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D5.2 Policy Recommendations to connect IVAP with RIS3

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Executive Summary

This deliverable is an effort to report our experience with our IVAP and how its proposed activities can be linked with the RIS3 to maximise impact. The report is based on the results of the two policy forums and provides concrete actions that can be taken to strengthen the link between IVAP and RIS3. At first, it analyses what the RIS3 is and why it is essential that EU projects are aligned with this strategy. Additionally, it explains the Skills2Scale Action Plan and proposes ways to link these two for better future exploitation. Overall, this document is a valuable tool to raise awareness on the importance of including Deep Tech talents nurturing as a priority of RIS3.

About the EIT HEI Initiative

The EIT HEI Initiative: Innovation Capacity Building for Higher Education has been designed with the aim of increasing the innovation and entrepreneurial capacity in higher education by bringing together HEIs in innovation value chains and ecosystems across Europe. A central philosophy of the EIT is the integration of the EIT Knowledge Triangle Model into all its activities. HEIs selected to participate in the HEI Initiative will also leverage and use the Knowledge Triangle Model as an enabler, facilitating the creation of systemic, institutional change. Additionally, HEIs selected to participate in the HEI Initiative will contribute to and leverage Smart Specialisation Strategies, the Regional Innovation Impact Assessment (RIIA) Framework, as well as align to the goals of the EIT Regional Innovation Scheme (EIT RIS). This will strengthen the links between HEIs and their local and regional ecosystems and provide an impetus to leverage additional funding sources beyond the HEI project funding period of the selected HEI projects.
HEIs are encouraged to prepare applications which will support the development and implementation of six Actions in their institutions, cumulatively leading to institutional transformation, an increase in entrepreneurial and innovation capacity, and integration with innovation ecosystems.

1. Introduction

The Skills2Scale project aims to make the involved HEIs catalysts of Deep Tech innovation. Adding to the EIT HEI Deep Tech Talent Initiative, through the educational and the acceleration programme that the project has developed and implemented, the ultimate goal is to train and mentor the deep tech workforce of the future. Aligning this effort with the RIS3 of Europe, as a whole, but also of each involved country separately, would maximise the impact of the project. This is why, in the project's activities, we included the implementation of 2 policy forums that would magnify the challenges of each country regarding RIS3, and make proposals on how to overcome these challenges. This deliverable is a very useful guide on what RIS3 proposes for each of the involved countries and make policy recommendations on how the advancement of Deep technologies can indeed help with the RIS3 priorities in each one of them. This way, we will have a useful guide for the future, on how we can improve our services and maximise the impact of the project's activities, by focusing on more specific thematises for each partner, optimizing their potential.

2. RIS3

Research and Innovation Strategies for Smart Specialisation (RIS3) is a pivotal policy framework within the European Union, designed to stimulate economic growth and innovation by leveraging the unique strengths and potential of each region. The primary goal of RIS3 is to promote tailored regional development, encouraging regions to identify and invest in areas where they possess specific strengths or untapped potential for innovation. By doing so, RIS3 aims to boost regional competitiveness, support economic transformation, and make more efficient use of public funds by minimizing duplication and fostering synergies between various policy measures and funding sources.

At its core, RIS3 involves an in-depth analysis of each region's economic, research, and innovation capabilities to identify priority areas for investment. This process is highly inclusive, requiring active participation from a broad range of stakeholders, including academia, industry, and civil society, to ensure that the identified priorities align with the region's needs and capabilities. Moreover, continuous monitoring and evaluation are integral to RIS3, enabling regions to adapt their strategies based on performance outcomes and emerging opportunities.

RIS3 is implemented as part of the EU's cohesion policy, which aims to reduce disparities between regions and is closely linked to the utilization of European Structural and Investment Funds (ESIF). Smart Specialisation Platforms provide essential support and guidance to regions in the development and implementation of their RIS3 strategies, fostering inter-regional cooperation and knowledge exchange. The approach emphasizes thematic concentration, directing resources towards a few well-chosen priorities to maximize the impact of investments.

The benefits of RIS3 are manifold, including economic transformation through the focus on niche areas of competitive advantage, increased efficiency in resource utilization, and the promotion of robust innovation ecosystems through enhanced collaboration among regional stakeholders and across borders. However, RIS3 also presents challenges, such as the need for strong governance and administrative capacities, the necessity of keeping strategies up-to-date with rapid technological and market changes, and the difficulty of ensuring that selected priorities genuinely reflect the region's potential rather than being driven by political or short-term interests.

