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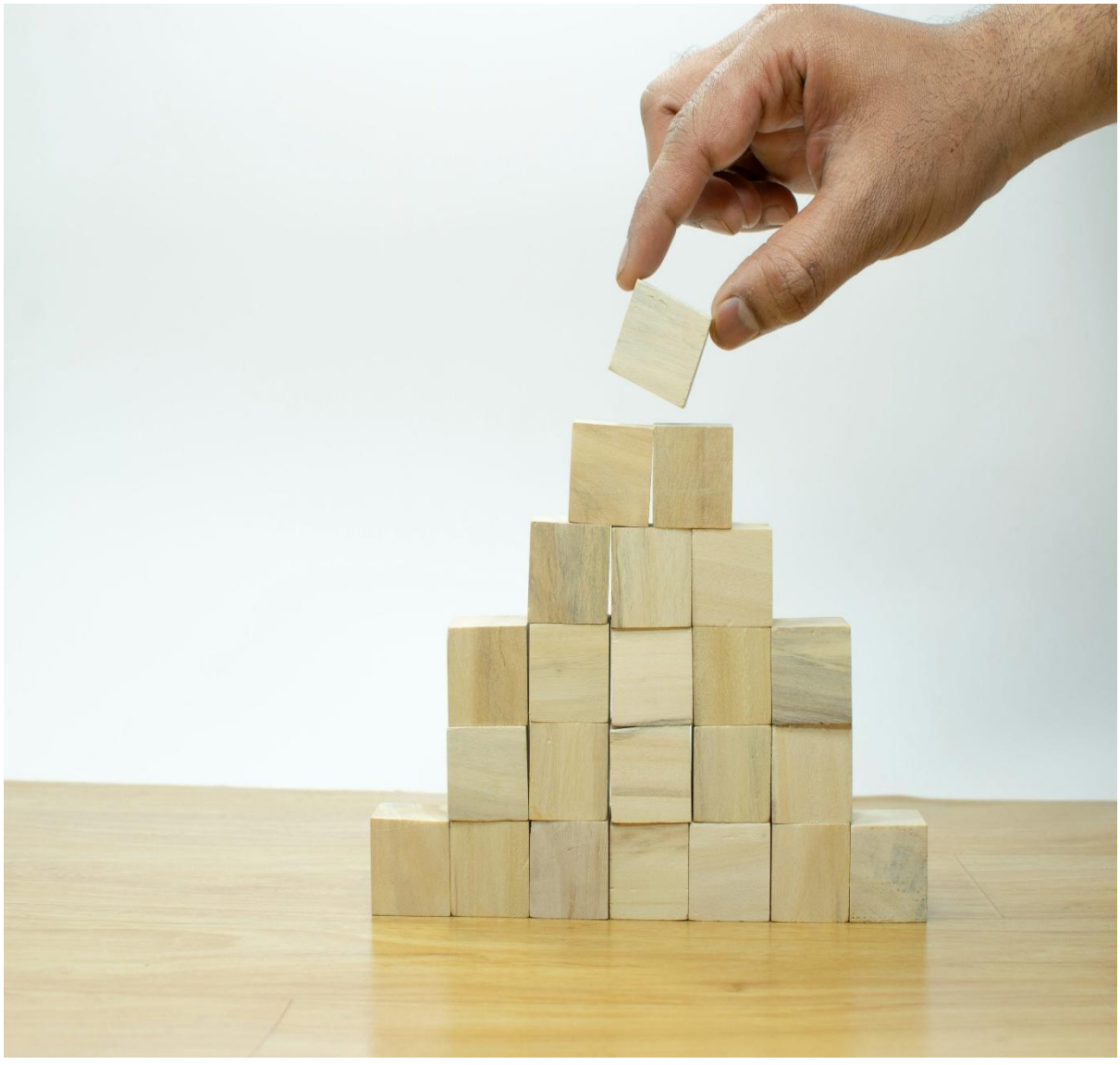
# Action Plan for the Research and Innovation (R&I) Strategy for the Development of the Entrepreneurial Ecosystem in Bosnia and Herzegovina



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Based on Article 55 of the Statute of the University of Banja Luka and Article 20 of the Statute of the Faculty of Economics, the Scientific and Teaching Council of the Faculty of Economics, University of Banja Luka, at its 8th session held on 19 May 2025, adopted Decision No. 13/3.576-VIII-8/25 on the appointment of members of the working group for the preparation of the document "Draft Strategy for Research and Innovation of the Faculty of Economics and Action Plan for the Implementation of the Research and Innovation Strategy". Within WP2 – *Capacity Building for Research and Innovation (R&I) in Enlargement Countries,* T2.3 – *Setting Research and Innovation (R&I) Directions in Enlargement Countries,* A2.3.1 – *Formulation of the Research and Innovation Strategy (draft version), D.2.4* – Action Plans for the Research and Innovation Strategy, the draft document "Action Plan for the Research and Innovation (R&I) Strategy for the Development of the Entrepreneurial Ecosystem in Bosnia and Herzegovina" was prepared by the working group in the following composition:

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## Content

## Executive Summary

## 1. Key Pillars of the Research and Innovation Strategy

The Research and Innovation Strategy of Republika Srpska and Bosnia and Herzegovina should be founded upon three interrelated pillars: *excellence in research, technology transfer and exploitation, and innovative entrepreneurship*. These pillars are essential for strengthening the national innovation ecosystem and integrating Bosnia and Herzegovina into the European Research Area (ERA).

### *1.1. Excellence in Research*

The objective is to improve the quality of scientific research, develop human capital and increase participation in international programmes (Horizon Europe, COST, EUREKA). Current allocations for research and development in Bosnia and Herzegovina amount to less than **0.3% of GDP**, among the lowest in Europe, with a fragmented legislative framework and a low number of highly cited publications and patents.

**Priorities:**

- *Increase public and private investment in R&D* through competitive funds and grants.
- *Establish national and university centres of excellence* equipped with modern infrastructure and laboratories co-financed through EU funds.
- *Promote the development of young researchers* through scholarships, grants and postdoctoral training.
- *Implement a system based on merit-based funding* for scientific projects and reform doctoral studies to enhance quality and relevance.
- *Reduce brain drain* by creating attractive working conditions and fostering collaboration with the diaspora.

### *1.2. Technology Transfer and Exploitation*

Collaboration between science and industry in Bosnia and Herzegovina remains limited, while corporate R&D investments and venture capital are virtually non-existent. Research outputs are rarely commercialised, and the number of patents (47 applications in 2024, of which 34 were domestic) remains exceptionally low. Priorities:

- *Establish a comprehensive technology transfer system* by developing technology transfer offices (TTOs), incubators, accelerators and science and technology parks.
- *Encourage patents and licensing* through more favourable intellectual property regulations and the implementation of early-stage commercialisation funding programmes (e.g. Proof of Concept).
- *Establish innovation funds* modelled after those in Serbia and North Macedonia, to co-finance joint projects between academia and industry.
- *Implement a smart specialisation strategy* **(S3)** and concentrate resources on sectors with comparative advantages (e.g. ICT, agri-technologies, renewable energy).

- *Promote the Quintuple Helix model* through regular science-business forums, consortia and joint research agendas.

### *1.3. Innovative Entrepreneurship*

Bosnia and Herzegovina (BiH) is witnessing a growing number of small and medium-sized enterprises (SMEs) engaging in innovation, yet there remains a lack of institutional and financial support for start-ups. The venture capital market is underdeveloped, and state support measures are limited.

Priorities:

- *Create a favourable business environment* through tax incentives for R&D, simplified business registration procedures and the establishment of a legal framework for alternative financing sources (venture capital, crowdfunding, angel investors).
- *Establish a national innovation fund* with a focus on seed funding, mentorship and the development of the start-up ecosystem.
- *Develop business incubators and accelerators* in partnership with universities and local communities.
- *Introduce entrepreneurship education* across all levels of education and strengthen digital skills.
- *Encourage diaspora engagement and private sector involvement* in the investment and mentoring of domestic start-ups.
- *Promote an entrepreneurial culture and reduce the fear of failure* through public campaigns and the celebration of successful domestic entrepreneurs.

For the sustainable development of the innovation ecosystem in BiH, synchronised action by government, universities and the business sector is required, aligned with European standards. Focus must be placed on:

1. Increasing investment in research and development,
2. Strengthening knowledge and technology transfer,
3. Creating an environment that supports innovative entrepreneurship.

These priorities form the foundation of the action plan for the implementation of the R&I Strategy and represent a pathway towards increasing innovation capacity, competitiveness and the integration of BiH into the European Research Area.

## 2. Strategic Enablers and Key Initiatives

For the implementation of the Research and Innovation Strategy, it is essential to define strategic enablers—intervention areas that will enable the achievement of the established objectives. In the Action Plan, these enablers represent horizontal components that support the pillars of the strategy. What follows is an overview of eight key strategic components (governance, strategy, universities, cultural transformation, international orientation, communication, digital and green transformation), along with proposed initiatives for their implementation. Particular attention is

devoted to the context of Republika Srpska and Bosnia and Herzegovina, relying on international reports, governmental documents and the experiences of comparable countries.

### *2.1. Governance*

*Governance of the research and innovation (R&I) system* entails the effective coordination of all levels of government and institutions, clearly defined competences and responsibilities, as well as the establishment of monitoring and accountability mechanisms for policy implementation. At present, the governance of the R&I sector in Bosnia and Herzegovina is highly fragmented—competences are divided between the state level (Ministry of Civil Affairs of Bosnia and Herzegovina), the entities (ministries for science in Republika Srpska and the Federation of Bosnia and Herzegovina) and the cantons in the Federation of BiH, with insufficient coordination. This fragmentation results in overlapping activities, inconsistent measures and inefficient use of resources (European Commission, 2023). The European Commission notes that limited cooperation among the various levels of authority significantly reduces the overall efficiency of the system and prevents even the modest available resources from generating greater impact (European Commission, 2023). In contrast, Republika Srpska, which holds competence over the field of science, has established a coordinated and unified governance system through the competent ministry.

As a priority initiative, it is necessary to establish bodies for the coordination of research and innovation policies at various authorised levels in Bosnia and Herzegovina. These bodies (such as national councils for science and innovation) should bring together representatives of all relevant ministries, the academic community and the business sector, serving as forums for the harmonisation of policies and programmes. Republika Srpska already has its own coordination structure (the ministry responsible for scientific and technological development), and it is essential to align strategies with other frameworks through regular communication mechanisms.

