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Advancing Research and Innovation in the Danube Region

Report – The Role of Smart Specialisation in the EU Enlargement and Neighbourhood Policies

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List of Abbreviations

AA	Association Agreements
BERD	business enterprise research and development
BES	Business-Enterprise Sector
B&H	Bosnia and Herzegovina
CEEC	Central Eastern European Countries
CIS	Commonwealth of Independent States
DCFTA	Deep and Comprehensive Free Trade Agreement
EaP	Eastern Partnership
EC	European Commission
EDP	entrepreneurial discovery process
EEU	Eurasian Economic Union
E&N	Enlargement and Neighbourhood
ENP	European Neighbourhood Policy
EU	European Union
FDI	foreign direct investment
FYROM	former Yugoslav Republic of Macedonia
GDP	gross domestic product
GERD	gross domestic expenditure on research and development
GOV	Government sector
HEI	Higher Education Institutions
HES	higher education sector
ICT	information and communication technology
IPA	Instrument for Pre-Accession Assistance
IUS	Innovation Union Scoreboard
M&E	monitoring and evaluation
NGO	non-governmental organisation

NIF	Neighbourhood Investment Facility
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Co-operation and Development
PPP	Purchasing power parity
R&D	research and development
RDA	regional development agencies
RDI	research, development and innovation
R&I	research and innovation
RI	research Infrastructures
RIS	regional innovation strategy
RIS3	Research and innovation smart specialisation strategy
SMEs	small and medium-sized enterprises
S&T	science and technology
S3	Smart Specialisation
TAIEX	Technical Assistance and Information Exchange instrument of the European Commission
Twinning	European Union instrument for institutional cooperation between Public administrations of the EU Member States and of beneficiary or partner countries
SIGMA	Support for Improvement in Governance and Management

1 Executive Summary

The Danube.INCO-NET project aims, among other issues, at fostering innovative and inclusive Danube societies through support to the design and implementation of the smart specialisation strategies. The less developed Danube countries outside the EU are urging for more support for reinforcing their research and innovation (R&I) capacities, improving policy implementation and governance. Therefore this report examines whether and how these territories could benefit from smart specialisation (S3) approach for their R&I strategies. The report explores the conditions under which the S3 model can be applied in the EU enlargement and neighbourhood (E&N) countries. The analysis examines R&I developments in 11 E&N countries. Within the EU Enlargement framework we discuss developments in 5 Western Balkan countries: Serbia, Montenegro, Macedonia, Albania and Bosnia & Herzegovina. In the context of the EU Neighbourhood policy we explore conditions for R&I in the Eastern Partnership countries: Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine. The report underlines the most significant R&I developments in the selected groups of the countries and provides an evaluation of their R&I policies with regard to S3. Consequently the report identifies the main gaps that might hinder successful implementation of S3 initiatives in the E&N countries. The authors suggest considering some essential pre-conditions for initiation of sustainable S3 processes such as achieving political consensus and commitment to launch the process; to establish sufficient R&I governance and coordination capacities and to build analytical and policy implementation capabilities. The report offers some guidance for the E&N countries on facilitating the S3 process and the issues to be considered. Furthermore, the report provides recommendations for the RIS3 assessment methodology to better capture the S3 relevant factors specific for the E&N countries.

2 Introduction

Smart specialisation (S3) is a place-based policy concept promoting regional economic transformation and investment through innovative activities in the selected domains. In the current programming period it has been an ex ante conditionality for the EU countries to develop smart specialisation strategies to focus their investments in the areas with highest impact and potential for competitiveness. The application of the S3 concept is spreading into the new domains as well as outside the EU borders. Among in total 179 regions and 20 countries that are members of the S3 Platform (S3P)[1] there are also Serbia and Moldova, as well as a few Turkish and Norwegian regions, which have expressed an interest in developing their smart specialisation strategies with the support of the S3P.

The Danube region is a very diverse macro-region which also includes non-EU countries such as the EU enlargement countries (i.e. Bosnia and Herzegovina, Montenegro and Serbia) and the EU neighbourhood countries (i.e. Moldova and Ukraine). The EU Strategy for the Danube Region (EUSDR) strengthens cooperation and the dialogue between the EU and non-EU countries in the region. It facilitates integration of candidate and potential candidate countries to accede the EU. It provides a platform to transmit the knowledge, strengthen the links and enhance the administrative culture in the non-EU countries. The creation of solid networks contributes to stability and cohesion of the region.

The Danube-INCO.NET project is a support action for the implementation of the EU strategy for the Danube Region (EUSDR) in the field of research and innovation (R&I). Among 19 partners it includes 4 partners from the non-EU countries: Ukraine, Moldova, Serbia, and Bosnia and Herzegovina. The S3P leads an action fostering innovative and inclusive Danube societies through support to the design and implementation of the smart specialisation strategies. Within this action the S3P initiated the S3 awareness raising and transnational learning events such as the S3 peer review in Novi Sad (Serbia, 2014) and S3 Design & Learning Workshop in Chisinau (Moldova) aiming to share benefits of the S3 approach and good practices in the EU countries.

The conditions to apply the S3 approach to R&I strategies differ a lot in the EU neighbourhood and enlargement countries from the EU member countries. Implementation of the S3 model outside the EU raises many questions about the barriers and opportunities and a country specific factors hampering knowledge transfer and more efficient R&I policies. That encouraged us to consolidate knowledge on research and innovation processes in the enlargement and neighbourhood countries in the systematic way evaluating the current status with regard to S3 in order to better prepare and target the future support actions in these countries.

2.1 Objectives, target group and the structure of the report

The report is aiming to explore the possibilities how the S3 approach could be applied to improve research and innovation (R&I) policies in the EU enlargement and neighbourhood countries and to provide recommendations for the capacity building actions.

[1] As of 1st December, 2016

In the first chapter of the report we will discuss the possible benefits of the S3 approach aiming to disseminate good practice and lessons relevant for less developed countries outside the EU. The subsequent chapters will explore R&I developments in the countries outside the EU identifying the major gaps and barriers (legal, political, financial, technology or capacity) taking into account the particular challenges that these countries experience in developing and implementing their R&I strategies.

EU's relations with its closest neighbours outside the borders are governed by the EU Enlargement Policy and European Neighbourhood policy frameworks. EU's Enlargement policy deals with the countries currently aspiring membership of the EU. The enlargement process is based on the accession criteria as conditionality to drive necessary political and economic reforms in these countries. EU Neighbourhood policy is aiming to develop closer political and economic ties between the EU and its neighbouring countries creating a stable, integrated and secure area. We deem it important that messages of the S3 concept are transmitted and communicated in coherence with these frameworks.

Some of the Danube countries outside the EU are beneficiaries of the EU Enlargement policy such as Bosnia and Herzegovina, Montenegro, Serbia; and other as Moldova and Ukraine are part of the EU neighbourhood countries. To increase the coverage and the benefits of this study we have decided to include countries outside the Danube region which share the common features and fall under the same EU policy frameworks. Within the EU Enlargement framework we will discuss the R&I policy developments in five *Western Balkan Countries* (WBC), which are candidate countries or aspiring to reach the EU membership: *Serbia, Montenegro, Macedonia, Albania and Bosnia & Herzegovina***.** In the context of the EU Neighbourhood policy we will explore the situation in six countries in Eastern Europe and the South Caucasus: *Armenia, Azerbaijan, Belarus, Georgia, Moldova, and Ukraine,* which are part of *the EU Eastern Partnership (EaP) initiative.*

The chapters on E&N countries start with a short discussion of the overall R&I context and also conditions stemming from the EU enlargement policy or neighbourhood policy frameworks. The analysis includes a comparative overview of R&I developments pointing out the particularities in each of the countries of the group. This part of the report aims to assess R&I systems of the respective countries with regard to the S3 approach identifying the existing gaps and country specific preconditions that might impede the development of the S3 strategy. The detailed country case studies on R&I systems of Ukraine and Macedonia representing each of the groups will provide in-depth insights into the current situation and development of R&I policies and capabilities to meet the S3 approach (see Annex IV and Annex V).

Based on the analysis of the previous chapters we will discuss possible implications for the EU Enlargement and Neighbourhood Policies and the countries addressed by these policies with regard to the S3. We will consider possible adaptations of the S3 model and necessary pre-conditions when applying it outside the EU taking into account the diverse conditions and levels of technological development, weak institutional capacities to pursue successful innovation policies and the different maturity and readiness for S3.

Finally the report clarifies the conditions of R&I systems in the EU enlargement and neighbourhood countries to apply S3 and provides recommendations regarding capacity building actions to address R&I challenges.

2.2 Methodology

The S3 Platform has developed the *RIS3 Guide*[2] which sets out the concept and provides orientations on how to develop RIS3. The Guidance is structured into six steps of R&I strategy development:

Step 1 - Analysis of the regional/national context and potential for innovation;
Step 2 - Governance: Ensuring participation and ownership;
Step 3 - Elaboration of an overall vision for the future of the region;
Step 4 - Identification of priorities;
Step 5 - Definition of coherent policy mix, roadmaps and action plan;
Step 6 - Integration of monitoring and evaluation mechanisms.

The R&I systems of the countries will be assessed with regard to these dimensions discussing bottlenecks and divergences from S3. We will use the *RIS3 Assessment Wheel*[3] which is built on the basis of the six steps described in the RIS3 Guide and the identification of critical factors for each step. The tool will allow the evaluation of essential factors for S3 development, will provide a visualisation of the assessment in a comparative way and will highlight the gaps. The methodology of RIS3 Assessment Wheel is explained in the Annex I.

RIS3 Guide and RIS3 Assessment Wheel have been developed to assess the Research and Innovation Strategies for Smart Specialisation (RIS3) in the EU regions. Here we will use these tools for the R&I strategies, which were not intended to comply with the S3 approach. Therefore the results have to be taken with care without making concrete judgements but in support to identify and address the difficulties.

In addition it needs to be noted, that country the assessments carried out with the RIS3 Assessment Wheel (Annex II, Annex III) are tentative and based only on desk research and in-country experience of the authors. For a more solid assessment in-country interviews with main stakeholders would be required, which were not possible due to the limitations of this project.

[2] http://s3platform.jrc.ec.europa.eu/s3-guide
[3] http://s3platform.jrc.ec.europa.eu/ris3-assessment-wheel

3 The Role of Smart Specialisation in the EU Enlargement and Neighbourhood Policies

3.1 The rationale for smart specialisation approach in non-EU countries within the EU Enlargement and Neighbourhood Policies

The smart specialisation (S3) for research and innovation strategies has been mostly applied at the EU countries and regions where it has been a requirement for regions implementing operational programmes with the European Structural & Investment Funds (ESIF). This model has been applied to increase the impact of knowledge-based investment. It has triggered a change of innovation-driven regional development and improvements in research and innovation policy design, which has been confirmed by the many EU regions.[4]

EU seeks to share the benefits of the EU with neighbouring countries and the countries that are aspiring EU membership in order to strengthening stability, security and well-being in Europe. Smart specialisation has been recognised as a strategic approach towards economic development leading to more effective R&I strategies and inclusive, sustainable growth, therefore EU neighbourhood and enlargement policies are putting more attention to smart specialisation.

EU's enlargement policy (European Commission, 2015a) provides increased economic opportunities and at the same has a powerful transformative effect on the countries aspiring EU membership. The enlargement countries see it as opportunity for long-term convergence, increase of investment and trade and access to the ESIF. Therefore it is a good momentum to kick start S3 based approach towards R&I to promote structural change and growth. The EU regulation establishing the Instrument for Pre-accession Assistance (IPA II) (European Parliament and the Council, 2014) clearly mentions smart specialisation as a thematic priority for assistance to enlargement countries. S3 and the accompanying ex-ante conditionality have a clear legal basis in the acquis communautaire and will be relevant fur future accession countries.

The new European Neighbourhood Policy (ENP) (European Commission, 2015b) declares that the modernisation of the economy, fostering research and innovation are crucial for promoting economic, social and territorial cohesion in the neighbourhood. It also recognizes that this could be achieved by facilitating increased participation of neighbourhood countries in EU initiatives through transfer of knowledge and applying already established models such as smart specialisation. In reinforcing cooperation in R&I with neighbourhood countries the EU supports a common knowledge and innovation space, bringing together R&I cooperation, mobility for academics, and capacity building. The cooperation includes widening access to programmes, resources and broadening mechanisms for co-funding.

The reform and transition processes in the enlargement and neighbouring countries are facilitated via numerous instruments: Technical Assistance and Information Exchange instrument (TAIEX)[5],

[4] http://s3platform.jrc.ec.europa.eu/smart-stories
[5] https://ec.europa.eu/neighbourhood-enlargement/tenders/taiex_en

instrument for institutional cooperation between public administrations - Twinning[6], Support for Improvement in Governance and Management (SIGMA)[7], Cross-Border Cooperation Programmes[8] and Neighbourhood Investment Facility (NIF)[9] and IPA[10]. These tools ensure practical transfer of know-how from the EU countries supporting the partners in upgrading and modernising their institutions. These instruments could be used to strengthen R&I policy governance and implementation capacities applied S3 based approach. Furthermore the number of associated countries to Horizon 2020[11] is growing which opens a wide range of opportunities and access to knowledge and R&I networks for the non-EU partners as they can participate under the same conditions as partners from the member states.

The EC has developed the S3 approach as a new tool to facilitate knowledge based growth in developed regions and also less developed regions and countries. The benefits of this approach are still early to judge though preliminary evidence suggests that it varies across countries/regions both regarding strength and types of effects (Kroll, 2015). It may lead to improved governance structure for R&I or to closer links between business and public R&D, or closer cooperation among companies in specific sectors or to broadening policy focus from the only R&D to innovation, etc. (European Commission, 2016) . Also, the S3 has been increasingly perceived as an approach that could have transformative effects on the countries aspiring to the membership by enhancing further investment in research and innovation and by streamlining these efforts in more coordinated and effective manner.

The benefits of the S3 approach evidenced so far are mainly gained during the process when developing S3 strategies. The biggest gains and value conceived from this process are experienced in improving governance of R&I. The S3 model requires that all relevant R&I stakeholders including industry, education and research institutions, and government and civil society participate in S3 strategy design and the priorities are identified through their systematic interaction and entrepreneurial discovery process. That worked differently in every region: in some the process was a natural extension of the existing tradition, in some less developed regions with low culture of cooperation it took more effort and was harder to achieve although brought rewarding results.

S3 requirement for an entrepreneurial discovery process triggered for widespread stakeholder participation engaging all actors of the innovation system. Public sector must engage with the private sector in order to have productive interaction. Interaction between entrepreneurial actors and policy makers facilitates transmission of entrepreneurial knowledge and allows leveraging scientific knowledge with market opportunities. Organising this interaction and building relationship between various stakeholder groups was recognised as the most valuable exercise in most of the countries (European Commission, 2016a).

[6] https://ec.europa.eu/neighbourhood-enlargement/tenders/twinning_en
https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/pdf/taiex/20160804-taieex-activity-report-2015_en.pdf
[7] SIGMA is a joint initiative of EU and OECD http://www.sigmaweb.org/
[8] Interreg IPA or Interreg ENI Cross-border programmes
[9] https://ec.europa.eu/neighbourhood-enlargement/neighbourhood/neighbourhood-wide/neighbourhood-investment-facility_en
[10] https://ec.europa.eu/neighbourhood-enlargement/instruments/overview_en
[11] http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cpart/h2020-hi-list-ac_en.pdf

Institutional environment is a prominent determinant to keep this relationship sustainable. Strengthening existing institutional structures to have sufficient analytical and implementation capacities and developing interaction mechanisms all these are prerequisites to make S3 possible. The creation of an institutional eco-system that fosters innovation will build the base for S3 strategy. Strengthening institutions and good governance is also one of the key aims (European Commission, 2016b) in the roadmaps of the EU and E&N countries' cooperation frameworks.

The EU regions mention S3 input in triggering competitiveness of economy through enhancement of relevant economic sectors and creation new niches. S3 helps to modernise the main sectors by adding scientific knowledge and inter-sectorial innovation to traditional industries. The S3 approach promotes economic opportunities in emerging sectors based on technological capabilities and synergies between related sectors. The new approach leads to the transformation of regional economies though increased productivity, labour efficiency and a high level of innovation which is helping to attract skills, ideas and capital. The modernisation of the economy, fostering innovation is one key EU cooperation priorities for building economic stability in E&N countries.

The S3 helps to creates transnational linkages and connections to global value chains. Collaboration in research and innovation is a key component of S3. Cooperation with others and looking outwards helps to understand the competitive position of a country with regard to others and to identify its position within global value chains. Collaborating in S3 countries and regions combine complementary strengths, exploit their competences in R&I, get necessary research capacity, overcome lack of critical mass as well as fragmentation and access to the global value chains. Transnational extensions in S3 contributing with new knowledge or capabilities allow finding new paths and lead to economic growth (Mariussen Åge et al., 2016)

One of the drivers for transnational and inter-regional collaboration in S3 relates to the attempts to overcome the lack of public investment for R&I, where the alignment of S3 agendas lead to alignment of funding instruments for implementation of joint initiatives. As discussed further in this paper low R&I funding is one of the major issues in all E&N countries. For the less developed regions S3 activities could enable technology upgrading via foreign direct investment and connections to global value chains (Radosevic and Stancova, 2015). Integration into the European markets, sharing know-how on R&I policy approaches, transfer of knowledge and capabilities, building joint projects in priority areas of mutual interest, getting access to additional funding sources and access to the EU programmes, all these are of prime interest of E&N partners.

Exploiting the benefits and potential of S3 model in the E&N countries depends on whether and how the S3 approach could be applied to improve research and innovation policies in their local context. In the following chapters we will try to explore this context in the framework of enlargement and neighbourhood concepts.

3.2 R&I systems in the EU enlargement countries from the perspective of S3

Slavo Radosevic

3.2.1 General context and chapter outline

For the Western Balkan countries the opportunity to become a member of the European Union is a true opportunity for long-term economic convergence, for inflow of the capital and rise of productivity through increased trade, competition and investment. It is a chance to get free access to the single market for goods and services, to achieve improved consumer choice (welfare gains) and to access EU Structural funds to help finance R&D, innovation, infrastructure and environmental projects. These opportunities are manifold and operate in all Western Balkan countries as a unifying force in otherwise quite fragmented societies. However, it is important to bear in mind that enlargement by itself does not solve competitiveness and technology or the industrial upgrading issue. The single market and meeting institutional preconditions for the EU membership improve the legal and institutional context for economic growth, but they by themselves do not guarantee improved competitiveness, social cohesion and balanced development.

In this chapter, we, first, briefly outline the key features of the five Western Balkan economies that either have the status of candidate countries or are on the way to get that status (Serbia, Montenegro, Macedonia, Albania and Bosnia & Herzegovina, further WB-5 countries). Second, we discuss the specific features of the S3 approach that may be expected in adoption by WB-5 countries. Third, we use the RIS3 Guide and the RIS3 Assessment Wheel as a framework to evaluate the overall readiness as well as the alignment of specific dimensions of S3 approach with the WB-5 countries R&I strategies. Fourth, we conclude that the S3 approach represents a useful tool for assessing R&I policies in the WB-5 but that its application in the WB context would need to recognise the different nature of innovation processes in the WB-5 and country and region specific obstacles to improved productivity and technology upgrading. In that respect, the RIS3 Assessment Wheel as a tool would need to be adjusted to capture the regional specific technology and upgrading challenges. We provide some suggestions in this respect at the end of the report.

3.2.2 Western Balkan - 5: key development and innovation features

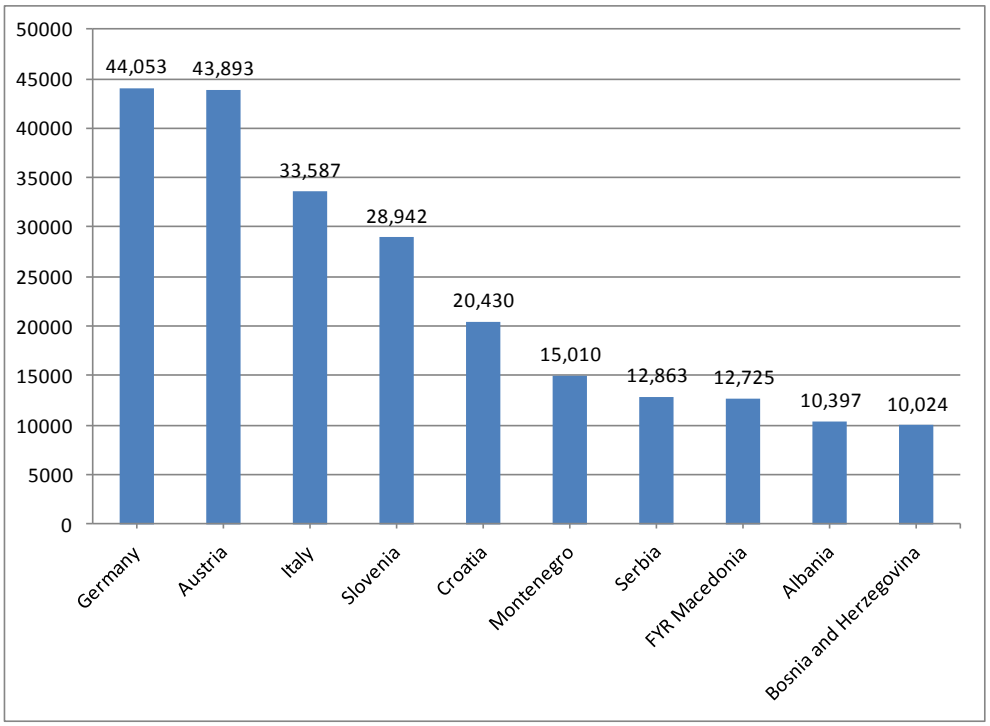
WB-5 countries belong to lower middle-income economies as their gross national income per capita (in PPP) varied in 2015 from $10K (Bosnia and Herzegovina) to $15K (Montenegro)[12] (see Figure 1). GDP per capital in WB-5 countries ranges from 22-34% of German income which makes it a fairly homogenous group.

This ranking is reflected in the World Economic Forum Global Competitiveness Index which divides countries/economies by stages of development into factor driven, efficiency driven and innovation driven. The WB-5 group falls into the category of efficiency-driven economies. In this stage of development, growth is also driven by innovation, but the weight of basic requirements and

[12] Source: Word Bank development indicators database 2016

efficiency factors which cannot be attributed directly to innovation and the overall sophistication of business practices is much more prevalent.

Figure 1: GDP per capita 2015, PPP (constant 2011 international $)



Source: World Bank Development Indicators 2016

Although quite homogenous regarding current incomes per capita, WB-5 countries are quite different regarding overall competitiveness and also regarding ranking on three different drivers of growth (Table 1).

Table 1: Ranking of Western Balkan – 5 economies on Global Competitiveness Index: overall and individual drivers (based on 140 economies)

Driver of growth	Macedonia FYROM	Montenegro	Albania	Serbia	Bosnia & Herzegovina
Basic requirements (institutions, infrastructure, macroeconomic environment)	60	58	87	96	95
Efficiency enhancers (higher education and training, goods and labour market efficiency, financial market development, technological readiness, market size)	64	75	89	83	112
Innovation and sophistication factors (business sophistication, innovation)	62	86	115	125	120
Overall ranking	60	70	93	94	111

Source: WEF GCI 2015-2016

Although they all rank higher in basic factors than on efficiency enhancers or innovation, there are big differences regarding business sophistication and innovation. This suggests that potential for growth based on innovation is quite different but also that the existing innovation potential is poorly

employed in their current growth. For example, the gap in ranking on innovation between Serbia and FYROM is quite high in favour of FYROM despite much more developed R&D system of Serbia.

The low-income level is quite an important feature of these economies as their drivers of growth are not identical to drivers of growth in high-income economies. Their drivers of growth are widely related to physical investments, production capability, human capital and skills, openness and acquisition of foreign knowledge and to a smaller extent to own R&D and technological capability, and business or institutional environment (Hulten and Issakson, 2007; Lee, 2013).

This specificity of WB-5 countries is quite important for S3 approaches in this region which should promote those drivers of growth that are the most relevant in the medium term. So, in addition to R&D and capability to generate new technologies policy should consider much more the role of production capability and capability to import effectively and adopt foreign technologies.

Production capability is the capability to produce at world standards of efficiency and quality at a given technology. This is the capability to use and operate given forms of technology in specific configurations and should be distinguished from the capability to create and implement innovations in production to change the forms and configurations of current technologies in use (Bell, 2007).

ISO9001 certificates per capita are a satisfactory proxy for production capability. ISO9001 is a general management standard and indicates that there are activities at the firm level which aim at operating at the world levels of efficiency with the given technology. Table 2 shows that there is a huge lag of WB-5 countries when compared to other reference economies.

Table 2: Number of ISO 9001 certificates per 1 million inhabitants, 2010-2014

Country	No of ISO9001 certificates per 1 million inhabitants
Italy	12297
Slovenia	4176
Germany	3236
Croatia	2899
Austria	2637
Serbia	1799
Bosnia and Herzegovina	1297
Montenegro	934
FYROM	897
Albania	243

Source: For ISO certificates ISO Database, for population World Bank Development Indicators 2016

This lag is particularly high in economies that are not yet part of European or regional value chains (FYROM, Montenegro and Albania[13]). However, by and large, there are significant differences in production capability among WB-5 countries. This calls for the broader understanding of innovation which should include non-R&D, design engineering and software, training and technical operating skills.

[13] Differences among countries also reflect differences in industry structure or biases of different sectors towards use of ISO9001 certificates.

R&D capabilities have property to generate new knowledge to technology frontier as well as to facilitate absorption of knowledge from abroad. However, just R&D is not sufficient for generating innovation. Non-R&D activities which are closely related to either R&D or production are design and engineering capabilities, and they are very often the key to industrial growth of many middle-income economies, including WB-5 economies. R&D is increasingly important as countries move closer to the technology frontier. However, in middle-income economies like in WB-5 countries R&D is also is important to enable absorption of foreign knowledge rather than generate new knowledge at technology frontier. In that respect, the nature of R&D is also different when compared to technologically more advanced economies.

WB-5 countries are investing to a quite limited extent in R&D. Their investments are comparable to economies of their level of income and are either close or well below 1% (Table 3). Also, their R&D systems are largely publicly driven with very limited investments by the business sector.

Table 3: Research and development expenditure (% of GDP), 2013

Country	GERD as % of GDP
Germany	2.9
Austria	2.8
Slovenia	2.6
Italy	1.3
Croatia	0.8
Serbia	0.7
Macedonia, FYRM	0.4
Montenegro	0.4
Bosnia and Herzegovina	0.3
Albania	..

Source: World Bank Development Indicators 2016

In summary, important features of WB-5 economies is that they are lower middle-income economies which growth is based largely on: the production capability or efficiency enhancing drivers related to training and skills of the labour force; the capacity to absorb foreign technology and to establish an economic system that promotes entrepreneurship, competition but also social cohesion. Enterprises in WB-5 countries, as in high-income economies are the major agents of the innovation process that respond to signals in the market and broader institutional environment. When the external environment is stable, predictable, and transparent and when it encourages competition but also a long-term planning horizon the enterprises are induced towards productive forms of entrepreneurship based on costs, quality and innovation. When the business environment is unstable, unpredictable, abundant in red tape and under the substantial influence of the discretionary state, this encourages corruption, buying favours and anti-innovative search for short-terms profits and their use for unproductive purposes.

Our core point here is that S3 for the WB-5 region needs to take on board these key developmental features. The WB-5 countries are in relative terms quite poor European economies and drivers of their growth differ from their richer northern and western neighbours. This calls for broader understanding of innovation as well as for identification of region and country-specific constraints. In

the next section, we use RIS3 Assessment Wheel as a framework to evaluate major gaps and obstacles that may hinder the development of appropriate S3 strategies.

In overall, WB-5 economies growth is based on production as opposed to technological capabilities. By this we mean that enterprises compete on basis of the efficient use of standard technologies but through enhancing production capability and adoption of foreign technologies. In this respect, they are similar to other countries of Central and Eastern Europe (see Majcen et al., 2009; Kravtsova and Radosevic, 2011).

3.2.3 Assessment of the R&I strategies in WB-5 countries with regard to S3

Historically, WB-5 countries, as well as the overall Balkan region, have not been a convergence region. Although, being nearby of Central and Western Europe historically this region has stayed European periphery (Gligorov, 2016, Gabrisch et al., 2016). This situation reflects feeble internal 'assets' as well as the ambiguous role of external factors like for example foreign banks in the very recent history. This is where the historical importance of enlargement and specifically S3 could play a major role in breaking this vicious circle of semi-development.

Further the R&I systems in WB-5 countries will be assessed with regard to their alignment to the S3 model. The assessment will follow the RIS3 steps described in the RIS3 Guide. The RIS3 Assessment Wheel will be used to as a tool to evaluate essential factors for S3 and to identify the gaps. The outcome of the RIS3 Wheel assessments can be found in the Annex II.

3.2.3.1 Analysis of the regional/national context in the WB-5 countries

Regional/national assets and framework conditions

S3 is a place-based policy concept promoting regional economic transformation and investment through R&I activities in selected domains. The identification of these strategic priority areas for R&I activities has to be based country specific context, analysis of the strengths and potential of the economy. Compared to the Central Europe WB-5 countries have a rather weak manufacturing sector especially in technology-intensive industries. The national context of WB-5 economies is summarised in the SWOT matrix below. The flexible labour market can be considered a real strength of the region. The weaknesses which deter growth are very limited investments in transport and energy infrastructures and vocational education. The EU enlargement process is immense opportunity to improve national governance and to integrate WB-5 economies into European supply chains. However, whether this possibility will be realised strongly depends on the speed of the enlargement process, on the state of the financial system. In addition to these common factors, there are several country-specific factors which are highlighted in SWOT matrix (Table 4).