2.1. RIS3 - Greece

In Greece, the implementation of Research and Innovation Strategies for Smart Specialisation (RIS3) is focused on leveraging the country's unique strengths and potential to drive economic growth and innovation. The Greek RIS3 strategy identifies key **priority areas** such as **agro-food, energy, environment, transportation, health, ICT, and tourism**, reflecting the nation's comparative advantages and developmental needs. By fostering collaboration among universities, research institutions, businesses, and public authorities, Greece aims to create robust innovation ecosystems that can enhance regional competitiveness and economic transformation. Continuous monitoring and stakeholder involvement ensure that the strategy remains adaptive and responsive to emerging opportunities and challenges, aligning with the broader goals of the European Union's cohesion policy to reduce regional disparities and promote sustainable development.

2.2. RIS3 - Spain

Spain's RIS3 strategy identifies key priority areas that vary across its autonomous communities, reflecting the unique characteristics and competitive advantages of each region. Common areas of focus include advanced manufacturing, agro-food, energy, health, ICT, and tourism.

The Spanish RIS3 framework emphasizes regional autonomy and customization, encouraging each region to develop its own smart specialisation strategy tailored to its specific economic and innovation landscape. This decentralized approach allows for a more precise alignment of investment and policy measures with local strengths and needs.

- In the **advanced manufacturing** sector, Spain's RIS3 promotes the adoption of Industry 4.0 technologies, such as automation, robotics, and artificial intelligence, to enhance productivity and competitiveness. Regions with a strong industrial base, such as the Basque Country and Catalonia, are focusing on modernizing their manufacturing sectors through innovation and technological integration.
- The **agro-food** sector, a critical component of Spain's economy, benefits from RIS3 by incorporating advanced agricultural technologies, sustainable farming practices, and food innovation. Regions like Andalusia and Murcia are leveraging their agricultural heritage and climate advantages to drive innovation in this sector, focusing on improving efficiency, sustainability, and value-added products.
- In the **energy** domain, RIS3 supports the development and deployment of renewable energy technologies, reflecting Spain's commitment to reducing its carbon footprint and promoting sustainable energy sources. Regions like Castile and León and Andalusia are leading in wind and solar energy projects, aiming to enhance energy security and sustainability.
- The **health** sector is another priority area, with RIS3 strategies promoting biomedical research, health technology innovation, and the development of new healthcare solutions. Regions such as Madrid and Catalonia are focusing on creating health innovation clusters, fostering collaboration between research institutions, healthcare providers, and businesses.
- **ICT** and **digitalisation** are transversal priorities across many Spanish regions, with RIS3 initiatives aiming to enhance digital infrastructure, promote digital skills, and support the digital transformation of traditional industries. This focus is particularly evident in regions like Madrid and Catalonia, which are investing heavily in ICT innovation and startups.
- The **tourism** sector, vital to Spain's economy, benefits from RIS3 strategies aimed at enhancing sustainability, improving tourist experiences through technology, and promoting cultural and natural heritage. Regions like the Balearic Islands and Canary Islands are focusing on sustainable tourism practices and innovative tourist services.
- Spain's RIS3 implementation is characterized by strong stakeholder involvement, ensuring that regional strategies are developed with input from academia, industry, and civil society. This collaborative approach helps to align regional innovation efforts with broader economic and social goals.

In summary, RIS3 in Spain is a strategic framework that capitalizes on the unique strengths of each region to drive innovation and economic development. By focusing on advanced manufacturing, agro-food, energy, health, ICT, and tourism, and fostering regional autonomy and collaboration, Spain aims to enhance its competitiveness and achieve sustainable growth.

2.3. RIS3 - Finland

In Finland, the implementation of Research and Innovation Strategies for Smart Specialisation (RIS3) is focused on harnessing the country's high level of education, robust research infrastructure, and advanced technological capabilities to drive economic growth and innovation.

Finland's RIS3 strategy emphasizes regional strengths and seeks to foster sustainable development through innovation, collaboration, and strategic investments. Key areas of focus include digitalization, bioeconomy, health, clean technologies, and advanced manufacturing.

