovation potentials alongside pressing societal and sustainability challenges. The S3 provides a structured framework to align national development with EU standards, fostering innovation-driven growth while addressing ecological, digital and social transformations.

During the mapping phase, six potential areas were initially identified — agriculture, fisheries and forestry; manufacturing industry; energy; tourism; information and communication technologies (ICT); and business process outsourcing (BPO). These domains reflected Albania's economic base and emerging opportunities. However, through extensive consultations in the Entrepreneurial Discovery Process, the focus was narrowed and refined to three main priority areas, ensuring greater concentration of efforts and resources, stronger cross-sectoral linkages and closer alignment with European trends.

The main S3 priority areas are:

— **Renewable energy and natural resources,** focusing on positioning Albania as a leader in renewable energy generation and sustainable resource management. This domain aims to combine energy security with environmental sustainability and strengthen Albania's role in the green transition.

— **Sustainable and diversified tourism,** which leverages Albania's cultural and natural assets to promote tourism models that are environmentally responsible, community-based and economically beneficial at both local and national levels.

— **Healthy and sustainable food chain,** which emphasises the transition toward organic and sustainable agricultural practices, modernised food processing, and improved food safety and security. This domain seeks to enhance productivity and competitiveness while safeguarding environmental and public health.

To enable these domains, the strategy identifies four horizontal, cross-cutting priorities:

— **Human capital development,** including reforms in education and training, stronger focus on STEM and vocational education, lifelong learning, and measures to retain and attract skilled professionals, including through diaspora engagement.

— **Support for research and innovation,** aimed at strengthening collaboration between academia, businesses, and government; improving technology transfer; and fostering clusters, innovation hubs and science–industry partnerships.

— **Support for business and innovation environment,** focused on simplifying regulations, improving access to finance, incentivising sustainable practices, and aligning Albania's business climate with EU standards to attract investment.

— **Digitalisation and connectivity,** through the expansion of digital infrastructure, wider adoption of advanced technologies such as AI and IoT, and the promotion of digital skills to drive efficiency and competitiveness across sectors.

The S3 also recognises the importance of tackling societal challenges, including high levels of informal employment, particularly in agriculture, regional disparities and skills mismatches. By

modernising its productive base, fostering formal employment and enhancing education and training systems, the strategy seeks to promote sustainable growth and strengthen Albania's integration into European value chains.

Table 9. Selected policy actions per priority areas in Albania focused on sustainability and societal challenges

	PRIORITY AREA		
	Renewable energy and natural resources	**Sustainable and diversified tourism**	**Healthy and sustainable value chain**
POLICY ACTION	Promote the development of solar and wind energy projects to diversify the renewable energy portfolio, harnessing Albania's ample sunlight and wind resources for clean power generation	Develop a tourism sector that contributes to the socio-economic development of the country while promoting responsible practices and preserving natural and cultural treasures	Increasing the economic sustainability of farms to tackle current and future challenges (i.e. climate change) through cost reduction, sustainable production and certification
	Encourage the utilization of waste-to-energy technologies, innovative technologies and biomass resources for clean energy production, reducing landfill waste and promoting resource efficiency	Promote rural tourism by connecting visitors with local farms and agritourist activities, emphasizing sustainable food production	Ensure long-term sustainability and innovation in fishing, tourism and aquaculture industries
	Promote a diverse mix of renewable energy sources and emerging technologies to reduce dependence on a single source	Digitalisation and technological development in the context of health tourism	Innovative and sustainable agricultural and breeding practices
	Support modern and flexible grid infrastructure and energy storage that can efficiently handle the various nature of renewable energy resources and enable cross-regional energy sharing		Strengthen agritourism and business development in rural areas
	Implement responsible forest management practices		
	Strengthening of mineral processing, increasing the efficiency of non-renewable resources by adopting new waste-free technologies		

Source: *Authors.*

Kosovo*

Kosovo* is in the final stages of the Smart Specialisation strategy development. It has followed the S3 methodology throughout the mapping exercise for revelation of preliminary priority domains. The process aims to enhance economic growth and societal well-being by focusing on the economy's unique strengths and opportunities for innovation (Hollanders et al, 2023). This strategic approach addresses sustainability and societal challenges by proposing directions for measures for fostering development and competitiveness in the identified preliminary priority areas.

These preliminary priority areas include ICT, Green Energy, Creative Industries, Food Processing, and Wood Processing, with all of them having significant potential for economic transformation and innovation. The selection of these areas was based on their current economic performance, innovation and scientific potential, followed by the qualitative analysis which included the ability to address broader societal challenges (e.g. needs for improved education, brain drain, etc).

The ICT domain has shown high growth rates in service exports and significant economic potential. This domain includes sub-areas such as software development, computer programming services, telecommunication services, and advanced ICT services like IoT, AI, and machine learning. These areas are crucial for driving digital transformation and creating high-value jobs, important for sustainable development. Creative industries, on another hand, contribute to a more diversified economy by encompassing activities like advertising, media, digital content creation, and artistic endeavours. The integration of the ICT with Creative industries enhances the potential for digital transformation and competitiveness.

Given economy's reliance on fossil fuels, the transition to renewable energy sources is critical for sustainability. The Green Energy priority area includes renewable energy sources and energy efficiency measures as sub-areas and focuses on reducing environmental impact, enhancing energy security and promoting sustainable development. These measures align with EU and Energy Community targets, contributing to the Sustainable Development Goal for Clean and Affordable Energy. The renewable energy sector, particularly in solar and wind energy, has high economic potential and is attractive for foreign investments.

Food processing and Wood processing are the remaining two preliminary priority areas that are both vital for economic stability and growth. Concerning Food processing, it represents a significant portion of GDP and employment, and the focus of the actions is to improve value chains, increase production efficiency, and enhance export potential. In the case of Wood processing, it was stated that this area benefits from abundance of natural resources and also has substantial export potential. This priority area would benefit from improving production processes, enhancing value addition, and fostering sustainable practices, such as digitalisation and automation (Hollanders et al, 2022).

Based on the findings from the mapping exercise document, several clusters of suggested S3 policy orientations for sustainable development can be identified:

1. **Enhancing innovation and R&D.** Increasing investments in research and development (R&D) and fostering collaboration between academia and industry are seen as critical. This orientation includes establishing technology transfer centres, research laboratories, and promoting joint research initiatives, and it is essential for all priority areas but has particular significance for ICT and Green energy. Increasing investments in R&D and fostering collaboration between academia and industry has the ability to drive advancements in software development, AI, renewable energy technologies, and efficiency improvements in manufacturing and processing.
2. **Improving data availability and quality.** This measure supports all priority areas by addressing the gaps in innovation metrics and data quality. Accurate and comprehensive data are seen as essential for informed decision-making and effective policy development across areas such as Food processing, Wood processing, and Creative industries. Enhanced data capabilities should also facilitate better monitoring and identification of growth opportunities.

3. **Promoting cross-sectoral collaboration.** Encouraging horizontal cooperation between ICT, Creative industries and Green energy can create synergies and enhance competitiveness. This measure is particularly relevant for ICT and Creative Industries, as these sectors can integrate digital technologies and creative solutions into traditional industries. For example, the integration of ICT with Food and Wood processing can enhance digitalisation and efficiency, while collaboration between Creative Industries and other areas can positively affect innovation capabilities.
4. **Supporting SMEs and start-ups.** Providing access to finance, reducing bureaucratic obstacles and offering technical assistance are seen as vital for the growth of SMEs and start-ups. These measures can have a particularly significant impact on Creative industries and Green energy, where small and medium enterprises often lead innovation. This kind of support should help SMEs and start-ups in these areas to innovate, scale, and contribute to economic growth and job creation.
5. **Focusing on education and skills development**. Aligning educational curricula with market needs and investing in vocational training programs can address the skills gap in the labour market, which affects all priority areas. Aligning educational curricula with market needs is vital for preliminary priority areas like ICT, which requires a highly skilled workforce, and Green energy, where specialized knowledge in renewable technologies is of great importance.

As the Smart Specialisation strategy of Kosovo* aims to address challenges of economic transformation and sustainable development and growth, the upcoming stages of the strategy drafting process should build on these findings and establish a robust mechanism for meeting the objectives through relevant policy actions and governance.

Bosnia and Herzegovina

The Smart Specialisation process in Bosnia and Herzegovina, initiated in 2018, has gained significant momentum in recent years. As the country is finalising its mapping exercise, it will confirm economic, innovation, and scientific potentials, pinpointing preliminary priority areas at both entity and national levels. The mapping report (Fabbri et al., 2024) will provide a solid foundation for addressing sustainability and societal challenges through the forthcoming Smart Specialisation strategy.

Energy and environmental sustainability have emerged as crucial areas of focus. The economy benefits from lower electricity prices, aiding energy-intensive industries. However, frequent electricity supply interruptions, especially in smaller municipalities, highlight the need for sustainable energy solutions. There is growing interest in renewable energy sources such as wind, solar, biomass, and biogas to reduce environmental impact and dependency on conventional energy. The shift towards a circular economy is evident, with efforts in recycling, repurposing materials, and reducing reliance on imported resources, addressing environmental challenges while creating economic opportunities.