Table 4: SWOT Matrix of the Western Balkan - 5 economies

Strength	**Weaknesses**
- Flexible labour markets - Long tradition in agriculture (Serbia) - Young population (Albania and Kosovo)	- Poor investment in transport and energy infrastructures - Poor investment in vocational education - Weak manufacturing sector - Complex state governance (B&H)
Opportunities	**Threats**
- EU Integration processes - Tourism - Energy sector development (Serbia, B&H, Albania) and forestry sector (B&H) - Integration into international transport and production networks	- Outmigration - Political stalemate and fragile situation (B&H, Macedonia, FYR and Kosovo) - Unreformed financial system - Slowdown in enlargement process

Evidence based analysis of regional/national context in current R&I strategies of WB-5

From the perspective of S3, it is important to explore whether the current R&I strategies of WB-5 are based on a sound analysis of the regional economies, societies, and innovation structures/ecosystems. A brief overview of the existing strategies in the region shows that the analyses are either non-existent or are entirely R&D focused. For example, the Albanian Science, Technology and Innovation National Strategy 2009–2015[14] and the 2012–2016 Strategy for Sustainable Economic Growth of Montenegro through Introduction of Clusters do not have an analysis section. The Innovation Strategy of the Republic of Macedonia for 2012–2020[15] has a brief and descriptive analysis of and challenges for the national innovation system and does not seem to be based on international benchmarking and does not draw on knowledge and insights of local entrepreneurs. Strategy for Scientific and Technological Development of Serbia for the period from 2016 to 2020 - "research for innovation"[16] contains analysis but it is narrow in scope by being focused only on R&D sector.

In the frame of the SmartEIZ[17] project, which is the twinning project to strengthen the cooperation between Institute of Economics, Zagreb (EIZ) and leading international partner institutions in EU, the questionnaire has been carried out on R&I policy support needs of innovation stakeholders in South East European countries addressing the issues of S3. Table 5 shows results of 99 responses by policymakers and policy analysts in the region (including Croatia) on the relevance of S3 topics. Learning how to conduct sound analysis for is not given high importance when compared to other items.

[14] http://portal.unesco.org/en/files/47499/12677115709STI_english.pdf/STI%2Benglish.pdf
[15] http://www.seecel.hr/UserDocsImages/Documents/InnovationStrategy%20EN%20version.pdf
[16] http://aler.rs/files/STRATEGIJA_naucnog_i_tehnoloskog_razvoja_Republike_Srbije_za_period_od_2016_do_2020_godine_Istrazivanja_za_inovacije_Sl_gl_RS_br_25_2016.pdf
[17] http://www.smarteiz.eu/

Table 5: The relevance of S3 topics[18]

S3 topics	Average weight	% of responses 5 and above
7. Developing transnational collaboration projects	5.7	77%
5. Entrepreneurial discovery process of identifying S3 priorities	5.5	82%
6. Effective implementation instruments and measures	5.5	78%
3. How to increase stakeholder involvement in R&I policy development	5.4	73%
8. Evaluation and monitoring of R&I strategies	5.3	70%
4. Setting up a right governance of R&I policy	5.3	71%
1. Learning about S3 strategy design	5.2	65%
2. Learning how to conduct sound analysis for S3	4.8	57%

Respondents had to give weights or the topics from 1 (not relevant) to 7 (very relevant):

The results of the questionnaire suggest that there is comparatively much higher interest in how to develop transnational collaboration projects, in the process of identifying S3 priorities, in effective implementation instruments and how to increase stakeholder involvement in R&I policy development. In other words, there is much more interest in the know-how of S3 activities rather than in intricacies of S3 based analysis.

The overall impression is that the analytical background in R&I strategies is quite limited except when these documents are prepared in cooperation with international organisations. And our survey of analyses that form the basis for strategies in the region suggests that there is huge scope for improvements in this respect.

3.2.3.2 Governance

Governance structures

S3 requires that stakeholders of different types and levels should participate extensively in the process, having at least a well-functioning tripartite governance model based on the involvement of industry, education and research institutions, and government. It implies that appropriate institutional structures are in place.

The overall institutional quality regarding protection of property and judicial independence in the WB-5 countries is lower than in Central Europe though these economies have also made visible progress in this respect in the recent period (EBRD, 2015). S3 is generally about structural change through R&D and innovation so we should focus on the broad notion of 'innovation governance' and specifically on 'R&I policy governance'.

The innovation governance in WB-5 countries is quite unfavourable. Market failures and lacking capabilities are too big to be overcome by weak states that are either quite fragile (cf. lacking

[18] Questionnaire was conducted in cooperation with the West Balkan INCO network by the team of the Smart EIZ twining project led by Aralica Zoran and Slavo Radosevic (work in progress). Respondents are from WB-5 and from Croatia.

political consensus on a myriad of economic issues) or have very limited room for autonomous action (limited room for independent macroeconomic policy). Enterprise owners operate on small markets and face tough foreign competition. So, very often they can only survive through privileged access to public sector contracts. With very high unemployment they are not forced to invest in training of labour force. Flexible labour markets further discourage investments in human capital especially in conditions of the weak vocational education system.

Policy governance in the area of research and innovation has been gradually established in WB-5 through international cooperation and largely through EU-funded programs and projects or as part of enlargement policy. However, WB-5 countries are in very different stages of formation of R&I policy governance. R&I policy governance is quite well established in Serbia, it is in the process of formation in Macedonia and Montenegro, and is still in early stages of formation in Albania and Bosnia & Herzegovina.

Regarding scope, R&I policy governance either exists still in rudimentary form (Albania, B&H) or is very much concentrated around one Ministry (Serbia, FYROM, Montenegro). This is largely a reflection of very limited investments in R&D and feeble business R&D sector.

The overall model of governance is rooted in all WB-5 in the idea of the linear innovation model which puts the focus on R&D as the main source of innovation. This has its most elaborate expression in Serbia which has the most advanced R&D governance. There are no comparable governance mechanisms or bodies, networks or organisational arrangements which are focused on non-R&D sources of innovation. Organisations like productivity centres, quality control and quality enhancement centres, industrial extension services, sector technology support services are not only non-existent but not yet the targets of policy. There is the overwhelming focus on governance of upstream R&D organisations. The need for downstream organisation for enhancing innovation and productivity is neglected.

In those three countries that have a more developed R&D governance (Serbia, Macedonia, FRM and Montenegro) competitive funding of projects prevails. This orientation particularly when it has been a long term trend like in Serbia is potentially promoting the best teams and projects but on the side undermines building of R&D organisations. The appropriate balance between project and institutional funding would be more favourable for the systems where demand for R&D is still limited.

The improved governance is also one of the key policy aims, so policy actions are oriented towards restructuring of the public R&D system (Albania) and integration of the business with the public R&D sector (Serbia).

In overall, R&D systems in WB-5 countries are dominantly public sector oriented with the activities concentrated in public sector centres and institutes, higher education institutions, line ministries, and governmental agencies. Even when organisations have a name that suggests their broader remit like Albanian National Agency for Technology and Innovation (ARTI), they are still very much public sector oriented.

This overly R&D focused organisations have been recently complemented by more downstream type of organisations. Largely driven by foreign funding and as part of the innovation and technology strategies, there are activities in establishing non-R&D organisations like Innovation Fund, Business

Innovation Services; Business Incubator Programme; and Cluster Programme (Serbia, Montenegro, Albania).

B&H is unique regarding governance as it is the country with the by far most complex governance overall arrangements including R&D. Its R&D system is highly decentralised, with the complex constitutional structure where policy and funding responsibilities are stretched across the entities of Republic of Srpska the Federation of B&H, and the Brčko District[19] as well as across the cantonal structure[20] of policy implementation bodies in the Federation of B&H. This has grave consequences for the capacity of the country to establish a R&D system and to formulate a consistent R&D policy. For example, there are significant discrepancies in funding modes between the state and entity level, and as pointed out by ERAWATCH country report (Ergarac, 2014, p. 3) 'a single approach or target in terms of competitive vs. institutional funding between the governance levels cannot be outlined'.

So, from S3 perspective WB-5 countries would need to expand much wider their governance in two directions. First, establishing fully fledged governance mechanisms for R&I policy, i.e., expand it beyond only research sphere towards diffusion and interaction with the business sector. Second, try to establish innovation governance by including business actors into the process of policy and by developing innovation as an inter-ministerial activity.

Broad participation

The institutional context for innovative enterprises in WB-5 economies is not favourable due to numerous weaknesses in the business environment. This is confirmed by the poor ranking of these economies (except FYROM) on the World Bank Doing Business rankings. However, from the perspective of S3 and innovation capacity, we point out two factors that could hinder an inclusive, participatory S3 process.

First, wage-setting in the WB-5 economies takes place at the company level and not in a comparatively centralised way at the industry level. This together with high unemployment leads to high flexibility in employing and laying off labour which in turn reduces incentives for investment in training. Second, the labour market in the WB-5 economies is characterised by relations between employees and employers that are confrontational rather than based on cooperation. In overall, there is also a lack of cooperative institutions of social partnership which could coordinate wage policy as a way to enhance competitiveness linked to productivity (Gabrisch et al., 2016). We consider these two factors to be significant obstacles to the broad participation of all stakeholders in S3 promoted a structural change of the economy. Broad participation would require the social inclusion of all actors that are engaged in the innovation process.

Another level at which broad participation should be considered is the R&I policy governance. The explicit aim of S3 is to engage all key stakeholders in the process of policy design and implementation. The review of ERAWATCH reports for the WB-5 countries suggest that the current approach in strategy and policymaking process is narrowly focused and remains largely within the

[19] Bosnia and Herzegovina is administratively divided into two entities: the Federation of Bosnia and Herzegovina and the Republic of Srpska. The Brčko District is a self-governing administrative unit as well as condominium under the dual sovereignty of Federation of Bosnia and Herzegovina and new formed Republika Srpska

[20] The ten cantons of the Federation of Bosnia and Herzegovina as political entities were established by the Law on Federal Units (Cantons) in 1996

public R&D sector. ERAWATCH report on Serbia (Kutlaca, 2014) describes it as traditional approach 'based on expert opinion, without inter-sectorial dialogue, communication with the extensive public community for identification of bottom-up initiatives and priorities, scenario development, forecasting, and other future-oriented activities, which are commonly collected under foresight exercise umbrella'. On the other hand, the S3 approach requires the much broader involvement of major stakeholders which need to agree on the biggest challenges and reach consensus on the appropriate tools to remedy the situation. WB-5 countries, for the time being, do not have institutional preconditions for a broad participatory approach that is required by S3. Such preconditions are easier to establish in Serbia and Montenegro; they are somewhat harder to establish in Macedonia, FYROM and would require considerable other changes in B&H and Albania.

Given limited administrative and policy capabilities, there is an opportunity for joint investments in funding regional programs and institutions, which will be pooling regional resources to create a critical mass for promoting smart specialisation in the WB-5 countries. Such efforts as the Western Balkans Regional R&D Strategy on Innovation adopted in 2013 is the right activity in this direction (World Bank, 2013). The realisation of this strategy can be facilitated through two *EU macro-regional strategies – Danube and Adriatic* – in which WB-5 countries participate and which can facilitate the design and implementation of national smart specialisation strategy. These activities should further help increase official and citizens understanding of the linkages between research, development, and innovation across key stakeholders.

Potential for the Entrepreneurial Discovery Process (EDP) in the WB-5 countries

The S3 model requires involving entrepreneurial knowledge into the S3 strategy development. Discovering potential new activities, identifying new opportunities within existing domains that emerge through a bottom-up interaction of public and private stakeholders named as Entrepreneurial Discovery Process is a crucial prerequisite and critical basis for the S3 process. What are the possibilities within each of the WB-5 countries to actively develop the EDP and the possibility and probability of involving the entrepreneurs into the decisions regarding the R&I prioritisation? First, the survey with policy makers and analysis in the region conducted within the SmartEIZ project (see Table 5) suggest that the EDP is identified as the area of the S3 where the knowledge gap seems to be among the biggest. In a range of 1-7, the relevance of this topic was valued on average with 5.5 together with the effective implementation of instruments and measures. 82% of respondents provided mark 5 which suggest that this is considered the critical issue.

However the knowledge on EDP would not by itself solve the issue if the governance does not improve. The desired S3 governance in the region should be developed built around quadruple helix actors and their mutual relationships. There is a noticeable trend of gradual improvements in the governance of the research and innovation systems in all WB-5 countries though starting from entirely different positions. However, despite the nominal wish expressed in strategy documents to promote triple helix activities, the only actors that are involved in the decisions regarding the R&I prioritisation are government and public sector R&D organisations**.** As pointed out in the contribution for this report by Josimovski (see Annex IV) there is 'low capacity of the private sector for innovation and weak industry-science linkages limit their positive effects'. A fourth actor - civil society - is quite weakly organised except R&D organisations (research institutes and universities) which can be vocal contributors in the process. Industry associations are potential new actors, but it

is hard to assess the degree to which they can be engaged in the EDP without an in-depth understanding of sector specific situations in different countries.

In summary, the potential for the EDP and stakeholders' involvement is closely dependent on the overall quality or impact of R&I policy. Table 6 shows results of 99 responses by policymakers and policy analysts in the region (including Croatia) on the following question asking to assess the impact of R&D & Innovation policy by giving weight to each of the following statements ranging from 1 - 'not the case'; to 7 - 'very true'.

The degree of dissatisfaction with the impact of R&D & Innovation policy is quite high, but it is relatively weaker on identification of R&I priorities and organised public consultation process involving a range of stakeholders. Stakeholders seem to be more concerned with the development and appropriateness of governance structures for R&I policy than with the involvement of stakeholders. While 55% of responses consider that governance structures are not developed and appropriate only 48% consider that the same applies to the process of public consultations in the identification of R&I priorities.

Table 6: Factors having impact on R&I policy

Factors having impact on R&I policy	average	Percentage of responses: 3 and above
Measures and forms of support reflect well needs of business sector	3.0	55%
Governance structures for R&I policy are developed and appropriate	3.0	55%
Substantial evaluations do exist, and their results are transparent and publicly available	3.1	54%
Overall set of support measures is appropriate given financial and political constraints	3.1	52%
Identification of R&I priorities is well organised public consultation process involving a range of stakeholders	3.2	48%
Measures and forms of support reflect well needs of scientific sector	3.2	50%
Formal evaluations procedures do exist, and they are useful	3.5	43%

So, although both are assessed as very unsatisfactory the quality of governance is considered as relatively worse than public consultations. Again, we should consider this in the context of other factors that are reducing the impact of R&I policy. The degree to which R&I policy reflects needs of scientific sectors is also evaluated better than governance structures for R&I policy. R&I policies in the region comparatively reflect much less the needs of the business than of the scientific sector. This situation reflects relatively better opportunities of the science sector to self-organise when compared to business sector but it, even more, reflects that the governance structures for R&I policy are not developed and are not considered appropriate. Also, mechanism of evaluations of policies and programs are formal with few substantial evaluations whose results are not publicly available.

Launching the meaningful EDP based processes in the WB-5 would require the improvement of quality of R&I policies in several dimensions.

The two most important improvements are as follows: the R&I policies should reflect much closer the needs of the business sector; and the governance structures for R&I policies should be further improved.

3.2.3.3 Shared vision

The WB-5 all share the strategic aim to develop knowledge-based economies integrated into the EU. In fact, the EU integration is the objective that most of the social groups unequivocally support. As a way to promote knowledge-based economy all WB-5 are committed to increased R&D expenditures and to increase their participation in EU R&D programs. However, they are far from articulating a shared vision of a future growth model and of ways to how to implement it. This is not surprising given the scale of constraints and uncertainties that they are facing. Equally, crisis periods like the current one call for a vision. This should not be grand top - down visions but can be grounded in the discovery of individual success stories and factors that are behind individual successes which do exist in all countries. The issue for policy is to make such successes visible and try to amplify them. So, rather than top – down WB-5 should also work on developing bottom-up visions over the medium term (for outline of this approach see Kuznetsov and Sabel, 2017).

For the time being some initial elements of this approach are gradually developing in Serbia through its Strategy for the Scientific and Technological Development of the Republic of Serbia 2010–2015 which emphasises focus and partnership. Focus is to be achieved by defining a list of national research priorities; partnership is to be achieved through the strengthening of ties with institutions, companies and other ministries to allow Serbia to validate its ideas in the global market and enable scientists to participate in infrastructural and other projects in Serbia (Kutlaca, 2014). Equally, difficulties in agreeing on national objectives are strongly present in B&H which has adopted not less than three strategies for STI: a national strategy and two state-level strategies which propose conflicting targets (Ergarac, 2014).

Broad view of innovation

For the time being, all WB-5 countries are focused on R&D oriented activities which stretch from establishing mechanisms to fund national R&D programs (Albania) to initiatives for supporting commercialisation of R&D activities of the public sector (Serbia)**.** Given their levels of income and their distance to the technology frontier, this approach is far too narrow and insufficient to promote growth and structural change. It may lead to pockets of excellence and science systems well integrated into the EU networks, but it will result in local irrelevance and the very limited role of domestic R&D in growth.

The R&D based approach to growth needs to be complemented by support to the mode of innovation which in innovation literature is termed DUI mode (Doing, Using, Interacting)(see Lorenz and Lundval, 2006; Jensen et al., 2007). The DUI mode of innovation is based on non-scientific drivers like learning-by-doing, learning-by-using and learning-by-inter-acting. R&D and innovation in middle-income economies like WB-5 are strongly determined by training of the labour force and by the

quality improvements. Instead of R&D, production capability proxied by indicators like ISO9001 certificates per capita is the most significant driver of productivity growth in CEE economies (Kravtsova and Radosevic, 2012).

The fact that productivity in WB-5 is driven by a host of non-R&D factors calls for a broad approach to innovation and policy which will consider not only R&D but also engineering and production capabilities. This difference in approach is not examined by overly imitative approaches in RDI policies of theWB-5 though this is not only their feature but is shared by many other less developed EU economies (see Izsak et al., 2015). It is of utmost importance that S3 of the WB-5 go beyond imitative approaches focused only on R&D based growth and focus on other non-R&D drivers of their growth and productivity.

A broad approach to innovation requires also establishing broader innovation governance and the larger set of organisations to be engaged in the process of technological modernisation including industry and professional associations, NGOs, chambers of commerce, etc. The power of ingrained linear understanding of the innovation process is deeply embedded in the policy thinking in the WB-5 despite obvious shortcomings of this approach and represents the biggest obstacle for networking of R&D sector with the rest of economy and society (Kutlaca, 2014).

Grand Challenges

A motivating vision should also address societal challenges that affect a concrete region or country and go beyond pure economic value creation. The shortcomings of an approach to growth based only on R&D is evident in the logic of grand challenges which are taken as one of 'the focusing devices' in the EU RDI policy and are part of the S3 model as well. Grand challenges define key societal issues as not only S&T challenges but as complex socio-economic challenges which require different modes of innovation, multiple sources of knowledge and an approach which goes well beyond distinctive disciplinary boundaries of the R&D system. By their very nature they need inter-sectoral and multi-stakeholders involvement (beyond current capacities of the WB-5) and will require radically different new approaches which will encourage local experimentation but also much stronger international links and cooperation. Individual WB countries are too small and weak to address them in isolation but could be much more active in sharing information about activities in agreed priority areas (climate change, energy) and ensuring that national funding is strategically aligned with the EU funding in these areas.

3.2.3.4 Identification of priorities

The core of the S3 approach is in the process of collective 'discovery' of new areas of innovation based growth which are well below identification of individual sectors (industries) but also above individual products or technologies (Foray, 2015). Focusing on a limited number of innovation and research priorities in line with their potential for economic transformation through the smart specialisation is a key feature of S3 strategies.

In the WB-5 countries, the process of identification of priorities is, first, largely confined to R&D priorities, and, second, is not organised as a 'discovery process'. So, application of S3 approach would need to introduce changes in both of these aspects.

Serbia has made some progress in this regard as its National priorities in the domain of S&T, defined in the "Strategy of S&T Development of the Republic of Serbia 2010-2015" (SSTDRS, 2010) defines not only R&D areas but also thematic issues like a priority. For example, its six priority areas are (1) biomedicine and human health; (2) new materials and nanosciences; (3) environmental protection and countering climate change; (4) agriculture and food; (5) energy and energy efficiency; (6) ICT; and (7) improvement of decision making processes and affirmation of national identity.

Similarly, the updated **Montenegrin Strategy** for Scientific and Research Activity 2012-2016, defines priority areas for research and development: energy, identity, ICT, competitiveness of the national economy, medicine and health, science and education, new materials, products and services, sustainable development and tourism, agriculture and food, and transport. The biggest calls for projects in priority areas are funded, and all other programmes consider defined priority areas as one of the criteria in the selection process. However, as ERAWATCH reports notes, there are no data on funding across these areas (Kaludjerovic, 2014).

Albanian second National Strategy for Development and Integration 2013–2020, defines new priority sectors for research which are deemed critical for meeting societal challenges and for stimulating growth and productivity to absorb high unemployment. These areas are ICT, agriculture (veterinary, zoo-technical), food and biotechnology, social sciences and albanology, biodiversity and environment, water and energy, health, and materials science.

On the other hand, the **FYROM** has not spelt out the priorities for areas of specialisation. Its research programmes are mainly generic and lack a sectoral or thematic character. ERAWATCH report (Josimovski 2014) indicate that a more dedicated focus on thematic areas can be expected in the following period, since the NPSRA 2012-2016, adopted in 2012, envisions several thematic areas. Also, the Public Procurement Bureau of the FYR of Macedonia is in the process of defining the priorities for the period 2014-2018, that should encompass the objectives of the Innovation Strategy.

Bosnia and Herzegovina has two territorially separate strategies for science, technology and innovation. Federation of B&H has approved Strategy of Development of scientific research and R&D for the 2012-2021 period (FMON, 2011). This document identifies 1) general directions, 2) functional directions and 3) sectoral directions of development of S&T. General directions are a) higher education, b) promotion of science, and c) S&T infrastructure. Functional directions are focused on a) sustainable development, b) use of ICT, c) energy efficiency, d) socio-economic R&D. Sector priorities are: a) automotive cluster, b) metal industry c) food and beverage industry, d) wood and furniture industry, and e) tourism. These are not the only priorities as equal importance should be given to all activities that can generate high value added. Srpska Republic National Assembly has adopted Strategy of S&T development 2012-2016 (Republika Srpska, 2012) which pursue seven thematic priorities: agriculture, ICT, new materials, medicine and health, energy and energy efficiency, environmental protection and climate change, social sciences and humanities.

In summary, priorities in three out of 5 WB-5 countries (Albania, Montenegro and Serbia) are defined, but they are not clearly derived from the analysis but by and large from the consultation process. In FYROM 'the priority sectors and industries are recognised in governmental policies and selected clusters, but they are not precisely defined' (Annex IV). Four of five WB-5 countries have prioritised spending on R&D though we do not have a clear picture on how prioritisation is implemented. This would require access to the allocation of R&D and other funds across projects and

programs. The example of this work in the EU context was ERA Watch Trendchart inventory [21] database which required the substantial effort of a large network. The process of generating priorities is conducted within the government coordinating bodies with the presence of representatives of R&D organisations and much weaker or not the presence of the business sector.

R&D & innovation priorities of the WB-5 broadly reflect very much the de-industrialized nature of these WB countries' economies. Within the SmartEIZ project, we asked policy makers and policy analysts with the region to list the importance of the following priority areas for R&D and innovation spending in their respective country (Table 7).

Table 7: The importance of priority areas for R&D and innovation spending

Priority areas	Average	% with 5 and above
ICT	5.7	82%
Energy	5.3	73%
Food	5.1	65%
Environment	5.0	64%
Healthcare	5.0	63%
Digital services	4.9	66%
Biosciences and Biotechnology	4.8	59%
Electronics, sensors, and photonics	4.2	44%
Advanced manufacturing	4.1	41%
Advanced materials	4.1	38%
Financial services	3.7	35%
Defence	2.3	25%
Space	2.3	12%

The respondents rated priority areas by scale 1 (not relevant) -7 (very important)

Responses clearly indicate that the RDI priorities of the WB region are not in the industry (Electronics, sensors, and photonics; Advanced Manufacturing, Advanced Materials) but in ICT, Energy and Food sectors. This is in striking contrast to Central Europe where advanced industry technologies play a much more prominent role in their S3 specialisations. Also, responses in Table 7 are consistent with the priorities as listed in S&T strategies of the WB-5.

Consistency and Critical Mass

One of the key issues for successful prioritisation is that it is derived based on the proper analysis of the national context. This is key to ensure the coherence between the identification of the SWOT and derived priorities. Some S3 analyses have been quite sophisticated in that respect and have managed to derive priorities at the level which is possible by the available statistical data and with the transparent methodology. However, there are also limits to the analytical procedure alone which does not capture tacit knowledge of key actors in innovation systems. Good analysis represents a necessary first step in this process.

Regarding WB-5, it would require further analysis to find out the extent to which in-depth analyses have been used as background for formulating national RDI strategies.

[21] http://www.eca-tactics.eu/project/inno-policy-trendchart

In order to achieve the change through knowledge based investments the priorities have to reach sufficient critical mass. A quick overview of RDI priorities in WB-5 shows that the number of priorities is not by itself the major issue but their level and specificity. Regarding numbers, they are reasonable, i.e. they are not dispersed on a large number of RDI sub-areas. Given that these are small economies with small R&D communities and a limited number of RD active firms the issue of critical mass even with the low number of priorities is the issue. However, there is not a general answer to this question as the issue of critical mass may vary widely among different areas.

The key issue is how to handle non-priority areas which boil to the problem of how to restructure RDI systems which are operating in survival modes. It is much easier to prioritise and achieve critical mass when the economy is growing, and the 'pie' gets bigger. When the funding budget is unchanged or even smaller in real terms, there are strong pressures to accommodate or present whatever activity is done as a national priority. One of the ways out of this impasse is to use explicit and sector-specific criteria about the critical mass. The other way is to use international cooperation as a way to overcome the issue of size.

3.2.3.5 Policy mix

R&I policy roadmaps in WB-5 countries

The policy mix that promotes structural change in the WB-5 countries is quite narrow. These countries have quite limited room to foster economic growth through macroeconomic policy. Namely, the scope for monetary policy and exchange rate flexibility is very much reduced due to high "euroization" of these economies or due to currency board arrangements. Subsidies to support the economic development are especially low in Albania and Montenegro and are comparably high in Serbia and Macedonia (Gabrisch et al., 2016, Kutlaca, 2014). The view is that it is very difficult to assess the degree of success of the investment support measures implemented in the Western Balkans (Gabrisch et al., 2016).

One of the channels for promoting structural change is through FDI. This policy is now shifting from large-scale privatisation towards new greenfield investments though there are still several major assets in the region that await privatisation, especially in Serbia. The success with FDI promotion is varied, but it seems to have positive effects in Macedonia FYR and Serbia.

The R&D and innovation policies are a new channel for promotion of structural change. However, its effects are uncertain and long term which explains their marginal role in the WB. It is not surprising that they are mostly tied to the EU funded and enlargement related programs. On the other hand, these policies are still marginal due to their too strong R&D orientation and neglect of downstream innovation activities which focus on quality, vocational skills, productivity, engineering and software. The unique opportunity of S3 approach is to develop policy mix that can address medium-term challenges related to levels of productivity and integration in global and regional value chains.

The policy mix in the WB-5 could be characterised as overly skewed towards R&D based model of growth. By this, we mean that the policy mix is focused on funding R&D programs conducted by the public sector R&D organisations and on commercialisations of R&D results funded in this way. There is a dearth of downstream and demand-led programs that address innovation, productivity and knowledge constraints of enterprises.

The policy mix of **Serbia** is concentrated on R&D activities funded by the Ministry of Education, Science and technology development. There is also the Programme for supporting Research in the Field of Technological Development which is generally about the funding of commercialisation of R&D results developed within the public sector. There is support for technology entrepreneurship in the Higher Education Sector (HES) and public R&D laboratories and institutes (PRO – Public Research Organisations) through university and PROs spin-offs. However, Serbia is the only country which has the Programme for Supporting SMEs and Entrepreneurs to Strengthen Innovation Activities, launched in 2011 by the National Agency for the Regional Development (Kutlaca, 2014). This program is more oriented to support non-technological innovation activities like services, organisational innovations and adoption of quality standards. In financial terms, the bulk of investments goes into R&D Infrastructure Investment Initiative which started in January 2011 with a budget of €420 million, half of which comes from an EU loan.

On the other hand, Serbia has also developed the strategic promotion of investment as a new mechanism to foster structural change. Serbian Investment and Export Promotion Agency (SIEPA) provide grants to domestic and foreign companies for investment projects in the manufacturing and tradable services sector as well as in tourism. Also, incentives are offered to companies settling in one of the 13 free economic zones which include exemptions from VAT and customs duties for certain materials or machines that are used in the production process. However, FDI and innovation policy are not linked as is the case with the majority of Central and East European economies (Radosevic and Stancova, 2015).

Montenegro follows similarly a solely R&D focused approach in innovation policy which is accompanied by measures aimed at fostering cooperation between the research and business communities. Following this model, it has plans to establish the Science and Technology Park (STP) with decentralised units (Kaludjerovic, 2014).