- **Digitalization** is a central theme in Finland's RIS3 strategy. The country aims to leverage its strong ICT sector to drive digital transformation across various industries. Regions like Helsinki-Uusimaa are focusing on smart city solutions, cybersecurity, and digital services, promoting the integration of advanced digital technologies to enhance productivity and create new business opportunities.
- In the **bioeconomy**, Finland capitalizes on its extensive forest resources and expertise in sustainable forestry and bio-based industries. Regions such as Eastern and Northern Finland are leading efforts in developing bio-based products, renewable energy solutions, and sustainable agricultural practices. The focus is on creating value-added products and promoting circular economy principles to reduce waste and enhance resource efficiency.
- The **health** sector is another priority area, with RIS3 strategies supporting the development of health technologies, personalized medicine, and digital health solutions. Finland's well-established health research institutions and vibrant health tech startup ecosystem are key assets. Regions like Tampere and Oulu are fostering innovation in medical devices, diagnostics, and health data analytics, aiming to improve healthcare outcomes and promote health tech exports.
- **Clean technologies** are integral to Finland's RIS3, reflecting the country's commitment to environmental sustainability and climate change mitigation. Regions like Southwest Finland are focusing on renewable energy, energy efficiency, and sustainable mobility solutions. The emphasis is on developing technologies and practices that reduce environmental impact and support the transition to a low-carbon economy.
- In **advanced manufacturing**, Finland aims to enhance its industrial base through innovation and the adoption of Industry 4.0 technologies. Regions such as Western Finland are investing in automation, robotics, and smart manufacturing solutions to boost competitiveness and productivity. Collaboration between research institutions, industry, and government is crucial to drive technological advancements and creating high-value manufacturing jobs.

Finland's RIS3 implementation involves a high degree of stakeholder engagement, ensuring that regional strategies are developed in close collaboration with academia, industry, and public authorities. This participatory approach helps align regional innovation efforts with national and EU-level priorities, fostering synergies and maximizing the impact of investments.

2.4. RIS3 - Czech Republic

In the Czech Republic, the implementation of Research and Innovation Strategies for Smart Specialisation (RIS3) is geared towards leveraging the country's scientific excellence, strong industrial base, and strategic geographic position to foster economic growth and innovation. The Czech RIS3 strategy is designed to enhance regional strengths, encourage sustainable development, and stimulate innovation through targeted investments and collaboration. Key focus areas include advanced manufacturing, digitalization, healthcare, energy, and environmental technologies.

- Advanced manufacturing is a major focus of the Czech RIS3 strategy. The country aims to build on its robust industrial sector by promoting the adoption of Industry 4.0 technologies, such as automation, robotics, and smart manufacturing. Regions like Central Bohemia and Moravia are leading efforts to modernize production processes, improve efficiency, and increase competitiveness through technological innovation and high-value manufacturing.
- In the field of digitalization, the Czech Republic leverages its growing ICT sector to drive digital transformation across various industries. The strategy emphasizes the development of digital infrastructure, cybersecurity, and e-government services. Prague and South Moravia are at the forefront, focusing on smart city solutions, digital startups, and innovative ICT applications to boost economic growth and improve public services.
- The healthcare sector is another key priority, with RIS3 strategies supporting the development of health technologies, biomedical research, and personalized medicine. The Czech Republic's strong medical research institutions and dynamic health tech startups provide a solid foundation for innovation. Regions such as Prague and Brno are fostering advancements in medical devices, diagnostics, and digital health solutions to enhance healthcare delivery and promote health tech exports.
- Energy and environmental technologies play a crucial role in the Czech RIS3 framework, reflecting the country's commitment to sustainability and climate goals. The strategy promotes the development of renewable energy sources, energy efficiency measures, and sustainable environmental practices. Regions like Ústí nad Labem and South Bohemia are focusing on green technologies, clean energy projects, and sustainable resource management to reduce environmental impact and support the transition to a low-carbon economy.
- The bioeconomy is also emphasized, particularly in regions with strong agricultural and forestry sectors. Strategies aim to develop sustainable agricultural practices, bio-based products, and circular economy initiatives. Regions like South Moravia are leveraging their agricultural expertise to innovate in areas such as agritech, sustainable farming, and bioenergy.

Stakeholder involvement is integral to the Czech RIS3 implementation, ensuring that regional strategies are developed with input from academia, industry, and public authorities. This collaborative approach helps align regional innovation activities with national and EU-level objectives, fostering synergies and enhancing the impact of investments.

In summary, RIS3 in the Czech Republic is a strategic initiative that leverages the country's strengths in advanced manufacturing, digitalization, healthcare, energy, and environmental technologies to drive innovation and sustainable economic growth. By focusing on regional specialisation, promoting collaboration, and investing in key sectors, the Czech Republic aims to enhance its global competitiveness and achieve long-term sustainability.