Moreover, effective financial governance of R&I forms an integral part of this enabler. The current funding system is inadequate—there is no single fund or agency at the state level to finance science, and resources are instead allocated in a fragmented manner across different levels of government. According to the European Commission, the lack of an efficient funding system is one of the factors preventing innovation policy from achieving better results (European Commission, 2023). Consequently, an initiative would be the establishment of consolidated research and innovation funds. This would enhance transparency and enable the financing of larger, joint projects of broader significance, instead of dispersing resources across numerous small-scale calls.

Administrative capacities represent another important aspect of governance. It is necessary to strengthen the capacities of ministries and agencies engaged in R&I policy—through staff training, the introduction of modern project management tools and the implementation of indicator monitoring systems. The success of strategy implementation depends on the ability of institutions to carry it out. In this regard, the introduction of a monitoring and evaluation (M&E) system will enable the tracking of progress through key indicators (e.g. number of start-ups, number of patents, R&D investments, etc.). The M&E system should be integrated into the governance structure—e.g. through the establishment of a dedicated unit or the engagement of expert organisations that will periodically evaluate the implementation of the action plan.

Regional and EU experiences underscore the importance of strong political support for the field of innovation. Therefore, one of the tasks under governance should be to raise awareness among decision-makers about the significance of R&I for economic development. Regular reports on the state of innovation, to be presented to governments and parliaments, can help ensure that R&I secures a rightful place on the political agenda. In this context, the EU Strategy for the Western Balkans (the so-called Innovation Agenda), adopted by ministers of the region in 2020, envisages the strengthening of innovation governance and joint monitoring of progress (European Commission, 2021). Bosnia and Herzegovina should actively participate in regional coordination mechanisms to adopt best practices in governance. All of the above initiatives are aimed at enabling the coherent and effective implementation of the strategy. Sound governance is the backbone of the strategy—without it, other components risk remaining disconnected and insufficiently effective. Therefore, strengthening governance structures and processes is the first step towards a modern research and innovation system.

### *2.2. National Strategy for Research and Innovation*

The existence of a clear, adopted strategy for research and innovation, accompanied by an action plan, is a fundamental precondition for the targeted development of the sector. In Bosnia and Herzegovina, the previous Strategy for Scientific and Technological Development was valid until 2022; however, its action plan ceased implementation after 2017, and no new document has since been drafted (European Commission, 2023). As a result, the country effectively operated without a valid science development plan during the period 2017–2023—a situation noted in European Commission reports, which state that from 2017 to 2023, no action plan was in place. Consequently, policies were ad hoc, fragmented, and reactive rather than proactive. This state of affairs contributed to further stagnation—the innovation gap between Bosnia and Herzegovina and the European Union continues to widen year after year (European Commission, 2023).

Republika Srpska has adopted the Strategy for the Development of Science and Technology, Higher Education and the Information Society for the period 2023–2029. In Sarajevo Canton, a draft Strategy for Science Development 2025–2028 has been published. Innovation and digitalisation have been identified as the leading accelerator in the Development Strategy of the Federation of Bosnia and Herzegovina for the period 2021–2027. The European Commission recommends that Bosnia and Herzegovina adopt a new science development strategy and accompanying action plan as a matter of priority (European Commission, 2023). This document should define a vision, priority areas (preferably based on a smart specialisation analysis) and concrete measures, including designated implementers and deadlines. The drafting process must involve all relevant stakeholders (ministries at the level of Republika Srpska, the Federation of BiH and the cantons, as well as academia, industry and civil society) to ensure that the strategy functions as a roadmap for the further development of science.

Furthermore, alignment with EU frameworks must be ensured—the strategy should reflect the goals of the European Research Area (ERA), the Green Agenda for the Western Balkans and the Digital Agenda, thereby demonstrating Bosnia and Herzegovina's commitment to European priorities (European Commission, 2021). It is advisable for the strategy to include defined strategic objectives and indicators. For example, targets may include increasing R&D investment to 1% of GDP by 2030, doubling the number of innovative start-ups over five years and raising the number of international scientific publications by a specific percentage. Each of these

objectives should have measurable indicators to be tracked through the action plan. Good practice suggests setting interim goals (e.g. for 2027 and 2029) to monitor trends and adjust policies accordingly.

A particularly important segment—the Smart Specialisation Strategy (S3)—should be integrated into or developed as a parallel document to the national strategy. The European Commission emphasises that the development of S3 in Bosnia and Herzegovina is still in its early stages, and that its absence negatively impacts activities in the field of research and innovation (European Commission, 2023). The S3 methodology assists in identifying narrowly defined priority areas based on competitive advantages (e.g. wood processing with the application of new technologies, the IT sector in agriculture, medical sciences, etc.). Republika Srpska has initiated activities on S3 and identified certain niches (e.g. in agriculture – agritech) (Ministry for Scientific and Technological Development, Higher Education and the Information Society of Republika Srpska, 2019), but it is necessary to complete this process and ensure the coordination of entity-level specialisations. An initiative would be to accelerate the finalisation of the smart specialisation process with support from the JRC of the European Commission and to incorporate its findings into the national strategy.

Following the adoption of the strategy, its implementation and monitoring are of critical importance. The action plan must define the responsible parties for each task, deadlines, success indicators and funding sources. A good practice example is Serbia, which, after adopting its strategy for scientific development 2016–2020, developed a detailed action plan and regularly monitored implementation through annual reports, leading to the majority of measures being implemented by 2020. Bosnia and Herzegovina should adopt a similar approach: for instance, forming an operational working group (or using the aforementioned Science Council) that would meet every six months to review the implementation of the action plan, identify delays and propose adjustments.

Finally, the strategy will not have an impact if it remains a “dead letter”. Therefore, it is essential to ensure its political adoption at a high level and a clear commitment to its implementation. Moreover, international support (EU Delegation, UNESCO, UNDP) can be mobilised to support the implementation through technical assistance projects and funding for specific measures. The strategy is foundational—a key enabler without which other initiatives lack a coherent framework. Its development and implementation must therefore be regarded as a strategic priority among the enabling mechanisms.

### *2.3. Universities*

Universities and higher education institutions lie at the heart of the research and innovation system—they generate new knowledge (through research) and train new professionals (through education). Universities must assume a more proactive role in implementing the innovation strategy. At present, they face numerous challenges, including low levels of research activity, limited science funding, outdated curricula insufficiently aligned with labour market needs and a lack of international recognition. Accreditation and quality assurance also remain problematic—the European Commission notes that the system of accreditation for higher education institutions is still not fully functional at the level of Bosnia and Herzegovina (European Commission, 2023), which indirectly affects the quality of scientific work.

To transform universities into drivers of innovation, reforms in higher education are necessary to stimulate research and strengthen links with industry. First, the research activities of academic staff must be encouraged. In the current system, teaching staff are burdened with teaching and administrative duties, and academic promotion is not always strictly tied to research output. An initiative would be to introduce criteria that evaluate scientific performance (publications, patents, project leadership) in promotion procedures and to allocate time and resources to achieve these results. For example, introducing a "one teaching-free day per week" rule for academics to focus exclusively on research, or providing internal university grants to launch research projects led by young researchers.

Second, universities must strengthen ties with industry. This involves establishing partnerships with companies—joint laboratories, commissioned research projects and the involvement of practitioners in the teaching process. Faculties in technical and natural sciences, in particular, should develop so-called Living Lab models, in which students and professors work on solving real-world industrial problems. In Republika Srpska, such practices are already emerging—for example, the Faculty of Technology in Banja Luka collaborates with local companies in the food industry—but these efforts need to be systematised and extended across all disciplines.

Third, it is essential to actively promote entrepreneurship within universities. This entails facilitating the establishment of spin-off companies by professors and students (by defining rules that allow inventions created at the university to be commercially exploited, with revenue-sharing arrangements between the inventor and the institution). To make this feasible, legislation must be adopted to support such activities (modelled, for instance, on the legal framework in Italy). Additionally, each university could establish a Centre for Innovation and Entrepreneurship offering advisory support to individuals wishing to launch a business based on university research. For instance, the University of Sarajevo established such a centre in cooperation with an Italian university, resulting in increased student interest in start-up activities. At the Faculty of Economics, University of Banja Luka, the Centre for Project Management and Entrepreneurship (CPME) has been active since 2014 and has contributed to the creation of student-founded start-ups.

Fourth, the internationalisation of universities is a key component of knowledge acquisition and diffusion within the framework of Open Innovation—a new paradigm of collaboration among universities, industry, research and development centres, institutions, citizens, and other stakeholders in innovation and research. Participation in international research projects (such as Horizon Europe, COST Actions, Erasmus+ for researcher exchange) brings not only financial resources but also new expertise. Universities in Bosnia and Herzegovina have already started engaging—for example, under the Horizon 2020 programme, Bosnia and Herzegovina participated in over 100 collaboration agreements with EU research teams (European Commission, 2023). This figure needs to be increased through better support for project applications (e.g. offering training in project writing, establishing project support offices at every university—as has been done at UNIBL with the Centre for Research Development and Support). The Commission notes an encouraging development—Bosnian researchers secured approximately EUR 1.65 million from Horizon Europe in 2021 and around EUR 2.1 million in 2022, demonstrating growing capacity (European Commission, 2023). This trend should continue—the target could be for each faculty to have at least one EU-funded project by the end of the strategy period.

Fifth, universities must also play a role in promoting scientific literacy and a culture of innovation in society. Through open science events, cooperation with secondary schools (e.g. "young researchers" programmes) and science popularisation, universities contribute to creating a favourable innovation climate. Strategically, universities are expected to support the implementation of practically all pillars of the strategy—thus, they must be viewed as implementation partners, not merely as policy subjects. This means that university representatives should be included in all bodies monitoring implementation (such as the previously mentioned Science and Innovation Council).

Ultimately, investing in universities is an investment in the future of innovation. Republika Srpska has recognised this through initiatives such as the establishment of new laboratories at the University of Banja Luka, but long-term sustainability requires systemic support. Recommended measures include establishing dedicated funds for university research, reforming higher education financing towards a performance-based model and fostering collaborative projects among universities in Bosnia and Herzegovina (to reduce fragmentation between the academic communities of the two entities). Only strong and interconnected universities can generate the critical mass of knowledge needed for a genuine innovation leap.

### *2.4. Cultural Change*

In the context of innovation, culture refers to the set of values, attitudes and norms that foster creativity, collaboration and readiness for change. In Bosnia and Herzegovina, there is substantial scope for enhancing innovation culture—traditional bureaucratic heritage and rigid structures often stifle entrepreneurial spirit and freedom of research. The strategic enabler "cultural change" therefore targets a transformation in the mindset across institutions, the economy and society at large, to promote innovation, openness and acceptance of risk.