Macedonia, FYR represent an extreme example of the linear innovation model logic through the introduction of Scientific Subsidies in 2008. These are one–time compensations for all researchers who publish scientific papers in impact factor journals. While quality and number of scientific publications from Macedonia, FYR do need further improvements it is highly uncertain what is exactly the chain of links between scientific papers and the innovation outcomes. In line with the horizontal and sector-neutral approach, Macedonia has also established support for R&D in the business sector. The legislation allows a zero corporate tax on all profits that are re-invested into company development. Also, there are special tax and fiscal incentives for foreign companies that invest in R&D activities and new technologies within the Technological–Industrial Development Zones (TIDZs)(Josimovski, 2014). More detailed information on Macedonia's case you will find in Annex IV.

Albanian policy mix is also strongly focused on a funding research program managed by the Ministry of Education and Science (€30 million). However, it is encouraging that some €4.8 million has been set aside for an Innovation Fund which awards grants to small and medium-sized enterprises (SMEs) for product development and process improvement through technology adoption which will be largely funded by foreign donors (Preci and Narazani, 2014).

Policy mix of B&H is research focused, but there are activities in establishing S&T parks of different profiles in the various regions of the country (Ergarac, 2014).

In a nutshell, the S3 approach would need to broaden the policy mix in WB-5 countries by addressing demand led innovation, non-R&D innovation, and productivity and quality issues in the business sector.

Balance of policy mix of targeted and horizontal measures

Like many latecomers, WB-5 countries have followed sound governance policies which are based on the presumption that improvement in market efficiency will suffice to drive economic growth and broad-based development. Indeed, WB countries continue to make progress in the overall business environment and structural reforms (see EBRD, 2015).

However WB-5 countries operate as small open economies with limited policy tools, budgetary and administrative capacities and thus have limited room for manoeuvre for any independent industrial policy. This leads to the difficult issue of balance between seemingly easier horizontal or generic innovation support measures vs. technology specific actions and programs. It should be noted that horizontal and vertical measures are not substitutes but complements. Horizontal measures also need prioritisation, and many of them are *de facto* about sector governance regimes or specific areas of structural reforms. Also, sector governance reforms are not sufficient without sector or technology specific innovation policy measures. Equally, sector or technology specificity can vary, and there is not a blueprint. A challenge for WB-5 policy makers is to make a balance between horizontal vs. vertical (sector) structural reforms and between horizontal vs. technology specific innovation policy programs. However, the bottom line is that structural reforms and innovation policy measures should be implemented complementary to each other.

The S3 approach in the Western Balkans context is about how to kick start the process of industrial and technology upgrading which is industry specific. The knowledge base for such a process in WB does not seem to be the major constraint as parts of it already exist or are in the process to be generated. For example, OECD (2009) study on sector competitiveness of several WB sectors has clearly indicated upgrading paths for apparel, automotive suppliers and business process IT outsourcing (see the Box 1 below)

Box 1. Patterns of industrial upgrading in Western Balkans in selected industries

Patterns of industrial upgrading in Western Balkans in selected industries

Apparel: from only CTM (42%) services to gradual introduction of Value Added services (OEM/OBM) + beyond imitation (design schools)

Automotive suppliers: to move out of subcontracting 'cost trap' towards improved quality standards, design and supply chain management skills

Business Process IT Outsourcing: from fragmented, diversified and local market-oriented firms towards focus on core competencies (specialisation) and creation of BPITO champions

Source: Based on OECD (2009[22])

Accordingly, WB-5 countries should aim to build policies that will foster these processes. The issue is whether mainstream R&D or innovation policy is a sufficient and necessary response to facilitate

[22] OECD (2009) Sector Specific Sources of Competitiveness in the Western Balkans, OECD, Paris

industry/technology upgrading in WB region. We argue that mainstream innovation policy is needed but not sufficient ingredient to promote technology upgrading of WB economies. In these economies R&D operates largely as a factor of absorptive capacity rather than as a direct source of value added and employment.

On the other hand, national differences in the levels of policy and administrative capabilities and different policy approaches would need to be respected. For example, Montenegro and Albania need an active industrial and FDI policy to promote the founding and settlement of companies. The manufacturing sectors in these countries contribute little to GDP, which in turn leads to constant current account deficits (Gabrisch et al., 2016). However, equally, it is not realistic that **Albania** can develop shortly support to local RD & Innovation or that this should be a higher priority compared to various indirect support measures. These alternative measures can be improving framework conditions by adapting new relevant laws or amending the existing ones, making sure that existing organisations in R&D and innovation are effective, or investing in human capacities to deal with new areas of ICT including procurement for upgrading its administration and electronic services for citizens, businesses and public employees (Preci and Narazani, 2014). Also, different policy philosophies should be respected. For example, the broad public consultation process conducted for the National strategy of FYROM has shown a preference for neutral sector measures rather than for *ad hoc* selection of specific high-tech areas (Josimovski, 2014). On the other hand, **Serbia** may be more in a position to follow strictly the S3 approach to selectivity with the aim to achieve critical mass but also synergies between local and international firms.

The area which needs to be much more strengthened in the WB-5 but which defies these horizontal versus vertical distinctions is the support from the EU to integrate manufacturing sectors of the Western Balkan countries into international networks. In that respect, Central Europe has been a success story that has been repeated neither in the case of the Western Balkan nor Southern European countries, as Greece and Southern Italy who are also struggling with similar problems regarding de-industrialization. In that respect, S3 should not be seen only as 'national' strategies for RDI based growth but also as a tool of macro-regional development and as a mechanism of using European complementarities in skills, labour costs with the aim to generate synergies and sustainable growth. The EU should aim at promoting the integration of the Southern and Southeastern European countries into international production networks with a particular focus on lower and medium tech industries (Gabrisch et al. 2016, Radosevic, 2016). Given their geographical position, WB-5 would, in that case, play quite an important role in the industrial integration of the EU Southern periphery.

This would require two things. First, closer integration of national S3 approaches with the EU macro-regional strategies than is the case today. The EU should increase their support for the Western Balkan countries' efforts to integrate their manufacturing sectors into EU supply chains. Second, the external dimension of S3 is its least developed dimension, and this would require building new approaches within S3 framework which could integrate global value chains issue into for the time being overly inward looking S3 approaches (Radosevic and Stancova, 2015).

What would this shift in focus mean for innovation policy of the WB-5 countries? This would require support for their policies in a new direction which goes beyond mainstream approaches focused on R&D driven growth and redirecting it towards demand-led innovation and integration of innovation policy with the FDI/supply chain policies. In that respect, S3 as a possible ex-ante conditionality for

the WB-5 countries cannot be just about meeting criteria of the well-established template but also should be on being engaged in policy experimentation within the EU macro —regional strategies which should continuously evolve in the light of new opportunities and challenges. These should embrace opportunities not only in the manufacturing industry but even more in service industries like tourism and IT, especially Business Process IT Outsourcing.

Regarding S3 this would require close integration of S3 priorities and the education and vocational training systems which are currently poorly aligned with the needs of the labour market. Gabrisch (Gabrisch et al. 2016) correctly suggest that it would be advisable to conduct regular surveys among entrepreneurs in WB to recognise required skill sets early on (qualification monitor). Overall, there is a need for a better matching of the supply and demand for skilled workers to tackle high youth unemployment. This should be complemented by much bigger support than is the case today to promote student exchanges within the EU and the WB region to foster the sharing of knowledge.

In summary, the current balance of policy mix reflects the idea of R&D based growth which is currently not the major driver of growth. Policy mix would need to undergo radical change by also embracing non-R&D drivers of growth and would need to be developed and implemented within the macro-regional framework.

3.2.3.6 Monitoring and evaluation

S3 strategy has to evolve and to react to the changes during implementation through the in-built evaluation process and monitoring activities, which allows assessing the progress and impact of the S3 related activities. Therefore, M&E are of prime importance within the S3 approach. Developed monitoring & evaluation systems are key to early detection of failures but also for the identifying successful cases which require upscaling of support.

Within the WB-5 there are no evaluation standards as well as institutions responsible for the assessment in the area of RDI. Ex-ante evaluations of RDI projects proposed under public calls are organised but vary across countries regarding quality. Within the EU sponsored projects monitoring of on-going activities, ex-post and impact evaluations are organised intermittently. The introduction of the S3 approach would require a major overhaul of the M&E systems which given the small size of local R&D and innovation communities should also be internationally supported.

In WB-5 countries there is a lack of statistical data on R&D systems and as to the quality of available data seems questionable. The collection of data on R&D in the business enterprise sector is particularly problematic (Kutlaca. 2016).

It seems that problems with statistics are only partially the issue of capacities and organisation but more of political will. For example, Republic of Srpska, which is part of B&H, has quite elaborate statistics on its R&D system and even has annual innovation surveys. Yet, at the level of the country B&H there is up to now no statistical document which would show the picture of R&D and innovation capacities.

On the positive side, national strategies are gradually being developed with built-in evaluation criteria. For example, FYR Macedonia's innovation strategy includes an action plan for the period 2013-2015 and for each policy measure there is a list of expected results and a list of indicators for

implementation and realisation. Additionally, the strategy has established evaluation and monitoring procedures which include permanent internal and periodic external assessments of the policy as a whole and its specific measures (Josimovski, 2014). It may be expected that these examples of good practice will spread throughout the region.

Also, the approach to S3 for the WB-5 countries would need to go beyond the standard set of the IUS indicators and metrics that this framework entails and which is confined on R&D based growth.

While WB-5 countries are gradually introducing internationally compatible S&T indicators, they have very limited knowledge of their non-R&D and innovation capacities in the business enterprise sector. There is a dearth of sectoral studies and understanding of the processes of industrial and technology upgrading in specific sectors. The OECD (2009) study is quite illuminating in that respect as it has shown the extent and nature of industrial upgrading in the major sectors in the Western Balkan. There is strong need for the institutions like Western Balkans Research and Innovation Centre (WISE)[23] gathering the efforts of Western Balkan countries to get engaged in the continuation of such type of work with the specialised consultancies and expert teams.

3.2.4 Summary of the findings from R&I strategies' assessment in WB-5 countries

The S3 approach in the context of enlargement and deepening cooperation with the EU offers a unique opportunity to kick-start and promote structural change and growth. However, if designed and implemented in an imitative way by blind copying of good practices developed for other contexts it can fail miserably. The key is to adapt it to the nature of innovation processes in the WB-5 countries and to address country and region specific obstacles to improved productivity, technology upgrading and improved framework conditions to foster innovation. In that respect, the S3 assessment tools such as the RIS3 Assessment Wheel would need to be adjusted to this context as well as the overall S3 approach would need to be much more differentiated to capture the regional specific technology and upgrading challenges.

Our analysis has shown the major gaps and obstacles that may impede the development of the S3 strategy in the WB-5 region. They are summarised in the Table 8 below.

Table 8: Main features and gaps of WB-5 countries' R&I strategies with regard to S3 model

RIS3 Guide Steps	Western Balkan – 5 countries
ANALYSIS OF REGIONAL / NATIONAL CONTEXT	**National assets and framework conditions** - Industrial tradition in some WB-5 countries (Serbia and B&H) but very much deindustrialised region - Flexible labour market - Limited room for manoeuvre for autonomous macroeconomic and industrial innovation policy limits promotion of structural change - Lacking investment in energy, transport infrastructure and vocational training - Complex and unstable political situation, especially in B&H, Macedonia FYR and Kosovo

[23] http://www.rcc.int/press/267/split-to-become-headquarters-of-the-western-balkans-research-and-innovation-centre

	- Strong outmigration, high unemployment and unused human potential - Positive developments in each of the WB-5 in establishing R&I policy as factor of promotion of structural change though from very different departing levels
	Evidence based analysis in R&I strategies - Quite limited analytical background in R&I documents - The existing analysis is entirely R&D focused (Serbia) - The analysis does not include international benchmarking - The analysis does not reflect the entrepreneurial environment, situation of local innovative firms
GOVERNANCE	- Public R&D focused governance established to very different degrees (Serbia/the most developed, FYROM and Montenegro at intermediate position, Albania and B&H/rudimentary) - Poor social conditions for generation of innovative enterprises (confrontational labour relations) - There are missing institutional preconditions for broad participation in S3 process - Re-organisation or establishment of new bodies in R&I governance like innovation funds in FYROM and Albania
SHARED VISION	- Too narrow view of innovation confined on R&D based growth - Social and grand challenges are addressed to a very limited extent and largely through international funding schemes - Unable to respond to global challenges without radically new approaches and international links which will stimulate local experimentation
IDENTIFICATION OF PRIORITIES	- Identification of priorities is confined to research area with some exceptions which also prioritise thematic areas (Serbia and Montenegro) - FYROM does not have precisely defined sectoral priorities - There is not clear picture of the analytical consistency between priorities and local context
POLICY MIX	- A very narrow and overly R&D skewed mix confined on public sector R&D and commercialisation of R&D results from public sector - None of the WB-5 countries envision possibility for pilot projects or tool for policy experimentation - Framework conditions are quite unfavourable especially in B&H, Macedonia, FYR and Kosovo - A country specific balance between targeted and horizontal measures is yet to be developed - FYROM has developed mainly horizontal measures
MONITORING & EVALUATION	- There are no evaluation standards as well as institutions responsible for the assessment in the area of RDI. - When present evaluations are formal and not easily publicly available - The introduction of S3 approach would require a major overhaul of the M&E systems which given the small size of local R&D and innovation communities should also be internationally supported.

A very preliminary assessment of each of five WB countries based on RIS3 Assessment Wheel has been provided in Annex II. This should be considered as potential useful basis for constructive dialogue about the nature and progress of their R&I policies.

In the portfolio of measures that can promote growth, structural change and employment generation of middle-income economies like WBC, investment in R&D are usually seen as costly measures with uncertain effects. For example, the WIIW study on Western Balkans (see Gabrisch et al., 2016, p 80) explicitly states that whose benefits cannot be foreseen or will likely be very low in the current environment are to be avoided. Thus the authors advise that countries, where only a few research institutions or larger companies implementing those research results exist, should refrain from costly public investments in research and development. Non costly measures like FDI tax credits if implemented well can generate solid basis for future growth. Some WBC have adopted FDI oriented measures relatively quickly for example through business taxation aimed at attracting companies or tailored infrastructure investments. This is a policy that Serbia and Macedonia FYR pursue and which gives effects regarding regional employment though its effects on technology transfer are still difficult to discern. Like in many other CEECs, their FDI policies are not related to their innovation policies which reduce possible technology transfer effects.

It is important to engage in this debate as RDI policies are conventionally not seen as an immediate priority in the WB-5 country context. **Our conclusion is that indeed if conventionally designed and implemented RDI policy makers will have a difficult time to put RDI policy on the top of government's policy agenda. However, if conceived in a way that they go beyond a sole focus on R&D and address the issue of sectoral technology upgrading, demand-led innovation, non-RD drivers of growth related to quality, productivity, engineering and software they have much better chances to generate medium-term results. Moreover, in comparative terms, they can be less expensive than alternatives.**

3.3 R&I systems in the EU neighbourhood countries from the perspective of S3

Manfred Spiesberger

3.3.1 EU Eastern Partnership framework and general context

The EU Eastern Partnership (EaP) includes six countries having emerged of the Former Soviet Union: Armenia, Azerbaijan, Belarus, Georgia, Moldova, and Ukraine. In the context of this paper on their S3 potential, we will be discussing the situation in all of these countries. For the case of Ukraine being by far the biggest country of this group, a more detailed analysis is be provided in Annex V.

The Eastern Partnership framework was established between the EU and these countries in the year 2009. Its major features are stronger political cooperation through association agreements (AA), integration in the EU economy via deep and comprehensive free trade areas (DCFTA), mobility and security in particular through visa liberalisation policies, fighting corruption and border management. Furthermore it includes cooperation on energy (via the Energy Union) and transport, and financial support in particular via the European Neighbourhood Instrument (ENI) and the DCFTA facility (for SME support) (European Commission, 2008).

These broad goals were translated into four thematic platforms[24]:

1. Democracy, good governance & stability
2. Economic integration & convergence with EU policies
3. Energy security
4. People-to-people contacts

Six Flagship initiatives complement these platforms. They are dealing with SMEs; Energy; Environment; Prevention, preparedness and response to natural and man-made disasters; Integrated border management; Sustainable municipal development.

Advancement in these fields of cooperation has been mixed. The region is navigating between closer cooperation with the EU via the association agreements (including the DCFTA), and closer cooperation in the frame of the Eurasian Economic Union (EEU) dominated by Russia. The EEU was established in 2015 on the basis of a Customs Union among Belarus, Kazakhstan and Russia, and involves meanwhile also Armenia and Kyrgyzstan.

Association Agreements (including the DCFTA) were concluded by the EU in 2014 with Georgia, Moldova and Ukraine. Armenia had finalised the agreement too, but decided not sign it and joined the Russian-dominated Eurasian Economic Union (EEU) instead. Meanwhile, in 2015 the EU and Armenia have again entered into talks about a cooperation agreement. Azerbaijan and Belarus still stand at the side-lines of this rapprochement process. However, lifting sanctions against Belarus[25]

[24] See: http://eeas.europa.eu/eastern/platforms/index_en.htm

[25] Most of the restrictive measures against Belarus were suspended in autumn 2015. See : http://www.consilium.europa.eu/en/press/press-releases/2016/02/25-belarus-sanctions/

was a sign by the EU that closer cooperation may be possible in the future. This thaw in relations came as a benefit of Belarus' mediation role in the Ukraine conflict.

A blow to the efforts for closer integration of the EU with the EaP region was given by a NO-vote in the Dutch referendum on ratification of the Ukrainian association in April 2016. The EU has confirmed meanwhile its willingness to continue on the association path,[26] but a solution to this issue of the NO-vote has still to be found.

Visa-free travel was achieved with Moldova in 2014. For Georgia the EC proposed visa-free travel in March 2016, but this was not approved yet by the Council. With Ukraine the visa liberalisation process is ongoing[27].

R&I fits as a complementary element in this cooperation framework under Platform 4 People-to-People contacts. Good progress on R&I cooperation has been achieved. A Panel on Research and Innovation with EaP countries was established in 2013 and has been convened once per year. The panel has agreed on collaborative research activities in three societal challenges: Health, demographic change and well-being; Climate action and environment; Secure, clean and efficient energy. More importantly, the EU has been open to associating the EaP countries to its Framework Programme for Research and Innovation. Moldova has been the frontrunner in these integration efforts. It became associated to the FP7 in 2012, and to H2020 from the outset in 2014. Ukraine and Georgia have been following this path with association to H2020 in 2015 and 2016 respectively. Armenia is still in the process of finalising the association at the time of writing of this paper (summer 2016), but this is expected to happen still in 2016[28]. The association opens up participation in this EU funding programme on an equal footing to EU member states, and importantly participation in programme committees at EU level. These committees allow an insight into the functioning of the EU, as well as regular exchanges and contacts with national and EU level R&I policy makers and administrators.

3.3.2 EaP countries: key developments of R&I policies

The research and innovation sectors of the EaP countries have all experienced a significant downsizing in terms of personnel and financially since the countries became independent at the beginning of the 1990s. For example, in the case of Moldova the R&D personnel declined to a fifth of the potential available at the time of the independence of the country. In figures that meant a downsizing from 25,000 R&D personnel (in head count) in the early 1990s to around 5,000 today (2016)(Spiesberger and Cuciureanu, 2016).

The governance of R&I and research performance is still marked by a strong role of the Academies of Sciences, which were the cornerstone of research in the Soviet Union. In the current situation we

[26] See the statement of EU High Representative Mogherini following her meeting with Ukrainian Prime Minister Groysman in July 2016: https://eeas.europa.eu/headquarters/headquarters-homepage/7277_en

[27] See:http://ec.europa.eu/dgs/home-affairs/what-we-do/policies/international-affairs/eastern-partnership/visa-liberalisation-moldova-ukraine-and-georgia/index_en.htm

[28] See the list of associated countries to Horizon 2020 at (August 2016): http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cpart/h2020-hi-list-ac_en.pdf

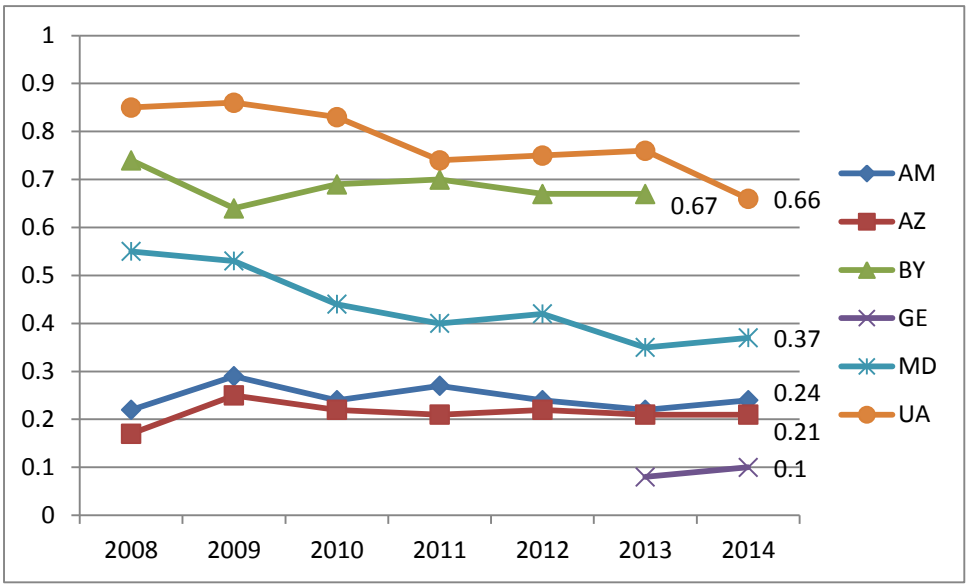
have on the extremes Moldova, where the Academy fulfils the role of a Ministry of Science, and Georgia, where most of the Academy research institutes were dissolved or merged into universities.

For R&I funding we can observe a trend to establishing specific bodies and agencies for managing it. For example, in Georgia the Georgian Innovation and Technology Agency (GITA) was established in 2014 for supporting innovation, and the Shota Rustaveli National Science Foundation got the task of allocating public research funding in 2010. In Moldova a similar development for externalising research funding from the Academy has been under way in 2016.

Financially all EaP countries invest in R&D far below the EU 28 average. The EU reached a Gross Expenditure on R&D (GERD) of 2.03% of GDP in 2014 (Eurostat, 2016). Among the EaP countries Ukraine and Belarus have traditionally the relatively highest investment, and have reached 0.67% and 0.66% GERD as a share of GDP in 2014. Overall we see declining and stagnating investment trends in the region. For Moldova this indicator has been declining to 0.37%, and for Armenia and Azerbaijan it is stagnating slightly above 0.2%. The exception may be Georgia, where GERD is increasing from a very low base of below 0.1%; other sources indicate a significantly higher level meanwhile for Georgia of 0.3% GERD of GDP planned for the current year 2016 (IncoNet EaP, 2016)

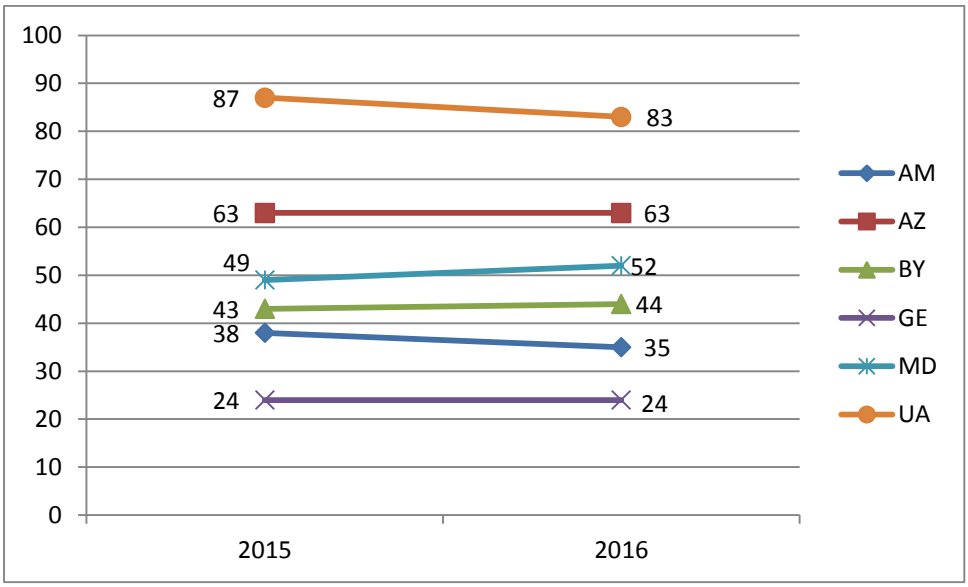
Economic development potential, competitiveness and the R&I ecosystem are depending importantly on framework conditions for business. An indicator for measuring the state of framework conditions is provided by the World Bank and its Ease of doing business index. Georgia is leading here among the EaP countries being in 24th place of world countries with a business friendly environment. Belarus is surprisingly well placed at position 44 in 2016, in spite of its strong state interference in the economy. The indicator should be interpreted cautiously therefore. Ukraine shows here the weakest performance, ranking only 83th among world countries.

Figure 2: GERD as a percentage of GDP for EaP countries



Source: Unesco Institute of Statistics (UNESCO-UIS), 2016

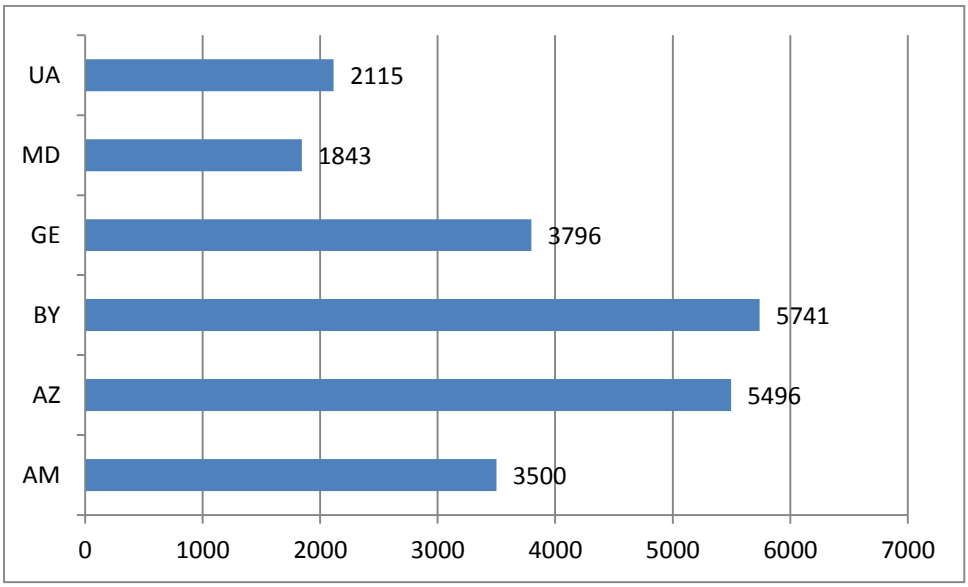
Figure 3: World Bank Ease of doing business index



Source: World Bank (2016): Ease of Doing Business

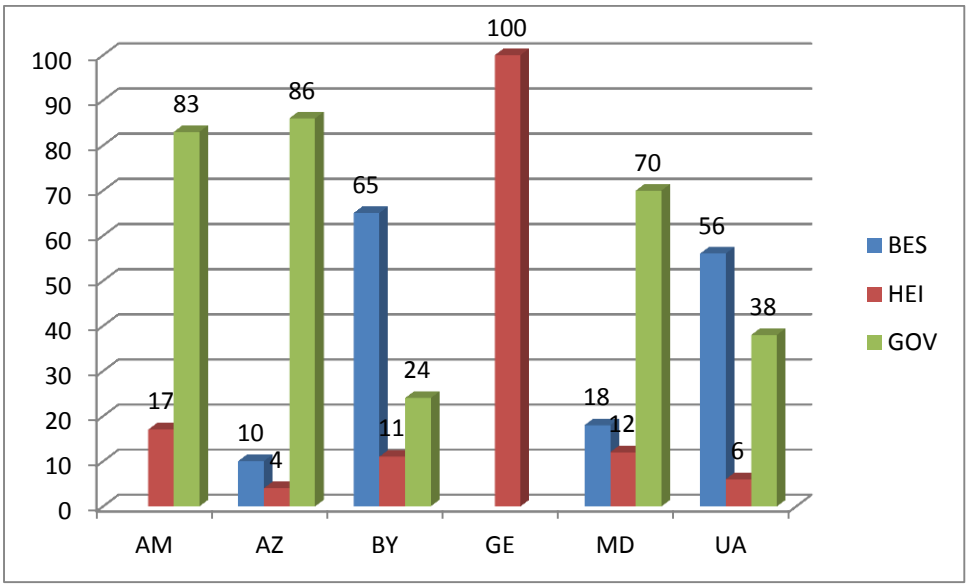
The ability of a country to invest in R&I is determined by the available resources and GDP of a country. As an indicator we take here the GDP per capita. The highest GDP per capita has Belarus with about US$ 5,700, while Moldova has the lowest with about US$ 1,800. All EaP countries have a GDP per capita below the EU countries. Among EU countries Bulgaria has the lowest GDP per capita with US$ 6,820; Lithuania has already a 2.5 times higher GDP than neighbouring Belarus.