2.5. RIS3 - Ukraine

In Ukraine, the implementation of Research and Innovation Strategies for Smart Specialisation (RIS3) faces unique challenges and opportunities due to the ongoing war situation. Despite these difficulties, Ukraine is focused on leveraging its scientific talent, technological capabilities, and strategic sectors to drive economic resilience, reconstruction, and innovation. The Ukrainian RIS3 strategy emphasizes regional strengths, sustainable development, and strategic investments, with particular attention to rebuilding and modernizing the economy. Key focus areas include digital transformation, energy independence, healthcare innovation, agritech, and defense technologies. A unique priority of the Ukrainian Strategy is national security, for obvious reasons.

- Digital transformation is a central pillar of Ukraine's RIS3 strategy. Given the importance of maintaining and enhancing digital infrastructure during the war, the country is investing in ICT solutions to support government services, education, and business operations. Regions like Kyiv and Lviv are leading efforts to develop robust cybersecurity measures, digital startups, and e-government services to ensure continuity and resilience in public and private sectors.
- Energy independence is another critical focus area, driven by the need to reduce reliance on external energy sources and enhance energy security. The strategy promotes the development of renewable energy projects, energy efficiency initiatives, and sustainable resource management. Regions such as Zaporizhzhia and Dnipropetrovsk are prioritizing investments in solar, wind, and bioenergy to create a more resilient and sustainable energy system.
- Healthcare innovation has become increasingly vital, particularly in response to the humanitarian needs arising from the conflict. The RIS3 strategy supports the development of health technologies, telemedicine, and trauma care solutions. Efforts are concentrated in regions like Kharkiv and Odessa, where advancements in medical devices, diagnostics, and digital health can significantly improve healthcare delivery and address urgent health challenges.
- Agritech is a key sector for Ukraine, given its rich agricultural resources and the need to ensure food security during and after the conflict. The RIS3 strategy focuses on sustainable agricultural practices, precision farming, and bio-based products. Regions such as Poltava and Vinnytsia are leveraging their agricultural expertise to drive innovation in agri-tech, enhance productivity, and promote sustainable farming practices.

- **Defense technologies** have gained prominence due to the ongoing war. The RIS3 strategy includes fostering innovation in defense-related research and development, focusing on areas such as unmanned systems, cybersecurity, and advanced materials. Regions like Kyiv and Kharkiv are leading these efforts, aiming to strengthen national defense capabilities and support the broader security sector.

Stakeholder involvement is crucial in the Ukrainian RIS3 implementation, ensuring that regional strategies are developed with input from academia, industry, civil society, and international partners. This collaborative approach helps align regional innovation activities with national recovery and resilience objectives, fostering synergies and maximizing the impact of investments.

In summary, RIS3 in Ukraine is a strategic framework that leverages the country's strengths in digital transformation, energy independence, healthcare innovation, agritech, and defense technologies to drive resilience, reconstruction, and sustainable economic growth. By focusing on regional specialization, promoting collaboration, and investing in key sectors, Ukraine aims to enhance its global competitiveness, ensure national security, and achieve long-term sustainability despite the challenges posed by the ongoing conflict.

3. Skills2Scale IVAP

In the application form, the Skills2Scale consortium developed an Innovation Vision Action Plan. Our expected vision was that by 2030, the involved HEIs of the project would establish a strong, growing consortium that would become a leading hub of innovation and entrepreneurship in the field of Beyond 5G technology. This will be achieved by fostering a culture of innovation and entrepreneurship across all partner HEIs, as well as by developing strong partnerships with external stakeholders in the industry, government, and academia.

By 2024 most of the benefited students of the program will make their first steps in the job market, having embraced the principles they were introduced in from the Accelerator and all the training programs. HEI administrators, professors and academic staff in general will begin to incorporate the things they learned to their curricula, being able to pass by the knowledge, cultivating more capable and innovative entrepreneurs of the future. By 2027, those students will have begun to make their impact in the innovation ecosystem as innovators, entrepreneurs, potential start-uppers, creating jobs, making impact in the deep tech field. Participating HEIs will be experienced seed beds of innovation, providing the market with capable, trained, holistically cultivated and ready actors of the innovation and entrepreneurship ecosystem.

Through the IVAP, the consortium aims to develop and implement cutting-edge innovation and entrepreneurial education programs that empower students to develop and launch their own businesses and startups in the Beyond 5G technology space. By providing access to top-notch training, mentorship, and funding opportunities, the consortium hopes to develop a new generation of entrepreneurs who will help drive innovation and economic growth in the region.