Concerning the potential priority domains for Smart Specialisation, the mapping report highlights some of the key areas and activities that support shift towards sustainability. ICT and digitalisation will play a pivotal role in supporting sustainability in the country. ICT supports innovation and digital transformation across industries, offering smart manufacturing solutions, IoT integration, and data analytics to optimize production, reduce downtime, and enhance quality control. The ICT sector is growing and has the potential to create jobs and boost economic growth. It promotes energy-efficient measures and responsible resource management. The adoption of Industry 4.0

technologies in manufacturing will lead to optimised production processes and predictive maintenance, enhancing efficiency and sustainability. In the metal and electrical industry, which features as potential priority domain, there is a push towards smart manufacturing, automation, robotics, renewable energy systems and sustainable materials. Automation and robotisation are seen as crucial strategies to address workforce decline and improve energy efficiency. The wood industry stakeholders recognise the environmental impact of their activities and increasingly use biomass-generated power and other renewable sources for internal consumption. The plastic industry is innovating in recycling, producing thinner and biodegradable plastics, and digitalising production processes to align with circular economy principles. The food and beverage industry stakeholders emphasise sustainability through waste reduction, resource conservation, eco-friendly packaging, and increased automation in production and processing. Finally, the tourism industry is also evolving towards sustainability. The development of eco-lodges, adventure sports, and community-based tourism could provide authentic and sustainable solutions and experiences. Effective policies supporting sustainable tourism practices are seen as essential for future growth.

The proposed measures and actions to address these challenges include promoting renewable energy solutions such as solar power and biomass to reduce fossil fuel dependency and enhance environmental sustainability. Industries are supported in integrating these technologies to lower their carbon footprint. There is a strong emphasis on advancing technological capabilities by investing in advanced technologies and automation to improve efficiency and product quality. For instance, real-time quality control systems are being adopted in the food industry, while the metal and electrical industries are focusing on complex manufacturing technologies.

Enhancing innovation ecosystems is another crucial aspect, involving businesses, research institutions, startups, and government agencies. Collaboration and resource-sharing are fostered to drive technological advancements and economic growth, while supporting sustainable practices remains a core objective, promoting responsible waste management, efficient resource utilization, and adherence to environmental regulations. Improving education and training is essential to address the skills gap, equipping the workforce with necessary skills in advanced manufacturing, digitalisation, and sustainable practices, thus enhancing innovation potential across industries.

3.5. Smart Specialisation common initiatives in the region

Since the start of the Smart Specialisation process in the Western Balkans, there was a growing need to share knowledge and experiences about the steps in the process among the economies, as they were facing similar challenges, especially regarding administrative capacity, legislative improvements and EU accession necessary actions. The S3 teams within the region established formal or informal channels of communication for this purpose. However, having in mind various economic and political contexts pertaining to the Western Balkans realities, it was often difficult or even impossible to proceed with knowledge sharing on particular Smart Specialisation related matter. Realising this tendency and the arising difficulties, in order to facilitate exchange of experiences, challenges, opportunities and solutions, the Joint Research Centre launched several regional Smart Specialisation initiatives.

The JRC High-level Conference on 'Smart Specialisation and Technology Transfer as Innovation Drivers for Regional Growth', held in Sofia in May 2018, was the first big event of this kind. It featured discussions on regional growth through innovation, Smart Specialisation and technology transfer. The first thematic session emphasised sharing successful R&D experiences, with diverse speakers from various institutions. A key focus was on building regional partnerships to increase participation in global value chains. Discussions highlighted the need for linking Smart Specialisation

Strategies (S3) in the Western Balkans (WB) to foreign direct investment (FDI), structural reforms, and 'big thinking'. Common challenges that were identified at the event included inadequate changes in business and academic environments and the need for modern educational systems to include industry internships. Essential factors for success included good quality data, dedicated governance, greater business engagement, fostering a better dialogue between academia and business through improved communication, and aligning educational systems with market needs and encouraging practical business experience for students.

Speakers coming from the Western Balkans, but also from different EU Member States, and with various backgrounds, shared lessons from the S3 process in different regions, highlighting the importance of stakeholder dialogue and clear criteria for partnerships. Experiences from Slovenia and Poland underscored the need for careful priority setting and monitoring, emphasizing trust and governance as critical components of a successful S3 process. Public officials from the Western Balkan economies discussing their ongoing efforts and plans to implement S3 strategies, outlining respective steps towards fostering innovation through dedicated ministries and supportive funds. Discussions with national S3 teams from the Western Balkans deepened throughout the event, with commitments to advance the S3 process and hold new similar events in the Western Balkan region.

The following regional conferences on Smart Specialisation were held in Podgorica in February 2019, Bucharest in June 2019, and Belgrade in October 2019.

The main objective of these events was to explore complementarities and cooperation potential in the process of designing Smart Specialisation strategies with other regions and develop cluster networks and cross-border value chains, thus enabling the outward-looking approach in the Smart Specialisation process. The goals were also to setup the ground for a peer-to-peer review with regions in the stage of developing Smart Specialisation strategies and exchange of good practices and to explore possibilities for cross-border cooperation on Smart Specialisation. The event in Podgorica gathered around 60 participants from Montenegro, Western Balkans and the neighbouring Member States. The event included presentation of the draft Smart Specialisation strategy of Montenegro, feedback from JRC and invited experts, and discussion on potential international cooperation on the preliminary Smart Specialisation priority domains identified by Montenegro.

The event in Belgrade was focused on presenting Smart Specialisation priority domains of Serbia and exploring potential for cooperation. Panellists at the conference agreed that such collaboration is essential for boosting the innovative capacities of the Western Balkans and aligning with EU standards. The upcoming IPA III, planned on a regional level, was mentioned as important instrument that would bolster the need for cooperation in order to avoid competition for funds. It was pointed out that effective governance of innovation strategies in South- East Europe involves cross-sectoral policymaking and participatory implementation and monitoring and that the European Commission's focus on competitiveness and employment, particularly supporting SMEs, aligns with these strategies. Programs like Horizon 2020, while challenging to absorb, offer significant support, provided there is strong inter-ministerial coordination and a focus on human skills development. Institutions like Serbia's Innovation Fund and Science Fund were proposed as crucial for sustaining stakeholder engagement and aligning national investments with S3 priorities.

When discussing challenges concerning sustainable solutions in relation to innovation policy, the discussants stated that the primary challenges involve fostering effective cooperation between science and business, attracting and retaining talent, and ensuring robust data for strategic planning. Some EU examples highlighted the need for substantial investment in infrastructure, financial support instruments like innovation vouchers, and inclusive practices to build ecosystems

that drive innovation. Key difficulties discussed included engaging the private sector, transitioning R&D centres into broader innovation ecosystems, and aligning educational systems with industry needs to support sustained growth. Furthermore, local representation, clear project ownership, and strong stakeholder involvement were proposed as critical to successful crowdfunding and innovation initiatives. Participants at the event also proposed several solutions for going forward. These included adopting participatory and inclusive approaches that involve a wide range of stakeholders, from government and academia to private firms and the general public, enhancing public-private partnerships, establishing clear performance indicators, and creating financial instruments that support both supply and demand sides. Examples, such as Health Hub Vienna, ENRICH, Adria incubator and Innovation Valleys in Lithuania, were given in that regard.

The mentioned regional conference in Bucharest was another effort to bolster collaboration in Smart Specialisation in the Western Balkan region. It included stakeholders from the wider South-East Europe region gathered around the idea of making Smart Specialisation strategies an important tool to promote transnational cooperation in the Western Balkans and to provide a dialogue forum for discussing strategic innovation policies and implementation practices in a European perspective. The event confirmed the commitment and support of JRC to the Western Balkans efforts toward political, economic and social transformation in the boarder South- East Europe Region. The sessions discussed the progress, results and challenges related to the design and implementation of successful Smart Specialisation strategies, innovation ecosystems and Technology Transfer. Key conclusions highlighted the need to strengthen the network and community of expertise in the Smart Specialisation domain. It was stated that the innovation performance of the SEE region is lagging behind the rest of Europe and the growth is insufficient, while the evidence-based outcomes were necessary for the development of appropriate monitoring and evaluation mechanisms. One of the main messages was that regional alignments of Smart Specialisation approach were very important to the concept of identifying regional value chains in the Western Balkans and the South-East European regions.

One of the important events of similar kind also included the S3 Peer-exchange workshop for the EU Enlargement and Neighbourhood region, organised by the JRC and held online in March 2022. At this event, participants from the entire region took part in an event aimed at providing assistance and sharing of experiences of peer countries/regions and experts, in planning, designing and implementing S3 strategies. The event included several renowned experts in the Smart Specialisation field who guided the discussion. The event served as an important opportunity to exchange questions and answers among the participants, to learn and find solutions to S3-related matters, share stories behind every S3 strategy and build an open community of S3 practice. The important step of the event included a self-assessment exercise before the workshop, based on which the presenting economies prepared a presentation about their territory and S3 development plans and progress of implementation. The event showed that the S3-related challenges are mostly common to the entire region and include insufficient funding opportunities for implementation of S3 actions, underdeveloped institutional capacity at multi-policy level and maintaining collaboration and involvement of relevant stakeholders. On the other hand, common solutions that resonated more strongly in relation to the issues included creation of sustainable Smart Specialisation implementation structure that focuses on continuous engagement of all stakeholders and looks for realistic measures through revision of Smart Specialisation targeted actions within policy mix.

The last in the chain of regional conferences on Smart Specialisation was the event in Skopje, held in October 2022[28]. The conference, named 'Implementing the Western Balkan Agenda on Innovation, Research, Education, Culture, Youth and Sport – Support to Smart Specialisation in the Western Balkans and Turkey', brought together high officials, policy makers, innovation practitioners, representatives from start-ups and SMEs, as well as members of academia, business society and civil organisations from the EU Enlargement region but also from the EU member states. The participants discussed the progress made by the Western Balkan economies in Smart Specialisation with the particular focus on the implementation stage and the contribution to the Western Balkan Agenda, as well as the progress made by North Macedonia in the Smart Specialisation process. The panels included reflections on the advancements and success stories from the Smart Specialisation processes of the Western Balkan economies. As in previous conferences, particular emphasis was given on promoting potential collaborations in innovation priorities across the Western Balkan region by enabling a discussion between the Smart Specialisation teams of all economies from the region. Some of the key challenges mentioned at this event included continuous lack of sufficient funding for innovative actions, maintaining political commitment and introducing a continuous multi-stakeholder governance.