Figure 4: GDP per capita in current US$ for the year 2015



Source: World bank data, 2016

Figure 5: GERD by sector of performance in % for the year 2014



Source: UNESCO UIS, 2016

Figure 5 shows the GERD by sector of performance: Business-Enterprise Sector (BES), Higher Education Institutions (HEI), and Government sector (GOV). The data indicate that the government sector has in Armenia, Azerbaijan and Moldova the overwhelming role in research performance. In Belarus and Ukraine it is the business enterprise sector which performs most research. Data for Georgia indicate that research is performed only in the Higher Education sector, as opposed to all other EaP countries. All these data need to be interpreted cautiously, as they are incomplete. Even if in Georgia most research institutes were merged into universities, not all research is performed in the Higher Education sector. Statistics reflect here a lack of data collection for BES and GOV categories. The higher shares of BES in Belarus and Ukraine may be explained by a stronger role of state owned businesses in R&D or by the legal form of research institutes, which are organised in some cases as businesses.

Data for the share of financing of GERD by the business-enterprise sector are available only for Azerbaijan, Belarus, and Ukraine. It amounts to about 30-40% for these countries.

Several of the EaP countries are actively trying to internationalise their R&D systems. Moldova has been the frontrunner in this process. The local Academy of Sciences has established several bilateral cooperation programmes with main partner countries (e.g. Romania, Russia, Germany, Belarus), and negotiated the Association of the country to the FP7. Armenia, Georgia and Ukraine have followed the path and associated to Horizon 2020. However, the internationalisation process of countries has been hampered by various reasons, such as lack of resources, lack of interest in the matter (Azerbaijan), or because of political reasons (e.g. Belarus).

To summarise the main features of the R&I systems of the EaP countries, we can highlight the following:

- EaP countries are marked by weak R&D systems with stagnant investments in R&D
- PROs are main players in R&D, while R&D in the HEI sector is only slowly developing (except Georgia, where HEIs are main research performers)

- R&D in the business-enterprise sector is funded largely by government
- Efforts to internationalise R&D systems have been undertaken

In the following, the R&I systems in the five EaP countries Armenia, Belarus, Georgia, Moldova, and Ukraine will be addressed individually with regard to RIS3 steps, and the RIS3 Assessment Wheel methodology will be applied to the country cases (Annex V). It needs to be noted, that these assessments are tentative and based only on desk research and in-country experience of the author. Also, we have to underline that R&I strategies and policies were in EaP countries not conceived according to a smart specialisation approach. We can assess here therefore only how current R&I strategies and policies would meet the RIS3 approach, and consequently scores are rather low.

3.3.3 Assessment of the R&I strategies in the EaP countries with regard to S3

3.3.3.1 Armenia

National context for research and innovation

Armenia is a landlocked country with trade relations additionally limited by political issues with some of its neighbours, in particular Azerbaijan and Turkey. The conflict of its neighbour Georgia with Russia in 2008 also had a strong influence on external trade as it disrupted land transport routes to key Russian and European markets. The most important Armenian export sectors include mining, alcoholic beverages and diamond processing, which together account for around 70% of exports (Ministry of Economy of Armenia, 2011).

The National Academy of Sciences (NAS RA) with its around 35 research institutions exists without major systemic and functional changes as compared to Soviet times. Although heavily downsized in personnel, it remains the main R&D performer in the country (IncoNet, EaP 2016).

Armenia's traditional fields of science and technology specialisation include physics and astrophysics, computer sciences and information technologies, biotechnology, health, and chemistry.

Governance structure involving triple or quadrature helix actors

The State Committee of Science established in 2007 carries out the S&T policy in the country[29]. The Committee is subordinated to the Ministry of Education and Science, but it can act relatively independently. The Committee is also responsible for development and implementation of research programmes in the country through three main financing mechanisms: thematic (project based) financing, basic financing and targeted research projects.

The Ministry of Economy is since 2006 responsible for development and implementation of innovation policy. There are some innovation support agencies (e.g. Technology Transfer Association, IT Park Yerevan), but no dedicated funding agency for innovation is operating in the country.

Governance is in place with the State Committee and Ministry of Economy and some SME support structures, but a dedicated innovation support agency is lacking. Procedures and coordination among the players could certainly be enhanced, and especially involvement of Civil Society Organisations (CSOs) and the wider society has no tradition. At least business has been involved in the industrial strategy development.

Strategies, R&I priorities, policy mix

The process of identification of R&I priorities in Armenia is not yet part of a collaborative discovery process, as research policy has its own priorities and industrial policy considers the R&I potential under the heading of knowledge intensive sectors only generally. In December 2014, the Government approved new, very broad science and technology development priorities for 2015-2019 which are stated to be:

- Armenian Studies

[29] http://www.scs.am/en/home

- Life Sciences
- Secure and Efficient Energy
- Key Enabling Technologies, Information and Communication Technologies
- Space, Earth Sciences, Sustainable Use of Natural Resources
- Basic Researches for Key Problems of Scientific and Socio-Economic Development

The Strategy of Export-led Industrial Policy (2011) identified promising sectors for export and subsequent economic growth. They were divided into three categories:

1. Resource-based sectors, including: food production (particularly brandy making, canned food production, wine, mineral water and juice production, fish breeding, fruit and vegetables), metal and non-metal mining and processing, tourism and related cultural products;
2. Skills-based sectors, including: diamond processing, jewellery manufacturing, watch manufacturing, pharmaceuticals, light industry (textile industry), health services, medical equipment and materials;
3. Knowledge-based sectors, including: precision engineering (machine building, instrument making, electrical and optical production), information technologies, engineering services, applied physics and biotechnologies.

These latter, knowledge-based sectors have been targeted as "new drivers of growth" in the medium to longer term, with an initial policy horizon of 2011-2020. Focus has been placed in first instance on precision engineering. Innovative fields have been identified and specific sector strategies developed. Such a systematic and profound analysis of technologies and services, and of potential research and business players in these fields, is a useful approach for a targeted promotion of the innovative sectors of the future.

A Strategy on Development of Science (2011-2020) and related action plans were elaborated by the State Committee for Science and approved by the government in 2010 (UNECE, 2014). The strategy and action plans are focused on general issues for advancing R&D in the country, but not dealing with thematic priority areas. Strategy and action plans aim at:

- Improving the R&D management system
- Integrating Science, Technology and Innovation
- Attracting young researchers to R&D
- Internationalising R&D

The science strategy does not include an assessment of the current situation in R&D. The science strategy was elaborated already six years ago by the state committee, and we can suppose that no broader stakeholder involvement took place. The Industrial policy strategy does provide a brief introductory section on the general situation of the economy, and more detailed assessments of specific industry sectors. Moreover, the industrial strategy was based on a more profound study conducted by a consultancy company, and involving consultations with stakeholders, in particular business, although it lacks transnational benchmarking to reveal competitive advantages.

A portfolio of strategies is available in the country, and with the Strategy of Export-led Industrial Policy efforts have been made to provide an analysis of national assets and economic development potential. The outward dimension of integration in international value chains is addressed to some extent in the industry strategy, but the dimension is constrained by isolation of the country from trade with major neighbours (Azerbaijan, Turkey). Entrepreneurial dynamics are stimulated via the

SME development organisation and especially in IT (via the IT park), but only little support for start-ups or clusters is available. For establishing a shared vision on RIS3 a broader view of innovation, consideration of grand challenges and future-oriented thinking will be needed. EaP countries are traditionally focused on technological innovation, although in the case of Armenia UNDP and EU have provided support for stimulation of social innovation[30]. On the identification of priorities Armenia stands out among EaP countries: the industry strategy has reviewed economic sectors and identified promising sectors for the future. But this has not led to concentrating resources on those industry sectors or related scientific fields. Regarding the policy mix for RIS3 we can note that action plans and implementation roadmaps for strategies are available. On the weak side are the balance of funding measures and framework conditions: only a rather limited share of the R&I budget is allocated competitively. Most funds are allocated traditionally as block grants, which strongly limits the measures. No dedicated innovation funding instrument is in place. As in other EaP countries, Monitoring and Evaluation need to be better established as procedures for measuring progress and for adapting policies. Some indicators are though included in the Armenian strategies.

The visual display of the assessment is provided in Annex III.

3.3.3.2 Azerbaijan

National context for research and innovation

Azerbaijan's economy is based on resource exploitation and the country is an oil and gas exporter. In 2014 more than 90% of its exports were fuels, which was equivalent to about US$ 20 billion (World Integrated Trade Solution, 2016). The trade balance was herewith largely in the plus. Azerbaijan has seen strong GDP growth rates for many years. But this has slowed significantly to 1.1% in 2015 and in 2016 GDP may even shrink, which is due to the decline in oil prizes. A diversification of the economy beyond the oil and gas sector has therefore become crucial. Consequently, innovation stimulation and reforms of the research sector appeared recently on the policy agenda. Similar to other EaP countries the research sector has been downsized since the independence of the country, but the R&I system has been left largely untouched.

Governance structure involving triple or quadrature helix actors

The Azerbaijan Academy of Sciences (ANAS) is still the dominating body in policy making and research performance, which has been perpetuated from Soviet times[31]. One of the significant changes to the governance was the establishing of the Science Development Foundation (SDF) in 2009[32]. In the governance system it is situated under the President of Azerbaijan. It deals with competitive basic and applied research funding, and covers all different thematic areas. Its types of grant competitions include classic research grant competitions, grants for young scientists and specialists, and mobility grants. In addition, targeted grant competitions such as for ICT, and Industry grant competitions are organised. A strong role for policy development within the Academy of

[30] See: http://kolba.am/en/ and http://www.am.undp.org/content/armenia/en/home/operations/projects/democratic_governance/kolba-innovations-lab-.html
[31] http://www.science.gov.az/
[32] http://www.sdf.gov.az/

Sciences provides a very centralised and research focused governance for R&I. In procedural terms governance is very much top-down with a strong role of the President of the country. What concerns involvement of triple and quadruple helix actors in platforms and working groups, it should be noted that involvement of Civil Society Organisations (CSOs) is restricted, and those of business and wider society has no tradition.

Strategies, R&I priorities, policy mix

The country's strategic goals are laid out in its development strategy - Azerbaijan 2020: Vision for the Future (Azerbaijan 2020, 2012). The strategy was approved in 2012. It identifies non-oil sectors, which will be developed to achieve future growth:

- renewable energies
- some basic industries such as aluminium, cement
- shipbuilding
- tourism
- agribusiness

A specific chapter of the strategy discusses in general terms the relevance of research and innovation for economic development. According to the document research and innovation will be stimulated and related support instruments will be established. These will include industrial parks, special innovation zones for ICT sector and the setting up of a State Fund for the Development of Information Technologies.

The Ministry of Economy has formulated a strategic plan for the years 2014-2016, which focuses again on the non-oil sectors of tourism and agri-business, but includes also information technologies as a prospective sector for economic development (Ministry of Economy and Industry of Azerbaijan , 2014).

A new Law on Science was approved in June 2016, which includes a large number of general priorities of state scientific policy in Article 3.3[33]:

- ethnogenesis of the Azerbaijani people, history, language, literature, art and culture, national and spiritual values, material and cultural heritage, economic, philosophical, legal and socio-political issues;
- socio-political, socio-economic and cultural development, defence capability and national security, democratic and legal state building and the protection of national interests, strengthening the role of science and accelerating scientific and technical progress;
- multiculturalism study, inter-religious dialogue and tolerance in the society;
- Azerbaijan's natural resources, geological, geographical, ecological and economic evaluation;
- assessment of the country's hydrocarbon resources, oil, petrochemical industries and non-oil sector development, modernization and diversification
- the national demographic development, problems of housing and social development;
- sustainable development challenges and knowledge-based society and economy;
- knowledge-intensive areas of production: alternative energy sources, nano, bio, information and communication technologies and other high-tech research;
- space research and other scientific fields related to the expansion of basic and applied research;

[33] http://science.gov.az/uploads/PDF/Elm_haqqinda_Azerbaycan_Respublikasinin_Qanunu.pdf

- scientific personnel training and strengthening science and innovation capacities.

To launch S3 related processes Azerbaijan does not yet feature a broad stakeholder involvement for strategy development and R&I policy development and implementation. Procedures are mostly top-down. Civil Society Organisations (CSOs) cannot operate freely in the country and rules have even been tightened in recent years (World Bank Group, 2015). Some efforts are made though to have exchanges and feedback from the private sector; for example consultations take place among the Ministry of Economy and the Entrepreneurship Development Foundation, which is an interest organisation of private sector actors. On the plus side stands the establishing of the Science Development Foundation already in 2009, which allocates competitive basic and applied research grants, and provides some innovation support too. The strategic documents lack sound analysis and consultation with various stakeholders as would be required for S3 strategies.

Due to the strong focus on oil and gas, strategy development has come into focus only recently with declining oil prices and the necessity to identify potential growth sectors for the economy. Strategic thinking remains rather general in Azerbaijan, and is not based on a sound analysis of national assets and development potential. The outward dimension of integration in international value chains has been realised for the oil and gas sector, but not beyond for other sectors. Entrepreneurial dynamics, start-ups or clusters were not much of an issue yet. Innovation stimulation measures have been planned in the Azerbaijan 2020 strategy, but in how far they will really be implemented has to be monitored closely.

For establishing a shared vision on RIS3 a broader view of innovation, consideration of grand challenges and future-oriented thinking will be needed. EaP countries are traditionally focused on technological innovation. The identification of priorities beyond oil and gas has mostly been neglected up to date, as specialisation was so much focussed on basic resources. Regarding the policy mix for RIS3 we can mention that the Azerbaijan 2020 strategy is implemented via action plans of Ministries, which remain however rather general.

On the weak side are the balance of funding measures and framework conditions: only a rather limited share of the R&I budget is allocated competitively. Most funds are allocated traditionally as block grants, which strongly limits the measures. Some innovation support is provided by SDF, but the organisation deals mainly with research funding. As in other EaP countries, Monitoring and Evaluation need to be better established as procedures for measuring progress and for adapting policies. No indicators are included in the Azerbaijan 2020 strategy.

The RIS3 Wheel Assessment is provided in Annex III.

3.3.3.3 Belarus

National context for research and innovation

Belarus is lacking major basic resources. Its economy is focused on trade with countries of the Former Soviet Union, in particular Russia. It is one of the founding countries of the Eurasian Economic Union. In difference to several other EaP countries it managed to conserve a solid manufacturing base. It still has a strong sector of large state owned companies ensuring

employment. Main sectors of industry are machine building and petro-chemical industry. Also, Belarus disposes of a certain number of new technology based firms, which are based on scientific expertise and R&D.

The education system is an asset of the country and supplies a sizeable number of engineers and technicians. Innovative high tech sectors include ICT, scientific instruments, and optics.

Governance structure involving triple or quadrature helix actors

The State Committee for Science and Technology (SCST) is the main body for conceptualising S&T and innovation policy and for overseeing its implementation[34]. It has mostly a coordinating function, while decision making processes are distributed over several actors, involving higher levels of governance: the National Assembly, the President's Office and the Council of Ministers.

The Belarusian Innovative Foundation (BelInFund) is a public body whose core mission is the support of innovative entrepreneurship in Belarus[35]. BelInFund provides early stage financing of innovative SMEs and entrepreneurs. Recently to its portfolio was added the organisation of annual national competitions for innovative projects targeted at young innovators.

Some governance elements have been perpetuated from Soviet times, in particular a strong role of the Academy and a State Committee responsible for policy making and implementation. But the system has been diversified and a basic research and an innovation fund have been added. In procedural terms it is top-down with a strong role of the President of the country. Stakeholders have been involved in strategy development and R&I policy development and implementation. But operation and involvement of Civil Society Organisations (CSOs) is restricted, and involvement of the wider society has no tradition or is possibly even not wanted. While formally the governance system is well established, it is marked by flaws in implementation such as limitations on stakeholder involvement, and lack of transparency.

Strategies, R&I priorities, policy mix

R&D activities are supported via two funding programmes: 1) State programmes for scientific research and 2) State science and technology programmes. Both types of programmes provide grant funding to R&D projects in selected research areas in accordance with the policy priorities of the country. The formation of the actual programmes is preceded by a complex and staged foresight process with the participation of the National Academy of Sciences, other R&D centres and the government. Funding of "scientific research" and "science and technology" projects is done on the basis of bids which are in principle open to local R&D institutes (mostly from the Academy of Sciences but also sectoral R&D institutes and companies). Competition in these programmes is limited, because it is to a large degree predetermined, which organisations would host a large share of the funded projects and, respectively, would receive the bulk of the budget funding allocated to the respective programme.

The main strategy document for socio-economic development is currently the National Strategy for Sustainable Socio-Economic Development in the Republic of Belarus until 2030. Innovation policies are embedded in the strategy. The strategic priority sectors for innovation policies included have a

[34] http://www.gknt.gov.by/opencms/opencms/en/index.html
[35] http://www.bif.ac.by/

bias towards sectors were Belarus already has a significant edge: hi-tech industries, bio-technology, nuclear energy.

The implementing programme for innovation policy is the State Programme for Innovative Development 2016-2020 (SCST, 2016). The programme opens with an analysis of the current innovation situation in Belarus and a review of implementation of the previous programme. It does not benchmark the country with other competitors. Main fields for innovative development have been identified with:

- Information and Communication Technologies,
- aerospace technologies,
- and bio- and nanotechnologies.

Below these general fields detailed sub-fields were defined, which are relevant for different sectors of industry. A limited number of indicators have been specified to monitor progress of the programme.

The Belarusian Innovative Foundation has also identified priority areas of support. The core technological fields and industries to be supported are:

- pharmaceuticals,
- mechanical engineering,
- medical devices,
- agriculture,
- and devices for research needs.

Strategy development and programming are done in Belarus mostly in a top-down approach. In the programme development and the related foresight process a certain outreach and stakeholder involvement has been ensured. The knowledge in how far the private sector was involved in the identification of the priorities remains however limited. For example the State Programme for Innovative Development was elaborated by the State Committee with help from other governmental organisations and the Academy of Sciences. Although some interinstitutional coordination efforts exist, launching an S3 process in Belarus would require opening up strategy development processes for the stakeholders outside the public domain. The Belarusian policy mix is based on a well developed strategic base and related implementation measures, which include R&I funding programmes, innovation fund, and technology parks. This situation is similar to its governance, but again the crucial issue is the practical side of implementation. Flaws such as overly bureaucratic procedures, an allocation of resources to predetermined recipients, and lack of transparency limit the effect of the measures.

The national innovation potential has been analysed in the strategy documents. The outward dimension of trade and skills flows and integration in international value chains has been addressed only briefly. The documents refer to Russia and Ukraine as main markets, and enhanced cooperation in the frame of the Eurasian Economic Union; other regions are mentioned in general terms. The developing knowledge intensive IT sector is well integrated in international value chains, other sectors of the economy are more focused on traditional clients in the Former Soviet Union region. Entrepreneurial dynamics and start-ups are stimulated via BelInFund and a network of technology parks, incubators and technology transfer centres in Minsk and the regions; 14 such institutions were operating in 2014.

For establishing a shared vision on RIS3 a broader view of innovation will be required, which is still focused on technological innovation and a linear innovation implementation approach. Grand challenges have been considered to some extent in strategies, but more future oriented thinking and scenario development will be needed. Consideration of grand challenges and future-oriented thinking will be needed. EaP countries are traditionally focused on technological innovation. Priorities have been identified in some detail for industry sectors in the innovation development programme, and financial means for implementing the programme and its priorities have been foreseen. Regarding monitoring and evaluation, and some indicators are included in the strategies and programmes.

A visual summary of this assessment you can find in the Annex III.

3.3.3.4 Georgia

National context for research and innovation

Georgia has been going through a difficult time since its independence, marked by internal and external conflicts. Two regions of the country, Abchasia and South Ossetia, are not controlled by the central government. On the upside, the country has achieved remarkable successes in improving the business climate and in combating corruption. Main export goods over the past years were ferro-alloys, copper ore, mineral water, fertilizers and agricultural products. An advantage of the Georgian economy is that it has a good potential for renewable hydro energy, which contributes a significant share of electricity production.

R&D and innovation were for many years neglected; priorities for the country were social and security issues. However, in the last few years innovation has come high on the agenda of the government. International organisations (in particular the World Bank) and donors are supporting the innovation stimulation efforts.

The main research performers in the country are the universities. This is in stark contrast to other EaP countries, where the Academies, governmental research organisations under line ministries, and to some extent business organisations are the main research performers. Following a law on the National Academy of Sciences of 2007, the Georgian National Academy of Sciences (NAS) has been reduced to few institutes and to advisory functions on R&I development. Today more than 80% of previous research institutes of the Academy and branch institutes are under the auspices of public universities. Some of the institutes merged and established research centres, a few institutes have kept their independent status (e.g. Eliava Institute of Bacteriophages), and others were closed down.

Governance structure involving triple or quadrature helix actors

The governance structure of Georgian R&I has undergone significant changes over recent years, and key actors have been added to the National Innovation System. The responsibility for science policy is in Georgia mainly with the Ministry of Education and Science (MoES). The Ministry also allocates the major part of public funding for R&D. Innovation is dealt with by the Ministry of Economy and Sustainable Development.

In 2015 a Research and Innovation Council (RIC) was established. Its purpose is to identify economic priorities and major trends for R&I policy development. The Council is chaired by the Prime Minister and is composed of representatives of the respective ministries, as well as of business and science.

The implementing agency for public research funding on a competitive basis is the Shota Rustaveli National Science Foundation (SRNSF)[36]. It was established in 2010 and is subordinated to the Ministry of Education and Science.

In 2014 the Georgian Innovation & Technology Agency (GITA) has been established under the Ministry of Economy and Sustainable Development. The agency is in charge of innovation policy elaboration and implementation. GITA was initially dealing mainly with support of the IT sector, but has been broadening meanwhile its thematic focus. As a recently established agency, it is still developing its portfolio of innovation support instruments. Under the same ministry and in the same year 2014 the Entrepreneurship Development Agency has been established, which provides support especially for SMEs, start-ups and export promotion.

Georgia disposes now of a well differentiated governance system. Also, in procedural terms a broad stakeholder involvement is foreseen, and international support is available to implement it properly. However, it needs to be underlined that these structures are all very recent, and practical implementation will have to show their effectiveness.

Strategies, R&I priorities, policy mix

In comparison to other EaP countries, Georgia has a less elaborated strategic base. The main strategy document relevant for R&I is **Georgia's Governmental Socioeconomic Development Strategy 2020 (SDS)[37].** The strategy deals in first place with the economic situation of the country and how growth can be stimulated. An assessment of the current situation introduces the strategy, and identifies the low level of competitiveness, insufficiently developed human capital and limited access to financial resources as most pressing problems**.** Benchmarking with other countries is limited to few crucial indicators of the Ease of Doing Business ranking of the World Bank. The strategy includes a specific chapter on 'Innovation and technology', which is referring to R&I development.

A strategic approach to innovation support will be, however, implemented with international support in the frame of the Competitiveness and Innovation Project (CIIP)[38]. This project is driven by the World Bank and donor countries (e.g. Austria, Norway). Through the project the Georgian government will be supported in establishing effective public-private dialogue mechanisms. This will be implemented through Competitiveness, ICT and innovation councils, and related working groups. The working groups will be co-chaired by industry and private sector stakeholders. They will involve private and public sector leaders, academia and think tanks will develop detailed road maps in support of the country's 2020 Development Strategy and competitiveness reform agenda. Selected industry strategies will be developed. An entrepreneurial discovery process and involvement of broad stakeholder groups is envisaged herewith. Practical implementation and advancement on this project has to be monitored.

[36] http://www.rustaveli.org.ge/en

[37] See Ministry of Regional Development and Infrastructure of Georgia http://static.mrdi.gov.ge/551e4a570cf24147438b1727.pdf

[38] See Competitiveness and Innovation Project: http://www.theciip.org/node/67

In the CIIP specific industry sectors with growth potential have been identified:

- high value added manufacturing, including metal processing, machinery, electronics and automotive which are also among the largest and densest industrial clusters,
- ICT and business services,
- and agribusiness.

Complementary to the CIIP, the World Bank supports the development of the innovation ecosystem with US$ 40 million, **in the frame of the Georgia National Innovation Ecosystem** (GENIE) Project (World Bank, Press Release, 2016). It will invest in a range of activities to boost the innovation potential, human capital, and access to finance. The project will be implemented by GITA.

The R&D component as basis for innovation is of less importance up to now, and no specific strategy document is available. SNRSF allocates competitive grants for R&D, and funds a broad field of priorities. Its programmes cover exact and natural sciences; engineering and technologies; medical and health sciences; agrarian sciences; social sciences and humanities. In addition, the Foundation finances research projects related to Georgian Studies, with up to 10 % of its annual budget.

Compared to other EaP countries Georgia with international support is in the process of establishing stakeholder interaction structures involving private sector. International organisations are playing an important role in funding innovation and supporting development of public-private dialogue mechanisms which could help to set up entrepreneurial discovery processes for S3 design.

The Ministry of Economy and Sustainable Development and its agencies have the outward dimension of integration in international value chains and export stimulation on their agenda. For stimulating entrepreneurial dynamics appropriate institutions (e.g. GITA) and measures (e.g. support for start-ups) have recently been established. Relatively weak is still the innovation structure and only few technology parks or incubators with limited resources are available. For establishing a shared vision on RIS3, Georgia is on its way towards broadening its innovation concept beyond technological, and some consideration of grand challenges has taken place. More future-oriented thinking and scenarios will be needed.

The identification of priorities for research is still a way to go for Georgia. It has been done preliminarily for innovation policies, where IT has been singled out up to now and the few innovation support resources were concentrated mostly on this sector. But this approach is about to be broadened with international support. Importantly for the policy mix for RIS3 a specific support agency for innovation has been established with GITA, which is in the process of differentiating its support portfolio (e.g. brokerages, grants, technology parks, innovation vouchers). Action plans and implementation roadmaps for innovation support are in the making and will be further elaborated with international support. The low financing and neglect of R&I policies until recently are a certain burden on current efforts. Monitoring and Evaluation will be strengthened with the international projects, which foresee respective procedures and indicators.

A visual summary of this assessment you can find in the Annex III.

3.3.3.5 Moldova

National context for research and innovation

Moldova is a landlocked country bordering the much bigger Romania and Ukraine. Part of the country, the region of Transnistria, is not under the control of the Moldovan government, but dependent on support from Russia. The Moldovan economy is built on a relevant agricultural sector, which represents 15% of GDP and 45% of commodity exports (in particular fruit and vegetables, oilseeds, and beverages). Besides agriculture, Moldova concentrates its economy on manufacturing, services and trading. A promising innovative sector for the country is Information and Communication Technologies (ICT). Manufactured products account for 52% of commodity exports, with high shares in electrical machinery, textiles and furniture sectors. The country's imports are mainly concentrated on fuel, manufactured products (electrical machinery and textiles), and agri-food products (World Bank, 2016; Stratan, 2014).

In spite of the difficult social and economic situation since the country's independence, a functioning education and a significantly downsized research system have been preserved. The R&I system presents several structural weaknesses such as low financing, ageing, migration and downsizing of the R&D personnel, a weak link to society's needs and challenges, insufficient possibilities for universities to perform adequate research, an almost inexistent involvement of the private sector and a rather unusual governance structure.

The main research performing organisation in the country is the Academy of Sciences. In addition governmental research organisations operate under specific ministries (e.g. health, agriculture). The universities are slowly gaining importance in research. Few is known about research and innovation performance of the business sector in Moldova. A few companies based on science and know-how still operate in the country (e.g. MECAGRO in agricultural machinery, and ELIRI in electronics).

Governance structure involving triple or quadrature helix actors

The current governance structure is in place since 2004. It attaches a central role to the Academy of Sciences (ASM) [39]. The Academy is the main policy-making institution and fulfills - to a large extent - the role of a Ministry of Science. The President of ASM is a member of the government. At the same time ASM manages most of the public R&I funds, and is the main research performing institution in the country. This has resulted in an institutional conflict of interest, since it places ASM as policy-maker and funding agency, while being at the same time the major beneficiary of the research funds as the country's performer of the lion's share of research in the country.

ASM and its subordinated bodies are the main players for policy implementation, notably through:

- A Center for Fundamental and Applied Research Funding (CFCFA) within ASM, established in 2012 for the allocation of public funding for fundamental and applied research and which manages the main Moldovan R&D funding programs.
- The Moldovan Agency for Innovation and Technology Transfer (AITT), another funding agency under the ASM, responsible for support of innovation and technology transfer.

[39] Academy of Sciences of Moldova: http://www.asm.md/?new_language=1

The other main policy making actors are the Ministry of Education and the Ministry of Economy, the first one having responsibility for the university sector, and the latter limited capacity related to innovation. It has the SME support organization ODIMM subordinated to it.

This governance structure is since few years under serious discussion and fundamental changes have been envisaged. These would lead to concentrating the policy making in Ministries, and focusing the role of the Academy on research performance. Accordingly, an independent agency for support of R&I has been recommended by an independent review panel in spring 2016 (Gulda et al, 2016).

The current model of governance does not ensure the involvement of all relevant stakeholders which is a requirement for an S3 strategy development. Coordination between ASM and Ministry of Economy on R&I policies is taking place, but the actors are more competing with each other than working together for a coherent R&I policy. Overall the governance structure and the procedures need significant improvement. First efforts have been made for involvement of business, CSOs and wider society, e.g. in the form of consultations.