The consortium also aims to develop strong partnerships with industry stakeholders in the Beyond 5G technology space, which will help to ensure that HEI research and development efforts are aligned with industry needs and priorities. By fostering collaboration and knowledge sharing between HEIs and industry partners, the consortium hopes to drive the development and commercialization of new technologies and products that will help to transform the industry.

Overall, the expected vision for 2030 is to become a recognized leader in the Beyond 5G technology space, driving innovation and economic growth in the region through a combination of cutting-edge research, education, and entrepreneurship initiatives.

The vehicle for this transformation and fostering of innovation will be the involved universities. Our goal is to make HEIs catalysts of innovation. Therefore, we developed a multidimensional, thorough training programme for academic, non-academic and administrative staff of HEIs, as well as an acceleration programme that focuses on student-led startups. The training programme focused on enhancing the skills of university staff on startup support programmes, guiding students that want to become entrepreneurs, both technically and professionally. Our training programme did not focus only on hard skills, related to 5G, AI and other trends of Deep Technologies, but also on soft skills, building partnerships, being extrovert, seeking and applying for funding, pitching in front of investors, and other aspects of being an entrepreneur.

Complementarily, the acceleration programme for student startups, accelerating 30 startups in 2 cohorts, over a period of 12 months, has been very successful. Most startups are from the involved HEIs, so the impact that the project has had on the 4 involved HEIs has already been significant. This is also accredited by the re-take of the HEI-Innovate Self-Assessment, which indicated their progress in this field.

Our experience from this project has helped us to make some conclusions on how our IVAP could have been more aimful, if it was better aligned with the RIS3 in each country. The policy forums that were implemented in both phases of the project, including stakeholders of the quadruple helix, really pointed out what challenges each country faces when it comes to igniting innovation, through universities. These challenges include lack of funding, lack of infrastructure, lack of knowledge, but also lack of talented workforce. As a result, we wanted to tackle those challenges through the holistic educational programmes that enhanced the skills of the workforce, both students and staff, in being an extrovert entrepreneur, navigating in funding programmes, exchanging best practices and valuable knowledge and building partnerships.

4. Policy Recommendations

After the implementation of the policy forums, and the end of the training programme, the acceleration programme and all the activities of the project, we have made some significant and concrete conclusions on how the better alignment of EU projects with the RIS3, both in European level, but also in regional level, when possible, can maximise the impact of each project.

4.1. Deep Technologies and Greece RIS3

Connecting Greece's RIS3 with advancements in Deep (Energy, Environment, and Production) technologies can significantly enhance the effectiveness of the strategy and drive sustainable economic growth. Deep technologies align closely with several of Greece's RIS3 priority areas, providing numerous opportunities for innovation and development.

In the **energy** sector, RIS3 can foster the development and deployment of renewable energy technologies, such as solar, wind, and geothermal power, which are abundant in Greece. Investment in smart grid technologies and energy storage solutions can further enhance energy efficiency and reliability. By integrating these advancements, Greece can reduce its dependence on fossil fuels, lower greenhouse gas emissions, and promote sustainable energy production.

For the **environment**, RIS3 can support the adoption of advanced environmental technologies aimed at waste management, water treatment, and pollution control. Innovations in recycling, circular economy practices, and sustainable land use can help address environmental challenges while creating new economic opportunities. Utilizing deep technologies in environmental protection and conservation efforts can lead to a healthier ecosystem and improved quality of life for citizens.

In the **production** sector, the focus on smart manufacturing and Industry 4.0 within RIS3 can be strengthened by incorporating deep technologies. Automation, AI, and advanced materials can enhance production efficiency, reduce energy consumption, and minimize environmental impact. By supporting the transition to more sustainable production processes, Greece can increase its competitiveness in global markets and attract foreign investments.

Collaboration between academic institutions, research centres, and industry is essential to drive the advancement of deep technologies. RIS3 can facilitate this by promoting public-private partnerships, providing funding for research and development projects, and fostering an innovation-friendly regulatory environment. Additionally, investing in education and training programs can equip the workforce with the necessary skills to thrive in a Deep-Tech driven economy.

In summary, integrating deep technology advancements with Greece's RIS3 strategy can amplify the country's innovation potential, enhance sustainable development, and improve economic resilience. By focusing on energy, environment, and production technologies, Greece can address key regional challenges and position itself as a leader in sustainable innovation within the European Union.

4.2. Deep Technologies and Spain RIS3

Integrating Deep Technologies with the RIS3 strategy in Spain can boost the nation's innovation potential and foster economic growth across various sectors. Incorporating advanced technologies into Spain's RIS3 framework can significantly enhance regional specialization efforts and promote sustainable development.