One of the key initiatives that looked into bringing policymakers and other stakeholders from the Western Balkans together to discuss tackling common challenges related to Smart Specialisation was the organisation of thematic workshops on common S3 priority areas. In 2021, the JRC organised first such event, focusing on collaboration in the agrifood area, while in the following year it organised the second – on the ICT priority domain.

The workshop on agrifood highlighted several common challenges and opportunities concerning sustainability in the agri-food sector across the Western Balkans. Participants identified low productivity, outdated technology, and insufficient institutional support as significant obstacles. The dominance of small farms, inadequate processing capacities, and a lack of integration into global value chains were seen as major issues. Additionally, there were concerns about low levels of private investment in research and development, limited access to finance for startups, and insufficient collaboration between public and private sectors. Despite these challenges, the region was noted for its high-quality and diverse agricultural products, rich biodiversity, and cultural heritage, which present significant opportunities for developing innovative and sustainable agri-food value chains. The discussions at the event emphasized the need for improved data availability, adoption of modern digital solutions, and better inter-sectoral cooperation to enhance regional competitiveness and sustainability.

To address these challenges and promote sustainability through innovation, several recommendations were made (Radovanovic et al, 2022). Financial instruments tailored to support both public and private investments in innovation were seen as crucial. Strengthening regional cooperation through structured networks and learning platforms were identified as tools to enhance knowledge sharing and collaborative efforts. Developing digital datasets to inform evidence-based policies and creating high-quality, sustainable jobs by integrating tradition with modern technology were also mentioned as important in that regard. Additionally, there is a need for capacity-building initiatives to bridge knowledge and skills gaps, particularly in research and development.
The discussants agreed that policies should focus on creating an innovation-friendly environment, promoting public- private partnerships, and aligning regional strategies with EU support mechanisms like IPA and Horizon 2020. Fostering a culture of continuous learning and adaptation,

[28] As of June 2024

along with targeted support for developing new business models and integrating modern technologies, was seen as an element that can significantly boost the sustainability and competitiveness of the agri-food sector in the Western Balkans.

The study on the agri-food sector in the Western Balkans completed in 2022 (Radovanovic et al, 2023a) supported the findings from the workshop and expanded on key challenges and opportunities for advancing the agri-food domain, particularly concerning sustainability. In addition to previously mentioned low productivity, the study mentioned that the region struggles with limited product diversification and that environmental issues such as climate change-induced droughts, floods, and high temperatures significantly impact agricultural yields. Furthermore, the study revealed that the sector faces infrastructure deficiencies, especially in irrigation and agricultural insurance, and lacks substantial foreign direct investment, which stifles growth and modernization efforts. The aging workforce and rural-urban migration exacerbate the human resource shortage, impacting the sector's capacity for innovation and technological development.

Despite these challenges, there are numerous opportunities to advance the agri-food domain in the Western Balkans, according to the same study. Increasing the capacities for innovation and technological development, such as mechanization and digitalization of the agri-food value chain, is seen as crucial for enhancing productivity and efficiency, while transitioning towards high-value products like functional foods and organic products can tap into both domestic and international markets. Emphasising sustainable practices, such as precision agriculture and environmental preservation, was mentioned as an important factor for enhancing the sector's resilience and global competitiveness. Strengthening regional cooperation through initiatives like the System of Green Corridors and liberalising trade relations can improve regional connectivity and economic integration. To support these advancements, it was recommended that national authorities focus on coherent policy measures, human resource development, digitalisation, and the integration of sustainability practices.

The thematic workshop on ICT in the Western Balkans, held in 2022, revealed several critical challenges and opportunities in the region's digital transformation. Key challenges included the low level of digital skills and significant brain drain, where skilled professionals migrate abroad. Additionally, inadequate digital infrastructure, such as insufficient broadband coverage and high-performance computing resources, hampers progress. Despite these hurdles, the workshop identified strengths in custom software development and data- driven ICT solutions. The importance of enhancing educational services, both formal and informal, to address the skills gap was emphasized. Participants also highlighted the need for better cooperation between academia, industry, and government to foster a more robust ICT ecosystem. Leveraging existing EU funding programs and fostering regional collaboration were seen as essential strategies to overcome outsourcing dependency and stimulate local product development.

To tackle these challenges and harness the ICT sector's potential, several recommendations emerged from the workshop. Improving educational services to enhance digital skills and mitigate brain drain is crucial. This involves updating curricula to include emerging ICT priorities, such as cybersecurity, and expanding training programs to reskill and upskill the workforce. Strengthening digital infrastructure, including broadband and high-performance computing capabilities, was seen as essential. Enhancing cooperation between academia, industry, and government would help create a more integrated and supportive ecosystem for ICT innovation. Additionally, increasing the visibility and accessibility of funding opportunities, especially from EU programs, can provide the necessary financial support for research and development. Finally, promoting regional cooperation and developing shared digital innovation hubs can facilitate knowledge exchange and create a critical

mass of expertise, driving the ICT sector's growth and sustainability in the Western Balkans (Radovanovic et al, 2023b).

The Smart Specialisation process in the Western Balkans has highlighted the necessity for enhanced knowledge sharing and collaboration among the economies facing similar administrative and legislative challenges, especially in the context of EU accession. Despite difficulties in communication and diverse economic and political contexts, the JRC's regional initiatives have facilitated the exchange of experiences and solutions. The conferences and workshops held across the region have underscored the importance of building regional partnerships, integrating Smart Specialisation strategies with foreign direct investment and structural reforms, and addressing the common challenges of inadequate business and academic environment changes, and the need for modern educational systems. Key recommendations include improving educational services to enhance digital skills and reduce brain drain, strengthening digital infrastructure, fostering cooperation between academia, industry, and government, increasing the visibility and accessibility of funding opportunities, and promoting regional cooperation through digital innovation hubs. These steps are crucial for advancing the Smart Specialisation process, fostering innovation, and driving sustainable economic growth in the Western Balkans.

4. Findings from the survey

A study was prepared with the aim to further explore the perceived effect of the Smart Specialisation exercise and its outcomes on major topics that surround transformation and sustainable development. The aim was to identify major impact areas, evaluate efficiency of the process and reveal the domains where further efforts in devising Smart Specialisation actions for sustainability of the Western Balkan region should be invested.

4.1. Methodology

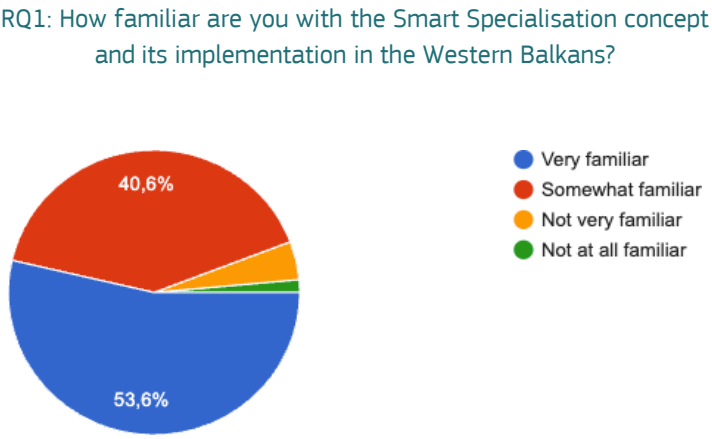
Based on previous findings and the aim of this study, the survey was prepared with the number of questions aiming to investigate the relationship between Smart Specialisation processes and sustainability challenges that the region is facing.

The survey was launched in May 2024 and shared with identified stakeholders from the Western Balkan economies. The questions for the survey are given in the Annex to this document. We aimed at receiving responses from all quadruple helix representatives from the region (governmental bodies, academic and research institutions, businesses and civil organisations). The collection of the responses was completed by the beginning of June 2024. In total, we received 75 valid responses covering all economies from the Western Balkan region.

4.2. Results of the survey

Somewhat surprisingly, although not all stakeholders that participated in the survey were part of any Smart Specialisation working groups in the region nor participated in the process itself, almost all respondents noted familiarity with the Smart Specialisation concept and its implementation in the Western Balkan region. Nearly half of them (53.6%) expressed full familiarity, while 40.6% said that they were somewhat familiar, increasing the share of total respondents that are well aware of the Smart Specialisation process to very high percentage of 93.6%. Only 4.3% responded that they are vaguely aware of the Smart Specialisation progress in the region, while just 1.4% indicated that they are not familiar with it at all.

Figure 9. Familiarity with the Smart Specialisation concept in the Western Balkans



Source: *Authors.*

When asked about the main achievements in implementing Smart Specialisation strategies and processes in the Western Balkans, the majority of respondents agreed on two key accomplishments: **increased investment in research and innovation,** confirmed by 71%, and enhanced competitiveness of local industries, marked by 60.9% of respondents. Additionally, two other notable achievements emerged from the implementation of the Smart Specialisation process: improved regional cooperation, noted by 50.7% of respondents, and strengthened partnerships with international stakeholders, highlighted by 37.7% of respondents. These achievements underscore the significant impact of Smart Specialisation in fostering economic growth and collaboration in the region.

Concerning the main challenges in implementing Smart Specialisation strategies and processes in the Western Balkans, a big majority of 69,6% noted limited funding and resources as a major hurdle, followed by lack of oordination among stakeholders (60.9% of respondents), skills shortages in key areas (49.3%) and insufficiently developed infrastructure (44.9%). Although often considered as a major factor on implementation of different policies in the Western Balkan region, political instability was marked only by 33.33% of the respondents. These results imply that limited funding and resources are the predominant challenges in implementing Smart Specialisation strategies in the Western Balkans, significantly impacting their effectiveness and success.