Business and NGO representatives are only marginally involved in policy making for R&I. More open discussions and consultation processes on R&I have been gaining importance only in recent years. A public consultation was held for preparing the National R&D Strategy in 2014, and a review of the R&I system was undertaken in 2012 and again in 2015/16 with the help of external experts. The review results were discussed with all main stakeholders, which has been a remarkable move towards more transparency and stakeholder involvement. But the results of the review still need to be taken up, and translate especially into fundamental changes of the governance structure.

Strategy, R&I priorities, policy mix

The country is still struggling to achieve a shared vision of how the R&I sector should be managed and develop. This holds also true for priorities.

As regards the R&I strategies:

- The **Innovation Strategy for 2013-2020: Innovations for Competitiveness**, developed by the Ministry of Economy and approved in September 2013 foresees five goals: adoption of an "open governance model" for R&I; enabling people to acquire innovation skills through entrepreneurship training; orienting companies towards innovation; using knowledge to solve societal and global challenges; stimulating demand for innovative products and services.

- The **National R&D Strategy of 2014**, developed by the ASM and approved by the Government reflects a consensus among R&I stakeholders around five main objectives: capacity building, focused priorities, stronger links within the system, internationalisation, and governance. The R&D strategy features a frank assessment of the difficult situation of R&D in the country, such as declining expenditure on R&D as a percentage of GDP, young talent moving abroad or leaving research, low salaries. It assesses the remaining capacity and outlines the importance for internationalizing the research community, in particular through associating to H2020.

In both legal texts, **the thematic priorities for R&I are not clearly identified**. The R&D Strategy mentions six broad societal challenges of H2020 as priorities:

1) health, demographic change and welfare;
2) food security, sustainable agriculture, marine, maritime and bio-economic research;
3) secure, clean and efficient energy sources;
4) smart, green and integrated transport;
5) fighting climate changes, efficient use of resources and raw materials;
6) inclusive, innovative and secure societies.

Besides, the Moldovan Parliament approved in June **2013 five strategic directions of R&I** for the period 2013 to 2020:

1) Materials, technologies and innovative products;
2) energy efficiency and use of renewable energy;
3) health care and biomedicine;
4) biotechnology;
5) national heritage and development of the society

These priorities are broadly defined and are lacking grounding on national assets and capabilities based on countries distinctive industry structures and links with entrepreneurial knowledge.

The Ministry of Economy has defined sectors with high potential for export. These include automotive, agriculture, ICT.

Relevant strategies for R&D and innovation are in place, although they are separate documents and prepared by competing actors. The documents include a certain analysis of national assets and economic development potential. The outward dimension of integration in international value chains has been addressed by the Ministry of Economy. Entrepreneurial dynamics are stimulated and some start-up support is available via the agencies ODIMM and AITT. Clusters are not much of an issue yet. For establishing a shared vision on RIS3 moving beyond technological innovation and a linear technology transfer approach will be required. First consideration of grand challenges took place. More future-oriented thinking and scenario development will be needed. The policy relies on a linear innovation model which puts focus on R&D.

The national policy for research and innovation is quite fragmented, and different institutions introduce different priorities. These are identified following a traditional approach, respecting EU programmes such as Horizon 2020 or decided in-house without much intersectoral dialogue and involvement of entrepreneurial knowledge. The Ministry of Economy is close to the business sector and has identified some priority sectors promising for export.

Regarding the policy mix for RIS3 we can mention that the support instruments for reserach and private business collaboration are limited. The balance of funding measures and framework conditions is weak. Only a rather limited share of the R&I budget is allocated competitively. Most funds are allocated traditionally as block grants, which strongly limits the measures. Some innovation infrastructure has been established by ASM and AITT in the form of technology parks and incubators, but again a better coordination with the Ministry of Economy would be needed on these instruments. Action plans and implementation roadmaps for strategies are available, as well as indicators for monitoring. In general, monitoring and evaluation culture needs improvement.

The visual presentation of this evaluation is provided in Annex III.

3.3.3.6 Ukraine[40]

National context for research and innovation

Ukraine is by far the largest state among the group of EaP countries. It has a population of about 45 million, while the next biggest countries in terms of population are Belarus and Azerbaijan with each about 9.5 million. Since 2013 the country has drifted into deep political and economic trouble due to the conflict with Russia about the Crimean peninsula and the ongoing conflict in Eastern Ukraine. The GDP per capita in current US$ declined in the two years from 2013-15 from about US$ 4,000 to US$ 2,100 (World Bank, 2016) [41]. Ukraine is a centralised state with a high concentration of power in the capital, and governors and their administrations representing executive power in the regions. Kiev remains the leader among the regions of Ukraine in terms of research and innovation activities. The city has established several development programmes, which contain research and innovation 'components'. Odessa, Lviv, Dnipro, and, especially, Kharkiv and some other large cities have also substantial innovative and industrial potential. Traditional sectors dominate in the national economy; they include ferrous metallurgy, coal-mining, energy production, basic chemicals, and agriculture. Lack of direction in modernising the national economy and insufficient incentives for developing high tech and innovative sectors are among key problems of the country.

Governance structure involving triple or quadrature helix actors

The President and the Council of Ministers are playing central roles in the decision-making process for R&I, while the Parliament determines the legal framework for S&T and innovation activities. With the decentralization reform, which started in 2015, the situation will likely change in the near future, and the country's regions could become more important actors in the formulation and implementation of innovation policy. Local authorities have some tools (e.g. provision of land, infrastructure support) to exert influence already now, especially on local universities and research organisations. In some regions, development programmes include sections specifically dedicated to R&D and innovation.

In 2014 the functions of science and innovation policy formulation were transferred to the Ministry of Education and Science of Ukraine (MESU). The Ministry is also a major implementing body, although a number of other ministries and agencies allocate state money to specific research programs, projects and research organisations as well. Block grants dominate the system for the allocation of R&D funds, but more competitive elements have been introduced in recent years. The State Fund for Fundamental Research of Ukraine has been distributing grants for research projects in different disciplines up until 2015.

The basic law "On scientific and scientific-technical activity" was modified in 2015, and this opened the way for a transformation of the whole national research system. A National Council of Ukraine on Science and Technology Development under the control of the Cabinet of Ministers of Ukraine has been established. Its main task is to ensure the effective cooperation of representatives of the scientific community, state agencies and the business sector in the preparation and implementation of state policy in the sphere of R&D. Another novelty is the creation of the National Research

[40] The Ukraine country assessment is based on a detailed description of the country situation provided by Igor Yegorov in Annex V.
[41] The figures are less dramatic if Purchasing Power Parities (PPP) are considered.

Foundation, which will replace the State Fund for Fundamental Research. The Foundation will provide grant support for basic and applied research in natural sciences, engineering disciplines, humanities and social sciences. But it can also support experimental development and innovation projects in R&D priority areas.

The main research player is still the National Academy of Sciences of Ukraine (NASU). Branch research institutes are another group of research performers; the universities are similar to other EaP countries gaining in importance in research performance. A significant transformation of the Academy is envisaged in the years to come, as a result of the revised law on scientific and scientific-technical activity.

Efforts are being made in Ukraine to involve more non-governmental stakeholders in the policy development and formulation. The government has created special advisory groups of representatives of the business sector, NGOs, research institutes and officials to co-ordinate reforms in different spheres, including innovation and industry.

Although efforts have been made, a lack of cooperation between different actors in the innovation system remains a fundamental obstacle for S3 processes[42]. The business sector is not sufficiently involved in discussions on the innovation issues.

The institutional set up is not optimal for launching S3 processes. A new body for competitive funding allocation is just in the making and the role of NASU is under discussion. The situation is in both respects not clear yet. Efforts for establishing a business-research-public dialogue and involving quadruple helix actors have been undertaken. Specific innovation or SME support agencies are lacking.

Strategies, R&I priorities, policy mix

Currently valid priorities for S&T date from 2012 from a State Law of Ukraine On Priorities in Science and Technology Development:

1) basic research of prominent multi-disciplinary scientific problems,
2) environmental studies,
3) Information and communication technologies (ICT),
4) energy generation and energy-saving technologies,
5) new materials
6) life sciences, including methods of fighting leading cause of illness and disease

It is evident that these broadly defined priorities will need more detailed specification, which will lead to a concentration of limited resources on these more specific priorities. The priorities in R&D and innovation were established without proper co-ordination with general priorities of social and economic development of Ukraine. They were formulated on the basis of propositions of different actors without proper analysis of corresponding potential in specific areas. Only in some sectors, such as biotechnologies, ICT and energy technologies special foresight-type studies were conducted in early 2010s at the national level.

Numerous technological innovation priorities have been formulated in a law. They include energy and energy-efficiency, transportation in general, but also peculiar fields (aerospace technology; ship-

[42] Igor Yegorov (2016). The Case Study on R&I Policy Framework In Ukraine With Regard to S3, JRC

building; defence technologies), new materials with emphasis on nano-materials, agro-industry, bio-medicine (medical services and treatment devices, pharmaceutics), cleaner production and environmental protection, and ICT & robotics[43].

In 2016, as proclaimed by MESU, the state budget should be used for further investments into basic funding of R&D institutions, grants for nationally funded projects, renovation of research infrastructure, support schemes for young researchers (including diaspora return), evaluation of state research institutions and universities, access to R&D databases (Scopus, WoS) and the establishment of the National Research Foundation of Ukraine.

Previous public interventions in the field of STI, however, showed that theory and practice of policy formulation and policy-delivery including follow-up activities are different things, especially concerning R&D funding. Funding has been directed only towards state-owned or state-influenced institutions up to now. Most of the state R&D budget is invested in NASU. The dominant funding principle is that of institutional allocation, while competitive project-based funding is very low. Public investment is oriented towards broadly defined R&D priorities which correspond to the still existing broad R&D landscape (at least on paper) of the country.

Policies rely on a linear innovation model, which is focused on research. Although broad based innovation is mentioned in some strategic documents it is not reflected at the programme level. Co-ordination between research and industrial policies in priority settings remains poor. An unstable political and business climate and limited financial resources (see Annex V) create difficult conditions to implement innovation programmes. On the plus side is an open political climate for development of CSOs and involvement of quadruple helix actors and wider society in policy processes and implementation. To launch S3 based processes Ukraine will need to solidify the interaction mechanisms between government and non-governmental organisations in business and research. Entrepreneurial dynamics and start-ups are supported via a network of about 30 science and technology parks and about 30 incubators. But their efficiency is reported to be low. The policy mix would need for RIS3 significant improvement, especially in funding measures and framework conditions. Only a rather limited share of the R&I budget is allocated competitively. Most funds are allocated traditionally as block grants, which strongly limits the measures. No dedicated innovation agency is in place, instead state programmes provide support. The difficult economic situation and limited resources restrain the differentiation of R&I support. As in other EaP countries, Monitoring and Evaluation need to be better established as procedures for measuring progress and for adapting policies.

A visual summary of this assessment you can find in the Annex III. Furthermore you will find a more detailed description of R&I situation identifying barriers and potentials for S3 in Ukraine in Annex V.

[43] Schuch, Klaus, Gorazd Weiss, Philipp Brugner, Katharina Büsel, 2016. Background Report: Peer Review of the Ukrainian Research and Innovation. Horizon 2020 Policy Support Facility. https://rio.jrc.ec.europa.eu/en/library/background-report-peer-review-ukrainian-research-and-innovation-system-under-horizon-2020

3.3.4 Summary of the findings from R&I strategies' assessment in the EaP countries

Traditional strategy development is well established in the EaP countries. However from the S3 point of view the strategies lack many critical factors starting from sound analysis of the research capabilities and assets embedded in local industries, outwards dimension, stakeholder involvement in the strategy design and appropriate governance structures. Therefore the envisaged priorities are often fragmented sets of different policy agendas and not the outcome of a joint discovery process. Strategy implementation, as well as monitoring and evaluation of the strategy implementation still need significant improvements.

With regard to the S3 model priority setting in the EaP countries is often done not systematically enough, and in a top-down approach. Consultations and involvement of all key stakeholder groups in strategy development has no tradition yet. Involving the broader society is even further away. These processes would necessitate that policy makers accept that broader groups, including businesses and non-profit organisations can operate freely and will be taken seriously and listened to. This is in several countries not the case yet (e.g. Azerbaijan, Belarus), and vertical command lines and top down decision making are still dominating. There are some first examples of consultations and stakeholder involvement though, e.g. in Moldova it was applied for developing the R&D strategy. In Georgia it is envisaged in the context of an internationally supported Competitiveness and Innovation Programme.

Research strategies are in the EaP countries mostly separated from innovation strategies, and have been elaborated in some cases by - or under the auspices of - competing public actors. A more integrated approach to R&I would be useful, as well as a broader view of innovation beyond classical technological innovation, including for example also service or social innovations. A more narrow approach would, however, be needed for priority setting. Priorities are in most EaP countries defined rather broadly. Business has only to a limited extent been involved in priority identification, while entrepreneurial discovery processes are only emerging. The cases of Georgia with its CIIP and Armenia with its industrial strategy seem most advanced in the sense of business involvement.

Several strategies include a solid assessment of the current situation of research and/or innovation (e.g. Belarus, Armenian industrial policy strategy), but it is not always the case. However, international assessments of the research and innovation sectors of EaP countries have been conducted, and the results inform the national policy making and strategy development. UNECE has organised Innovation Performance Reviews of Armenia, Belarus and Ukraine[44]. A policy mix peer review of research and innovation of Moldova was implemented in 2012 under the FP7 project IncoNet EECA, and of Armenia and Georgia in 2015 under the FP7 project IncoNet EaP in 2015[45]. Reviews of Research and Innovation of Moldova and Ukraine have been performed in 2015-16 under the EU's Horizon 2020 Policy Support Facility[46]. UNESCO has supported research policy making in Azerbaijan with an advisory project in 2009-11[47].

[44] See UNECE, Innovation Performance Reviews http://www.unece.org/innovationperformancereviews.html
[45] IncoNet EaP http://www.inco-eap.net/
[46] https://rio.jrc.ec.europa.eu/en/policy-support-facility/peer-reviews
[47] See http://www.unesco.org/new/en/natural-sciences/science-technology/sti-policy/country-studies/azerbaijan/

In the governance of R&I significant modifications have occurred in several EaP countries. New R&I coordination bodies have been introduced (e.g. National Council of Ukraine on Science and Technology Development), and specific agencies for funding of research and for support of innovation activities have been established (e.g. Georgian Innovation and Technology Agency). Setting-up of governance bodies and procedures, as well as elaborating strategies alone will not be sufficient. Countries must come from formal modifications of governance to practical improvements in the implementation of policy. Principles of transparency and objectivity will have to be applied in the operation of R&I support bodies, inclusive participation of stakeholders (e.g. of representatives of SMEs and Civil Society Organisations) and consideration of their positions in policy elaboration and implementation will be required. This necessitates also a cultural shift to a more open and democratic policy making and implementation.

The governance needs also to be adapted to the size of the country and its R&I potential. The smaller countries Armenia, Georgia and Moldova will not need a highly differentiated governance and strategic base, but a well focused and efficient one.

R&I Performers in EaP countries: In the EU28 universities (Higher Education Institutions - HEI) are very important research players, directly linking education and research. This approach of "research universities" is still in an evolutionary phase in EaP countries. Traditionally the government sector (GOV) plays the most important role in research performance, and also in applied research and in innovation activities. Academies of Sciences and branch research institutes under Ministries are the relevant players in the government sector.

The business-enterprise sector (BES) as R&I performer is hard to assess, because data are lacking. It is less important usually than in the EU28, and in some of the EaP even marginal. Data are not reliable, as some research institutes are organised as companies and counted to BES.

Trade, FDI, and integration in regional and international value chains are hampered in all EaP countries either by regional conflicts or sanctions because of political reasons. All EaP countries except Belarus experience conflicts with neighbours over certain disputed regions: Armenia and Azerbaijan among them over Nagorny Karabakh. For other countries the disputes are with Russia: Georgia over Abchasia and South Ossetia, Moldova over Transnistria, and Ukraine over Crimea and Eastern Ukraine. Belarus experiences some trade limitations with Western countries due to the undemocratic nature of its political system.

Information and communication technologies have proven over all EaP countries to be a perspective innovative field, with several companies per each country operating in this field. ICT businesses have the advantage of requiring only low capital investment and they can rely on still good education in the informatics and natural sciences in the region.

Monitoring and evaluation are in all EaP countries on the weak side. Strategy and programme documents include usually indicators for measuring progress of implementation and results. These indicators are monitored, but no external evaluation of the usefulness of indicators and of the results is currently performed. Evaluation of projects submitted to research and innovation funding programmes and agencies is performed. Some of the agencies have been established very recently (e.g. Georgian Innovation and Technology Agency - GITA) and their performance cannot be assessed yet. Mostly it is national experts which are used for project evaluations, which limits the reliability of evaluations. It is only a limited share of the public R&I budgets, which are distributed through

competitive procedures based on evaluation. Examples of evaluation of research entities is still rare, e.g. in Moldova it is performed to some extent by the National Council for Accreditation and Attestation (CNAA).

R&I statistics in EaP countries are incomplete, in some cases not fully reliable and important statistics are even missing. This concerns statistics on business R&D and on innovation activities, which are important in our S3 context. Most advanced on statistics seem here Belarus and Ukraine, which can provide data even about innovation activities. The State Statistical Service of Ukraine has started to conduct surveys of innovation activities in recent years in line with the Eurostat methodology. However, this statistics is focused on the industrial sector only.

The major gaps that may impede the development of a S3 strategy in the EaP countries are compiled in the table below.

Table 9: Main features and gaps of the EaP countries R&I strategies with regard to S3 model

RIS3 Guide Steps	EaP countries
ANALYSIS OF REGIONAL / NATIONAL CONTEXT	- International benchmarking limited by lack of proper statistics (e.g. on business R&D and innovation) - Reliable statistics on business R&D and innovation activities are lacking - Existing analysis is often R&D focused - Analysis does not sufficiently reveal industrial strenghts and entrepreneurial environment - Trade flows, FDI and integration in international value chains hindered by regional conflicts and trade sanctions - Innovation support structures and programmes (e.g. for start-ups, venture funding, etc.) in an early stage of development
GOVERNANCE	- tradition of top-down strategy development; limited involvement of broad stakeholder groups yet - low private sector involvement in R&D and in innovation policy - weak research-business links
SHARED VISION	- focus on technological innovations, while other forms of innovation are mostly neglected
IDENTIFICATION OF PRIORITIES	- tradition of a broad definition of priorities - research and industrial policies offer different sets of priorities - identification of priorities is not done systematically enough and with appropriate methodologies - spreading of the low R&I funding over a wide range of priorities and lack of focusing
POLICY MIX	- low public R&I funding, which is mostly allocated in an institutional funding mode to Public Research Organisations (PROs) - Weak transparency of funding allocation - Lack of financial resources hampers implementation of strategies and action plans
MONITORING & EVALUATION	- Monitoring and evaluation weakly established in the region - Mismatch between strategy development (which is relatively well established), and strategy implementation (weak)

To sum up the analysis, we should note that smart specialisation is a new approach for the EaP countries. The R&I systems will have a long way to go to be adapted to S3 requirements and in some countries fundamental changes to policy making (e.g. allowing broad stakeholder

involvement) will be necessary. Due to limited resources, the countries will have to make choices which policy mix and R&I stimulation measures will be affordable. A highly differentiated system will especially for the smaller among the EaP countries not be needed. The measures should be easily accessible for the target groups, transparent, lean in administration, and focused on relevant priorities for the country. Scarce resources should not be spread on too many measures, which would reduce the impact.

3.4 Implications for the EU enlargement and neighbourhood policies and the countries concerned

Slavo Radosevic, Manfred Spiesberger

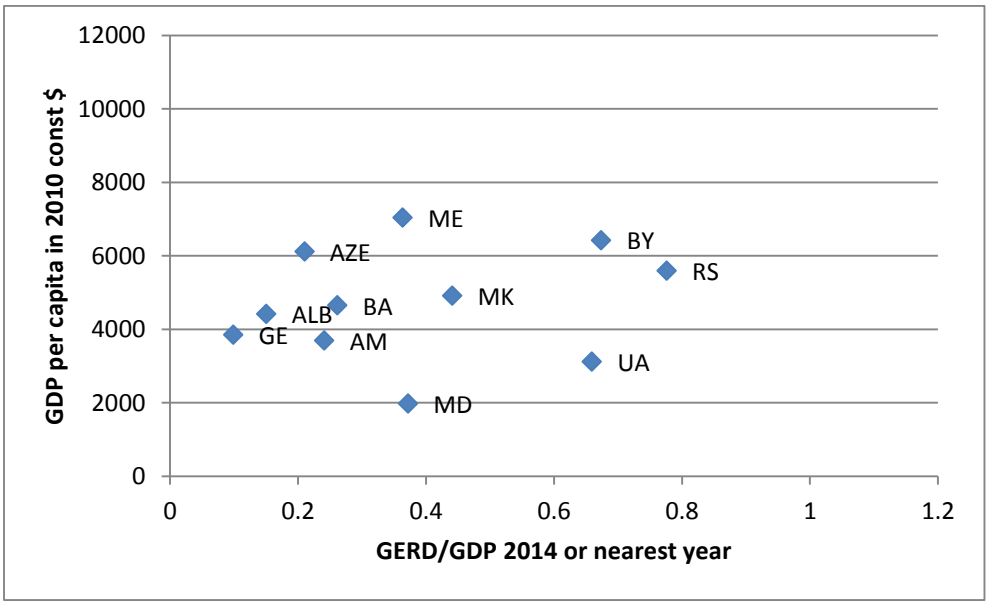
3.4.1 Summarising the context

S3 policy approach was originally conceived for implementation within developed European Union (EU) Member States, and that is where its philosophy seems to fit well (McCann and Ortega-Argillés, 2011). Established research and development (R&D) capacities, an economy with a large technology sector and institutional preconditions in the public and private sector appear to be the most conducive environment for the implementation of the S3 policy model (see Foray, 2015; Kroll, 2016, 2017; Asheim et al., 2017; and compare with Paliokaitė et al., 2016; Karo et al., 2017; Tsipouri, 2017). On the other hand, the need for new policy approaches like S3 seems to be even greater in less developed regions. This situation has previously been described as the regional innovation paradox or 'the apparent contradiction between the comparatively greater need to spend on innovation in lagging regions and their relatively lower capacity to absorb public funds earmarked for the promotion of innovation and to invest in innovation-related activities compared to more advanced regions' (Oughton et al., 2002).

In that respect, Enlargement and Neighbourhood (E&N) countries represent, on average, an extreme version of this paradox as the level of R&D activity in these countries lags behind that even in the majority of the EU's less developed regions and, in per capita terms, they are relatively much poorer economies. Figure 6 shows the relationship between income levels and relative expenditure in nine E&N countries [48]. R&D expenditure in these countries is either below or well below 1 % of gross domestic product (GDP), while the GDP per capita is between USD 2 000 and 7 000 These development features have a strong influence on the main drivers of the country's economic growth as well as on R&D and innovation policies. Drivers of growth in these countries are typical for middle-income economies, namely primary factors such as agricultural raw materials, natural resources and a low-cost labour force working in low value-added activities. Production capability rather than innovation capability is the most significant driver of productivity growth (Radosevic and Yoruk, 2016). R&D in these economies is significant but largely as a driving force for 'absorptive capability' (for econometric evidence, see Kravtsova and Radosevic, 2011). There is evidence that in some E&N economies lower levels of productivity are due to low production sophistication and poorer management quality and practices (Bloom et al., 2011). The technology activity of firms is often intensive, but it is directed towards adaptation to and adoption of new equipment, improved production quality and process engineering cost improvements. R&D is often a very peripheral part of innovation expenditure. In summary, innovation is not necessarily based on R&D nor does it require cooperation with R&D organisations.

[48] R&D data for Albania are not available. Its GDP per capita is USD 4 400 in constant 2010 terms.

Figure 6: Gross expenditures for R&D in GDP and GDP per capita



Source: World Bank development indicators database 2016 except for Albania UNESCO UIS database figure for 2008

An important feature of the E&N economies is that they have the business R&D sector is weak (Albania, Georgia, FYROM and Moldova) or is predominantly extramural (Belarus, Ukraine).

Unlike Central European economies, E&N economies are outside global value or supply chains. Only a few are integrated in the worldwide economy, and then only in specific sectors (information and communication technology (ICT) outsourcing services — Ukraine, Armenia, Belarus; diamond processing — Armenia; clothing — FYROM; automotive parts — Serbia; agriculture sectors — Ukraine). This is in striking contrast to Central Europe, where foreign direct investment plays a major role in export services.

R&D systems in several E&N economies have stabilised after a period of decline, especially in the EaP countries, but are not drivers or co-drivers of innovation processes. Public R&D in the science sector is weak and unbalanced as a result of historical legacies, particularly in the EaP countries, which, as former Soviet Union countries, had science and technology (S&T) specialisations within a much larger production and technology system that does not correspond to the radically changed new context.

These structural features of the E&N economies are reflected in the level of development and profiles of their research and innovation (R&I) policies. In these countries, the higher the relative proportion of GDP spent on the R&D sector, the more developed the R&I policies seem to be.

Based on the expenditure for R&D (see Figure 6) and on comparative development of R&I policies as elaborated in this study, we can group the 11 E&N economies into three clusters.

(1) The first cluster consists of **Belarus**, **Serbia** and **Ukraine**, which have quite different profiles of R&I policies but share developed sets of tools to support R&D and innovation, and established institutional and organisational structures for innovation policy. Belarus has an active and elaborate innovation policy, and there is a strong 'pressure to innovate', with a developed innovation infrastructure but with limited in-house R&D in the enterprise sector. Ukraine has also established

R&D support but unrelated to technological upgrading of the business enterprise sector. Serbia has an established R&D system and its policy is focused on funding R&D programmes conducted by public sector R&D organisations and on the commercialisation of R&D results. While structures have been established, their procedures and effectiveness still require significant improvement.

(2) The R&I policies of **Armenia**, **Azerbaijan**, **FYROM**, **Georgia**, **Moldova** and **Montenegro** are still in the initial or formative stages compared with the countries in cluster 1. These countries have established specific instruments and have set up a R&D system, but are still lagging behind in the process of developing elaborate and fully fledged R&I policy frameworks. Although different from each other, Armenia, Azerbaijan and Georgia, in contrast to FYROM and Montenegro, represent the post-Soviet R&D system characterised by a strong legacy of the Academy of Science (Azerbaijan and Armenia) and top-down orientation of scientific policies. This legacy is particularly strong in the case of Azerbaijan. Georgia's R&D system is, despite very low funding, more reformed as it has transformed its Academy institutes into higher education institutions and has also reoriented itself towards the financing of innovation activities. Armenia also falls into this group as a result of low investment in R&D and its semi-reformed R&D system. Its innovation policy emerged only in 2008, as an attempt to expand activities beyond public R&D activities. FYROM and Montenegro's R&D systems are institutionally different from those of the four EaP countries in this group. However, they are much less developed than R&D systems in Belarus, Serbia and Ukraine.

(3) **Albania** and **Bosnia and Herzegovina** have, for different reasons, not yet established the fundamental functioning elements of R&I policy. This is reflected not only in the lack of data available on their R&D system, but also in the absence of established coordination mechanisms and innovation policy instruments.

However, irrespective of differences in the degree of development of R&I policies and their profiles, E&N countries have one feature in common: the overall model of governance used by these countries is rooted in the idea of a linear innovation model, which puts the focus on R&D as the main source of innovation. Indeed, R&D as a factor of absorptive capacity of these economies is a crucial mechanism, but, equally, their policies should be directed towards non-R&D drivers of growth and productivity. For example, in countries that have developed R&I governance, there are no comparable governance mechanisms or bodies, networks or organisational arrangements that are focused on non-R&D sources of innovation. Organisations such as productivity centres, quality control and quality enhancement centres, industrial extension services and sectoral technology support services are not only non-existent, but are not yet the targets of policy.

Finally, the weak institutional capacity to pursue innovation policies and the different degrees of readiness to apply the S3 approach requires specific approaches by country or by group of countries.

3.4.2 Implications for S3 in the EU Enlargement and Neighbourhood policies

Given these key features of E&N countries from the S3 perspective, what are the policy implications for the EU E&N policy?

First, the EU S3 approach towards E&N countries needs to recognise the differences in their levels of innovation activities and the fact that **innovation in E&N economies is driven by non-R&D activities**.

So, it is important to acknowledge that each country strikes a balance between R&D-oriented and non-R&D-oriented supporting activities and programmes. There are strong limits on innovation policies that are only R&D oriented. Instead, policies to promote quality improvement, productivity-enhancing measures, for engineering, software, user-oriented innovations and training of the labour force should also be present. Innovation policies should focus on the whole innovation chain, including production capabilities. Currently, policies focus on the commercialisation of the results of public R&D, new technology-based firms and science–industry links, while technological activities and technological upgrading in the business sector as well as non-technological innovation are neglected. The latter should receive more attention in R&I policies in E&N economies. S3-based R&I policy embraces a broad view of innovation, supporting technological as well as practice-based and social innovation. The focus not only on R&D-based innovation is convenient for E&N countries, though the specificity of the E&N economies requires that some of the existing S3 model tools are adjusted to this context. The overall S3 approach would need to be much more differentiated to capture the specific technological and upgrading challenges of these economies.