Spain's RIS3 strategy prioritizes the adoption of **Industry 4.0 technologies within the advanced manufacturing** sector. The integration of Deep Technologies such as robotics, AI, and nanotechnology can further transform production processes, improve efficiency, and elevate competitiveness. Regions with a strong industrial base, including the Basque Country and Catalonia, can spearhead these efforts by implementing advanced robotics for automation, AI for predictive maintenance and process optimization, and nanomaterials to enhance product performance and durability.

The **agro-food** sector, essential to Spain's economy, can greatly benefit from Deep Technologies. Regions like Andalusia and Murcia can utilize AI and IoT (Internet of Things) for precision agriculture, boosting crop yields and resource efficiency. Biotechnology can drive the development of sustainable farming practices and high-value-added food products, while nanotechnology can enhance food safety and quality through innovative packaging solutions and sensors.

In the **energy** sector, Spain's commitment to renewable energy development can be reinforced by Deep Technologies. Regions such as Castile and León and Andalusia can incorporate AI and IoT for smart grid management and optimization of renewable energy sources. Nanotechnology can improve the efficiency and storage capacity of solar panels and batteries, thereby enhancing energy security, reducing carbon footprints, and promoting sustainability.

The **health** sector is another critical area where Deep Technologies can have a profound impact. Regions like Madrid and Catalonia, which are already focusing on health innovation clusters, can further advance biomedical research and healthcare delivery through biotechnology, AI, and robotics. AI can enhance diagnostics and personalized medicine, while robotics can improve surgical precision and healthcare automation. Biotechnology can drive the creation of new treatments and vaccines.

ICT and digitalization, crucial across many Spanish regions, can gain significant advantages from Deep Technologies. Regions such as Madrid and Catalonia can continue to heavily invest in AI, quantum computing, and cybersecurity to support digital transformation. AI can be utilized for big data analytics and automation across various industries, while quantum computing can solve complex problems beyond the reach of classical computers. These advancements will strengthen Spain's position in the global digital economy.

The **tourism** sector, vital to Spain's economy, can leverage Deep Technologies to enhance sustainability and improve tourist experiences. Regions like the Balearic Islands and Canary Islands can use AI to analyze tourist patterns and optimize resources, while augmented reality (AR) and virtual reality (VR) technologies can offer immersive cultural and natural heritage experiences. Sustainable tourism practices can be promoted through the use of clean technologies and smart infrastructure.

In summary, connecting Deep Technologies with RIS3 in Spain can significantly enhance the country's innovation capabilities and drive sustainable economic growth. By focusing on advanced manufacturing, agro-food, renewable energy, health, ICT, and tourism, and integrating AI, biotechnology, nanotechnology, robotics, and quantum computing, Spain can strengthen its regional specialization strategies, foster collaboration, and achieve broader economic and social goals. This integration will position Spain as a leader in technological innovation and sustainable development.

4.3. Deep Technologies and Finland RIS3

Integrating Deep Technologies with the RIS3 strategy in Finland can significantly enhance the nation's innovation landscape and drive economic growth across various sectors. Finland's RIS3 strategy emphasizes the adoption of **advanced manufacturing and Industry 4.0** technologies. Integrating Deep Technologies such as robotics, AI, and nanotechnology can further revolutionize production processes, improve efficiency, and elevate competitiveness. Regions with a strong industrial base, such as Uusimaa and Pirkanmaa, can spearhead these efforts by implementing advanced robotics for automation, AI for predictive maintenance and process optimization, and nanomaterials to enhance product performance and durability.

The **bioeconomy**, a critical component of Finland's economy, can greatly benefit from Deep Technologies. Regions like Eastern Finland and South Ostrobothnia can utilize AI and IoT (Internet of Things) for precision agriculture and sustainable forestry, boosting yields and resource efficiency. Biotechnology can drive the development of sustainable agricultural practices and high-value-added bio-based products, while nanotechnology can enhance resource management and environmental sustainability.

In the **energy** sector, Finland's commitment to renewable energy development can be reinforced by Deep Technologies. Regions such as Northern Ostrobothnia and Lapland can incorporate AI and IoT for smart grid management and optimization of renewable energy sources. Nanotechnology can improve the efficiency and storage capacity of wind and solar energy systems, enhancing energy security, reducing carbon footprints, and promoting sustainability.