Table 10. Key achievements and challenges related to Smart Specialisation in the Western Balkans

RANK	MAIN ACHIEVEMENTS	MAIN CHALLENGES
1	Increased investment in research and innovation	Limited funding and resources
2	Enhanced competitiveness of local industries	Lack of coordination among stakeholders
3	Improved regional cooperation	Skills shortages in key areas
4	Strengthened partnerships with international stakeholders	Insufficiently developed infrastructure

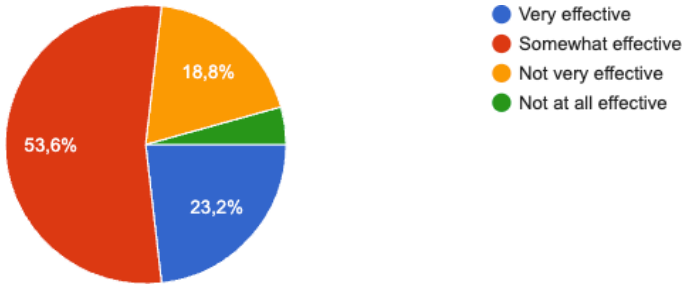
Source: *Authors.*

These results imply that limited funding and resources are the predominant challenges in implementing Smart Specialisation strategies in the Western Balkans, significantly impacting their effectiveness and success. Additionally, issues such as lack of coordination among stakeholders, skills shortages and underdeveloped infrastructure further complicate the implementation process.

The respondents answered very positively regarding the potential of addressing sustainability challenges through Smart Specialisation in their region. Almost a quarter (23.2%) of all respondents noted that Smart Specialisation was very effective in addressing these challenges, while just over half (53.6%) indicated that it was somewhat effective. The remaining 18.8% did not find Smart Specialisation effective for this purpose, with just 4.3% considering it inefficient in addressing sustainability challenges.

Figure 10. Addressing sustainability challenges by S3 in the region

RQ2: To what extent have the Smart Specialisation strategies/process been effective in addressing sustainability challenges in your region?



Source: *Authors.*

Having in mind the positive opinion on Smart Specialisation as a tool to help addressing challenges related to sustainable development, the respondents were asked about the specific recommendations for enhancing the effectiveness in that regard. Majority replied that encouraging collaboration between government, industry and academia, encouraging innovation in green technologies and improving access to funding for sustainable initiatives would represent the best initiatives. The top five recommendations are provided in the Table 11.

Table 11. Main recommendations to Smart Specialisation in the Western Balkans

RANK	MAIN RECOMMENDATIONS	NOTED BY % RESPONDENTS
1	Encourage collaboration between government, industry and academia	81.2%
2	Encourage innovation in green technologies	66.7%
3	Improve access to funding for sustainable initiatives	55.1%
4	Implement policies to promote eco-friendly practices	42.0%
5	Increase investment in renewable energy	39.1%

Source: *Authors.*

These recommendations highlight the critical areas for improvement to enhance the effectiveness of Smart Specialisation in sustainable development. Implementing these proposed initiatives could significantly boost collaboration, innovation and funding, thereby addressing sustainability challenges more effectively.

It is important to mention that more than half of respondents (52.2%) do not think that current policies' framework adequately support and facilitate Smart Specialisation initiatives for sustainability in the Western Balkans. This suggests that there is a perceived need for policy reform to better support Smart Specialisation initiatives for sustainability in the region. Without addressing this gap, the effectiveness of Smart Specialisation in fostering sustainable development may remain limited.

The aim of the survey was also to analyse how can the Smart Specialisation affect regional economic integration. The results showed that most of the respondents believe that connectivity and infrastructure within the region as well as regional collaboration and trade were enhanced by Smart Specialisation actions. These were followed by other actions, as given in the following table.

Table 12. Perceived effect of Smart Specialisation on economic integration in the Western Balkans

RANK	MAIN RECOMMENDATIONS	NOTED BY % RESPONDENTS
1	Improved connectivity and infrastructure within the region	43.5%
2	Facilitated collaboration and trade in the region	34.8%
3	Had no noticeable effect on regional economic integration	31.9%
4	Encouraged development of regional value chains and clusters	30.4%
5	Enhanced cross-border investments and business partnerships	21.7%

Source: *Authors.*

In terms of stakeholder collaboration efficiency within Smart Specialisation, it was generally assessed as high, as only 21.7% rated the level of collaboration between government, non-governmental organisations, academic institutions and private sector as poor. However, when discussing key barriers for effective collaboration among these stakeholders in Smart Specialisation initiatives, three were marked by at least half respondents. Limited resources and funding were marked by 56.5% respondents, followed by differences in priorities and objectives with 50.7% and lack of communication and coordination with 52.2% votes.

Concerning the alignment of educational programmes and skills needs with Smart Specialisation and sustainability goals, 55.3% respondents replied positively on the effectiveness of educational institutions in the Western Balkans in aligning their curricula with Smart Specialisation and sustainability needs, while the rest assessed it as negative. In regard to skills, only 5.7% assessed the potential of Smart Specialisation to improve skills needed to address challenges related to priority areas as low, hinting that there is still significant room for improvement in leveraging Smart Specialisation to enhance the skills needed to address priority area challenges.

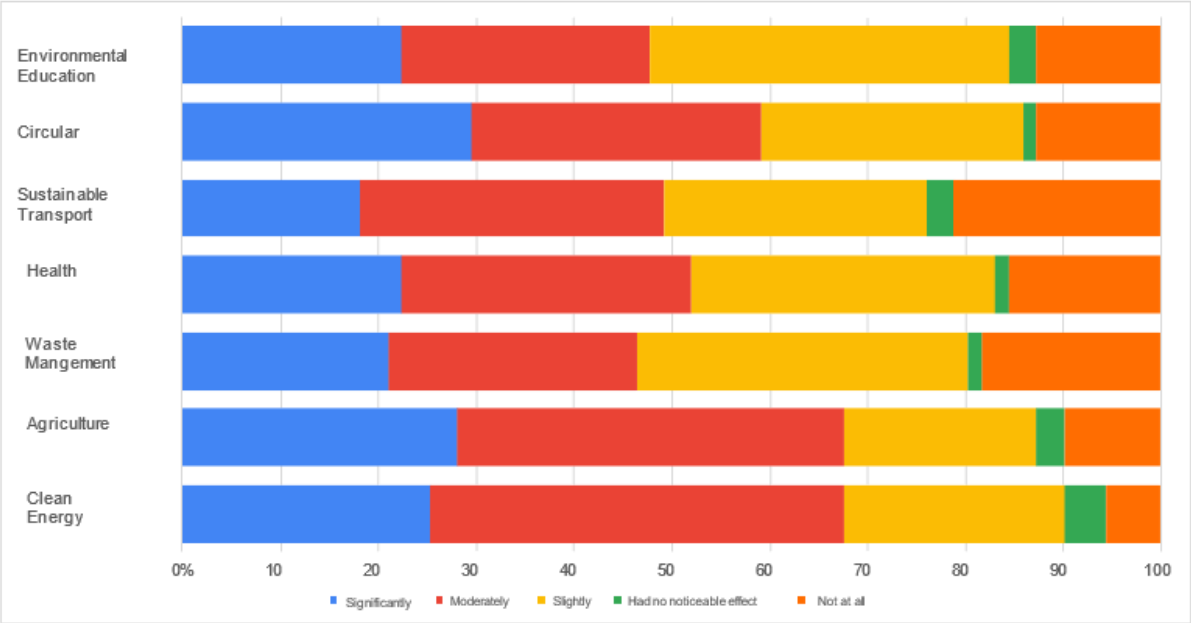
One of the key parts of the survey was intended to assess the effect of Smart Specialisation processes on major sustainability challenges. The respondents were asked to give their evaluation of the impact that the process has had on the areas strongly affecting sustainable development, such as sustainable transport, clean energy and others. The options provided included the scale from ‘not providing any impact’ to ‘providing significant impact’. After normalising the values, clean energy, sustainable agriculture and circular economy stood out as being marked as the areas in which the practices from the Smart Specialisation exercises contributed the most. These were followed by health and environmental education, which fared slightly worse. The lowest results were recorded for waste management and sustainable transport, for which respondents seemed to be more skeptical when it comes to impact of Smart Specialisation on these areas. In general, the opinions were more heterogeneous than expected and the results suggest the need for stronger focus on sustainability issues when devising actions based on Smart Specialisation in the Western Balkan economies.

These perceptions align with broader evidence: ICT collaboration is emerging as a horizontal driver of both digitalisation and green solutions (Fabbri et al., 2025), yet firm-level sustainability practices

remain uneven across sectors (Nukić & Selimić, 2025). In agriculture, the potential of AKIS to diffuse circular and climate-resilient practices is evident. Even in areas seen as weaker, such as waste and transport, complementary studies point to opportunities, from eco-certifications and recycling initiatives in industry to ICT-enabled logistics and mobility solutions. This suggests that survey perceptions reflect not only sectoral readiness but also underexploited innovation linkages that Smart Specialisation could strengthen. Detailed results are presented in the figure below.

Figure 11. Perceived impact of Smart Specialisation on major sustainability areas in the region

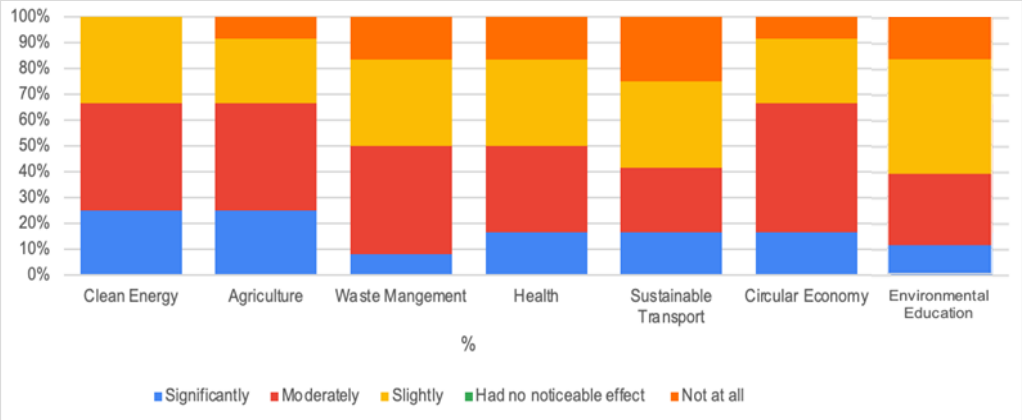
Q3: To what extent has the Smart Specialisation facilitated enhancements in the following areas?