One key aspect is the organisational culture within public research institutions. At present, many institutes and faculties are hierarchically structured, with insufficient incentives for young researchers and for interdisciplinary work. An initiative would be to introduce programmes that reward teamwork and results—such as annual awards for innovative projects, financial bonuses for research groups achieving patents or practical outputs and similar measures. Furthermore, institutions must encourage experimentation and tolerance for failure. In innovation, it is normal for many ideas to fail; rather than penalising failure, institutions should learn from mistakes and try again. Changing this mindset can be supported through leadership training and the introduction of more flexible rules for projects (e.g. funding pilot projects even if outcomes are uncertain).

Anti-corruption measures and meritocracy are also part of cultural change. Innovation thrives in environments where the most competent and creative individuals progress—not those with the strongest connections. It is essential to ensure that funding for research and innovation is allocated transparently, based on expert evaluation. This builds trust in the system. Efforts by public authorities to improve innovation policies and activities are starting to yield results, but systemic cooperation among all actors remains necessary (European Commission, 2023). Transparency and accountability—such as publicly publishing project outcomes, use of funds and their impact—should become the norm. This represents a cultural shift towards more open governance.

Cross-sectoral and inter-institutional collaboration also has a cultural dimension. At present, barriers between academia and industry are partly cultural—stemming from differences in language, mutual distrust and lack of familiarity. A culture of trust and partnership must be cultivated. One initiative could be the establishment of dialogue platforms (regular meetings, conferences) where researchers and business representatives exchange ideas. Through ongoing communication, understanding is built and stereotypes broken (e.g. businesses often perceive universities as overly theoretical, while universities feel industry does not value science—the truth lies somewhere in between, and collaboration benefits both sides).

At a broader level, public awareness of the importance of science and innovation must grow. Cultural change also entails the public beginning to view scientists and innovators as drivers of development and supporting investment in this field. The media can play a role by promoting the achievements of domestic innovators. Moreover, creativity must be encouraged in the education system from an early age—through project-based learning, robotics and coding competitions, and science camps for secondary school pupils. These are small building blocks that shape a pro-innovation culture among new generations.

A vital part of cultural change is also gender equality and inclusivity in innovation. It is necessary to actively involve women in STEM fields and ensure equal opportunities for all, regardless of background. Bosnia and Herzegovina already has a relatively high share of women in science (e.g. among academic staff), but they are often underrepresented in leadership positions in research. Targeted measures—such as mentorship programmes for young female researchers and highlighting successful female scientists as role models—help to break down cultural prejudices.

Maintaining high ethical standards and practising responsible research (the so-called Responsible Research and Innovation – RRI concept) is also part of this cultural dimension. The WBC-RRI.NET project has promoted future scenarios for responsible research in Bosnia and Herzegovina and the region by involving society in innovation through the quadruple helix approach. Cultural change means that scientists and innovators consider the societal impacts of their activities from the outset, leading to more sustainable and socially accepted innovations.

To initiate these cultural changes, the strategy should incorporate educational and promotional activities: seminars for institutional leaders on innovation management, awareness-raising campaigns and specific reforms in internal organisational practices (e.g. universities could revise internal regulations to reward collaborative projects between departments, which is currently uncommon). Culture changes slowly, but it is strategically vital to sow the seeds of these transformations from the very beginning of the strategy's implementation—without cultural support, structural reforms are likely to face resistance or remain underutilised.

### *2.5. International Orientation*

International orientation refers to the readiness and ability of the domestic research and innovation (R&I) ecosystem to integrate into global flows of knowledge, collaboration and markets. For a relatively small country such as Bosnia and Herzegovina, internationalisation is of critical importance—it provides access to greater funding sources, opportunities to learn from best practices and integration into European innovation networks. Encouragingly, recent progress has been made: since 2021, Bosnia and Herzegovina has been an associated country to the Horizon Europe programme, granting its researchers and innovators full participation rights

in the EU's largest R&I programme (European Commission, 2023). In the very first year, significant results were achieved—with €1.65 million competitively secured in 2021, and preliminary data for 2022 showing an increase to over €2.1 million (European Commission, 2023). These achievements, although modest in absolute terms, prove that BiH researchers are capable of competing at the European level and should be further encouraged to do so.

Strategic initiatives within the international orientation component include, first and foremost, the optimal utilisation of EU programmes. Beyond Horizon Europe, these also include COST (researcher networks), EUREKA (industry-oriented applied research), Erasmus+ (mobility and capacity building in higher education), among others. Bosnia and Herzegovina should establish national contact points and dedicated support teams for each of these programmes in order to increase participation rates. In the region, Serbia serves as a good example—as an associated country, it secured over €150 million from Horizon 2020 between 2014 and 2020, while Bosnia and Herzegovina attracted around €8.6 million (European Commission, 2023). This discrepancy is partly due to better support infrastructure and stronger promotion of international opportunities in Serbia. Therefore, BiH must close this gap by investing in awareness-raising and researcher training for project proposal writing.

International orientation also entails regional cooperation within the Western Balkans. A common Regional Strategy for Science and Innovation was adopted in 2013 by the region's ministers, promoting joint mobilisation of resources and knowledge (World Bank, 2013). Bosnia and Herzegovina actively participates in initiatives such as the Western Balkans Platform on Research and Innovation and various regional projects (e.g. via the RCC). These efforts should be continued and deepened—for example, through joint calls for research proposals between BiH and neighbouring countries, or intra-regional researcher exchanges. Regional cooperation serves as a stepping stone toward integration into the wider European community and helps countries in similar positions to strengthen their capacities collectively.

The inclusion of the diaspora is a unique opportunity to be seized. Bosnia and Herzegovina has a considerable scientific and professional diaspora around the world—experts working in leading universities and companies. Initiatives such as "Brain Gain" programmes or diaspora scientist networks can facilitate knowledge transfer and partnerships. For instance, Serbia's "Returning Point" programme links overseas professionals with domestic institutions; Bosnia and Herzegovina could develop a similar portal and fund to financially support collaborative projects with the diaspora (e.g. guest lectures, startup mentorship, joint research projects).

Promoting domestic innovations in foreign markets is another crucial aspect of internationalisation. Innovative enterprises from BiH must compete globally in order to grow. Governments at both state and entity levels can support this by organising delegations to international technology fairs, connecting startups with foreign investors (e.g. through events like "Investor Days" inviting international VC funds). Additionally, joining international innovation hub networks—such as the European Institute of Innovation and Technology (EIT)—creates new opportunities. In this regard, it is encouraging that BiH has been included in the EIT Regional Innovation Scheme from 2025 (European Commission, 2023), enabling domestic actors to participate in EIT initiatives for capacity building and projects in areas such as climate innovation, digital technologies and more.

International orientation also refers to alignment of domestic policies with international standards. This includes participation in the European Research Area (ERA)—for example, embracing principles of open science, researcher mobility (e.g. removing barriers to recognition of diplomas and international experience) and more. The European Commission emphasises that integration into the new ERA supports national R&I reforms (European Commission, 2021). One potential initiative would be the development of a National ERA Accession Agenda, identifying BiH's current position with respect to key ERA priorities (such as the free movement of researchers and knowledge, gender equality in science, synergy with EU Structural Funds, etc.) and outlining the measures needed to meet these requirements.

Ultimately, international orientation must become an integral part of every component—universities should have international strategies, research institutes should seek partners abroad and companies should target EU markets. A success indicator for this enabler will be, among others, Bosnia and Herzegovina's progress on global innovation indices. In recent years, the Global Innovation Index (GII) ranked BiH in the 70s and 80s (e.g. 70th in 2022), but with meaningful internationalisation and investment, improvement is possible—Serbia, for example, reached 55th place, partly due to stronger international engagement. Therefore, BiH should aim for similar advancement, using international orientation as a lever for accelerating the development of its innovation system.

### *2.6. Stakeholder Communication*

Stakeholder communication is a horizontal enabler that ensures all ecosystem actors—researchers, businesses, policymakers, civil society and citizens—are informed, engaged and coordinated in the process of strategy implementation. Effective communication builds trust, facilitates two-way information exchange (top-down and bottom-up) and ensures that policies align with real needs on the ground.

One of the initial steps involves establishing mechanisms for consultation and dialogue. This means that, when defining actions and reforms under the strategy, relevant stakeholders should be consulted. For example, before adopting new laws or funding programmes, public consultations or focus groups should be conducted with representatives of universities, chambers of commerce, associations of innovative enterprises and NGOs active in the technology sector. This approach not only enhances the quality of policies (by incorporating practical insights), but also increases their acceptance during implementation.

Such dialogue can be institutionalised through the formation of permanent working groups or advisory bodies. For instance, an Innovation Council comprising representatives from academia, industry and civil society could periodically issue recommendations to governments on strategy implementation. Likewise, sector-specific platforms (e.g. digital, agro-innovation, health innovation) would allow experts in particular domains to communicate their needs and ideas to policymakers. The European practice of the quadruple helix model—where civil society is included alongside government, academia and business—demonstrates that broader participation leads to more sustainable and socially acceptable innovations (Đonlagić Alibegović et al., 2022).

A particular aspect of communication is the promotion and dissemination of information about opportunities offered through the strategy. Often, actors are unaware of available support

programmes, grants or training. A dedicated communication campaign should be developed to clearly convey strategic messages to target groups. This might include: the development of a central innovation portal (aggregating all news, calls and events in the R&I domain), regular newsletters for researchers and businesses, and the use of social media to highlight success stories. For example, when a research team secures a Horizon project or a company develops a patent, this should be publicised—sending a signal to the community that positive developments are occurring and motivating others to engage.

Communication must be two-way: it is essential to establish channels through which stakeholders can provide feedback to authorities and strategy implementers. This could involve periodic surveys or satisfaction assessments (e.g. annual surveys measuring business satisfaction with innovation support—according to the European Commission, businesses in BiH are currently the least satisfied in the Western Balkans with the level of digitalisation in public services (European Commission, 2023), which is a crucial feedback point for policymakers). Additionally, formal channels such as an online platform where companies can report barriers they encounter (e.g. regulatory obstacles to innovation) would help identify and address problems during action plan implementation.

In Republika Srpska and the Federation of BiH, chambers of commerce and business associations can play a pivotal role in stakeholder communication. They should be actively involved as partners in promoting the innovation agenda. For instance, the Chamber of Commerce of Republika Srpska could establish a dedicated section for innovation and digital transformation, bringing together companies interested in the topic and facilitating the flow of information between public authorities and businesses.