The **health** sector is another critical area where Deep Technologies can have a profound impact. Regions like Helsinki-Uusimaa and Tampere can further advance biomedical research and healthcare delivery through biotechnology, AI, and robotics. AI can enhance diagnostics and personalized medicine, while robotics can improve surgical precision and healthcare automation. Biotechnology can drive the creation of new treatments and medical innovations.

ICT and digitalization, vital across many Finnish regions, can gain significant advantages from Deep Technologies. Regions such as Uusimaa and Southwest Finland can continue to heavily invest in AI, quantum computing, and cybersecurity to support digital transformation. AI can be utilized for big data analytics and automation across various industries, while quantum computing can solve complex problems beyond the reach of classical computers. These advancements will strengthen Finland's position in the global digital economy.

The **cleantech** sector, a crucial part of Finland's economy, can leverage Deep Technologies to enhance environmental sustainability and improve resource efficiency. Regions like Kainuu and North Karelia can use AI to optimize waste

management and recycling processes, while advanced materials and nanotechnology can contribute to developing innovative environmental solutions.

In summary, connecting Deep Technologies with RIS3 in Finland can significantly enhance the country's innovation capabilities and drive sustainable economic growth. By focusing on advanced manufacturing, the bioeconomy, renewable energy, health, ICT, and cleantech, and integrating AI, biotechnology, nanotechnology, robotics, and quantum computing, Finland can strengthen its regional specialization strategies, foster collaboration, and achieve broader economic and social goals. This integration will position Finland as a leader in technological innovation and sustainable development.

4.4. Deep Technologies and Czech Republic RIS3

Integrating Deep Technologies with the RIS3 strategy in the Czech Republic can significantly enhance the country's innovation landscape and drive economic growth across various strategic sectors. By integrating advanced technologies more aimfully into the Czech Republic's RIS3 framework, the country can strengthen its regional specialization efforts and become more competitive, through sustainable development.

The Czech Republic's RIS3 strategy prioritizes **advanced manufacturing and Industry 4.0** technologies. Integrating Deep Technologies such as robotics, AI, and nanotechnology can revolutionize production processes, improve efficiency, and enhance competitiveness. Regions with strong industrial bases, such as Central Bohemia and Moravia-Silesia, can lead these efforts by deploying advanced robotics for automation, AI for predictive maintenance and process optimization, and nanomaterials to enhance product performance and durability.

In the **bioeconomy** sector, which plays a crucial role in the Czech Republic's economy, Deep Technologies can significantly contribute. Regions like South Bohemia and Vysocina can leverage AI and IoT (Internet of Things) for precision agriculture and sustainable forestry practices, optimizing resource use and improving yields. Biotechnology can drive innovations in bio-based products and sustainable farming techniques, while nanotechnology can enhance environmental monitoring and management.

Renewable energy is another priority area where the Czech Republic aims to enhance its capabilities through RIS3. Regions such as Liberec and Pardubice can integrate AI and IoT for smart grid management and optimization of renewable energy sources. Nanotechnology applications can improve the efficiency and storage capacity of solar panels and energy storage systems, thereby promoting energy security and sustainability.

The **health** sector stands to benefit significantly from Deep Technologies. Regions like Prague and South Moravia can advance biomedical research and healthcare delivery through biotechnology, AI-driven diagnostics, and robotics-assisted surgery. AI can improve patient care and treatment outcomes, while biotechnology innovations can lead to the development of new therapies and medical technologies.

In conclusion, connecting Deep Technologies with RIS3 in the Czech Republic can enhance the country's innovation capabilities and drive sustainable economic development. By focusing on advanced manufacturing, the bioeconomy, renewable energy, health, ICT, and cleantech, and integrating AI, biotechnology, nanotechnology, robotics, and quantum computing, the Czech Republic can strengthen its regional specialization strategies, foster collaboration,

and achieve broader economic and societal goals. This integration will position the Czech Republic as a leading power in technological innovation and sustainable development within Europe.

4.5. Deep Technologies and Ukraine RIS3

Integrating Deep Technologies with Ukraine's RIS3 strategy amidst the challenges of conflict holds immense potential to advance the country's innovation landscape, foster resilience, and stimulate economic growth across various critical sectors. Ukraine must put Deep Technologies into its strategic framework, so that the country not only can bolster regional specialization efforts, rebuild infrastructure, and promote sustainable development despite the ongoing conflict but also to ignite innovations that enhance national security.