Source: *Authors.*

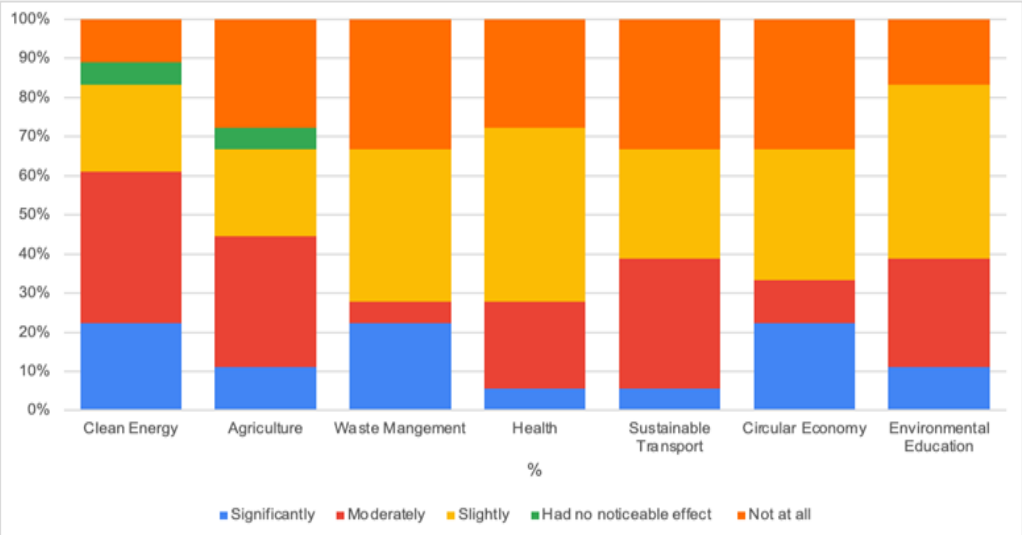
Analyzing the impact of Smart Specialisation across sustainability areas, academia and the business sector show generally positive perceptions. Both report moderate enhancements in Clean Energy and Health. Academia highlights significant improvements in Waste Management and Circular Economy, while the business sector notes moderate gains in these areas. Views on Agriculture, Sustainable Transport, and Environmental Education are mixed for both, with academia generally perceiving slightly more positive impacts.

Figure 12. Perceived impact of Smart Specialisation on major sustainability areas in the region (Business Sector)



Source: *Authors.*

Figure 13. Perceived impact of Smart Specialisation on major sustainability areas in the region (Academia)



Source: *Authors.*

Overall, both sectors recognize the value of Smart Specialisation, with academia noting stronger impacts in specific areas and the business sector indicating steady, moderate improvements. The business sector shows consistent moderate enhancements, reflecting the positive influence of Smart Specialisation initiatives. Specifically, moderate improvements are most commonly reported in Clean Energy, Agriculture, Waste Management, and Health, with varied but positive impacts in Sustainable Transport, Circular Economy, and Environmental Education.

After applying the scoring to the options above, where the option 'had no noticeable effect' was equal to 1 point and the option 'significantly' received 5 points, we normalised the score in order to present the perceived effect of Smart Specialisation on enhancement of targeted sustainability areas. The graph below aims to show the observed importance of Smart Specialisation (marked with blue background) on these areas so far in the Western Balkans.

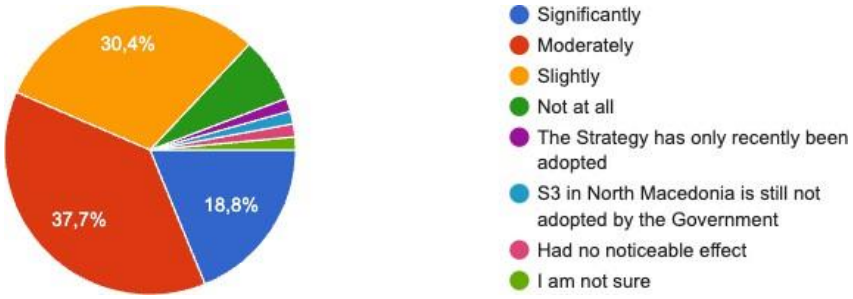
Figure 14. Radar map on effect of Smart Specialisation on major sustainability areas in the region

Note: Closer the edges of the blue background to a certain area, stronger the effect on that area
Source: *Authors.*

Concerning the impact on the environment, from the previous graph it can be concluded that the majority of respondents did not seem to be convinced of the positive impact of Smart Specialisation on environmental education. However, when asked if the Smart Specialisation process facilitated the shift to environmentally sustainable sources, most of the respondents agreed that it had either a moderate or significant effect on such a shift. The results were even more positive when the question involved the impact of S3 on the green transition in the region, with a total of 56.5% assessing it as moderate or significant, indicating a strong perceived benefit in promoting eco-friendly development through evidence-based innovation policy such as S3.

Figure 15. Impact of S3 on green transition

RQ4: To what extent have the Smart Specialisation processes supported green transition?

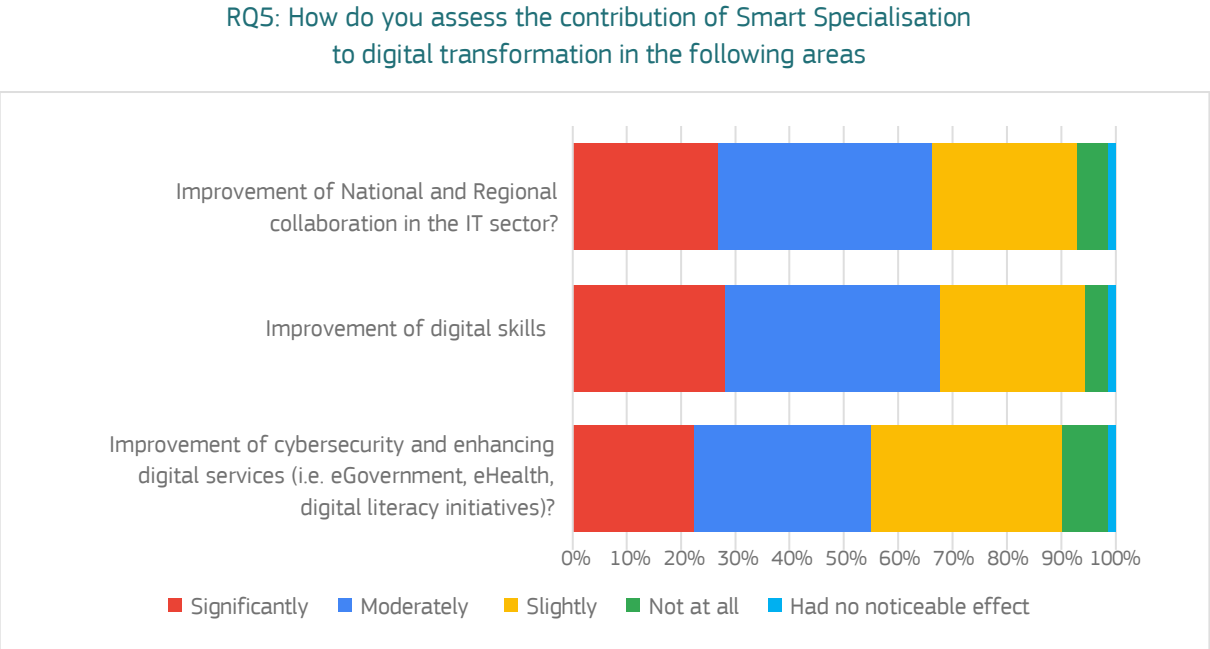


Source: *Authors.*

Finally, the respondents were asked to assess the impact of the Smart Specialisation experiences in the region on the area of digital transformation of the economies. The contribution of the application of the Smart Specialisation approach was recognised by most stakeholders. More than half of them assessed it as positive for all three areas that were questioned. Improvement of digital skills was evaluated as moderately or significantly affected by S3 by 70% respondents, followed by improvement of national and regional collaboration in the IT sector by almost 70%. The effect of S3

on improvement of cybersecurity and digital services was perceived with somewhat less certainty by the respondents, but still received positive opinion with over 57% respondents assessing it as moderate or significant. These results suggest that the potential of Smart Specialisation on boosting digital transformation can and should be exploited by the Western Balkan economies.