The role of media and public discourse should not be overlooked. Creating a "positive narrative" around innovation in the public sphere will help generate broader societal support. As noted in the cultural enabler, the popularisation of science overlaps with public communication. Organising events such as science and innovation festivals, television programmes featuring locally developed technologies and involving prominent figures (e.g. successful diaspora innovators) as innovation ambassadors are all ways to make the strategy "alive" and relevant to citizens.

Ultimately, well-designed communication ensures that all actors feel part of the same team working toward the transformation of a knowledge-based economy. When the private sector sees that it can reach the government with a proposal and be heard, when scientists feel that their voice is acknowledged in programme development, and when citizens perceive that innovation serves the common good, then a healthy climate of trust is established. In such a climate, the implementation of all other strategy components flows more smoothly because there is a shared vision and support—this is the ultimate goal of this strategic enabler.

### *2.7. Digital Transformation*

Digital transformation is an indispensable component of a modern innovation system. It entails the adoption of digital technologies across all sectors of the economy, the digitalisation of public services, the development of digital skills and infrastructure, as well as the creation of new digital products and services. For Bosnia and Herzegovina, digital transformation represents both a major challenge and a significant opportunity. The challenge lies in the current level of

digitalisation, which lags behind the EU: business sector surveys highlight dissatisfaction with e-government and the digital environment – as many as 60% of small enterprises lack even a basic website, while only around 18% actively engage in e-commerce (European Commission, 2023). Furthermore, the implementation of e-government is hampered by political disunity and the absence of harmonised standards at the state level (European Commission, 2023). However, the opportunity lies in the fact that digital technologies can bypass certain stages of development and accelerate progress: with relatively modest investment, digital platforms can connect innovators from Bosnia and Herzegovina with global markets.

Strategic initiatives for digital transformation must operate on several fronts. Firstly, the development of digital infrastructure – high-speed broadband internet, particularly in rural areas, data centres and similar facilities. Without robust infrastructure, digitalisation is unsustainable. This requires investment and public-private partnerships (e.g. telecom operators, supported by governments, could expand network coverage). Secondly, the enhancement of digital skills within the population. Bosnia and Herzegovina faces a shortage of ICT professionals, which directly limits innovation (the lack of competitive human capital and availability of ICT personnel has been identified as a barrier to digital innovation). It is necessary to modernise educational curricula – introducing programming and digital literacy from primary school onwards, expanding STEM streams in secondary schools and increasing enrolment in IT and related faculties. Additionally, reskilling and adult training (e.g. IT sector retraining programmes) can relatively quickly generate a new wave of digital entrepreneurs.

Thirdly, the focus must be on the digitalisation of micro, small and medium-sized enterprises (MSMEs). Most MSMEs in Bosnia and Herzegovina have not yet adopted modern digital tools – such as e-business, cloud computing or data analytics (Centre for Policy Evaluation and Research, 2022). One initiative would be to launch a “Digitalise MSMEs” programme that offers technical and financial assistance to companies seeking to implement digital solutions. This could include vouchers for software acquisition, subsidised consultancy for digital transformation or the establishment of Digital Innovation Hubs (DIHs). DIHs are centres where companies can test technologies and receive guidance (an EU concept increasingly applied in candidate countries). Bosnia and Herzegovina should establish at least one DIH in each entity, focusing on key industries (e.g. one for manufacturing, one for the IT sector), which has already begun with the establishment of such hubs.

Fourthly, the improvement of e-government and digital public services. This is the responsibility of the authorities, but it has a direct impact on the innovation ecosystem – efficient e-government reduces administrative burdens for innovative companies. The European Commission notes that the development of e-services in Bosnia and Herzegovina is slow due to a lack of regulatory harmonisation across government levels, the absence of a unified framework for e-signatures and e-identification, and weak coordination (European Commission, 2023). The initiatives are clear: a state-level law on electronic identification and digital services should be adopted (aligned with EU standards such as the eIDAS Regulation); a unified digital identity for citizens, valid across the entire country, should be established; and registers and databases across entities and cantons should be integrated. Projects such as the One-Stop-Shop for businesses (enabling entrepreneurs to register a company, report taxes and contributions online, etc.) should be prioritised. These measures not only improve the business environment but also generate large volumes of data that can subsequently be utilised for innovation (open data initiatives).

Fifthly, digital transformation must be supported through cybersecurity and a suitable legal framework. As more business activity moves online, cybersecurity becomes imperative. Research has shown that MSMEs in Bosnia and Herzegovina are often unaware of the importance of cybersecurity and perceive it as an expensive investment (Centre for Policy Evaluation and Research, 2022). The action plan should provide for awareness-raising activities on cyber hygiene and even co-financing of security solutions in companies. In parallel, laws governing digital business (electronic signatures, data protection – e.g. GDPR implementation, digital banking, payment services) must be modernised to facilitate the flourishing of innovations such as fintech, e-commerce and others.

A potentially valuable initiative is the establishment of a national digital platform serving as a central hub for digital transformation support. As suggested by recent research, an online platform should be developed to match supply and demand for digital solutions in Bosnia and Herzegovina – whereby MSMEs could find domestic IT companies offering relevant products/services, thereby stimulating the local digital ecosystem (Centre for Policy Evaluation and Research, 2022). Such a platform could also offer educational content, tutorials and similar resources. The report by the Centre for Policy Evaluation (2022) recommends a range of measures: from financial support for MSME digitalisation and awareness-raising, to the elimination of regulatory barriers (e.g. costly payment processing and postal fees for e-commerce) – all of which should be incorporated into the action plan.

Ultimately, success indicators for digital transformation will include an increase in the proportion of digitally active enterprises, growth in e-commerce and improved positioning on digitalisation indices (e.g. the EU's Digital Economy and Society Index – DESI). At present, Bosnia and Herzegovina ranks among the lowest in Europe by these indicators, but with focused efforts, significant progress could be achieved by the end of the strategy implementation period. This would lay the groundwork for participation in global Industry 4.0 trends – where digital technologies such as artificial intelligence, the Internet of Things and big data are driving innovation. If Bosnia and Herzegovina succeeds in keeping pace with digital transformation, its innovators will be better positioned to compete and connect with the world, which, combined with other enablers, will lead to a sustainable innovation ecosystem.

### *2.8. Green Transformation*

Green transformation refers to the transition towards a sustainable, low-carbon and resource-efficient economy, in line with the principles of environmental protection and climate change mitigation. For Bosnia and Herzegovina, the green agenda is of paramount importance, as the economy remains heavily reliant on hydrocarbon energy (coal, oil) and energy-intensive industry. Data show that Bosnia and Herzegovina has the highest energy intensity of GDP in the region – consuming around 6.7 MJ of energy per dollar of GDP, which is twice the EU average (Ignjatović et al., 2024). Moreover, $CO_2$ emissions per unit of GDP are the highest compared to neighbouring countries (Ignjatović et al., 2024), due to reliance on outdated lignite-fired thermal power plants (Bosnia and Herzegovina operates five large thermal plants with a combined capacity of approximately 2,000 MW that emit enormous quantities of $CO_2$ and pollutants) (Ignjatović et al., 2024). This trend is unsustainable – both ecologically and economically: the EU is introducing mechanisms such as the CBAM (Carbon Border Adjustment Mechanism), which

will impose levies on products with high carbon footprints (Ignjatović et al., 2024), making exports from Bosnia and Herzegovina more expensive on EU markets if no action is taken.

The green transformation is therefore both an obligation and an opportunity. Bosnia and Herzegovina signed the Sofia Declaration on the Green Agenda for the Western Balkans (2020), assuming commitments in five areas: energy decarbonisation, circular economy, pollution reduction, sustainable agriculture and biodiversity protection (Balkans Fund for Strategic Research, 2021). However, fulfilling these commitments requires concrete steps. The key initiatives under this enabler include:

*Energy transition*. The gradual phasing-out of coal and shift towards renewable energy sources (RES), along with improved energy efficiency. Bosnia and Herzegovina has set a target for 43.6% of electricity to come from RES by 2030 (Ignjatović et al., 2024), with the current share already at around 37–38% due to hydroelectric plants. It is necessary to accelerate investment in solar and wind energy – although entities have initiated RES auctions, procedures should be expedited and bureaucratic obstacles removed. Investment in energy-efficient infrastructure (e.g. building insulation, more efficient district heating systems) also holds vast potential. The European Commission recommends drafting and implementing a building renovation strategy to improve energy savings (European Commission, 2023). Innovation plays a role here through the development of local solutions, such as smart grids that integrate RES, energy storage systems (batteries) and similar. Scientific and technological institutions in Bosnia and Herzegovina could focus on adapting these technologies (e.g. the Faculty of Mechanical Engineering in Sarajevo is developing solar collector prototypes adapted to local conditions). The action plan should support such projects.

*Circular economy*. Transitioning from the linear model ("take – make – dispose") to a circular one, where waste is minimised and resources are recycled and reused. This is especially relevant in the waste and materials management sector. Initiatives may include support for innovation in recycling, biomaterials, energy valorisation of waste and more. Research indicates that resource productivity in the Western Balkans is five times lower than in the EU (Ignjatović et al., 2024), implying enormous material value is being wasted. Innovations in packaging, processing industrial waste into secondary raw materials, and similar measures can simultaneously protect the environment and create new jobs. Action plans for the circular economy should be developed, and innovative companies (e.g. those producing furniture from recycled wood or biofuels from waste) should be supported both financially and through public promotion.

*Sustainable mobility and transport.* Innovations in electromobility, alternative-fuel public transport and smart transport systems are part of the green transformation. Bosnia and Herzegovina has yet to make significant strides in this area – the number of electric vehicles is negligible, incentives for their purchase are lacking and charging infrastructure is underdeveloped. The action plan may include measures such as: tax reliefs for electric vehicle imports, pilot projects introducing electric buses in urban areas and the development of domestic capacities (e.g. technical universities could work on solar charger prototypes, vehicle conversion to electric drive, etc.). Horizon Europe provides funding opportunities for Green Deal projects – Bosnia and Herzegovina should actively seek partnerships in such consortia.

*Green innovations in industry and agriculture*. Traditional industries (metallurgy, chemical, wood processing) must innovate to reduce emissions and resource use. Technologies such as carbon

capture and storage, replacing fossil fuels with hydrogen in industrial processes, and precision agriculture (optimising fertiliser and water use) are all innovations that should be encouraged. Research institutes and companies should collaborate on demonstration projects. For example, in Slovenia, a pilot project to replace coke with wood waste in steel production has produced favourable $CO_2$ reduction outcomes; Bosnia and Herzegovina could learn from this and test similar innovations in its own industries.