Second, S3 for E&N economies should recognise that **the importation of technology in different forms is of great significance** to technological upgrading in these economies. As argued elsewhere (Radosevic and Stancova, 2016) the transnational dimension of S3 has so far been its most undeveloped component. The key challenge for smart specialisation is how the local production stage of global value chains may become a building block of the regional innovation strategy. For E&N economies, integration into regional and global value and supply chains as a source of technological upgrading and structural change is just as important as R&D and innovation activities. This is even more important given that the majority of the E&N economies are either outside these networks or present only in segments of them. This requires a broadening of the scope of the innovation policies in E&N countries such that R&D and innovation policy is integrated into FDI promotion and support for supply chains. The European Commission (EC) should develop a long-term approach to facilitate the integration of these economies into EU supply chains as a way to promote their technological upgrading, but also as a mutually beneficial way to strengthen these supply chains. The present activities on the integration of the science systems of E&N countries into EU programmes should be expanded to linkages and twinning activities, which would be focused on downstream activities, training, quality improvement, productivity enhancement, meeting of EU health and safety standards, etc. S3 could serve as a bridging factor facilitating access to value chains when combining similar or complementary competences and finding specific roles in global value chains.

Third, the **institutional capacity for S3 is seriously lacking** in E&N countries. S3 requires developed public–private and mezzo (sector)-level coordination mechanisms. It assumes that there is sector- and technology-specific policy expertise and that there are institutional and financial conditions for experimentation. As these preconditions are absent, EU E&N policy should strongly support capacity-building measures in R&I policy, including monitoring and evaluation (M&E) capacity. However, these capacity-building measures should be tailored to the specific conditions of middle-income economies where drivers of productivity are not the same as in high-income EU economies. Copying capacity-building programmes or adopting off-the-shelf tools will not be effective.

Fourth, **establishing country-specific S3 governance mechanisms is an essential precondition** for the implementation of S3-type policies. But establishing policy capabilities alone, without the capacity to engage in dialogue with the private sector, will not be sufficient. Similarly, having good

communication with the private sector but weak policy capabilities is also not enough. E&N countries have organised constituencies in the public R&D sector, but constituencies for innovation activities in the business community are, as a rule, more dispersed and thus harder to self-organise. Furthermore, the corporate community could be very poorly organised so that the public sector may need to improve private–private coordination.

In some E&N countries, horizontal policies will be more appropriate than vertical ones when public–private coordination is weak. In addition, **the appointment of a single agency to coordinate S3 processes could be recommended** when intra-public sector coordination is undeveloped. Thus, policy design should be tailored to the coordination capacities of innovation policy. However, the key task of S3, for it to be effective and relevant, will be the development of coordination capacities in innovation policy. E&N policy should establish **a minimum standard of coordination capacities in innovation policy, which should be considered a precondition for the S3 process.** These requirements could be framed in generic terms and should allow for the significant institutional and political variety that exists in the E&N countries. A lean and targeted approach should be taken, which will reflect the size of each country, as well as of its R&I community. Overly bureaucratic solutions and competing bodies need to be avoided.

Fifth, **S3 calls for a shared vision and identification of priorities to be generated through an entrepreneurial discovery process (EDP)**. The S3 is, by definition, a kind of experimentalist policy, as would be expected given the importance of EDP in its design. However, this inevitably clashes with the rigid nature of administrative procedures in E&N countries. The challenge is how to square this feature of S3 with requirements for selectivity, learning, and trial and error. This issue is not unique to E&N countries but is very common across many EU regions, especially in cohesion countries[49]. The viable solution would be to nurture autonomous public agencies that have freedom to issue tailor-made rules. These organisations should have a mandate to operate under a different regime, which would enable them to promote a portfolio of projects and manage them depending on their successes or failures. A culture of accepting a certain level of risk and failure in innovation support will be needed here. This could be possible when there is a political commitment to the S3 process. In summary, the application of S3 would require an entrepreneurial type of agency, which could be developed through twinning arrangements with different EU countries. These agencies would be required to manage portfolios of projects with a common theme and strategy behind the portfolio, even though the strategy may be implicit. The aim is to develop the capability and motivation to experiment, make mistakes and correct them (Kuznetsov and Sabel, 2017). These agencies whose nuclei are often already present as well-functioning organisations of different types in various countries. They should be supported as potential drivers of the EDP.

Sixth, **the S3 policy mix calls for a different balance between horizontally and vertically focused instruments.** Horizontal policies lack the focus of vertical policies. Although vertical policies might be more prone to failure, they are potentially more effective than horizontal policies as they are more focused. Horizontal policies are less prone to failure but at the price of potentially reduced effectiveness. E&N countries have quite diverse cultures and preferences in terms of policy style preference, which should be recognised. Their policy mixes should be gradually developed and can be effective only when the previous five preconditions have been met. The policy support should

[49] For the 2014-2020 period, the Cohesion Fund concerns Bulgaria, Croatia, Cyprus, the Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia and Slovenia.

explore what are the low-cost and administratively less demanding, but effective, policy measures that are feasible in individual E&N countries. It is important to bear in mind that these actions should result from local EDP and extensive discussion with local stakeholders.

3.4.3 Policy implications for the E&N countries

In this section we will address what changes in E&N countries would be required to adopt the S3 approach.

It is important that E&N countries willing to apply the S3 model would meet the necessary **preconditions for S3 policies**. Based on the evidence in this report, some countries do not have preconditions in place as they have not yet established fully fledged, developed innovation policies as tools of their technological upgrading and structural change. In particular, this applies to Albania, and Bosnia and Herzegovina, both of which still need to establish functioning R&D systems and R&D policy, and, with international assistance, to establish programmes for support of technological upgrading of enterprises.

Armenia, FYROM, Georgia, Moldova and Montenegro are in the process of developing R&D and innovation policies, which would require active support from the EC, as outlined in the section above. Belarus, Serbia and Ukraine all have established R&D policies but would need to broaden the scope of such policies and establish innovation policies covering all aspects of the innovation value chain.

The degree of development of strategic policy capacity for innovation promotion varies widely among E&N countries. Accordingly, E&N countries need to either establish or enhance institutional capacity for provision of support services to local firms and investors within development and technology agencies.

Countries need to continue the integration of their R&D networks into EU networks as a means to access the latest R&D knowledge and become integrated into international knowledge networks. Equally, E&N countries need to support integration in downstream areas of the innovation value chain by promoting access of local firms to international supply chains as well as upgrading within these networks. I E&N countries should not be expected do this on their own, but they should actively seek support from the EU through different twinning and linkages initiatives and participation in the EU funding schemes. At the same time, the strategic objectives of EU pre-accession assistance or European Neighbourhood Instrument must embrace improvement of the environment for competitiveness and innovation.

E&N countries would need to evaluate whether the existing governance structures are suitable from the S3 perspective and agree on how to improve coordination and communication between the private and public sectors in innovation activities. Countries should envisage what organisations in the national context are best suited to facilitate and improve the collaboration between the stakeholders, the public sector, the private sector, universities and non-governmental organisations (NGOs).

The improvements in R&D and innovation policies would lead to better capacities to develop S3-based strategies. Although there are no formal requirements or need to comply with S3 criteria, as discussed above some preconditions must be met to launch robust and sustainable S3 processes. The

creation of shared visions and priorities should be seen as a process rather than as a precondition for S3. The entrepreneurial discovery process will be successful only if it is inclusive and interactive, which means that some institutional governance and coordination capacities are required.

Significant changes in the policy culture and management of R&I will be required to make S3 work properly. As outlined above, a more horizontal approach to policy-making that makes room for a broad involvement of all relevant stakeholder groups will be required. This will also mean giving a voice to representatives from small and medium-sized enterprises (SMEs) as well as creating space for development of NGOs and their involvement in policy-making. Risk and failure are associated with innovation activities and to some extent must be accepted in innovation support schemes. Another cultural issue with the E&N countries concerns the tendency for over-regulated, overly bureaucratic and conflicting regulations. Clear and simple regulation as well as lean management structures with clear distribution of responsibilities will be required. Better coordination among governmental players in R&I and the economy is recommended, which, as far as possible, should take place in established bodies.

External support for EDPs and study of good practice in EU countries would facilitate this process significantly. An example could be the planned stakeholder involvement and workshops for developing industry strategies in Georgia in the context of the Competitiveness and Innovation Project, which was supported by the World Bank.

The S3 is inextricably linked to policy mix for its implementation. Given the institutional, political and other constraints, the E&N countries should examine what is the desirable policy mix, that is, what is the most appropriate balance between different types of policy instruments for the specific country, given the available funds and policy capacity.

M&E is a critical self-reflection instrument of innovation policy and should be should be built into the policy as a means for learning and correction. It is essential that countries develop local expertise in this area, though initially they will need extensive international assistance to do so.

In conclusion, the main institutional preconditions for the S3 process are not yet in place in several E&N countries. This requires **the minimum preconditions** for initiating a robust and sustainable S3 process:

- Effective, consensus-building **political leadership** in three domains (research and universities, the private sector and public authorities) that is willing to embark on the process of S3.
- 'Critical mass' of **analytical and policy implementation capacities** in the public sector, industrial associations and the R&I sector.
- Established **interaction mechanisms** between government and non-governmental organisations in the business and R&D sectors involved in the policy-making process. Where these organisations are missing there needs to be a willingness to develop public–private partnerships and collective action institutions — firm associations, public agencies and forums.

In addition to these requirements, there should be the political will and a broad consensus among stakeholders to identify potential local innovation and production capabilities; funding and network support will be need to achieve critical mass necessary for further growth and export.

4 Conclusions and Recommendations

Expansion and diffusion of the S3 concept is now under way as it has been recognised an attractive model, promoting growth and well-being in regions. It has been acknowledged as a driver of innovation and regional economic transformation. In the EU Member States, S3 has triggered wider stakeholder involvement in R&I strategy development, led to closer links between business and research and helped to leverage scientific knowledge with technological capacities and market opportunities. The S3 model is not a single method that can be applied to all regions irrespective of context. The application of S3 differs from region to region, aligning the place-based innovation processes with the knowledge dynamics and the specific socio-economic conditions encountered in each region.

It is still too early to judge the impact of S3 policies; however, most EU regions and Member States perceive the S3 process as highly beneficial in streamlining R&I investment and effort in a more coordinated way, increasing its impact on the economy. It is also thought that less developed regions outside the EU could benefit from these lessons to improve R&I policy modes.

In the framework of its E&N policies, the EU strives to strengthen the stability, security and well-being of its neighbours, improving the framework conditions for reform, building capacity, opening access to programmes and reinforcing cooperation. The EU E&N policies recognise the S3 model as a useful framework for advancing R&I activities and their governance. How and if this model will be adapted by non-Member States remains to be revealed. The conditions required to develop S3-based R&I policies are less favourable outside the EU and will require fundamental changes to policy-making.

In this report we analyse two groups of countries: five countries in the Western Balkans some of which are EU enlargement countries or EaP countries, also defined as EU neighbourhood countries in Eastern Europe. While the general context, framework conditions and degree of development of R&I might be different, these countries have some common features and challenges.

R&D activities in the E&N countries lag far behind those in many of the EU's less developed regions. Based on their expenditure on R&D in terms of GDP and developments in R&I policies, E&N countries can be classified into three groups:

1) Belarus, Serbia and Ukraine have relatively better developed R&D support than other E&N countries.
2) Armenia, Azerbaijan, FYROM, Georgia, Moldova and Montenegro are in the process of developing R&D support instruments.
3) Albania and Bosnia and Herzegovina still lack the fundamental elements of a properly functioning R&I policy.

Despite the different level of advancement, the general R&I context in these countries can be summarised as follows:

- The common feature of E&N economies is that these countries usually have a weak business R&D sector. Most industry-related research is still concentrated in a few large state-run research centres. R&D in the business sector is largely financed by the government.
- The governance of R&I policies of E&N countries is based on the linear innovation model, focusing on R&D as the main source of innovation.

- The paradox is that the drivers of growth in E&N countries are different — production capability rather than R&D is the primary driver of productivity growth. Innovation is not necessarily R&D based and does not always originate from R&D organisations or in close cooperation with them. Non-R&D-driven business innovation often plays a more important role in local innovation ecosystems.
- Although efforts to internationalise R&D have been undertaken and most E&N countries are associate Horizon 2020 countries, overall, E&N countries have weak links to or are outside the global value or supply chains.

In this context we have tried to explore how the S3 model could help to improve R&I policies in E&N countries. Therefore, we have assessed the R&I systems in these countries with regard to the main S3 principles stated in the RIS3 Guide following the six steps of the strategy development cycle. The main gaps are summarised below.

1. Analysis building — reliable statistics on business R&D and innovation activities are often lacking, existing analyses are often R&D focused, not sufficiently reflecting industrial strengths and entrepreneurial environment. Analysis does not include international benchmarking.

2. Governance — constitutes the main pitfall in E&N countries for the S3 process. Weak institutional capacity hampers moving towards efficient R&I policies. Innovation governance concentrates largely on the public sector, mainly involving responsible ministries, academies of sciences and research institutes. Usually the main institutional structures are present but coordinating bodies facilitating interaction between different institutions and organisations involving the business sector are lacking. The governance model does not ensure the involvement of all relevant stakeholders of the R&I system. If they are involved, businesses and NGOs participate only marginally in consultations. Good efforts have been made in some countries, but these are fragmented and not yet consistently applied to overall R&I policy.

3. Shared vision. The main divergence from the S3 model is that R&I strategy visions are often confined to research and technological development, failing to recognise and consider broad-based innovation, which embraces the whole innovation system and its participants, and may include various forms of innovation, such as policy innovations, social innovations, institutional innovations, structural innovations and innovations in services. The R&I strategies concentrate too narrowly on the exploitation of scientific–technological knowledge. Consequently, acknowledging innovation that is responding to societal challenges, such as health, well-being, sustainability, the environment and energy efficiency, is missing.

4. Identification of priorities. Most of the countries have identified thematic R&I priorities. In some countries these priorities are confined to research only, whereas others have envisaged thematic priorities in industry or have different sets of priorities applied for research and economic development policies. As a result of the bottlenecks in the governance systems the priorities identified are not the consequence of systematic consultation with stakeholders or of an EDP.

5. Policy mix. Low availability of public funding for R&I, unfavourable framework conditions and weak governance hamper the implementation of policy strategies. Existing R&I funding is often distributed to research institutes and their programmes, while universities and business receive only a limited proportion of the funding. Implementation programmes and plans are R&D focused and lack support for business innovation.

6. M&E. This is weakly established in E&N countries. Lack of comprehensive statistical data on R&I, especially in the sector of business innovation, limits M&E activities. Weak or limited M&E activities often reflects an institutional capacity problem and competence for M&E needs to be reinforced.

These are deficiencies that will have to be tackled through the S3 process. In most E&N countries S3 is a new approach for R&I; therefore, these initiatives should be guided and supported by the EU bodies and EU partner countries.

4.1 Policy recommendations for the E&N countries

As identified by this report, many countries lack the capacity to develop and sustain S3 initiatives as they do not have fully fledged innovation policies. Therefore, some important preconditions need to be met before launching the S3 process.

1. **Political will, commitment and consensus** regarding the viability of and need for an S3-based process, are required.

2. A country should have sufficient **institutional governance and coordination capacities** to ensure interaction mechanisms among the relevant stakeholders in research, higher education, the private sector and public authorities. If coordinating bodies are missing, these must be established or based on the existing institutions and teams within.

3. A country should build **analytical and policy implementation capacities** in R&I, embracing research, technological development and business innovation, and improve R&I policy development and implementation quality standards.

In addition to these basic preconditions, countries should also take into account the following issues:

- Improving the overall quality of R&I policy development would result in better readiness for S3.
- S3 is not just a part of R&I policy, it should be at the top of the strategic agenda, integrating all policies relevant for economic transformation. It is important to avoid competing interests and over-domination, and to organise inclusive and transparent processes.
- S3-based R&I policy embraces a broad view of innovation, supporting technological as well as practice-based and social innovation. Developing favourable framework conditions and support for business innovation would allow developing capacity to respond to greater technological challenges in the future.
- The E&N countries must expand their policy mix spectrum by addressing demand-led business innovation, non-R&D innovation, productivity and quality issues as well as technological upgrading.
- The E&N countries must reinforce coordination mechanisms between the private and public sectors in innovation activities. Countries should envisage which organisations in their national context are the best suited to facilitate and improve collaboration between stakeholders in the public sector, the private sector, the research sector and NGOs.
- S3 is a place-based policy concept, relying on the local innovation ecosystems. Therefore, larger countries in particular must consider regional diversity and specialisation, allowing the

more advanced regions to experiment with S3 pilot projects and establishing links with EU regions with common specialisation fields.

- Countries need to continue integration into the EU R&I networks and find ways to gain access to the latest good practice and knowledge from EU countries. E&N countries should actively seek support from the EU through different twinning and linkages initiatives and participation in the EU funding schemes. Support schemes, such as Horizon 2020 Policy Support Facility, must be exploited to gain the necessary expertise.
- E&N countries could benefit from aligning their S3 priorities with common areas of interest with their neighbouring EU partners from the Danube and Adriatic–Ionian EU macro-regions and active participation in the platforms provided by these macro-strategies. The alignment of the R&I priorities could help them to better exploit certain R&I synergies. Liaising with EU partners could contribute to better coordination of R&I activities of E&N countries as well as to greater participation in the EU research programmes.

In contrast to EU countries, the implementation of S3 strategies outside the EU is not supported by concrete EU funds, and lack of funding is perceived as one of the major obstacles to initiating the S3 process in E&N countries. Therefore, existing EU support instruments, such as the IPA (Instrument for Pre-accession Assistance), TAIEX (Technical Assistance and Information Exchange), Twinning, SIGMA (Support for Improvement in Governance and Management) and the NIF (Neighbourhood Investment Facility), have to be considered to reinforce capacity for R&I policy development. The strategic objectives of EU pre-accession assistance and European Neighbourhood Instruments must be revised in a way that embraces improving the environment for competitiveness and innovation, extending opportunities to reinforce R&I by applying the good practice of the S3 approach and strengthening cooperation with the partner countries.

It must also be noted that application of the S3 approach outside the EU has to follow the principles of a differentiated approach, respecting the different context, and different expectations and interests.

4.2 Recommendations for the RIS3 assessment methodology

Based on the analysis, we have shown that, as a tool, the RIS3 Assessment Wheel needs to be adjusted to suit the specific situation of E&N countries. The RIS3 wheel was originally designed to assess the quality of S3 strategies in EU countries and regions. The context in E&N countries requires redefinition of the focuses that are critical for a viable S3 process. As this work is outside the scope of this report, we outline here only directions in which such revisions should go, but which stay within the existing RIS3 assessment framework.

Analysis of regional/national context should be much more focused on non-R&D drivers of growth and should be based on indicators that are more appropriate to E&N economies. The available local competence and perspective sectors need to be identified more systematically, and based on solid analysis. In addition to R&D indicators the analysis should be more firmly based on indicators that reflect potential and strengths, such as value added per sector, employment per sector, productivity, exports, etc. Together with scientific indicators, such as publication output and patent output, it is important to analyse production capability and indicators such as ISO certificates, trademarks,

different industry-specific certification indicators and industry-specific skills certificates. These should be supplemented by analysis of trade indicators such as export unit prices, changes in structure and sophistication of export and import products and services. For some major sectors of the economy, analysis should indicate upgrading pathways.

The **outward** dimension of the strategy should give a rough picture of the scale and modes of international trade, FDI and global value chain integration. Where possible, countries should utilise data on trade in value added.

The assessment of **entrepreneurial dynamics** over and above the typical analysis of the number of innovative firms per sector would need to address the obstacles to growth faced by small firms and the lack of the infrastructural preconditions needed for their growth (e.g. lack of incubators, start-up support, etc.). It should assess if there are links between large and small domestic firms and should assess the entrepreneurial dynamics of large firms (entry, exit, mergers and acquisitions, innovation and R&D activities, and export orientation).

The **governance** dimension should focus on assessment of **policy capabilities** and on the appropriateness of innovation policy **governance structures**. This refers to the existence or otherwise of coordinating bodies, platforms or forums and of innovation support agencies and measures. In the last decade some E&N countries have been exposed to political and military tensions that have had an impact on long-term policy commitments and reforms. The presence of a politically stable government is crucial for good governance and economic development.

In addition, the assessment of policy capabilities should go beyond innovation policy capabilities and governance but also assess linkages with other policies, such as SME support or promotion of FDI. For example, in the case of FDI policy it is important that investment promotion agencies are able to identify suitable inward investment projects addressing strategic needs and attract high value-added FDI. It is also important to evaluate whether investment, innovation or industrial policies are suitable to address the technological upgrading needed to attract foreign capital.

Assessment of the governance structures should extend beyond domestic innovation policy and assess which bodies and stakeholders are involved in FDI and activities promoting the global value chain. What opportunities are available for domestic firms and industrial or business associations to shape the promotion of linkages with international companies? How do domestic policies promote internationalisation of domestic firms? Do the existing governance structures support such an internationalisation?

The governance dimension should also assess whether industries and sectors are self-organised into clusters, association or networks and whether they are directed outwards or inwards.

Consequently, the beyond-R&D approach in the first two sections of the RIS3 Assessment Wheel should be followed in the next steps, which address the issue of shared vision, identification of priorities, policy mix and M&E.

Shared vision should focus on a view of innovation that covers a range of activities including productivity improvements, skills and training, user-oriented innovation, local problem-solving capabilities through social innovation and obstacles to the development of such capabilities in business and non-business sectors.

Identification of priorities should extend beyond R&D into prioritisation of all activities that drive growth, productivity and structural change. In prioritisation, E&N countries should also consider the revitalisation of traditional industries (e.g. agro-food, light industry, construction, etc.) with cross-sectoral innovation, ICTs or key enabling technologies (KETs) and technology-upgrading services. Often high-tech sectors have not reached the critical mass required to bring about the desired structural change to the economy. Therefore, intersectoral and international partnerships in creating and applying knowledge, technologies and innovation can help to modernise traditional sectors with knowledge-driven potential. Priorities should be assessed from the perspective of their consistency or alignment with needs of specific sectors and industries as well as from the perspective of critical mass of entities.

Policy mix should go beyond the conventional portfolio of instruments focused around funding R&D or innovation projects and should extend to instruments that can help firms to identify needs and find appropriate technological solutions or identify and provide solutions through targeted assistance. The support package for priority sectors besides traditional support measures for R&I should consider including: technology extension services, such as assistance to firms to improve productivity and quality; compliance and metrology services, testing and quality control; support to domestic and ISO standards compliance; technical assistance supporting energy efficiency; technology demonstration centres. The policy mix should include appropriate technology support services that underpin a country's ability to innovate and export.

Finally, **M&E** should be more broadly considered and should go beyond M&E of S3-supported activities. Assessment and evaluations should address effectiveness of public support to (1) institutes and groups, including university and research departments, teams and laboratories; (2) institutions and operators, including public research organisations and universities; (3) teaching programmes and procedures; and (4) R&I systems as a whole, including technical infrastructure organisations (innovation, productivity centres, metrology and standardisation services organisations, etc.). The underlying rationale for this approach is that M&E should be considered a part of the public management modernisation agenda and should be introduced with the help of international organisations and other countries.

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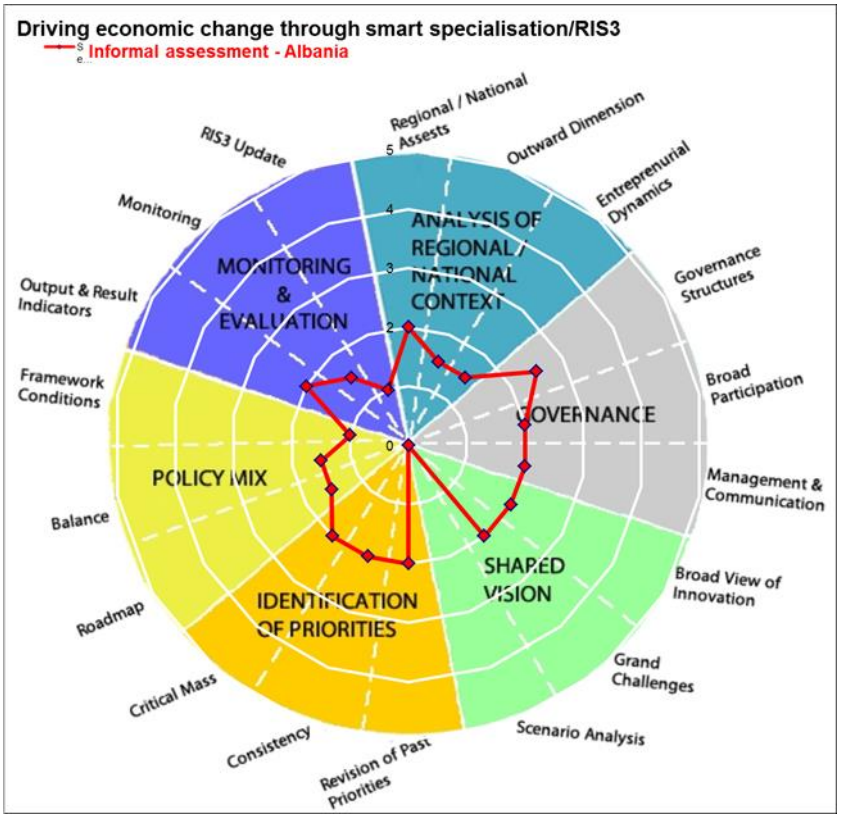
Annex I – RIS3 Assessment Wheel – a tool to evaluate RIS3

The RIS3 wheel is built on the basis of the six steps described in the RIS3 Guide and the identification of 3 critical factors for each step. The scaling tool (from 0 to 5) estimates the seriousness of the evidence provided in the process as far as each critical factor is concerned with the following meaning: *0 = no information available on the specific element; 1 = poor; 2 = to be improved; 3 = fair 4 = strong; 5 = excellent*

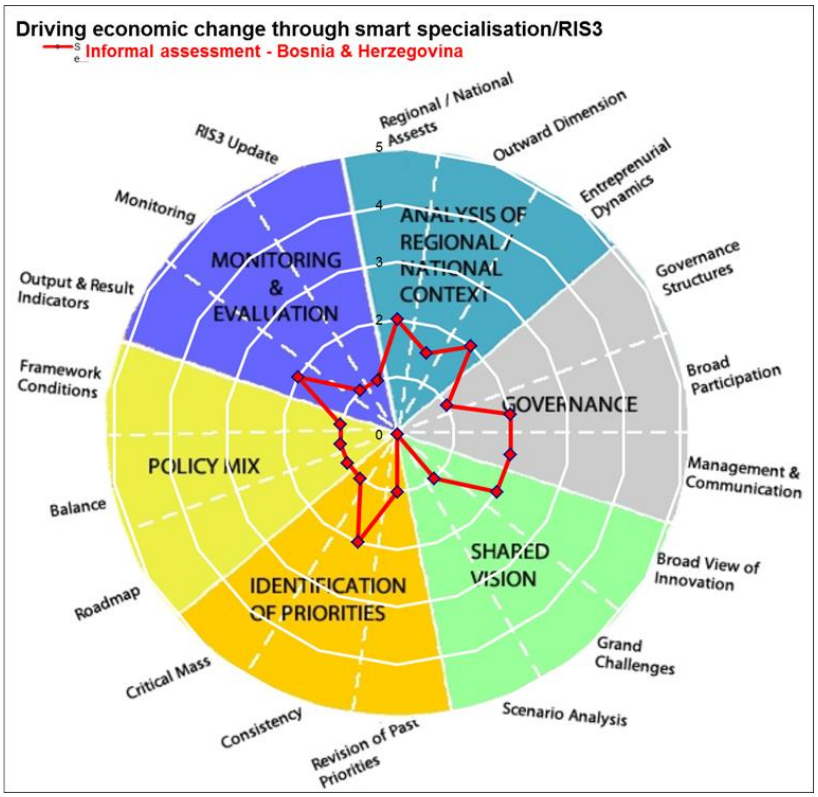
RIS3 Guide Steps	Sections	Scores	Short explanatory - see the RIS3 Guide & Annexes for reference	RIS3 Guide reference
ANALYSIS OF REGIONAL / NATIONAL CONTEXT	**Regional / National Assets**	0 - 5	regional / national assets' endowment SWOT innovation potential & skills for knowledge based development	Step 1 (page 18) + Annex I (pages 28-33)
	Outward Dimension	0 - 5	connectivity - knowledge, trade & skills flows positioning in trans-regional and international value chains trans-regional/international collaboration networks	Step 1 (page 19) + Annex I (pages 28-33)
	Entrepreneurial Dynamics	0 - 5	start-ups, clusters, entrepreneurial networks FDI; new forms of self-employment, etc.	Step 1 (page 20) + Annex I (pages 28-33)
GOVERNANCE	**Governance Structures**	0 - 5	Identification of specific bodies and definition of their tasks, roles and responsibilities	Step 2 (page 21) + Annex I (pages 34-44)
	Broad Participation	0 - 5	Interactive, consensus-based application of collaborative leadership principles quadruple helix actors (involvement of boundary spanners)	
	Management &Communication	0 - 5	use of open forum discussion and citizen dialogue; e-governance	
SHARED VISION	**Broad View of Innovation**	0 - 5	Are social, organizational, service and market innovation considered beside technological and science based innovation?	Step 3 (page 22) + Annex I (pages 45-50)
	Grand Challenges	0 - 5	Societal inclusive, environmental and sustainable economic development	
	Scenario Analysis	0 - 5	Risk assessment and contingency plan for possible future changes	
IDENTIFICATION OF PRIORITIES	**Revision of Past Priorities**	0 - 5	Critical revision of past experiences (from RIS to RIS3) dynamic identification of actual or potential areas with competitive advantages	Step 4 (page 22) + Annex I (pages 51-52)
	Consistency	0 - 5	Alignment with context analysis and harvesting of entrepreneurial discoveries and DAE	
	Critical Mass	0 - 5	Concentration of resources to the limited number of priorities	
POLICY MIX	**Roadmap**	0 - 5	incl. action plan and pilot projects	Step 5 (page 23) + Annex I (pages 53-58)
	Balance	0 - 5	Appropriate mix of targeted and horizontal measures	
	Framework Conditions	0 - 5	e.g. allowing for support to experimentation	
MONITORING & EVALUATION	**Output & Result Indicators**	0 - 5	Selection of a limited number of Output & Result Indicators linked to priorities with clearly identified Baseline and Targets	Step 6 (pages 24-25) + Annex I (pages 59-64)
	Monitoring	0 - 5	Mechanisms, supported by appropriate data collection, to verify how the activities in the RIS3 strategy are delivering the Output and Result Targets	
	RIS3 Update	0 - 5	Revision of priorities and policy mix as a result of the Monitoring exercise	