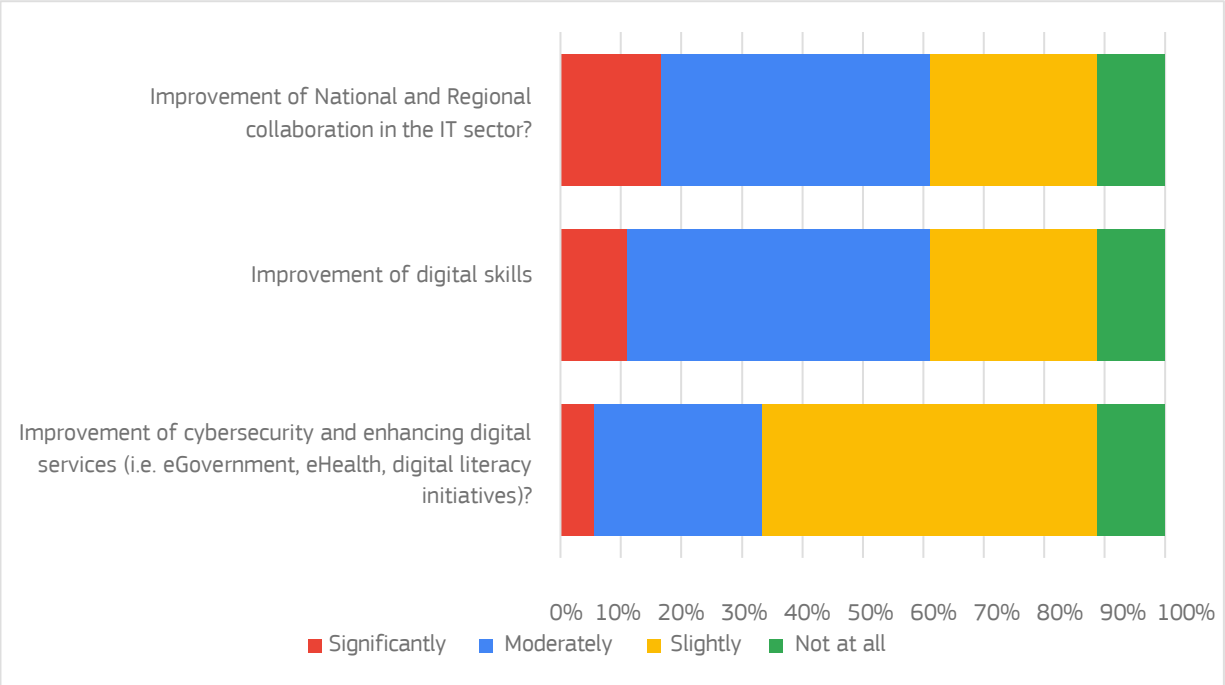
Figure 16. Perceived contribution of Smart Specialisation to digital transformation



Source: *Authors.*

The Smart Specialisation strategy's impact on digital transformation shows clear differences between academia and the business sector. Academia views the strategy positively, citing 'Significant' improvements in digital skills and 'Moderate' advancements in regional IT collaboration, reflecting enhanced educational initiatives and research partnerships. However, they see only 'Slight' improvements in cybersecurity and digital services, indicating room for growth in these critical areas.

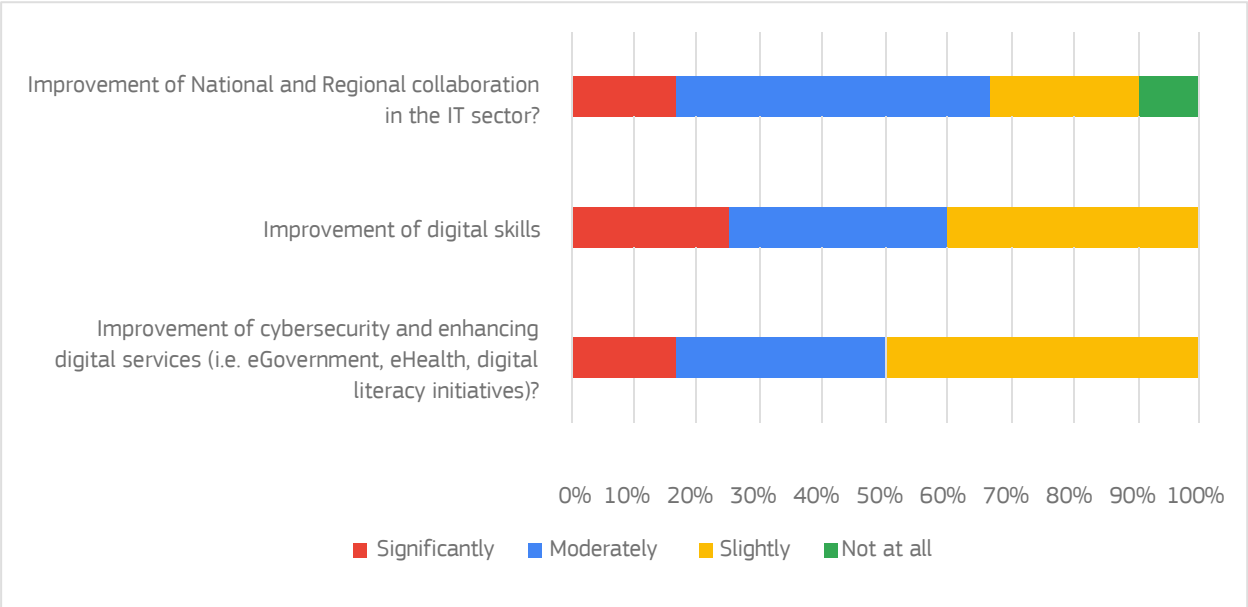
Figure 17. Perceived contribution of Smart Specialisation to digital transformation (Academia)



Source: *Authors.*

In contrast, the business sector offers a more critical perspective. Many businesses rate improvements in cybersecurity and digital services as 'Slightly' or 'Not at all', highlighting concerns over the adequacy of these enhancements. Similarly, improvements in digital skills and regional collaboration are often seen as minimal, pointing to a disconnect between the skills developed and those needed by businesses.

Figure 18. Perceived contribution of Smart Specialisation to digital transformation (Business Sector)



Source: *Authors.*

These differences highlight the varied priorities and challenges faced by each sector. Academia values developmental strides and collaborative efforts, while businesses focus on the practical and immediate applications of digital transformation. This underscores the need for a balanced approach in implementing Smart Specialisation strategies, addressing both long-term academic goals and immediate business needs to foster a more comprehensive digital transformation.

The respondents mostly agree that the Smart Specialisation has notably contributed to digital transformation in various regions, enhancing innovation, public services, and business competitiveness through the adoption of digital technologies. Key successes include improvements in e-governance, digital healthcare, and support for SMEs, particularly in economies like Albania. However, challenges such as digital infrastructure gaps, skills shortages, and regulatory barriers remain, limiting the full realisation of potential. While the Western Balkan region does show moderate success, some economies, such as Bosnia and Herzegovina, still struggle due to lack of clear strategy and institutional support. Based on responses, continued efforts in resource allocation, skills development, and regulatory enhancements would be crucial for further progress in digital transformation.

The findings from the survey suggest that while the Smart Specialisation process is widely recognized and has positively impacted several key areas, there is a significant room for improvement to fully exploit its potential in relation to tackling sustainability issues and boosting growth. The substantial awareness and familiarity with Smart Specialisation among stakeholders indicate a strong foundation and a potential broad base of support for the initiatives and actions in this area. However, some of the identified challenges, such as limited funding and resources, lack of coordination among stakeholders and skills shortages, underscore the need for strategic interventions to enhance the effectiveness of such initiatives and actions.

Despite these challenges, the survey highlighted significantly high perceptions on some relevant S3 achievements, such as increased investment in research and innovation and enhanced competitiveness of local industries. These perceptions demonstrate that when properly supported, Smart Specialisation can drive substantial economic benefits and sustainable development. However, the perceived relatively lower impact of S3 on areas like waste management and sustainable transport indicates that further targeted interventions are necessary to ensure a more comprehensive approach to sustainability.

Based on the responses from the survey, it can also be concluded that stronger focus on addressing the gaps in policy support and infrastructure is required. More than half of the respondents believe that the current policy framework does not adequately support Smart Specialisation initiatives, highlighting the need for policy reform. Enhancing collaboration between government, industry, and academia, fostering innovation in green technologies, and improving access to funding for sustainable initiatives are all critical steps for consideration when going forward. Additionally, the alignment of educational programs with Smart Specialisation goals needs to be further strengthened to develop the necessary skills to address sustainability challenges related to S3 priority areas.

Furthermore, the positive impact of Smart Specialisation on digital transformation suggests that these initiatives can significantly contribute to the region's modernization efforts. By focusing on these areas and addressing the challenges, the Western Balkan region can better leverage Smart Specialisation to achieve comprehensive and sustainable economic growth, fostering a more resilient and innovative economy.

4.3. Suggestions for enhancement of the Smart Specialisation framework

The survey results indicate the need for several strategic enhancements to the Smart Specialisation framework to better address sustainability challenges in the Western Balkan region. First and foremost, the findings suggest a requirement for inter-policy reform and improved coordination among stakeholders. With over half of the respondents feeling that the current policy framework should be enhanced, it would be important to consider introducing the step that requires thorough consideration of all regional and national policies that are related to economic transformation, tackling societal challenges and pursuing sustainable development. Establishing a central coordinating body, working group or task force dedicated to continuously aligning the priorities and activities of various stakeholders, ensuring their efforts are synergistic and mutually reinforcing, seems to be highly beneficial.

Addressing the predominant challenge of limited funding is essential to S3 activities in the entire region. A significant majority of respondents highlighted financial constraints as a major hurdle, underscoring the need for securing more robust financial support. This could involve advocating for increased EU funding, seeking additional national and regional resources, and encouraging private sector investment. Mentioned consideration of comprehensive policy framework would help in identifying existing or planned funds that could be mobilised for S3 related actions for sustainability. Efficient resource management practices and optimising the use of existing resources can further help to maximize the impact of sustainability initiatives despite financial limitations.

Enhancing institutional capacity and aligning educational programs with Smart Specialisation goals remain to be critical steps. Providing comprehensive S3 training programs for national authorities, local governments, and other stakeholders that would include important elements of sustainability would ensure they are well-equipped to implement and manage Smart Specialisation strategies effectively. Furthermore, aligning national educational curricula in the region with the needs of Smart Specialisation and sustainability goals is vital. This is needed to ensure that the workforce possesses the necessary skills to address priority challenges, addressing the concern that only a small fraction of respondents felt the potential for skill improvement was low.

The survey results also highlight specific areas requiring focused interventions, particularly waste management and sustainable transport. These areas showed lower perceived impacts, indicating a need for targeted efforts to develop innovative solutions and promote sustainable practices. It is important that these and other transformational challenges are put into focus before launching stakeholder dialogue under the Entrepreneurial Discovery Process, so that they can be thoroughly discussed within related priority areas. In that regard, sharing best practices and successful case studies from regions that have effectively addressed these challenges can provide valuable insights and guidance.