*Strengthening institutional capacity for green transition.* As emphasised by Ignjatović et al. (2024), the greatest challenge of the green transition lies not only in technology but in institutional reform and policy coordination. It is essential to better align energy, industrial, agricultural and innovation policies with green goals. In practice, this means involving Ministries of Ecology and Energy in innovation bodies, and conversely, including the academic community in energy strategy development and explicitly accounting for the role of innovation. The European Commission observes that the lack of a unified regulatory framework for investment in the low-carbon energy sector is hampering progress – for instance, the absence of a national energy regulatory agency hinders the attraction of RES investment (European Commission, 2023). This is an institutional reform that must be considered.

Despite the challenges, the green transformation represents a development opportunity. Investments in renewables and green technologies create new jobs (e.g. the RES sector is labour-intensive during construction), increase energy independence and reduce long-term costs. Additionally, as part of EU integration, Bosnia and Herzegovina will be required to meet specific green criteria – it is better to proactively pursue transformation than to face future penalties or trade barriers. One positive signal is that Sarajevo has been included in the European Mission for Climate-Neutral and Smart Cities by 2030 (European Commission, 2023), meaning it will receive technical assistance and funding to accelerate green investments in the urban context. This experience may serve as a model for other cities in Bosnia and Herzegovina.

Ultimately, the success of the green transformation will be measured by reductions in emissions, increases in the share of renewable energy and improvements in environmental quality (cleaner air and water, fewer waste landfills). Yet beyond these quantitative indicators, a crucial outcome will be a shift in mindset – among citizens, the economy and authorities – that ecology and economy go hand in hand. Innovation is the tool that can facilitate this synergy, and through a strategic approach, Bosnia and Herzegovina can avoid being held back by green transitions and instead modernise its economy through green innovation, creating better jobs for the future (Ignjatović et al., 2024).

## 3. Roles and Responsibilities

The effective implementation of the research and innovation strategy requires clearly defined roles and responsibilities of all relevant stakeholders – from state institutions and academia to research organisations, the private sector and civil society.

Strategies in this domain establish goals and development priorities for science, technological progress and the application of innovative solutions, but their successful implementation depends on the coordinated and accountable engagement of all involved actors. In this context, understanding and precisely determining the roles and responsibilities represents the

foundation for establishing a functional and effective system of support for research and innovation.

**Table 1**

*Mapping of stakeholders*

| STAKEHOLDERS | ROLE | RESPONSIBILITIES WITHIN THE ACTION PLAN |
|---|---|---|
| Government institutions (ministries, agencies) | Decision-makers and strategy coordinators | – Defining national priorities<br>– Drafting and implementing the legislative framework<br>– Providing public funding<br>– Evaluating outcomes and policies |
| Policy-makers (expert groups, advisory bodies) | Policy design based on analysis and evidence | – Analysing the needs of the R&I sector<br>– Drafting policy proposals<br>– Recommending incentive measures<br>– Advising government institutions |
| Investors (VC funds, business angels) | Financial support for innovation | – Investing in start-ups and technologies<br>– Collaborating with the R&D sector<br>– Mentoring and advising start-ups<br>– Establishing specialised funds |
| Science and technology parks (STPs) and innovation hubs | Infrastructure and support for R&D and technology transfer | – Providing conditions for start-up development<br>– Connecting science, industry and academia<br>– Organising support programmes<br>– Promoting technology transfer |
| Incubators and accelerators | Support for early-stage business development | – Identification of innovative teams<br>– Training and mentoring<br>– Networking with investors<br>– Market access and capacity growth |
| Universities and research institutions | Drivers of research and human resource development | – Conducting research<br>– Educating qualified personnel<br>– Developing technology transfer offices<br>– Collaborating with the business sector and the EU<br>– Designing and implementing research projects<br>– Upholding ethical and social responsibility |
| Start-ups and innovative SMEs | | – Developing new solutions and products |

| | | |
|---|---|---|
| | Innovation and commercialisation drivers | – Participating in projects and funding programmes<br>– Providing feedback on needs and barriers<br>– Testing innovations in practice |
| Private sector | Partner in the application of research results | – Collaborating with the R&D sector<br>– Investing in innovation<br>– Employing skilled personnel<br>– Defining market needs |
| Civil society organisations (NGOs, foundations) | Bridging science and society | – Promoting socially responsible innovation<br>– Participating in public consultations<br>– Monitoring the impact of innovation<br>– Involving the civil sector (citizens) in the development of public R&I policies by fostering so-called "social innovation" |

*Notes*. The table presents the stakeholders relevant for the effective implementation of the research and innovation strategy.

*The roles of stakeholders* are integrated into the action plans of the research and innovation strategy, structured according to:

- the strategic priority areas,
- the implementation timeframe,
- performance indicators, and
- the responsible stakeholders.

*Strategic priority areas* – The Action Plan elaborates the strategic goals by thematic or sectoral priorities, within which the key actors for the implementation of specific activities are identified.

*Implementation timeframe* – Each activity is assigned a clear time horizon (short-term, medium-term, long-term or a concrete deadline), which enables monitoring of implementation dynamics and the setting of realistic deadlines for achieving the planned results.

*Performance indicators* (output and outcome indicators) – Clearly defined quantitative and qualitative indicators allow for the measurement of progress and success in implementation (e.g. number of completed projects, number of researchers involved in cooperation with industry, number of patents, level of citizen engagement, etc.).

*Responsible stakeholders* – Each activity is assigned a specific responsible institution or group of actors, thereby ensuring accountability, coordination and implementation monitoring.

In this way, an integrated and transparent approach to the implementation of the strategy is achieved, enabling all stakeholders to clearly understand their role, obligations and contribution to the achievement of common goals. At the same time, such a structure of the action plans facilitates monitoring, evaluation and adjustment of measures in accordance with changes in the environment and the needs of the system.

The alignment of European Union development policies with those at all levels of government in Bosnia and Herzegovina represents one of the key preconditions for the successful integration of the country into the European development framework. Given the multi-layered administrative

and political structure of BiH, the harmonisation process faces numerous challenges stemming from fragmented competences, insufficiently developed coordination mechanisms, as well as varying institutional capacities at the state, entity, cantonal and local levels.

The specificities of the political and institutional structure of BiH require a unified approach to strategies in the field of research and innovation – based on inter-entity cooperation, alignment of priorities and strengthening the role of all relevant actors, including academia, the business sector and civil society. Although burdened with numerous obstacles, these processes also represent an opportunity to build a functional, decentralised, yet coordinated system for scientific and innovation development, which can contribute to stronger and faster integration into the European Research Area (ERA).

## 4. Timeline and Key Steps

The presented plan is based on the strategic priorities defined within the national policy on science, technological development and innovation, with the aim of establishing a competitive, sustainable and internationally integrated research and innovation ecosystem.

The Gantt chart provides a visual representation of the implementation dynamics of strategic measures and priorities within the Action Plan for Research and Innovation. It offers a clear overview of the sequence, duration and interlinkages of activities during the initial three-year implementation period (2026–2028), thereby facilitating planning, coordination and progress monitoring.

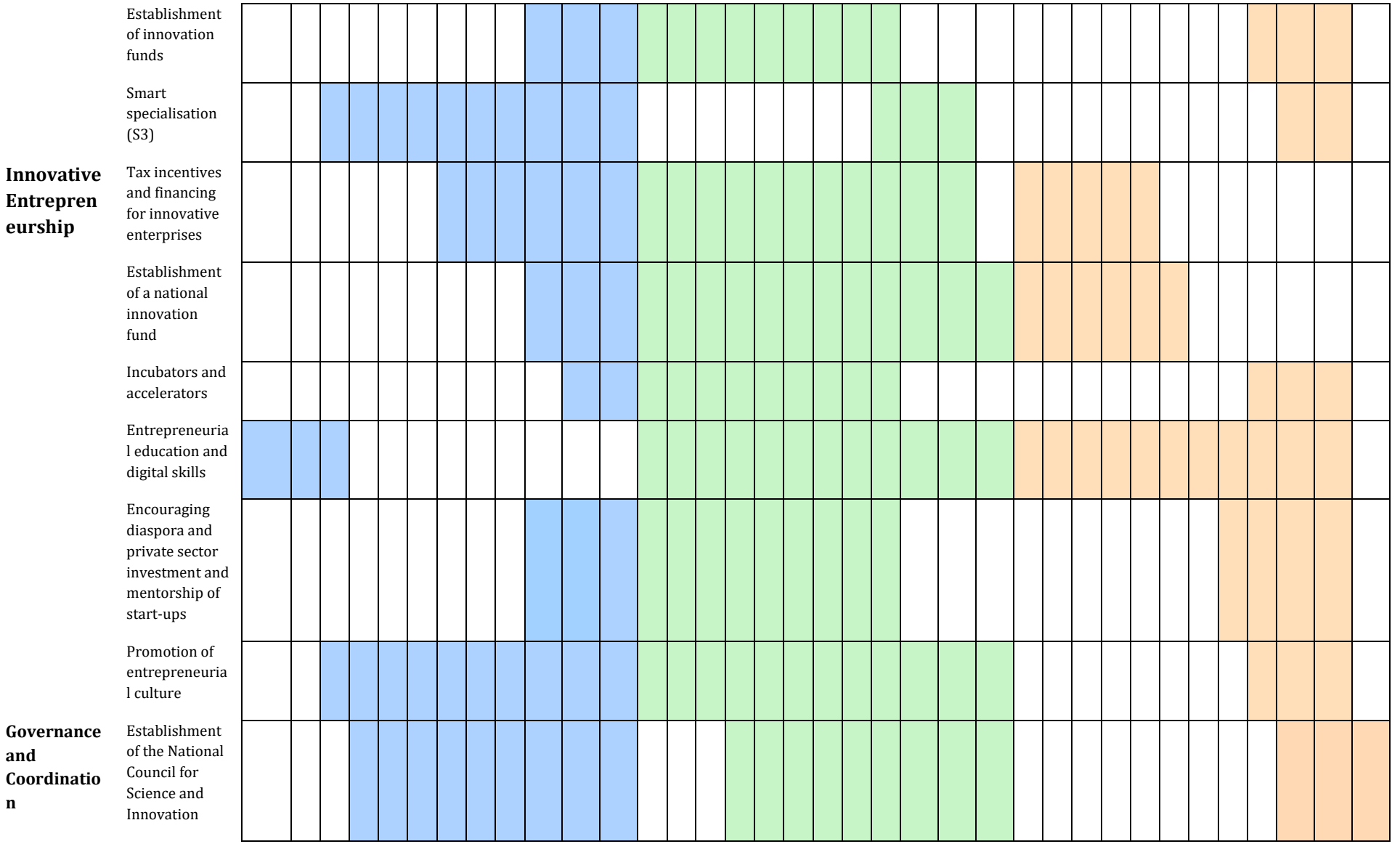
Within this plan, activities are structured according to implementation phases encompassing the full cycle from preparation to evaluation:

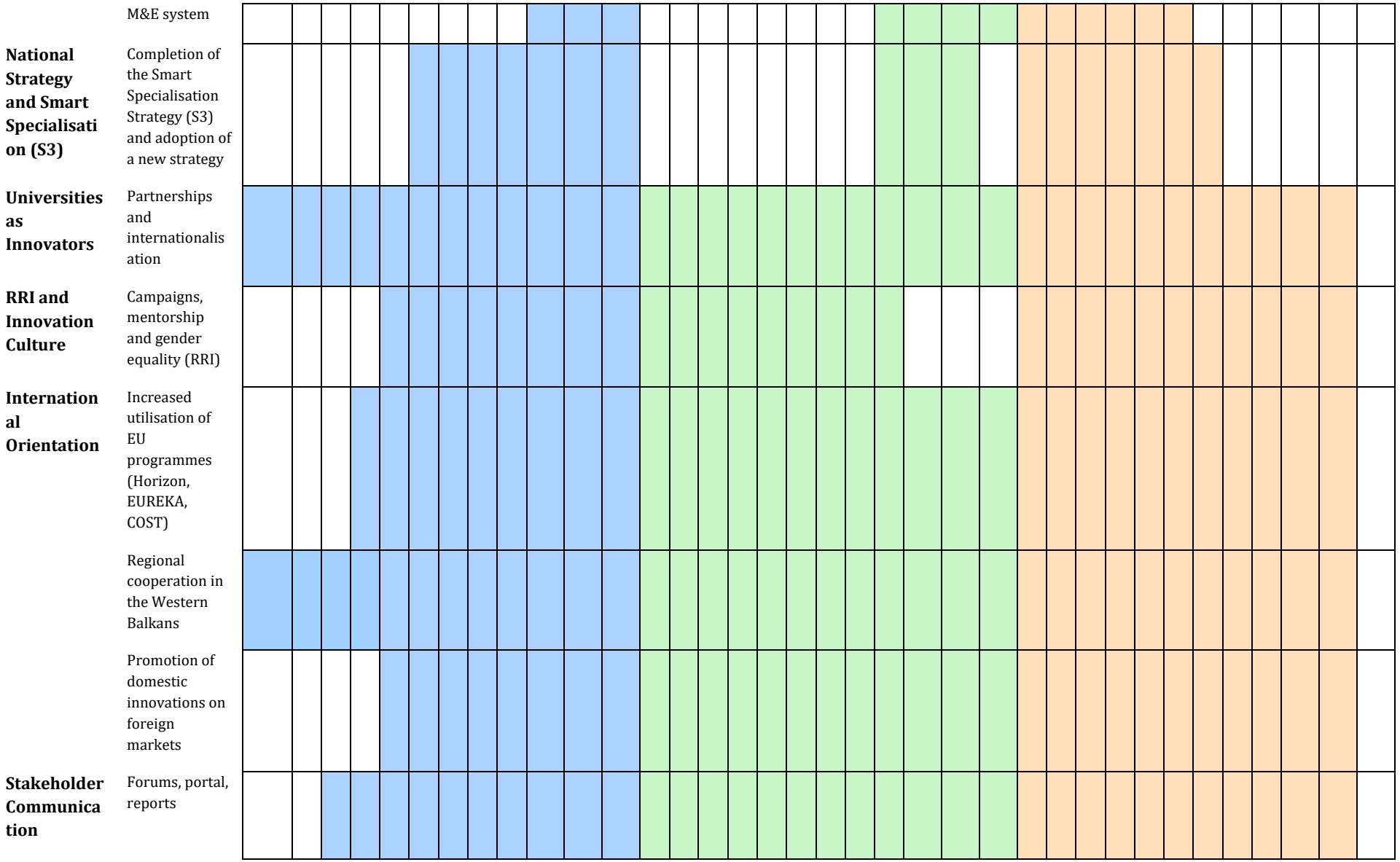
- **Planning and establishment** – setting the institutional and programmatic foundations for implementing the strategy;
- **Implementation and development** – operational execution of the planned measures and activities;
- **Consolidation and evaluation** – assessment of the results achieved and reinforcement of system sustainability.

**Table 2**

*Chronological overview of the implementation of reform initiatives in the R&I system (Gantt chart 2026–2028)*

| | Year | 2026 | | | | | | | | | | | | 2027 | | | | | | | | | | | | 2028 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| **KEY PILLAR** | **ACTIVITY** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Excellence in Research** | Expansion of existing and establishment of new funds and grants for R&D and young researchers | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Establishment of national and university centres of excellence | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Reform of doctoral studies | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Cooperation with the diaspora | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Technology Transfer and Exploitation** | Development of TTOs, incubators and science and technology parks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Intellectual property legislation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |


Innovative Entrepreneurship
Governance and Coordination
Establishment of innovation funds
Smart specialisation (S3)
Tax incentives and financing for innovative enterprises
Establishment of a national innovation fund
Incubators and accelerators
Entrepreneurial education and digital skills
Encouraging diaspora and private sector investment and mentorship of start-ups
Promotion of entrepreneurial culture
Establishment of the National Council for Science and Innovation




WP2. Capacity Building for Research and Innovation in Enlargement Countries T2.3. Setting Research and Innovation Directions in Enlargement Countries, A2.3.1. Formulation of the Research and Innovation Strategy (draft version), D.2.3. Research and Innovation Strategies.

| | |
|---|---|
| **Digital Transformation** | Infrastructure and digital skills |
| | Digitalisation of SMEs and legal framework |
| **Green Transformation** | Renewable energy sources and circular economy |



Legend:

| | | |
|---|---|---|
| Start of Activity | Development and Implementation | Operational Outcomes |

Explanation of implementation phases:

- **Phase I: *Initiation of Activities***

This phase involves the initiation of institutional, planning and regulatory processes.

Activities include:

- ✓ Excellence in Research – preparation and launch of new R&D funds and grants, development of a model for centres of excellence, reform of doctoral studies.
- ✓ Technology Transfer – mapping of potential and planning for the development of Technology Transfer Offices (TTOs), analysis of intellectual property regulations, drafting of the Smart Specialisation Strategy (S3).
- ✓ Innovative Entrepreneurship – amendments to tax regulations, establishment of a national innovation fund and development of partnerships with universities for incubators.
- ✓ R&I System Governance – establishment of the National Council and development of the M&E system methodology.
- ✓ Digital and Green Transformation – initial planning of digital infrastructure and development of plans for renewable energy sources (RES) and the circular economy.

- **Phase II: *Development and Full Implementation***

This is the phase in which activities transition from planning to implementation:

- ✓ Excellence in Research – awarding of grants, establishment of centres of excellence, implementation of reformed doctoral programmes and cooperation with the diaspora.
- ✓ Technology Transfer – establishment and implementation of TTOs, innovation funds and pilot implementation of the S3 strategy.
- ✓ Innovative Entrepreneurship – launch of accelerators, implementation of entrepreneurship education, development of a diaspora mentoring network.
- ✓ System Governance – functioning of the Council, testing of the M&E system.
- ✓ Digital Transformation – delivery of training programmes, development of e-services and digitalisation of SMEs through the "Digitalise SMEs" programme.
- ✓ Green Transformation – implementation of investments in RES and energy efficiency programme.

- **Phase III: *Operational Results***

This phase marks stabilisation and the achievement of measurable results:

- ✓ Excellence in Research – consolidation of research funds, international networking of centres of excellence and evaluation of doctoral reform outcomes.
- ✓ Technology Transfer – stable functioning of the TTO network, expansion of innovation funds and strengthening of intellectual property protection.
- ✓ Innovative Entrepreneurship – continued funding of start-ups, linkage with investment funds and monitoring of impact.

- ✓ System Governance – full implementation of the M&E system and evaluation of the Council's performance.
- ✓ Digital Transformation – expansion and optimisation of digital platforms, and strengthening of cyber security.
- ✓ Green Transformation – consolidation of achieved effects, impact assessment and replication of successful projects.

### 4.1. Implementation Timeline

In order to develop a detailed timeline for the implementation of each initiative outlined in the Action Plan of the Research and Innovation Strategy, it is necessary to align the main phases and initiatives with clearly defined implementation periods. Based on the content presented in the chapters "Strategic Enablers and Key Initiatives" and "Timeline and Key Milestones", an indicative implementation schedule is provided.

This timeline allows for the gradual yet sustainable development of a functional research and innovation ecosystem in Bosnia and Herzegovina, with clearly defined priorities and timeframes for each implementation phase. The structure of implementation dynamics is grounded in the principles of efficiency and synergy between the academic, private and public sectors.

**Table 3**

*Indicative Implementation Timeline for Strategic Initiatives (2026–2028, by month)*

| Initiative / Activity | Start | End | Description / Note |
|---|---|---|---|
| Expansion of existing and establishment of new R&D and youth research grants | February 2026 | December 2026 | Expansion of existing grant schemes and creation of dedicated funds for young researchers. |
| Establishment of national and university centres of excellence | July 2026 | December 2027 | Establishment of thematic centres of excellence at leading universities and institutes. |
| Reform of doctoral studies | April 2026 | June 2027 | Modernisation of curricula and development of interdisciplinary and international doctoral programmes. |
| Collaboration with the diaspora | September 2026 | December 2028 | Establishment of a "Brain Gain" network, with joint research projects and mentoring schemes. |
| Development of TTOs, incubators and science-technology parks | May 2026 | December 2028 | Development and strengthening of capacities for technology transfer and support to start-ups. |
| Intellectual property regulations | July 2026 | March 2027 | Alignment of national legislation with EU |

| | | | |
|---|---|---|---|
| | | | standards and researcher education. |
| Creation of innovation funds | October 2026 | September 2027 | Consolidation of existing funding mechanisms and establishment of new innovation funds. |
| Smart specialisation strategy (S3) implementation | March 2026 | June 2027 | Finalisation and implementation of the national Smart Specialisation Strategy (S3). |
| Tax incentives and financing of innovative enterprises | July 2026 | June 2027 | Introduction of tax incentives for R&D investment and start-ups. |
| Establishment of a National Innovation Fund | October 2026 | June 2027 | Creation of an institutional fund to support early-stage innovation. |
| Incubators and accelerators | January 2027 | September 2028 | Development of support programmes for start-up growth through mentoring and investment networks. |
| Entrepreneurship education and digital skills | February 2026 | December 2028 | Programmes for the development of digital competences and innovative entrepreneurship. |
| Diaspora and private sector investment and mentorship | January 2027 | December 2028 | Networking of investors and mentors from the diaspora with domestic innovators. |
| Promotion of entrepreneurial culture | March 2026 | December 2028 | National campaigns and events to foster an innovation culture and vibrant start-up scene. |
| Establishment of the National Council for Science and Innovation | April 2026 | November 2026 | Establishment of a body for the coordination and strategic governance of the R&I system. |
| Monitoring and Evaluation (M&E) system | October 2026 | December 2027 | Establishment of indicators and regular reporting on implementation progress. |
| Finalisation of S3 and launch of new strategy | June 2026 | June 2027 | Integration of smart specialisation into the national innovation framework. |