Ukraine's RIS3 strategy emphasizes sectors such as IT and digitalization, agriculture, energy, healthcare, and infrastructure redevelopment. The integration of Deep Technologies like AI, robotics, and biotechnology can play a pivotal role in revitalizing these sectors. Regions with strong industrial bases, such as Kyiv, Lviv, and Dnipropetrovsk, can lead efforts in deploying advanced robotics for manufacturing automation, AI for smart agriculture and healthcare diagnostics, and nanotechnology for material science applications, contributing to rebuilding efforts and economic recovery.

In **agriculture**, a cornerstone of Ukraine's economy affected by conflict, Deep Technologies can significantly enhance productivity and sustainability. Regions like Kharkiv and Poltava can utilize AI and IoT (Internet of Things) to optimize precision agriculture, improving crop yields and resource efficiency despite challenges in rural areas. Biotechnology advancements can aid in developing resilient crops and eco-friendly farming practices, while nanotechnology applications can improve soil health and food safety through advanced sensors and materials.

Energy remains a critical focus within Ukraine's RIS3 strategy, aiming to enhance efficiency and reduce dependency on external energy sources amidst conflict disruptions. Regions such as Zaporizhzhia and Mykolaiv can integrate AI and IoT for smart grid management, optimizing energy distribution and consumption efficiency. Nanotechnology innovations can enhance the performance and durability of renewable energy technologies like solar panels and energy storage systems, supporting Ukraine's transition towards sustainable and resilient energy solutions.

In **healthcare**, Deep Technologies offer promising solutions to mitigate the impacts of conflict on public health infrastructure. Regions like Kyiv and Kharkiv can leverage biotechnology for pharmaceutical innovations and personalized medicine, addressing healthcare challenges exacerbated by conflict. AI-driven diagnostics can improve disease detection and treatment effectiveness, while robotics can enhance surgical precision and healthcare delivery efficiency in trauma and emergency situations.

ICT and digitalization are pivotal for Ukraine's resilience and recovery, with RIS3 initiatives focusing on digital infrastructure development and cybersecurity amidst heightened security challenges. Regions like Kyiv and Lviv can continue investing in AI, quantum computing, and cybersecurity to advance digital transformation efforts. AI-powered analytics and automation can optimize logistics and supply chain management, while quantum computing can address complex computational challenges critical for national security and economic stability.

Innovations in **cleantech** are crucial for environmental sustainability and post-conflict recovery efforts in Ukraine. Regions like Lviv and Odesa can leverage Deep Technologies to enhance waste management systems and promote eco-friendly technologies despite infrastructure challenges. AI and IoT applications can improve resource efficiency and support sustainable urban planning, contributing to Ukraine's green development agenda amidst reconstruction efforts.

In conclusion, connecting Deep Technologies with Ukraine's RIS3 strategy amidst conflict can bolster the country's innovation capabilities, foster resilience, and drive sustainable economic development despite adversity. By focusing on advanced manufacturing, agriculture, energy, healthcare, ICT, and cleantech and integrating AI, biotechnology, nanotechnology, robotics, and quantum computing, Ukraine can strengthen regional specialization strategies, promote collaboration, and achieve broader economic and societal goals despite ongoing challenges. This integration will help Ukraine to mitigate the financial consequences of the conflict.

5. Conclusions

RIS3 is a very useful map that countries can follow to fully exploit their advantages and fulfil their potential. Each country has different competitive advantages, and sometimes it is difficult for an EU project to address all the different aspects. In the Skills2Scale case, we targeted Deep Technologies and focused on Beyond 5G connectivity. 5G can be utilized in innovative startups directly, for telecommunication services, microchips, antennas etc. but also indirectly, in Agrifood, tourism, waste management and other fields, by using its capability for fast transfer of data. Therefore, making entrepreneurs familiar with the use cases of 5G can be useful for all the European regions, despite the RIS3.

Overall, our IVAP aims to transform the involved universities into hubs that ignite innovation and support their students to have an entrepreneurial mindset, be extroverted and foster innovation. We are achieving this through the education of the staff of these universities. Via our educational programme and the various aspects that it covers, not only on technical things, but also cultivating soft skills, the academic, non-academic and administrative staff of these HEIs have really gained the know-how on how to build startup support programmes and help their students with the first entrepreneurial steps. The methodology of our IVAP and the Peer Learning Events, complemented by the Local Stakeholders' event that disseminated the knowledge shared, has been really successful.

Our next goal is, through effort to continue the Skills2Scale project, and even upscale it, through other EU programmes, to better align the thematises of the training to the RIS3 of each involved country. This way, we will maximise the impact of the project and create real value for each country separately.

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