Fostering innovation in green technologies is emerging as another key priority in the entire European continent. When a Smart Specialisation team is considering policy actions together with the key stakeholders from the designated priority areas, this topic requires strong attention in relation to possible missions and institutions that will become part of an innovation system. In that regard, establishing innovation hubs focused on green technologies could help in driving advancements and facilitating collaboration between research institutions, industry and government in boosting potential for sustainable growth. Providing research and tax incentives and subsidies for businesses and researchers in this field can further stimulate innovation and the adoption of sustainable practices.

Developing comprehensive monitoring and evaluation mechanisms remains essential for tracking progress and impact of Smart Specialisation actions, especially for addressing transformational and sustainability challenges. This includes setting clear indicators, regular reporting, and conducting independent evaluations to ensure transparency and accountability. Implementing a dynamic, cyclical approach to strategy development and execution with transparent and participatory reviews allows for necessary adjustments based on feedback and evolving needs, ensuring that the Smart Specialisation process remains responsive to new challenges and opportunities.

By addressing these strategic areas, both Smart Specialisation design and implementation frameworks can be more effectively aligned with sustainability goals, significantly enhancing the impact of Smart Specialisation on the region's sustainable development and economic growth. This approach not only supports the existing strengths of the framework but also ensures that it evolves to meet the specific needs and challenges of the Western Balkan region.

5. Conclusions and recommendations

The Western Balkan region is coping with a range of sustainability challenges that impact its environmental, economic, and socio-political landscapes. The region faces significant environmental degradation, with pollution affecting soil, water, and air. These problems are worsened by outdated industrial practices and limited access to cleaner technologies, leading to high levels of air pollution, primarily from aging coal plants and a heavy dependence on private vehicles. On the other hand, the region is tackling socio-economic challenges, such as high unemployment rates, low foreign direct investment, aging population, brain drain and significant infrastructure gaps. Inflation and energy supply disruptions add to the economic fragmentation, making the transition to a low-carbon economy particularly slow. An additional institutional challenge is the limited alignment with European sustainability reporting standards, which constrains access to EU value chains and finance. When it comes to policies, there are still evident governance issues such as fragmented ministerial silos, lack of stakeholder trust and non-inclusive decision- making processes. These issues are further complicated by political sensitivities, hindering the implementation of effective cross-border and regional policies.

Despite many hurdles, the Western Balkans have made significant push towards sustainable development. One notable achievement is the adoption of the Smart Specialisation approach for innovation policy development, leading to the establishment of dedicated teams to manage and monitor progress in Smart Specialisation strategies design and implementation. Up to today, the economies like Montenegro, Serbia, North Macedonia and Albania have either adopted or are actively implementing Smart Specialisation strategies, while Kosovo* and Bosnia and Herzegovina are nearing the end of the process. The successful implementation of Smart Specialisation strategies in the former three economies offers valuable lessons that can be replicated across the Western Balkans. For instance, Montenegro's focus on sustainable agriculture, energy, ICT, and sustainable tourism demonstrates a holistic approach to integrating economic growth with environmental sustainability. ICT cooperation, identified as a regional enabler of both digitalisation and green transition, and agricultural knowledge and innovation systems for climate-resilient agri-food, further broaden the range of Smart Specialisation actions beyond the green transition alone. Serbia's efforts in enhancing research and innovation infrastructure provide a model for other countries to follow. These examples highlight the importance of targeted investments and stakeholder engagement in achieving sustainable development goals. Through their dedicated teams for Smart Specialisation, the Western Balkan economies (except for Bosnia and Herzegovina, where this S3 phase is not yet done) have successfully organised resources and engaged stakeholders through the quadruple helix model, which includes academia, industry, government, and civil society. However, all these economies face significant challenges, including limited resources, the need for continuous technical support, and the impact of external factors such as the COVID-19 pandemic. The design and implementation frameworks for Smart Specialisation provided by the JRC have been pivotal, guiding these economies through phases such as institutional capacity building, mapping exercises, stakeholder dialogue, and the finalization of strategic frameworks. This structured approach has ensured that the strategies are comprehensive and tailored to the specific needs of each country. The Smart Specialisation efforts by the Western Balkan economies are supported by enhanced regional cooperation and integration efforts with the European Union, and by technical expertise provided by the Joint Research Centre of the European Commission.

The Western Balkan region can significantly benefit from leveraging existing EU programmes and directionalities to enhance policy actions for sustainable development. Participation in initiatives like

Horizon Europe[29], Digital Europe[30] or Life+[31] provides the necessary funding, technical support, and policy guidance to implement effective sustainability measures. These programmes offer frameworks and resources that align regional policies with EU standards, fostering a more integrated approach to sustainable development. The New European Innovation Agenda and the Growth Plan for the Western Balkans also provide directionalities, notably through Regional Innovation Valleys (RIVs) and flagship reforms, which can help Western Balkan economies integrate more fully into EU industrial value chains. Moreover, these efforts support the region's transition to a low-carbon economy by promoting renewable energy, energy efficiency, and green technologies. The economies have already made substantial progress through these EU programmes, contributing to research and innovation and demonstrating a commitment to the United Nations Sustainable Development Goals (SDGs) with projects focused on clean water and sanitation, affordable and clean energy, climate action, and life on land. Additionally, the new Growth Plan for the Western Balkans and the Economic and Investment Plan for the Western Balkans aim to support long-term recovery and foster regional cooperation, emphasizing green and digital transitions with significant investments in infrastructure, digital transformation, and environmental protection.

Looking ahead, the region has several opportunities to capitalise on. Advancing green and digital transitions can enhance renewable energy technologies and improve energy efficiency, which are both very important topic for the region. Strengthening governance and fostering inclusive decision-making processes can improve regional cooperation and policy alignment with EU standards, as part of the EU accession agenda. Economic diversification, particularly by promoting sustainable agricultural practices, supporting small and medium enterprises (SMEs), and encouraging innovation in green technologies, is seen as crucial. Furthermore, capacity building initiatives and enhancement of the education system present significant opportunities for the region. Developing green skills and educational programs tailored to the needs of emerging sectors can prepare the workforce for a green economy, and this present a very important area for future policy actions that should shape the region. At firm level, comparative research shows uneven uptake of sustainability practices across industries, highlighting the need for support instruments, advisory services and better reporting standards to ensure widespread adoption. Enhancing research capabilities and supporting startups in the domains that facilitate twin transition should be prioritised when exploiting innovation potential. Concerning green transition, addressing pollution and environmental degradation through sustainable practices across various sectors will also be vital. Regarding digital transformation, efforts should be made to tackle digital infrastructure gaps, skills shortages and regulatory barriers. An important boost for actions in this area could come from stronger strategic commitment and increased institutional support, enhanced regulatory frameworks and resource allocation, and skills development.

As advancing green and digital transitions remains a significant task for the region, Smart Specialisation strategies present numerous opportunities for the Western Balkan economies in that regard. For instance, Montenegro's strategy includes priority areas such as sustainable agriculture, energy, ICT, and sustainable tourism, and the economy is already implementing policy measures in these domains. These areas are not only economically beneficial but also contribute to environmental sustainability and societal well-being. Also, the Entrepreneurial Discovery Process (EDP), a critical component of the Smart Specialisation process, has been instrumental in fostering

29 https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en

30 https://digital-strategy.ec.europa.eu/en/policies/green-digital

31 https://cinea.ec.europa.eu/programmes/life_en

stakeholder engagement and ensuring that the strategies are grounded in real-world needs and potentials. This inclusive approach has facilitated the identification of priority areas and the development of policy actions that are well-aligned with regional strengths and opportunities. Recommendations for enhancing Smart Specialisation process in the domain of sustainability challenges include enhancing cross-border cooperation, strengthening governance and institutional capacity, focusing on education and skills development, promoting sustainable practices, and utilising digital transformation. Specific measures could include setting up regional ICT cooperation platforms to pool digital and green innovation resources and upgrading knowledge and innovation structures to improve knowledge transfer in priority areas, such as agri-food systems. These recommendations build on the regional cooperation highlighted in this study, emphasising the need for robust governance structures, improved stakeholder engagement, and effective resource management.

The findings from the survey on Smart Specialisation processes in the Western Balkan region provide a clear roadmap for enhancing their effectiveness and highlight substantial achievements and notable challenges, particularly concerning sustainability. The survey, which gathered insights from a diverse array of stakeholders, reveals a high level of familiarity with the Smart Specialisation concept and a recognition of its role in fostering regional economic development. However, it also underscores significant areas for improvement to fully harness its potential in addressing sustainability challenges. The survey results indicate that Smart Specialisation has already made meaningful push in addressing sustainability challenges. Key areas where S3 has contributed positively include increased investment in green technologies and the promotion of eco-friendly practices, as perceived by the stakeholders from the region. Respondents also highlighted improvements in clean energy, sustainable agriculture, and the circular economy as notable achievements. These areas are crucial for sustainable development, and the positive impact of Smart Specialisation in these domains underscores its potential as a driver of eco-friendly innovation and practices.

Despite these achievements, the survey also points to areas where the impact of Smart Specialisation on sustainability has been less pronounced. Waste management and sustainable transport were identified as areas with lower perceived impacts. This suggests a need for more targeted interventions and innovative solutions in these fields. The survey respondents also highlighted limited funding and resources, lack of coordination among stakeholders, and skills shortages as major challenges that hinder the full potential of Smart Specialisation in addressing sustainability issues.