Annex II – RIS3 Wheel Assessment of the WBC-5

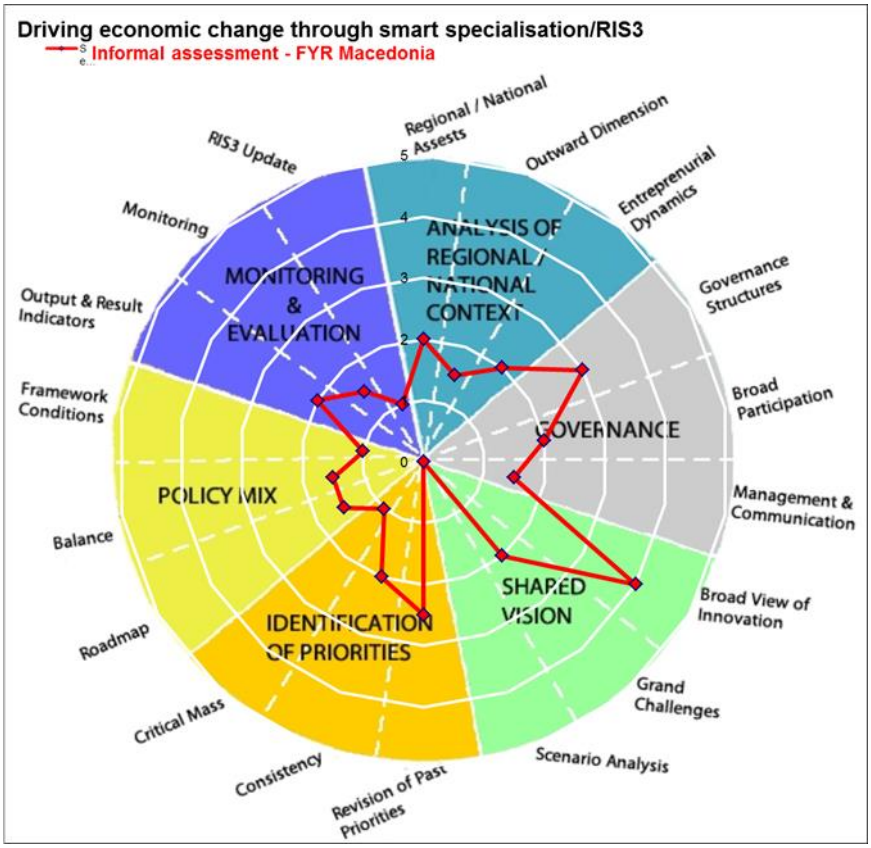
Albania



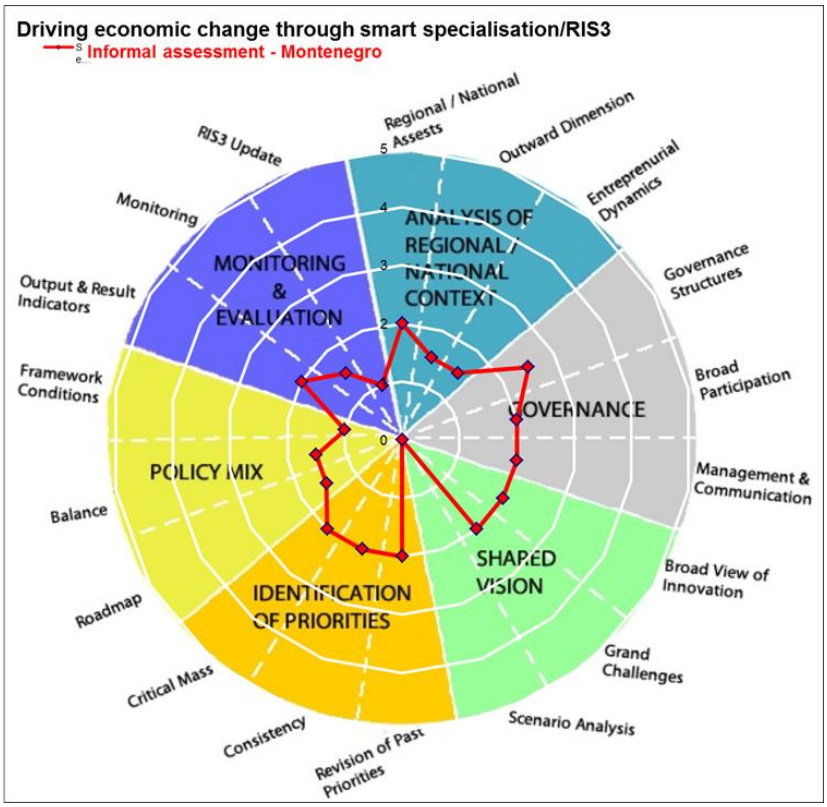
Bosnia & Herzegovina



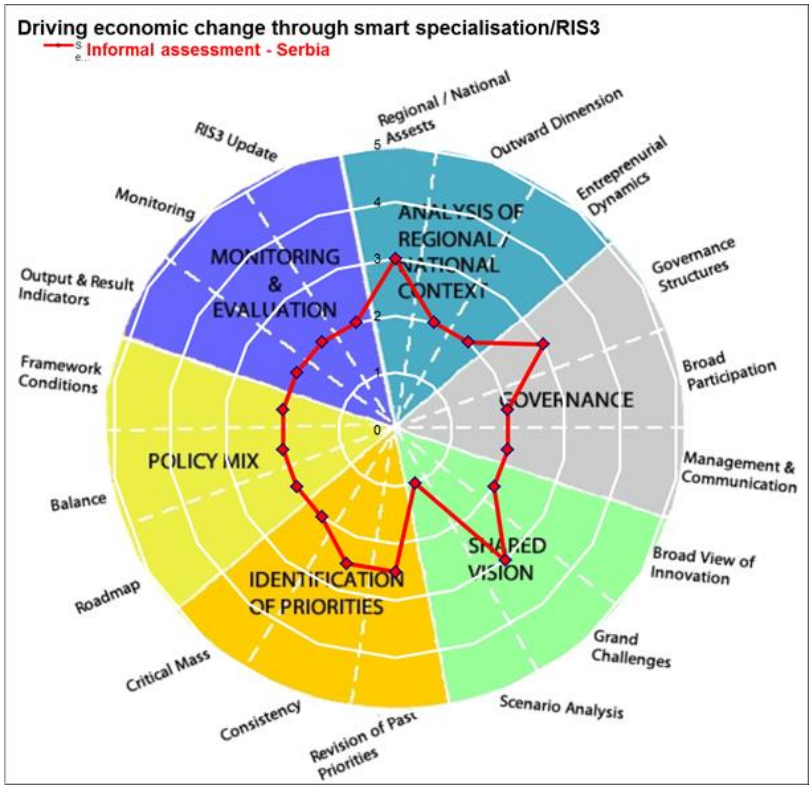
FYROM



Montenegro

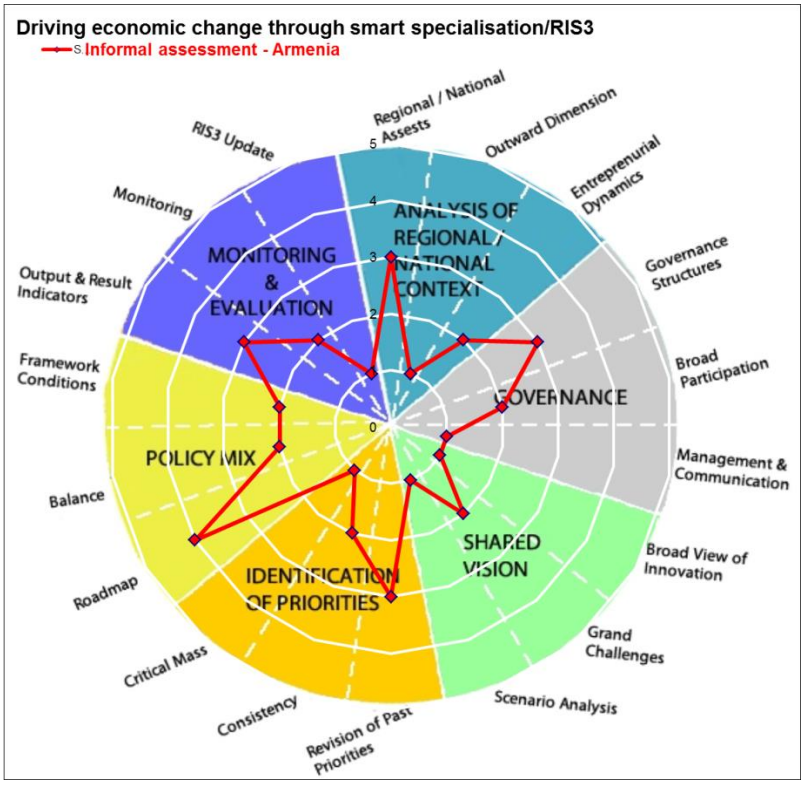


Serbia

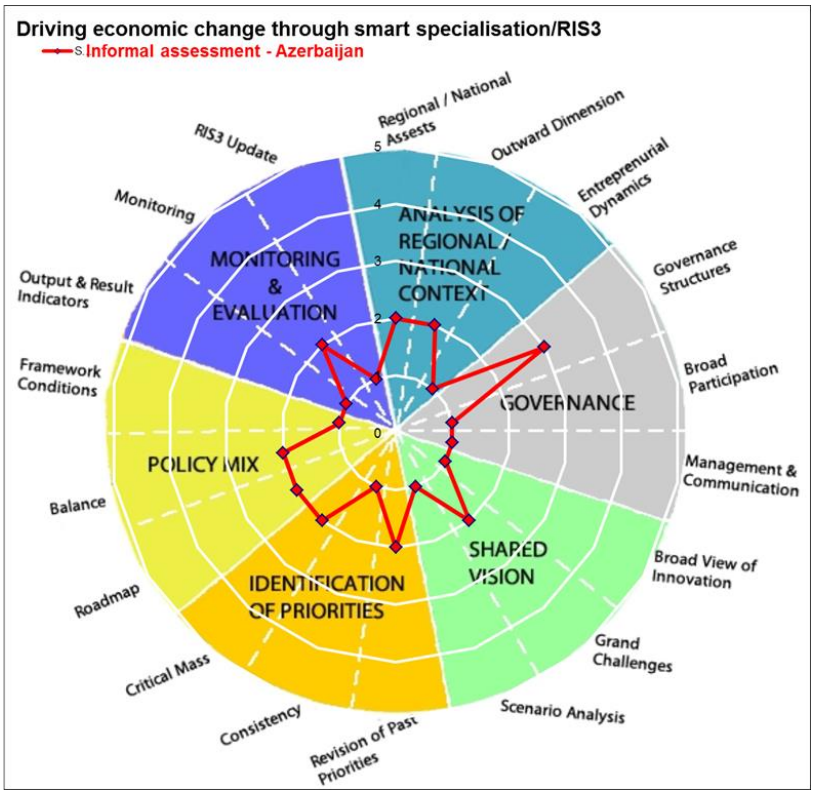

Driving economic change through smart specialisation/RIS3
Informal assessment - Serbia
Regional / National Assests
Outward Dimension
Entreprenurial Dynamics
Governance Structures
Broad Participation
Management & Communication
Broad View of Innovation
Grand Challenges
Scenario Analysis
Revision of Past Priorities
Consistency
Critical Mass
Roadmap
Balance
Framework Conditions
Output & Result Indicators
Monitoring
RIS3 Update
ANALYSIS OF REGIONAL / NATIONAL CONTEXT
GOVERNANCE
SHARED VISION
IDENTIFICATION OF PRIORITIES
POLICY MIX
MONITORING & EVALUATION
0
1
2
3
4
5

Annex III – RIS3 Wheel Assessment of the EaP countries

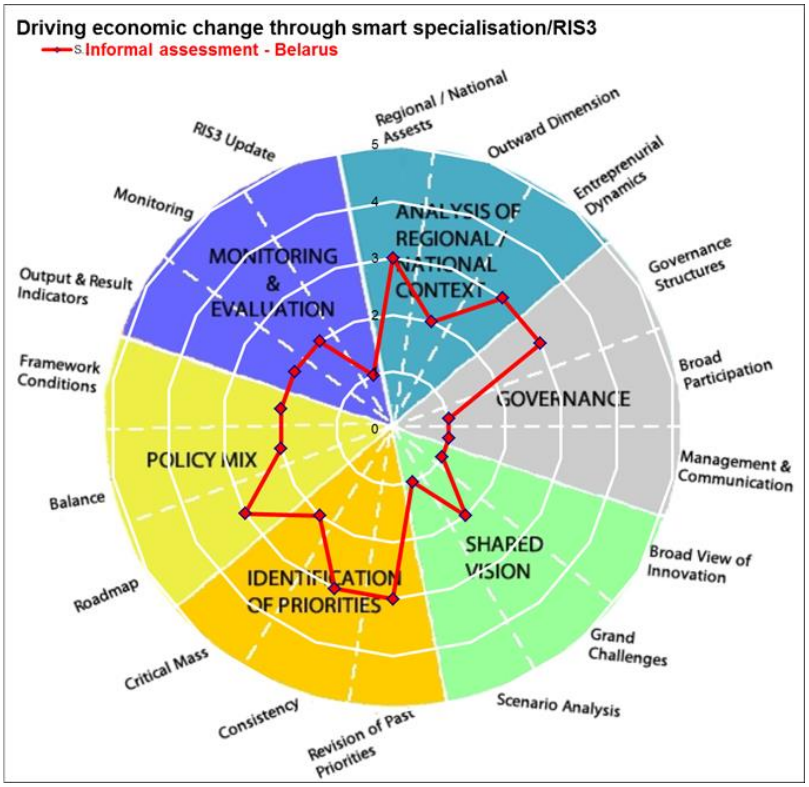
Armenia



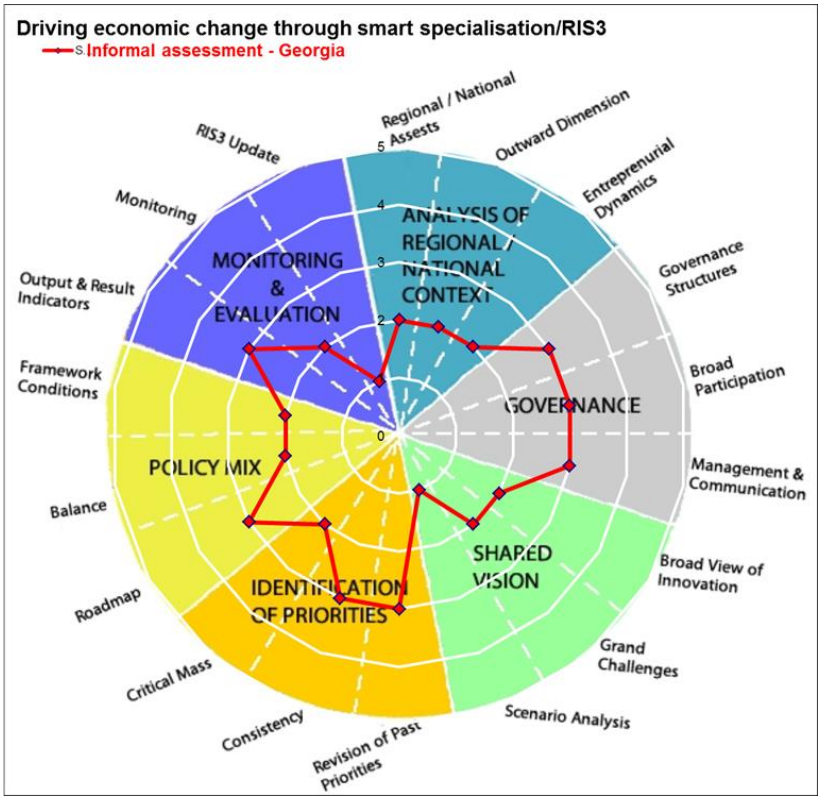
Azerbaijan



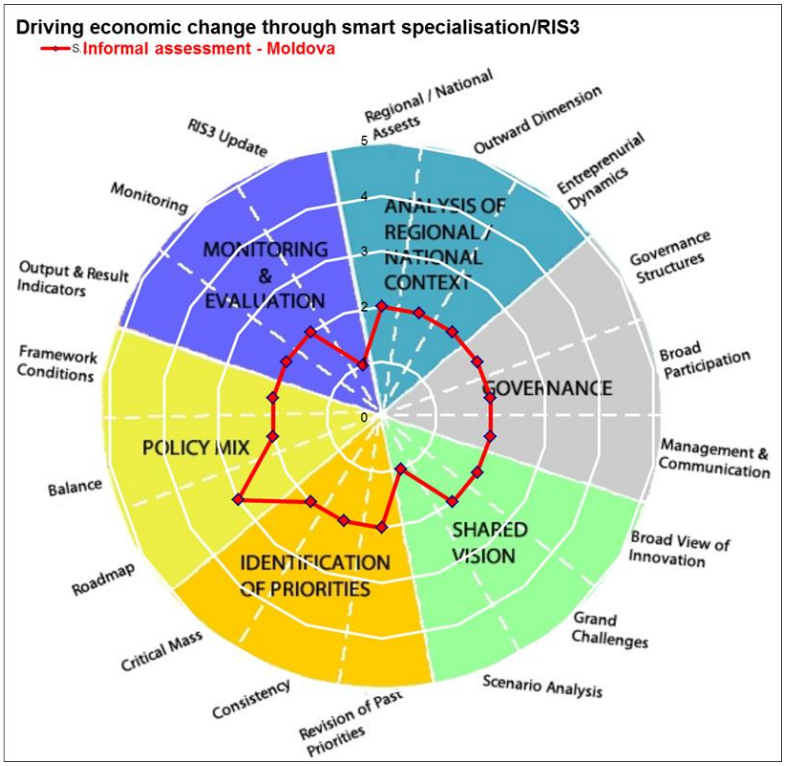
Belarus



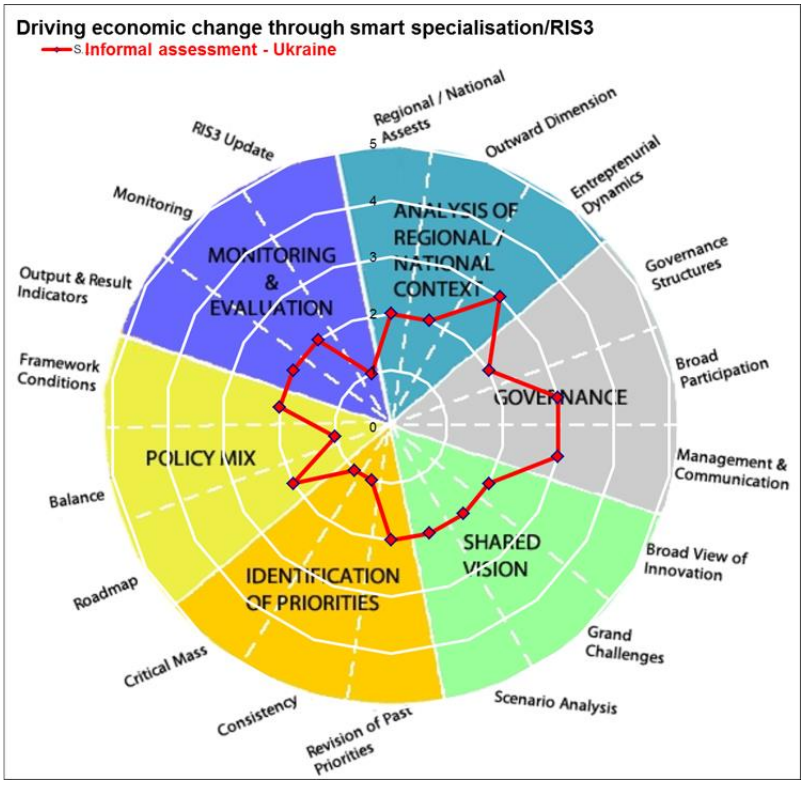
Georgia



Moldova



Ukraine



Annex IV — The Case Study on R&I Policy Framework in FYROM with regard to Smart Specialisation

Sasho Josimovski

Introduction

Since 2010, the government of FYROM has expressed a high degree of commitment to implementing its economic programme through support for science, education, R&D and innovation. This commitment resulted in the reorganisation of the R&D and innovation governance structure in the country, an improvement in the business climate and competitiveness, and the strengthening of international promotion of the country as an attractive investment destination. However, FYROM has not adopted the S3 strategy, and, according to the available national and international R&I statistics, it is a modest innovator and has an underdeveloped R&I system compared with EU Member States. The concept of smart specialisation in the country is recognised in the Innovation Strategy of the Republic of Macedonia for 2012-2020 as a sound basis for building up the national innovation system, but the strategy takes a neutral stance on sectors and does not impose sector specialisation. This case study attempts to assess the R&I system of FYROM and the conditions to adopt the S3 concept through the analysis of the six steps of S3 strategy development listed in the RIS3 Guide, following the RIS3 Wheel methodology.

Background information on the R&I situation in FYROM

The next sections will follow the format of the RIS3 Guide and its steps to identify major gaps in and obstacles to each step of strategy development that could hinder the potential development of the S3 strategy. The FYROM R&I system and its governance are highly centralised at state level, with the public sector dominant in both R&D funding and performing structures.

According to the latest available data from the State Statistical Office of the Republic of Macedonia (SSORM), gross domestic expenditure on research and development (GERD) as a percentage of GDP was 0.52 % in 2014, significantly below the EU average of 2.03 %. However, this was substantially higher than 2011, when it was only 0.22 %. The structure of FYROM GERD by sector of performance is unfavourable. The main weakness is the proportion of GERD allocated to business enterprise research and development (BERD), which was 11.57 % of GERD in 2014. In terms of performance, the leading sector was the higher education sector (HES), accounting for 73.44 % of GERD in 2014, while the government sector's contribution to GERD was 14.99 %.

The structure of GERD by funding source is also unfavourable. The government sector is the main funding sector for R&D activities in FYROM, accounting for 69.5 % of GERD in 2014, while private R&D funding was only 20.1 % of GERD. However, private R&D funding in both absolute and relative terms was significantly higher in 2014 than in 2011, by 316 % and 57 %, respectively.

The available research, development and innovation (RDI) statistics show that the quality of human resources in FYROM is poor, as is the quality of the HES as the main provider of researchers (European Commission, 2014). As the educational and research systems is poorly developed, there has been almost no inflow of researchers and university professors to FYROM from abroad. For the same reason, an outflow of high-quality researchers and professors was recorded in the period following independence in 1991, which further decreased the quality of human resources available

for R&I. During the period 1995-2005, the rate of emigration of the tertiary-educated labour force from the country approached 30 % (European Commission, 2013), the highest level among the south-eastern European countries. However, according to the SSORM, the total number of researchers in FYROM increased by 45 % in 2014 compared with 2013. The HES accounts for 85.4 % of all researchers in FYROM, and for 77.6 % of published output in the country. The proportion of researchers employed in the business sector is only 2.7 %.

Faculties and public research institutes, as units of state universities, are the main participants at the research performer level. The next biggest research performer is the Macedonian Academy of Sciences and Arts, whose five departments are considered part of the government sector. The R&D units in the industrial sector, SMEs and the different forms of science–industry cooperation, such as technology parks, business start-up centres and incubators, are also significant R&D performers in the country. The main research performers within the business sector are large companies.

The main programmes by which international partnerships have been established in FYROM are international funding programmes such as FP7, Horizon 2020, EUREKA, COST, ERA NET and TEMPUS, but the majority of the partnerships exist only for the duration of the projects. International collaboration and cooperation is are supported by a national measure, the Bilateral Cooperation Programme (BCP), which is based on agreements for cooperation in the areas of education, science and technological development signed by the country with over 20 EU and non-EU countries. Between 2007 and 2013 FYROM organisations participated in over 500 eligible FP7 proposals, with 101 proposals retained for funding totalling EUR 12.6 million. In the cooperation category, 48 proposals were main-listed, with EU funding totalling EUR 7 million, with the majority of the projects in the fields of ICT, the bio-economy, energy and health. In the framework of Horizon 2020, until January 2016, 25 projects in FYROM organisations were retained for funding totalling EUR 1.9 million. Almost half of the projects are in the fields of energy and health. According to the latest available data from the Ministry of Education and Science, the country is participating in 160 actions under European Cooperation in Science and Technology (COST) framework with 287 participants in all domains.

The commitment of the government to strengthen national research infrastructure (RI) and access to intergovernmental, European and world-wide research infrastructure is realised through a number of initiatives, namely (1) adoption of the Equipping Laboratories for Scientific Research and Applicative Activities (ELSR) four-year measure in 2010; (2) establishment of the Macedonian Academic and Research Network (MARNet) as an independent institution in 2011 and the Macedonian Point for Internet Traffic Exchange within MARNet; and (3) the country's participation in the European Organisation for Nuclear Research (CERN) through the National Agency for Nuclear Technologies, established in 2010. ELSR is the largest governmental investment that improves RI at public universities and institutes and accounts for the biggest proportion of public R&D funds (52 % or EUR 5.7 million in 2014). Despite the significant investment in RI through the ELSR measures, the country has not adopted the national roadmap for quality RI, which can further utilise the existing and new RI. The involvement of the country in the European Strategy Forum on Research Infrastructures (ESFRI) is still in its early stages and no areas of specialisation have yet been specified. Nominations have been made to most European governance bodies, such as the European Research Area Committee and the Strategy Forum for International Cooperation; however, as a result of the low administrative capacity of FYROM, participation in meetings has been irregular.

Until 2015 there was also a lack of high-quality, simple and easily accessible public support for innovative start-up companies, which was considered a weakness of the country's innovation system. The situation has been changing since the establishment of the Fund for Innovation and Technology Development of Macedonia (FITD) in 2013, which is a state institution that aims to contribute to the overall development of innovation through various financial instruments. The fund pursues its objectives by providing co-financing grants for start-ups, spin-off companies and innovations, co-financing grants for technology transfer, co-financing grants and conditional loans for commercialisation of innovations and technical assistance through business technology accelerators. In 2015, FITD opened the first two calls for proposals with a total budget of EUR 1.9 million. In both calls 33 companies were selected for financing through co-financing grants for start-ups, spin-off companies and innovations, and conditional loans for commercialisation of innovation. No company was selected for funding through co-financing grants for technology transfer. The majority of the companies selected are in the IT sector.

FYROM has a small open economy in which exports and imports account for a considerable part of GDP. The economy has an unfavourable structure as it is based on traditional sectors that, by their nature, are not knowledge driven. Furthermore, the national industry builds its competitiveness on a relatively inexpensive workforce, which also negatively influences the demand for knowledge. Since 2008 the government has organised an intensive international promotion of the country as an attractive investment destination. However, the results so far have not been satisfactory, and the country lags behind all comparative economies. According to the National Bank of the Republic of Macedonia, net FDI in FYROM fell to EUR 157 million in 2015, from EUR 205 million in 2014 and EUR 252 million in 2013 and the FDI influx has been almost exclusively privatisation driven and market-seeking. These disappointing figures can be explained by various factors, such as the small size of the country's economy, sluggish economic development, adverse prospects for future growth, bureaucratic and administrative constraints and a lack of law enforcement (OECD, 2013a). Despite this, manufacturing remains the biggest FDI sector, accounting for 33.8 % of FDI in 2013 and 28.2 % in 2014. Furthermore, the current manufacturing facilities are technologically obsolete as a result of low levels of investment in fixed assets. This is an impediment to the sector's competitiveness (OECD, 2013a). Some of the FDI was in the medium- and high-tech industry sector, which is expected to increase the contribution of medium- and high-tech products to the country's total exports.

There is a consensus among policy-makers in FYROM that the small capacity of the private sector to be directly involved in RDI activities and weak science–industry links are significant structural challenges for the country. According to the survey 'Technology Transfer in the Republic of Macedonia' (Stankovic et al., 2012), almost 52 % of the responding enterprises claimed that their s technology was transferred by another entity. Of those, 100 % answered that the transferring entity was a foreign firm. There was no mention of technology transfer from universities, governmental institutes or other domestic firms. This situation is indicative of the poor research culture within FYROM's business community. Hence, it will be very difficult for the public policy stakeholders in the areas of scientific research and innovation to put the triple helix innovation model on the agenda and encourage the private sector to stimulate its own R&D involvement.