| | | | |
|---|---|---|---|
| Campaigns, mentorship and gender equality (RRI) | May 2026 | December 2028 | Promotion of responsible research, equal opportunities and ethical standards. |
| Increased participation in EU programmes (Horizon, COST, EUREKA) | April 2026 | December 2028 | Training and support for applications to international funding programmes. |
| Regional cooperation in the Western Balkans | July 2026 | December 2028 | Strengthening of networks and joint projects within the WB6 initiatives. |
| Promotion of domestic innovations in international markets | January 2027 | December 2028 | Participation in international fairs, missions and promotion of the innovative Bosnia and Herzegovina brand. |
| Forums, stakeholder portal and reports (communication with stakeholders) | May 2026 | December 2028 | Creation of an innovation portal, organisation of stakeholder forums and publication of annual innovation reports. |
| Infrastructure and digital skills (digital transformation) | March 2026 | December 2027 | Development of digital infrastructure and training in advanced digital tools. |
| Digitalisation of SMEs and legal framework | July 2026 | June 2028 | Voucher schemes, advisory services and alignment of the regulatory framework for e-business. |
| Renewable energy, circular economy and green innovation | May 2026 | December 2028 | Pilot projects and investments in green technologies and sustainable industry. |

This timeline outlines the implementation plan for key initiatives in the field of research, development and innovation (R&I) for the period 2026–2028. The activities are grouped according to strategic pillars – from research excellence, technology transfer and innovative entrepreneurship, to digital and green transformation. The plan defines indicative start and end months for the implementation of each activity, ensuring a logical sequence of reforms, institutional strengthening and investment in the innovation ecosystem. The timeline enables coordinated implementation of measures, progress monitoring and transparent reporting on the achievement of the objectives of the national innovation and science policy.

### 4.2. Key Milestones for Monitoring Progress

Based on the content of the chapters related to implementation and progress indicators, a framework of key milestones has been defined for the three-year implementation period 2026–2028.

Milestones represent measurable and time-bound events or outcomes that enable continuous monitoring of progress in the implementation of strategic research and innovation priorities.

They serve as reference points in the implementation of the Action Plan, ensuring clear tracking of achievements, timely performance assessment and the identification of any potential deviations in execution.

The following section provides a detailed overview of the defined milestones by year and month for the period 2026–2028.

**Key milestones for monitoring implementation progress (2026–2028)**

| Milestone | Target period | Description / Indicator |
|---|---|---|
| New national and university research funds established | Q4 2026 | The first public calls for the funding of research projects published. |
| Centres of excellence established at universities | Q4 2027 | Research centres formally registered and the first thematic research programmes launched. |
| Doctoral studies reform adopted | Q2 2027 | New regulations and curricula adopted at the majority of public universities. |
| First joint research projects with the diaspora launched | Q2 2028 | A minimum of five projects launched in cooperation with researchers from the diaspora. |
| **Milestone** | **Target period** | **Description / Indicator** |
| New intellectual property regulations adopted | Q1 2027 | The intellectual property rights (IPR) law or regulation entered into force. |
| Technology Transfer Offices (TTOs) and incubators operational at universities | Q2 2027 | At least three Technology Transfer Offices (TTOs) operational (UNIBL, UNSA). |
| Innovation fund established | Q3 2027 | The first public call for innovative projects launched. |
| Smart Specialisation Strategy (S3) finalised and adopted | Q2 2027 | The document formally adopted and published in the official gazette. |
| **Milestone** | **Target period** | **Description / Indicator** |
| Tax incentives for startups introduced | Q2 2027 | Adoption of a new tax bylaw or law. |
| National Innovation Fund operational | Q3 2027 | First seed grants awarded. |
| First accelerator programme cycle launched | Q2 2028 | At least 10 startups included. |
| Entrepreneurship education programme fully implemented | Q4 2028 | Training sessions and courses conducted in all major university centres. |
| **Milestone** | **Target period** | **Description / Indicator** |
| National Science and Innovation Council established | Q3 2026 | Decision on the establishment and appointment of members. |
| Monitoring and Evaluation (M&E) system functional | Q4 2027 | First annual implementation report drafted and published. |
| **Milestone** | **Target period** | **Description / Indicator** |

| | | |
|---|---|---|
| Increased number of applications to EU programmes (Horizon, COST, EUREKA) | Q4 2027 | At least 30% increase compared to 2025. |
| Joint regional projects launched in the Western Balkans | Q3 2028 | A minimum of three joint projects. |
| Domestic innovations showcased at international fairs | Q4 2028 | Participation in at least five international events. |
| **Milestone** | **Target period** | **Description / Indicator** |
| Digital research infrastructure operational | Q4 2027 | National research network (e-infrastructure) operational. |
| SME digitalisation programme launched | Q1 2027 | First vouchers and support measures for the SME sector published. |
| First circular economy and RES projects launched | Q2 2028 | At least three pilot projects financed. |
| **Milestone** | **Target period** | **Description / Indicator** |
| National innovation portal launched | Q3 2027 | Innovation portal operational and regularly updated. |
| Annual innovation forums organised | Q4 svake godine | At least one innovation forum held annually. |
| Mentoring and gender equality programmes active | Q2 2026 | Active mentoring networks and programmes for women in innovation. |

The milestone system is aligned with the priorities and main implementation phases of the Strategy, ranging from institutional establishment and the development of programme mechanisms, to the stage of consolidation and evaluation of results. In this way, it enables structured reporting and transparent management of the implementation process of the R&I system in Bosnia and Herzegovina.

## 5. Monitoring and Evaluation

- *Develop key performance indicators (KPIs)* for measuring the effectiveness of the Research and Innovation (R&I) Strategy, such as:
  - Number of start-ups established
  - Amount of funding raised by start-ups
  - Number of patents filed and technologies commercialised
  - Number of jobs created in innovative sectors
  - Number of partnerships between academia and industry (number of signed agreements)
  - R&D expenditure as a percentage of GDP, aimed at improving Bosnia and Herzegovina's position in international innovation rankings (Serbia is currently ranked 53rd according to the OECD classification)
  - Increase the number of commercially successful academic spin-off companies by 20
  - Strengthen participation in the Horizon Europe programme
  - Increase the share of graduates in science, technology, engineering and mathematics (STEM) fields by 20%, and the share of women graduates in technical sciences by 5%

- Establish incentives for researchers to pursue entrepreneurial careers.

- *Establish monitoring mechanisms* at both national and regional levels.

The successful implementation of the Research and Innovation (R&I) Strategy aimed at developing the entrepreneurial ecosystem in enlargement countries requires the establishment of a comprehensive monitoring and evaluation (M&E) system that will enable continuous progress tracking, outcome assessment and timely adjustment of planned measures. Such a system, aligned with the best practices of the European Union, constitutes a key mechanism for ensuring the effective realisation of strategic goals, the efficient use of resources and the increased impact of innovation activities on the socio-economic development of the region.

Monitoring and evaluation (M&E) are not merely technical processes for collecting and processing data, but strategic tools that enable evidence-based decision-making. On the one hand, continuous evaluation ensures transparency and accountability among all stakeholders; on the other, it allows policymakers and implementing bodies to respond in a timely manner to identified challenges and opportunities. The primary aim of the M&E system is to provide mechanisms for tracking the implementation of the priority measures defined in the Strategy, as well as to enable the assessment of their impact on the development of the innovation ecosystem. M&E serves as a tool for determining the extent to which strategic goals have been achieved, whether the implemented activities are yielding the expected results, and whether corrective actions are required.

### *5.1. Key Performance Indicators (KPIs)*

The success of the Strategy will be assessed based on clearly defined, measurable and verifiable performance indicators. These indicators cover several key dimensions of innovation development, including the strengthening of entrepreneurial capacity, enhancement of technology transfer and the development of human capital.

Performance indicators relating to entrepreneurial capacity and innovation activity will include:

- ✓ Number of start-ups established (Business Registers of Republika Srpska, 2025; Judicial Commission of the Brčko District of BiH, 2025; Federal Ministry of Justice, 2025)
- ✓ Amount of funding raised by start-ups during their first year of operation
- ✓ Number of new jobs created in innovative sectors such as IT (software development and distribution), metal and electrical industries and the wood-processing industry (Government of Republika Srpska, 2023), with a targeted increase of 20%
- ✓ Number of commercially successful academic spin-off companies (target: 20% increase)
- ✓ Total value of approved incentives for launching innovative businesses (local, regional and national level)
- ✓ Number of research and development organisations (target: 20% increase) (Republika Srpska Institute of Statistics, 2024)
- ✓ Share of innovation-active enterprises (target: increase by 5 percentage points) (Republika Srpska Institute of Statistics, 2024).

Progress in technological development and knowledge transfer will be measured by:

- ✓ Number of patents filed and technologies commercialised (Institute for Intellectual Property, 2023)
- ✓ Number of partnerships between academia and industry (measured by signed agreements)
- ✓ Number of approved Horizon Europe and other projects supporting technological development and knowledge transfer, measured by number of projects and total value of approved funding (European Commission, 2025c)
- ✓ Percentage of the population possessing basic digital skills – targeted increase of 10 percentage points, measured by the *Economic Convergence Scoreboard for the Western Balkans* (OECD, 2025).

Research activity and the development of human resources will be monitored through the following indicators:

- ✓ R&D expenditure as a percentage of GDP, aimed at improving the country's position in international innovation rankings (Republika Srpska Institute of Statistics, 2024)
- ✓ Number of employees engaged in R&D activities (target: gender balance and overall increase of 10%) (Republika Srpska Institute of Statistics, 2024)
- ✓ Increase the share of enrolled and graduated students in science, technology, engineering and mathematics (STEM) fields by 20%, and the share of women among graduates in technical sciences by 5% (Republika Srpska Institute of Statistics, 2024)
- ✓ Number of innovation research papers published in internationally recognised journals indexed in WoS (Web of Science) (Government of Republika Srpska, 2023), with a target increase of 20%.