However, the perceived potential of Smart Specialisation to efficiently address sustainability challenges remains strong. The survey respondents provided several key recommendations to enhance the effectiveness of Smart Specialisation in this regard. Firstly, encouraging continuous collaboration between government, industry and academia is seen as essential for efficiency. Such collaboration can leverage the strengths of each sector, fostering innovation and the development of sustainable practices. This aligns with the principle of the quadruple helix model, which is central to the Smart Specialisation approach. This can be bolstered by creating formal networks and platforms for stakeholder engagement. Furthermore, respondents emphasised the importance of encouraging innovation in green technologies. Establishing innovation hubs focused on green technologies and providing incentives such as grants, tax breaks and subsidies can stimulate advancements and facilitate the adoption of sustainable practices, and drive advancements in clean energy, sustainable agriculture and the circular economy. These measures can help bridge the gap between research and practical application, boosting sustainable development across various sectors. Improving access to funding for sustainable initiatives is another critical step. Securing

more robust financial support, whether through increased EU funding, national and regional resources, or private sector investment, is vital for overcoming the predominant challenge of limited funding that is visible across the entire Western Balkan region. Efficient resource management practices can further maximise the impact of available funds, ensuring that sustainability initiatives receive the necessary support.

The survey also highlights the need for comprehensive policy reforms to better support Smart Specialisation initiatives for addressing sustainability challenges. More than half of the respondents felt that the current policy framework does not adequately facilitate the initiatives related to sustainability. Addressing this gap involves creating a more supportive and integrated policy environment that aligns with sustainability goals. Establishing a central coordinating body or task force to ensure alignment and synergy among various stakeholders' efforts across ministries that are in charge of relevant policies (i.e. environmental, innovation, industrial, digital, educational, employment, etc.) can enhance the effectiveness of policy implementation.

Enhancing institutional capacity and aligning educational programs with Smart Specialisation goals is seen as vital for building the necessary skills to address sustainability challenges. Providing comprehensive training for national authorities, local governments and other stakeholders ensures they are well-equipped to implement and manage Smart Specialisation strategies effectively. Aligning educational curricula with the needs of Smart Specialisation and sustainability goals can prepare the workforce for emerging sectors and technologies, fostering a culture of innovation and sustainability. The survey results also underscore the importance of developing comprehensive monitoring and evaluation mechanisms, which are essential for the Smart Specialisation exercise and are used for assessing the advancement in sustainable development (e.g. in relation to SDGs). These mechanisms are essential for tracking progress and ensuring transparency and accountability. Therefore, setting clear indicators, regular reporting and conducting independent evaluations are important for providing valuable feedback, allowing for necessary adjustments and continuous improvement.

To further enhance the impact of Smart Specialisation on sustainability, additional measures can be introduced. For example, establishing innovation hubs that focus specifically on green technologies can drive advancements in clean energy, sustainable agriculture and the circular economy. Providing incentives such as grants, tax breaks, and subsidies for businesses and researchers working on sustainable projects can stimulate innovation and practical application of research findings. Moreover, integrating Smart Specialisation priority areas with broader sustainability goals can create synergies that amplify the impact of both initiatives.

While the Smart Specialisation process in the Western Balkan region has made significant progress in addressing sustainability challenges, there is substantial potential to enhance its effectiveness. By focusing on collaboration, innovation in green technologies, improved funding access, policy reforms, institutional capacity building and comprehensive monitoring, Smart Specialisation can continue to drive sustainable development and economic growth in the region. Equally, aligning national S3 frameworks with European sustainability reporting standards will strengthen investor confidence and market integration, while embedding them within the NEIA's Regional Innovation Valleys will ensure stronger European connectivity. These strategic enhancements would ensure that the Smart Specialisation actions and tasks evolve to meet the specific needs and challenges of the Western Balkan region, fostering a more resilient and innovative economy.

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List of abbreviations and definitions

Abbreviations	Definitions
BPO	Business Process Outsourcing
BIM	Building Information Modelling
EDP	Entrepreneurial Discovery Process
EU	European Union
E&N	Enlargement and Neighbourhood
FDI	Foreign direct investment
ICT	Information and communication technology
IoT	Internet of Things
R&I	Research and innovation
R&D&I	Research, development and innovation
S3	Smart Specialisation
SDGs	Sustainable Development Goals
SME	Small and medium enterprise
STI	Science, technology and innovation

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Annex

The questionnaire from the survey

1. Country/Economy:
   - _____

2. Which type of entity you represent?
   - Public authority
   - Business sector
   - Academia
   - Civil organisation
   - Other: _____

3. What size is your business/ organization (by number of employees)?
   - Micro (1-9 employees)
   - Small (10-49 employees)
   - Medium (50-249 employees)
   - Large (250 and more employees)

4. How familiar are you with the Smart Specialisation concept and its implementation in the Western Balkans?
   - Very familiar
   - Somewhat familiar
   - Not very familiar
   - Not at all familiar

5. What are the main achievements in implementing Smart Specialisation strategies in the Western Balkans?
   - Improved regional cooperation
   - Increased investment in research and innovation
   - Enhanced competitiveness of local industries

- Strengthened partnerships with international stakeholders
- None of the above (please explain in the option "Other")
- Other: _____

6. What are the main challenges in implementing Smart Specialisation strategies in the Western Balkans?
   - Limited funding and resources
   - Lack of coordination among stakeholders
   - Insufficient infrastructure
   - Skills shortages in key areas
   - Political instability
   - None of the above (please explain in the option "Other")
   - Other: _____

7. To what extent have Smart Specialisation strategies been effective in addressing sustainability challenges in your region?
   - Very effective
   - Somewhat effective
   - Not very effective
   - Not at all effective

8. What specific recommendations would you offer to enhance the effectiveness of Smart Specialisation strategies in addressing sustainability challenges?
   - Increase investment in renewable energy projects
   - Enhance collaboration between government, industry, and academia
   - Implement policies to promote eco-friendly practices
   - Encourage innovation in green technologies
   - Improve access to funding for sustainable initiatives
   - None of the above (please explain in the option "Other")
   - Other: _____

9. Do you believe current policies adequately support and facilitate Smart Specialisation initiatives for sustainability in the Western Balkans?

- Yes, policies adequately support Smart Specialisation initiatives
- No, policies do not adequately support Smart Specialisation initiatives
- Other: _____

10. How has Smart Specialisation affected regional economic integration within the Western Balkans?

- Facilitated collaboration and trade among Western Balkan countries
- Improved connectivity and infrastructure within the region
- Enhanced cross-border investment and business partnerships
- Encouraged the development of regional value chains and clusters
- Had no noticeable effect on regional economic integration
- None of the above (please explain in the option "Other")
- Other: _____

11. How would you rate the level of collaboration among various stakeholders (government, NGOs, academia, private sector) in Smart Specialisation initiatives?

- Excellent
- Good
- Fair
- Poor
- Other: _____

12. What are the key barriers to effective collaboration among stakeholders in Smart Specialisation initiatives?

- Lack of communication and coordination
- Differences in priorities and objectives
- Limited resources and funding
- Regulatory and bureaucratic obstacles
- Lack of trust among stakeholders

- None of the above (please explain in the option 'Other')
- Other: _____

13. What role do SMEs and local communities play in the success of Smart Specialisation initiatives?

- They are key drivers of innovation and economic growth
- They provide valuable insights and expertise in local contexts
- They contribute to the development of regional value chains
- They foster entrepreneurship and job creation
- They enhance the sustainability and inclusivity of initiatives
- None of the above (please explain in the option "Other")
- Other: _____

14. How effective are educational institutions in the Western Balkans at aligning their curricula with Smart Specialisation and sustainability needs?

- Very effective
- Somewhat effective
- Not very effective
- Not at all effective
- Other: _____

15. How do you assess the potential of Smart Specialisation to improve skills needed to address challenges related to priority areas?

- Very high potential
- Moderate potential
- Low potential
- No potential
- Other: _____
-

16. To what extent have Smart Specialisation strategies facilitated advancements in clean energy?

- Significantly

- Moderately
- Slightly
- Not at all
- Other: _____

17. To what extent have Smart Specialisation strategies facilitated advancements in agriculture?

- Significantly
- Moderately
- Slightly
- Not at all
- Other: _____

18. To what extent have Smart Specialisation strategies facilitated advancements in waste management?

- Significantly
- Moderately
- Slightly
- Not at all
- Other: _____

19. To what extent have Smart Specialisation strategies facilitated advancements in health?

- Significantly
- Moderately
- Slightly
- Not at all
- Other: _____

20. To what extent have Smart Specialisation strategies facilitated advancements in sustainable transport?

- Significantly

- Moderately
- Slightly
- Not at all
- Other: _____

21. To what extent have Smart Specialisation strategies facilitated the shift to environmentally sustainable sources?

- Significantly
- Moderately
- Slightly
- Not at all
- Other: _____

22. To what extent have Smart Specialisation processes facilitated advancements in circular economy?

- Significantly
- Moderately
- Slightly
- Not at all
- Other: _____

23. To what extent have Smart Specialisation processes facilitated enhancements in environmental education?

- Significantly
- Moderately
- Slightly
- Not at all
- Other: _____

24. To what extent have Smart Specialisation processes facilitated supporting green transition?

- Significantly

- Moderately
- Slightly
- Not at all
- Other: _____

25. How do you assess the contribution of Smart Specialisation to digital transformation in your region, particularly in public services and businesses, in improving cybersecurity and enhancing digital services (i.e. eGovernment, eHealth, digital literacy initiatives)?

- Significantly
- Moderately
- Slightly
- Not at all
- Other: _____

26. How do you assess the contribution of Smart Specialisation to digital transformation in your region, particularly in public services and businesses, in improving digital skills?

- Significantly
- Moderately
- Slightly
- Not at all
- Other: _____

27. How do you assess the contribution of Smart Specialisation to digital transformation in your region, particularly in public services and businesses, in improving national and regional collaboration in the IT sector?

- Significantly
- Moderately
- Slightly
- Not at all
- Other: _____

28. How do you assess the contribution of Smart Specialisation to digital transformation in your region, particularly in public services and businesses, in other areas (please specify)?

- _____

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