A particular strength of these indicators lies in their comparability at both regional and European levels. Although target values may differ across countries, a common framework enables the comparison of trends and benchmarking of regional countries within the broader European context. Nonetheless, key performance indicators must be tailored to the specific conditions of each country, since baseline values vary and, as such, the target values at the end of the monitoring period cannot be uniform, nor can the same percentage change be universally expected.

### *5.2. Data Collection, Processing and Reporting*

The collection and processing of data for monitoring and evaluation of the Strategy will be based on a combination of secondary and primary sources, thereby ensuring the comprehensiveness, relevance, accuracy and comparability of information. Secondary data sources will include existing administrative and statistical databases, while primary data will be collected through targeted research where relevant information is not publicly available.

To the greatest extent, official data from national statistical institutions will be used, including the Republika Srpska Institute of Statistics, the Federal Institute of Statistics and the Agency for Statistics of Bosnia and Herzegovina. These institutions provide standardised and internationally comparable data on economic trends, employment, R&D expenditure, the number of enterprises by sector, as well as demographic and educational indicators. In addition, data from line ministries will be utilised, primarily the Ministry for Scientific and Technological Development, Higher Education and the Information Society (2025), and the Ministry of Economy and Entrepreneurship (2025). These sources offer insight into budget allocations, innovation support programmes, education policies and institutional capacities. For intellectual property protection — particularly the number of registered patents and protected technologies — data will be drawn from the registers of the Institute for Intellectual Property (2023), while business dynamics will be monitored using business registers, including information on the number of registered start-ups, spin-off companies and SMEs in the innovation sector. Internal data from faculties and universities will be used to monitor the number of contracts concluded between academia and industry, as well as data on the number and structure of enrolled and graduated students.

Where public data is unavailable, primary data collection will be conducted through surveys, focus groups and interviews with key stakeholders, particularly newly established enterprises, start-ups, universities and innovation support organisations. This approach will enable the collection of qualitative insights into the barriers and opportunities within the innovation ecosystem, complementing the quantitative indicators. All data will be analysed using descriptive and inferential statistical methods, as well as tools for trend analysis and data visualisation. This will ensure the validity and reliability of findings, as well as enable the tracking of progress in relation to the Strategy's defined goals and indicators.

### *5.3. Monitoring Mechanisms*

The effective implementation of the Research and Innovation Strategy requires the establishment of clear and transparent monitoring mechanisms that will enable the systematic collection, processing and analysis of progress data. These mechanisms should ensure the timely provision of information to policymakers, research institutions and the business sector regarding results and challenges, while allowing for the adjustment of measures and activities in response to changes in the environment.

Monitoring the implementation of the Research and Innovation Strategy will be organised across multiple operational levels, with faculties and the research teams involved in the USE IPM project playing a key role. In this way, the monitoring process is brought closer to the source of knowledge and innovation creation, ensuring greater transparency, accuracy and responsiveness to emerging challenges. At the faculty level, special monitoring and evaluation teams will be established, consisting of the Vice-Dean for Research, department representatives and project activity coordinators. These teams will be responsible for monitoring the implementation of research projects, recording achieved performance indicators (e.g. number of publications, registered patents, participation in international projects, secured funding) and regularly submitting reports on the status of key performance indicators. Members of the USE IPM project will be responsible for data collection, maintaining internal progress reports (including activity implementation timelines and obstacles encountered) and delivering these reports to the faculty monitoring team, ensuring a continuous flow of information from researchers to faculty leadership.

Additionally, participating faculties will be required to organise an annual forum for the evaluation of research activities, where research teams will present their results and discuss implementation challenges. These forums will provide opportunities for knowledge exchange

among faculties from different participating countries, facilitating comparison of progress dynamics, identification of common problems and discussion of shared solutions.

At the regional level, a cooperation mechanism will be established among partner institutions from the participating countries (BiH, Serbia, North Macedonia, Albania) through the formation of a regional coordination board composed of project coordinators from each country. The board will meet once a year to conduct a comparative analysis of results, identify common challenges and propose policy alignment measures. This approach ensures that monitoring results are not confined to national boundaries, but rather serve as a foundation for mutual learning and the strengthening of the regional research and innovation community.

At the end of the Action Plan implementation period, each faculty will compile a comprehensive evaluation of the implementation of the Research and Innovation (R&I) Strategy, aimed at assessing the extent to which planned activities have been realised and determining their actual impact on the development of the entrepreneurial and innovation ecosystem. The evaluation will compare the status of success indicators at the beginning and end of the period. It will also include details on completed activities, challenges encountered during implementation and reasons for any failure to meet objectives. These reports will be used to prepare a synthesised regional report summarising the achievement of key success indicators across the participating countries.

In evaluating activity results and assessing key success indicators, the following criteria will be considered:

- ✓ Efficiency – measuring the ratio between resources used for activities (financial, human, institutional and time-related).
- ✓ Effectiveness – assessing the extent to which target KPI values were achieved.
- ✓ Impact – evaluating the long-term effects of the Strategy on the entrepreneurial ecosystem, including those that may only emerge after the implementation period.
- ✓ Sustainability – assessing whether the results and effects of the Strategy are likely to be sustained, particularly with regard to the stability of funding and the durability of links between academia, the private sector and public institutions.

The evaluation methodology will be of a mixed nature and will include the following analyses:

- ✓ Quantitative analysis – quantifying the number and percentage of fulfilled individual KPIs.
- ✓ Qualitative analysis – conducting focus groups or interviews with key actors involved in the Strategy's implementation (researchers, business representatives, start-ups, etc.) to gain insight into opportunities and obstacles within the innovation ecosystem.
- ✓ Comparative analysis – comparing results and achievements across the enlargement countries to identify good practices and shared challenges.

This approach provides a comprehensive overview of KPI achievement and enables the identification of both shared and country-specific challenges. The implementation of the Research and Innovation Strategy lays the foundation for the development of a sustainable innovation ecosystem in the enlargement countries, the effects of which should be further strengthened and expanded in the future.

## 6. Risk Management

Within the framework of implementing the Research and Innovation Strategy, crisis management is regarded as an essential component of the resilience of the entire ecosystem. Particular emphasis is placed on anticipatory management, which is based on the early identification and monitoring of risks, as well as the systematic supervision of key indicators that may signal potential disruptions. Through continuous monitoring of the financial stability of start-ups, regulatory changes and international trends, it is possible to develop preventive measures that reduce the likelihood of a crisis occurring in the first place. In this regard, scenario planning also plays an important role, including the development of simulations that allow for the identification of various potential outcomes and the preparation of appropriate responses. The anticipatory approach also entails the development of flexible institutional capacities, diversification of funding sources and the establishment of stable partnerships with the academic and business sectors, thereby making the ecosystem less vulnerable to external shocks. As noted by Williams et al. (2017), linking research on crisis management and organisational resilience demonstrates that a proactive approach enables faster adaptation and mitigation of the negative effects of uncertainty.

Nevertheless, it is not possible to avoid crises entirely, which is why reactive management also plays a vital role, ensuring a rapid and coordinated response once a crisis has occurred. In this context, clearly defined roles and the establishment of operational crisis teams are of key importance, as they enable swift, coordinated and effective action. Crisis communication is also of particular importance and must be transparent and consistent towards all stakeholders, as the preservation of trust and the legitimacy of the Strategy depend on it. Reactive management also includes a business continuity plan, ensuring the continuation of critical research and innovation activities even under emergency circumstances, as well as post-crisis evaluation. In this way, organisations not only address the consequences but also learn from each crisis and use those experiences as a basis for strengthening future plans (Bundy et al., 2017).

Combined, anticipatory and reactive management constitute a coherent framework that allows for the forecasting and mitigation of crises where possible, and for efficient and decisive responses when they are unavoidable. This dual approach not only reduces the negative effects of potential disruptions but also fosters a culture of resilience within the research and innovation ecosystem, thereby enhancing its long-term stability, competitiveness and sustainability. At the same time, combining anticipatory and reactive approaches builds trust among all stakeholders, as it demonstrates that the system possesses both a long-term development vision and the capacity to confront unforeseen challenges.

## Conclusions and Recommendations

Bosnia and Herzegovina holds genuine potential to accelerate its transition towards a knowledge-based economy, provided that higher education institutions — in particular, the University of Banja Luka and its Centre for Project Management and Entrepreneurship (CPME) — maintain a pivotal role in knowledge transfer, engagement with the private sector and the development of open innovation within the framework of the Quintuple Helix model. The proposed R&I Strategy and Action Plan are fully aligned with the priorities of the European Commission (Horizon Europe, S3, ERA and the Green Deal), drawing on a combination of empirical methods including desk research, Delphi studies, focus groups and quantitative surveys. The three interconnected pillars — research excellence, technology transfer and exploitation, and innovative

entrepreneurship — form the foundation for building systemic capacity and sustainable cooperation between academia and industry.

Key challenges remain low innovation intensity, weak policy coordination and insufficient institutional support. For this reason, the European Commission recommends the urgent adoption of a national R&I strategic framework with a clearly defined action plan and performance indicators. In this context, the establishment of a joint body for the coordination of research and innovation policy is advised, tasked with implementing a monitoring and evaluation system and ensuring regular progress reporting. A second priority is the adoption of a national R&I strategy with an S3 component and the setting of quantified targets (e.g. increasing R&D expenditure to at least 1% of GDP by 2030 and doubling the number of innovative start-ups within five years).

The role of universities should be further strengthened through the development of a network of technology transfer offices, the establishment of innovation laboratories and the introduction of internal grant schemes. It is necessary to launch an innovation fund with a dedicated early-stage support line (Proof of Concept, seed capital) and to develop support programmes for academic spin-offs and SMEs. Horizontal priorities should include digital and green transformation, through the creation of digital innovation hubs and green pilot projects aligned with the EU agenda. Furthermore, international cooperation must be enhanced, including participation in Horizon Europe and COST programmes, and activation of the diaspora as partners and mentors. The establishment of permanent platforms for dialogue with industry and civil society, and the systematic communication of results through annual reports and a dedicated R&I portal, will contribute to transparency and the strengthening of an innovation-oriented culture.

The proposed measures derive from the three pillars of the strategy and European recommendations. Their strength lies in their interconnectivity, clarity of objectives and measurable outcomes. The rapid establishment of a coordination body, the adoption of an R&I strategy with S3 logic and the creation of an early-stage development fund represent the first steps (“quick wins”) that can enhance institutional credibility and generate momentum for a broader reform of Bosnia and Herzegovina’s research and innovation system.

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