According to the Innovation Union Scoreboard 2015, FYROM as a modest innovator is characterised by low R&D and innovation intensity. Although the country's relative performance improved from 35 % of the EU's performance level in 2007 to 42 % in 2014, it still performs well below the EU average on nearly all innovation dimensions and indicators.

ASSESSMENT OF THE R&I SYSTEM ACCORDING TO S3

The following sections will follow the format of the RIS3 Guide and its steps on how to assess if the current situation of R&I strategy development in FYROM complies with the S3 methodology.

Step 1 — Analysis of the national and regional context

As stated in the RIS3 Guide, an S3 strategy needs to be based on a sound analysis of the regional economy, society and innovation structure, aiming to assess both existing assets and prospects for future development. The more comprehensive analysis of the national RDI system of FYROM was prepared in cooperation with international organisations (World Bank and OECD) in 2013. The comprehensive analysis was conducted to support the development of the Innovation Strategy of the Republic of Macedonia for 2012-2020 (ISRM 2012-2020). This strategy was based on a broad public consultation process conducted for the purposes of the strategy, analysis of the innovation landscape and performance of a strengths, weaknesses, opportunities and threats (SWOT) analysis.

At the national level, FYROM is part of the Western Balkans Regional R&D Strategy on Innovation (WBRDSI), which is a regional initiative for development of a joint strategy that integrates the strategies of all countries involved and also sets regional priorities and measures.

Step 2 — Governance

The analysis of the national RDI system published in October 2013 (World Bank, 2013) identified the governance of FYROM as one of the main policy challenges. This finding is in accordance with the previous analysis of the national innovation system (OECD, 2013b) and points out that the governance structure of the innovation system does not provide efficient legal and policy arrangements for a supportive environment in private sector and university–enterprise cooperation. Since 2013 the country has strengthened governance of the R&I system through its reorganisation focusing on political and operational levels. The framework for these policy developments comprises a Law on Innovation Activity (LIA), changes to the Law on Higher Education (LHE) (Government of the Republic of Macedonia, 2008) and changes to the Law on Scientific and Research Activities (LSRA), all adopted since 2013. The current policy documents and laws promote the development of partnerships between various stakeholders in innovation and R&D. However, the triple helix activities are not strengthened with links to or from civil society, which limits the creation of a quadruple helix.

The government of FYROM is the highest executive body responsible for preparation and implementation of national research policies. At the operational level, the main ministries involved in R&D and innovation policies are the Ministry of Education and Science through the Department of Competitiveness, Entrepreneurship and Innovation, and the Ministry of Economy. The main advisory and expert bodies for R&D, implementation of industrial policy and innovation, are the governmental National Council for Higher Education, Science, Innovation and Technology (NCESIT) and the National Council for Entrepreneurship and Competitiveness (NCEC). NCESIT is a newly established official authority responsible for providing advice to the government within the scope of higher education and R&D, envisaged in the LHE and LSRA. Additionally, the government has two advisory committees, the Committee for Competitiveness and the Committee for Entrepreneurship and Innovation. The committees provide advice to the government during the preparation and evaluation of the corresponding policies and three-year action programmes for development and commercial exploitation of innovations.

Furthermore, companies in FYROM are supported by the European Information and Innovation Centre in the Republic of Macedonia (EIICM) and the Agency for Promotion of Entrepreneurship in the Republic of Macedonia (APERM). EIICM was established in 2008 as a partner in the Enterprise Europe Network, and the APERM was established in 2003 as a state-owned institution to realise the programmes' measures and activities for the promotion of small-business entrepreneurship.

In FYROM, clustering and collaboration between firms is limited (European Commission, 2013; OECD, 2013a). Half the product innovations are developed internally by firms and only a small proportion of these innovations result from collaboration with other businesses or research institutions. Innovation-oriented cooperation between businesses takes place with either customers or suppliers, and only to a very limited extent with other firms in the same sector. While more than two thirds of businesses would like to cooperate with customers or suppliers in the future, only one third would like to cooperate with competitors (European Commission, 2013). However, given the limited size of the domestic market, in order to be innovative firms must form strategic alliances with counterparts operating in the same sector.

As the creation and implementation of demand-side measures require substantial financial resources, and as the overall effect does not necessarily justify the cost, especially in small open economies such as the economy of the FYROM, the national RDI policies and measures are mainly focused on the supply-side and have neglected aspects of demand that might stimulate or enable R&D and innovation (OECD, 2011; Government of the Republic of Macedonia, 2012a).

FYROM is continuously working towards improvement of the operational efficiency of the state institutions involved in RDI and provision of high-quality public service for its citizens and businesses by using the power of technology and innovation. However, the country was ranked 96th out of 193 countries by its E-Government Development Index (EGDI) in 2014. This represents a significant fall in the rankings: in 2012, it was ranked 70th. In absolute number, the EGDI rank (scored between 0 and 1) has dropped from 0.5587 in 2012 to 0.4720 in 2014. This is the result of the need for process reform and transformation to overcome the financial, legal, organisational and technological obstacles to innovation.

Step 3 — Shared vision

The definitions of innovation used in national policy documents encompass a broader scope that concerns organisational changes, processes and service improvements. This approach gives options to institutions and businesses to obtain funding for different types of innovation and contribute to the overall improvement of innovation in the country.

The ultimate vision of the government for economic development and improvement of the national competitiveness and company productivity through support of science, education, R&D and innovation is built into the main national policies, laws and strategies. However, the general impression is that the implementation of the policies has slowed as a result of the low capabilities of the private sector for performing RDI activities, weak university–industry linkages, the incomplete reorganisation of the governance structure and the unavailability of sufficient funding from both public and private sources. Certain social and grand challenges are addressed through participation in IPA and other international funding schemes in the areas of energy, health, agriculture, biotechnology, food processing, chemistry, pharmaceutical research and environmental protection.

The public funding of education, science and innovation in the country is highly prioritised by the government of FYROM. However, there are no clear results-based financial policies for the

distribution of the public R&D and innovative funds among the performing units. The state universities are provided with institutional funding for all of their basic activities, based on the number of students and study programmes. The scientific output of the universities is not a criterion for their funding. Although the LHE envisages the establishment of a Council for financing higher education that will determine the criteria for financing, such a body has not yet been established. The Programme of the Government for the period 2011-2015 envisages specific R&D and innovation measures, such as fiscal incentives offered to foreign investors for investment in new technologies, co-financing of the investment for inventions and patents that have the potential to become effective, and grants to encourage technology transfer and funding for the FITD's instruments. The largest investment in the period 2012-2014 was made to improve the research at public universities and institutes, which are obliged to open laboratories to external users, the business community and international researchers. However, since no scenario analysis was prepared, there is no clear evidence that these investments have had any leverage effect on private investments in R&D and innovation.

Step 4 — Identification of priorities

In FYROM there is no specific regional approach to the design or implementation of research policies as it is a small country. The country has not spelled out the priorities for areas of specialisation, and is not registered with the S3 Platform of the European Commission. The ISRM 2012-2020 recognises that successful economic development does not necessarily coincide with an increasing proportion of production in high-tech sectors. High-value-added activities can also be found in traditional sectors and innovation can help firms move from low-value-added activities to high-value-added activities. Hence, instead of trying to artificially develop specific sectors such as high-tech sectors, the innovation policy of the country takes a neutral stance regarding sectors and primarily fosters the innovation capabilities of businesses horizontally. It is up to the complementary policies to direct resources towards sectors in which endowments and capabilities offer the greatest potential for moving up the value chain, thereby facilitating smart specialisation.

In addition to the national R&D policies, which are mainly focused on general research support and promotion, since 2012 the government has increased its efforts to promote R&D and innovation strategies and measures in specific sectors that have been recognised as important for the national economy, such as the agricultural, tourism, ICT and energy sectors. This is in line with the philosophy that smart specialisation is focused on more effective spending of public resources, creating synergy, identifying the strongest areas, and mapping and benchmarking of clusters (OECD, 2013b). According to Invest Macedonia, the main governmental agency for foreign investment and export promotion in the country, there are four key national industries: (1) ICT; (2) agribusiness and food processing; (3) apparel; and (4) automotive components. These leading industries are also recognised by industries' development analysis. On the other hand, several clusters are present in FYROM and over the years they have been supported by a variety of donors (European Commission, 2013). According to the ISRM 2012-2020, the clusters do not have to be high-tech or R&D intensive, they can evolve around any sector with a comparative advantage. The most active clusters include an IT cluster, a fruits and vegetables processing cluster, a wine cluster, a snail-producing cluster, a textile cluster and an automotive cluster. According to Polenakovic (2015), the most suitable way to prepare a S3 strategy in FYROM is to replace the top-down policy with a bottom-up approach to identify needs and capacities, in which the clusters will have an important role in the determination of the priority areas. However, there seems to be a lack of capacity to innovate in the existing clusters and there is lack of resources to create world-class players in any industry.

According to the WBC-INCO.NET project report 'Initial RIS3 Assessment of the Selected WB Country or Region' (European Commission, 2013), considering skills, expertise and knowledge, the region has the potential to put itself on the map as a recognised world-class place of competence in the fields of (1) software; (2) agribusiness and food processing; (3) automotive components; and (4) generic pharmaceuticals.

Step 5 — Policy mix

The current policy documents and laws promote innovation, entrepreneurship, enhancement of the quality of the business environment and development of partnerships between various stakeholders in innovation and R&D. The policies and laws propose an increase in the flow of knowledge between innovation participants and the commercialisation of research through strengthening collaboration and links between universities, businesses, industry and the labour market. However, there is still lack of infrastructure and framework conditions for their establishment, and, as a result of the structural weaknesses of the private sector regarding RDI and cooperation with the HES, they are inefficient and have a very limited impact on the R&I systems in the country.

The ISRM 2012-2020 includes an action plan for the period 2013-2015 and for each policy measure there is a list of expected results and indicators for implementation and realisation. The action plan prescribes measures for encouraging private investments in R&D and innovation, such as innovation vouchers for SMEs, supporting import of R&D equipment, subsidised loans, supporting access to regional financial institutions and setting up a business angel network. The action plan also defines responsible institutions for every activity planned under these areas of intervention. The majority of them fall under the responsibility of the Ministry of Education and Science and the Ministry of Economy. However, the action plan does not include scope for pilot projects or other tools for policy experimentation.

The majority of RDI measures launched by the government of FYROM are horizontal and not sector specific; however, educational institutions, SMEs and innovative ICT companies are targeted with a small number of specific measures.

According to the ISRM 2012-2020, adequate framework conditions, such as human capital, access to finance, intellectual property rights legislation and a favourable business climate, are required in the country. The strategy also recognises access to finance as a major weakness in the framework conditions for innovation and as a major barrier for companies' development.

According to the Innovation Union Scoreboard 2015, FYROM has the worst intellectual assets indictor performance, with scores in the region of 8 % of corresponding EU averages. The State Office of Industrial Property of the Republic of Macedonia (SOIP) is the institution responsible for performing activities related to acquiring and protecting intellectual and industrial property rights. Some policy developments initiated by the SOIP in 2013 and 2014, such as new Strategy for Industrial Property, refer to improving the protection of intellectual property and promoting innovation markets and regulations. The LIA adopted in 2013 also provides a legal framework for the creation and commercialisation of intellectual property rights resulting from state-funded research and enables universities with appropriate legal rights to engage in commercialisation activities and other forms of industry–science collaboration.

Step 6 — Evaluation and monitoring

While steps have been taken to improve legislation for coordination, a clear effective M&E system of the RDI policy in the country is still missing. The general opinion is that FYROM is lacking an M&E system to assess the successes and failures of past interventions and to prepare for new ones. There is no evidence of the assessment of direct and indirect impacts of interventions and no systematic approach towards M&E. The only exception is the establishment of the Advisory Body for Innovation, with the mission to guide, monitor and coordinate measures derived from the ISRM 2012-2020. Furthermore, the strategy ISRM 2012-2020 highlights the need for adequate data for M&E and has well-established M&E procedures that include permanent internal and periodic external evaluations of the policy as a whole and its specific measures.

The overall innovation performance measurement system in FYROM was established through the inclusion of the country in the IUS. In IUS 2015, it is stated that the country's performance on many of the indicators has not changed over time as data are available for only one year.

There has been no official evaluation of the innovation support programmes since 2010. However, as a part of the regular yearly reports, the responsible ministries submit reports to the government on the majority of the R&D and innovation measures.

Broad consultations are regular practice in FYROM during the preparation of all national policy documents. Consultation processes are usually coordinated by the responsible ministries, and all important stakeholders are involved in the processes. However, the ministries decide which suggestions will be adopted for the final version of the policy.

Summary

The summary of this analysis can be also visualised by the RIS3 Assessment Wheel and the results of this assessment for the FYROM are presented in Annex II. The Wheel gives a visual image of the status of the S3-related processes in FYROM; however, it must be recognised that assessments rely on the expertise of evaluators and certain aspects of the scores are subjective.

Further, based on the analysis made, we can identify some barriers that could influence S3-related development in FYROM.

National context — main developments and barriers

Despite significant investment in RI and intensive international promotion of FYROM as an attractive investment destination, some important shortcomings of the R&I system compared with international standards remain: limited access to finance; the low capacity and research culture of the private sector for performing RDI activities; weak science–industry linkages; and the unfavourable structure of the economy. Participation of the country in trans-regional and international collaboration networks is limited as a result of the low quality of the HES and human resources. However, the investment in medium- and high-tech industry sectors through FDI and the increased entrepreneurial dynamics through the FITD could be regarded as positive signs of the strengthening of innovation in the country.

Governance — main developments and barriers

Since 2013, FYROM has strengthened the governance of its R&I system through its reorganisation and establishment of new bodies with increased decision-making power. Because the crucial bodies of the RDI system are not yet operating at full capacity, the ultimate effects of the proposed measures regarding increasing efficiency of the RDI governance cannot be measured. Although the current policy documents and laws state and promote triple-helix activities, low capacity for innovation in the private sector and weak industry–science links limit the positive effects of these policies and laws. Additionally, quadruple-helix activities are in the early stages of development as they are not strengthened by links to or from civil society. Demand-side measures that stimulate R&I are neglected in national policies and action plans, while the powers of e-government public services are only partially used.

Shared vision — main developments and barriers

Policy documents in FYROM take a broad view of innovation, encompassing organisational changes, processes and service improvement. The government's vision for economic development envisages innovation, science and education as the main driving forces for the improvement of national competitiveness and company productivity. Social and grand challenges are partially addressed, mainly through participation in IPA and other international funding schemes. No scenario analysis has been prepared for the country.

Identification of priorities — main developments and barriers

While the priority sectors, industries and selected clusters in the country are recognised in governmental policies, they are not precisely defined, and a lack of capacity to innovate among existing clusters and promoted sectors can be observed. Furthermore, cross-sectoral priorities and priorities for innovation and knowledge-based development are neither clearly defined nor adequately financially supported.

Policy mix — main developments and barriers

The ISRM 2012-2020 includes a well-defined action plan for the period 2013-2015, but this does not envisage the possibility of pilot projects or other tools for policy experimentation. Access to finance is recognised as a major weakness in the framework conditions for innovation and as a major barrier to companies' development. A balanced mix of targeted and horizontal measures is lacking, as the majority of RDI measures launched by the government of FYROM are horizontal and not sector specific. The lack of protection of intellectual and industrial property rights, of promotion of innovation markets and of regulations can be still regarded as barriers to the development of innovation activities in the country.

Monitoring and evaluation — main developments and barriers

A clear and effective monitoring and evaluating system of the RDI policy in the country is still missing. The only exceptions are the established M&E procedures in the ISRM 2012-2020 strategy. The strategy foresees the need for adequate data to carry out M&E, but so far it lacks evidence that this mechanism is applied. The main barriers to the M&E of the R&I system are that these functions are primarily carried out by governmental institutions without the active involvement of the other stakeholders and that there is no connection between priority revision and monitoring exercises.

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Annex V – The Case Study on R&I Policy Framework in Ukraine with regard to Smart Specialisation

Igor Yegorov

Background information on the R&I situation in Ukraine

The key elements of the Ukrainian science, technology and innovation system were created in the pre-independence period. The system itself is highly centralised, with state-owned organisations dominating. The economic crisis and political problems in the post-Soviet era have had a negative impact on R&D and innovation. According to the State Statistical Service of Ukraine, the proportion of the budget dedicated to GERD dropped to 0.66 %, its lowest ever level, in 2014, down from more than 1 % in the middle of the previous decade. Bearing in mind the large and rapid depreciation of the national currency and the overall drop of GDP (by more than 15 %) in 2014-2015, this means a substantial decline in national R&D funding in real terms.

State and local budgets were sources of slightly less than 40 % of GERD, while BERD was approximately on par with this (39.5 % from state and local budgets). Ukraine had a relatively high level of international sources of R&D funding in 2014 (19.8 %). However, it is worth noting that this was substantially higher in 2010 (25.7 %). The contribution of internal sources (local non-state investors) to R&D has grown, while the importance of other funding sources (state budget and international investors) has declined. As to the distribution of expenditure on R&D, the business sector plays a leading role (56.4 % of total expenditure), followed by the governmental sector (37.8 %) and HES (5.8 %). The private non-profit sector does not play an important role as an R&D performer or funder. R&D expenditure in the private non-profit sector still accounts for less than 1 % of total R&D expenditure in Ukraine. In general, it is evident that R&D expenditure in Ukraine (in both absolute and relative terms) is much lower than in most EU countries, especially in the case of business R&D expenditure.

As to the quality of human capital, Ukraine has inherited a relatively well-developed education system. Currently, more than 70 % of school leavers go on to university-level education. However, serious concerns have been raised regarding the quality of education in technical and natural sciences. According to the Round University Ranking[50], prepared by Thomson Reuters, only one Ukrainian university that specialises in technical and natural sciences was in the top 700 universities in the world in 2016 — Kyiv Polytechnic Institute took 636th position. This is largely attributable the economic crisis and the limited employment prospects for university graduates in industry. Universities have limited interaction with industry. Some high-tech sectors no longer exist (e.g. electronics and a number of defence-related enterprises in the machine-building industry). Since the mid-2000s, the proportion of graduates in the natural sciences has declined by one third and in technical sciences by more than one fifth, while students of the humanities and arts grew by 5 % and in social sciences, business and law by 45 %. It is not easy to assess the number of researchers in Ukraine, as the country does not use full-time equivalent (FTE) indicators. However, the number of scientists has decreased more than three-fold in last 15 years. The majority of research personnel are concentrated in the state institutes, while more than 70 % of doctoral degree holders are working for the HES.

[50] http://roundranking.com/

Public research institutes are the main participants in R&D. Existing instruments of R&D and innovation support (e.g. private foundations, technology parks, business incubators and leasing centres) are relatively poorly equipped, personnel are not trained adequately and financial resources for innovation activities are scarce.
The traditional sectors (e.g. ferrous metallurgy, coal-mining, energy production, basic chemicals and agriculture) dominate the national economy. These sectors have a more stable technological base, and they are traditionally less innovative than medium and high-tech sectors, which contributed to the overall decline in the number of innovative enterprises. Bearing in mind the size of enterprises in the medium- and high-tech sectors, these enterprises play the most visible role in innovation activities. Lack of direction in modernising the national economy and insufficient incentives to develop high-tech sectors are barriers to the creation of a competitive economy.

ASSESSMENT OF THE R&I SYSTEM ACCORDING TO THE S3

The following sections will follow the format of the RIS3 Guide and its steps to identify major gaps and obstacles in each step of strategy development that could hinder the potential development of the S3 strategy in Ukraine.

Step 1 — Analysis of the regional and national context

As is laid out in the RIS3 Guide, the S3 strategy must build on the sound analysis of the economy and innovation structure, assessing existing assets and prospects for future development. The first step requires reliable statistical data and in-depth analysis. Ukraine has a long tradition of collecting data on innovation activities. However, the statistics are focused only on the industrial sector. The State Statistical Service of Ukraine has started to conduct CIS-type surveys of innovation activities in recent years, in line with Eurostat methodology. According to the data from both sources (CIS-type survey and the traditional survey of innovation in industry), innovation activities have declined in the Ukrainian economy. The proportion of innovative enterprises in industry dropped by more than one fifth during the 2012-2014 period, and expenditure on innovation activities was reduced in real terms by more than half during this period.

The latest comprehensive survey of the Ukrainian innovation system was made by a group of international experts in 2013 (UNECE, 2013). It showed that although R&D and industrial potential have been shrinking in since the late 1980s, Ukraine still had capacity for modernisation of its economy. For instance, as publication analysis shows, the country is still a relatively strong player in the new materials, space and aeronautics research sectors, especially if compared with some other countries in the region (BILAT — Ukraine, 2015).
Ukraine took part in the official calculation of indicators for the Innovation Union Scoreboard in 2016 for the first time (European Commission, 2016). The country was assigned a modest place at the very bottom of the list according to Innovation Index. Ukraine is performing well below the EU average for nearly all dimensions and indicators with the exception of the indicators related to the level of education.

In the national context, transnational benchmarking is not embedded as a practice in strategy development. Transnational cooperation in R&I is determined by cooperation agreements. Ukraine has bilateral agreements on cooperation in science and technology with more than 50 countries.

However, not all of them are equally important, and some agreements have no practical because money for implementation is lacking. Almost all scientific contact with Russia was terminated in 2014 as a result of events in Crimea and Donbas[51]. On the other hand, relations with other partners, especially the EU, have improved. However, Ukraine is not strongly integrated in the production chains of European companies, except perhaps in the agricultural sector.

Ukraine signed an agreement in association with the EU Horizon 2020 programme in March 2015. This opens the way for more active cooperation with EU countries in R&D in the near future. However, extra support from the Ukrainian government for promotion of joint research and innovation activities is needed as well as additional links between Ukrainian research establishments and their EU counterparts to forge partnerships in future projects. Support for capacity-building measures in R&I through different instruments of the corresponding policies could help in this regard, especially in developing an S3 strategy.

Step 2 — Governance

The RIS3 Guide implies that the S3 strategy must be developed while taking into account the views of all innovation participants in R&I; therefore, countries must have inclusive governance structures to fulfil this requirement.

The Ukrainian President and the Cabinet of Ministries are playing central roles in decision-making processes, while the Parliament determines the legal framework for S&T and innovation activities. So far, R&I policies in Ukraine have come mainly from central government, while the role of local authorities in exerting influence on S&T and innovation development has been limited. As a result of the decentralisation reform, which began in 2015, the situation is changing, allowing the regions to play a more prominent role in the formulation and implementation of innovation policy.

In 2014, the Government of Ukraine made changes in the governance of science, technology and innovation. The State Agency on Science, Innovation and Informatisation was abolished and the science and innovation policy formulation functions were transferred to the Ministry of Education and Science of Ukraine. The Ministry plays a key role in formulating state science and innovation policy, although a number of other ministries and agencies also allocate state money for specific research programmes, projects and research organisations. The Ministry of Education and Science supervises the activity of the HES and, to some extent, the institutes of six state-owned academies of sciences. The largest of them, the National Academy of Sciences of Ukraine, is an important player in the national research system; it receives approximately half of the government's total R&D budget. The Academy is responsible for basic research, but also has coordinating functions in many R&D and innovation-related programmes, participates in establishing S&T priorities and provides scientific advice to the government.

Ministries exert influence on sectoral R&D and innovation policies through various branch institutes under their supervision. Traditionally, branch institutes have had strong ties with enterprises and conducted a great deal of research that was in the interest of the companies. In recent years, the importance of these institutes has declined, and the ministerial control over their activities has

[51] The Russian military intervention in Ukraine and the annexation of Crimea in 2014

weakened. Some research institutes are connected with the relatively new R&I organisations that have emerged since 2000, such as technology parks and technology transfer centres.
The level of coordination between executive power, legislative bodies and some key business groups remains low. A substantial part of the business sector is not actively involved in the preparation of legal documents related to S&T and innovation. Development of the S3 strategy will require changes to the whole system of management of these organisations.

To resolve a number of problems in the S&T and innovation process, the Ministry of Education and Science of Ukraine, along with other ministries, state academies of sciences and NGOs, has substantially modified the Law of Ukraine 'On scientific and scientific-technical activity', which was passed by the Ukrainian Parliament at the end of 2015. The new version of the Law contains a number of amendments. It reinforced an institutional support of S&T activities and cleared the way for transformation of the whole national research system. The Law establishes the National Council of Ukraine on Science and Technology Development under the control of the Cabinet of Ministers of Ukraine. The main task of the Council is to ensure the effective cooperation of representatives of the scientific community, state agencies and the business sector in the preparation and implementation of state policy in the disciplines of S&T. Another innovation is the creation of the National Fund for Research instead of the State Fund for Basic Research, which was subordinated to the Ministry of Education and Science of Ukraine. The Fund's key function is to provide grant support for basic and applied research in natural sciences, engineering, humanities and social sciences. The Fund can also support experimental development and even innovation projects in S&T priority areas. The Law plays an important role in the process of transformation of the state academies of sciences of Ukraine, especially the National Academy of Sciences of Ukraine. The Law has cleared the way for involvement of ordinary scientists in the election of governing bodies of the academies; it has also established restrictions on the holding of the highest positions in academies and on the number of members and corresponding members of the academies. Additionally, research institutions from the state sector have received the right to be co-founders of commercial companies and to contribute to the company's share capital.

Ukraine has started to implement key elements of its e-government strategy in recent years. However, it is too early to assess the outcomes. The most visible result of the strategy is probably the implementation of an electronic system for public procurement procedures in 2016 ("Prozorro")[52].

Regional dimension of R&I

Ukraine is a unitary state, consisting of 25 relatively large administrative regions or oblasts. There are also 490 districts, or raions, at the lower level[53]. Ukraine is a centralised state with a high concentration of power in the capital, and governors and their administrations represent executive power. While regions have their own 'mini-parliaments,' or 'oblastnie rady', which are elected by the local population, the President nominates the governors from Kiev after consulting with Parliament and the Prime Minister. The President also nominates the heads of district administrations. The state fiscal system provides the central executive bodies with the bulk of tax revenue, making local authorities heavily dependent on Kiev. As a result, research policy and innovation policies are mainly

[52] https://prozorro.gov.ua/
[53] Ukraine is divided into 3 main administrative divisions: oblast (region), raion (district), and council (city, settlement, and village)

directed from the central ministries, although local authorities also have some tools to exert influence, especially on local universities and research organisations.

Until now local authorities have played a negligible role in S&T and innovation policy. There is no specific governance system for R&D throughout the various regions of Ukraine. According to the proposed changes to the national legislation, one of the primary responsibilities given to regional authorities involves the formulation and financing of regional R&D and innovation programmes, within the limits of regional budgets. Authorities could also create regional financial organisations to provide loans for R&D and innovation projects. In reality, however, local authorities had almost no funding to support R&D and innovation. In recent years, the proportion of total funding for R&D that came from regional sources was around 1 %, and, in 2015, this dropped to lower than 0.3 % of total R&D expenditure. The total research budget of regional authorities was less than EUR 2 million, according to the official exchange rate in 2015. However, in some regions, development programmes have a sectoral dimension. These regions typically influence R&D through indirect measures, such as provision of land or upgrading of infrastructure. This clears the way for development of regional strategies within the national S3 strategy.

There is no single body at the regional level that is responsible for R&D development. Some regional administrations have created special departments with responsibility for S&T and innovation policies. The National Academy of Sciences of Ukraine has six Regional Scientific Centres, each of which coordinates scientific activities in various disciplines. The Ministry of Education and Science also has 19 centres of S&T and economic information in different regions (oblasts) of the country. They can provide information and advisory support on S&T and innovation policies for regional authorities and companies.

Kiev remains a leader among the regions of Ukraine in terms of R&I activities. The city has several development programmes that include R&I components. Key measures of these programmes focus on the modernisation of urban infrastructure. As a result of these programmes, hundreds of R&I projects have been implemented since 2010. Odessa, Lviv, Dnipro, and especially Kharkiv, and some other large cities also have substantial innovative and industrial potential.

Business involvement in R&I policy development

Formally, the government has created special advisory groups comprising representatives of the business sector, NGOs, research institutes and government officials to coordinate reforms in different spheres, including innovation and industry. There are also plans to establish a special Department of Industrial Policy within the Ministry of Economic Development and Trade (in 2017). This Department would coordinate the efforts of business groups and the government in modernisation of national industry. However, it is difficult, at the moment, to predict how successful this coordination will be. Another initiative is the creation of a special High-Tech Office within the Government to stimulate the development of high-tech industries, starting with the ICT sector. Business associations and government experts are actively involved in the preparation of legal documents related to the establishment of the Office. However, procedures for taking into account differences of opinion are not well defined. Therefore some important initiatives from the side of non-government participants might be ignored in the decision-making process.

Step 3 — Shared vision

President Petro Poroshenko announced his reform strategy "Strategy-2020" in 2014[54]. The key idea of the Presidential Strategy is to promote further integration of Ukraine into European economic and legal space, and the growth of cooperation between Ukraine and the EU. It includes a number of different goals. The plan assumes that the Ukrainian GDP per capita (under the purchasing power parity) estimated by the World Bank will increase to 16 000 USD by 2020, Ukraine will enter the top 20 countries according to the conditions for doing business, the top 40 states according to the Index of Competitiveness and sets other targets. There is a consensus in Ukrainian society that these goals are important for the country. This Strategy does not target S&T directly or mention S3, but some of the goals correspond with the key principles of smart specialisation.

S3 embraces a broader concept of innovation, not only investment in R&D. Ukrainian state organisations follow the definition of innovation proposed by the Organisation for Economic Co-operation and Development (OECD) in the Oslo Manual (OECD, 2005), which includes not only technological but also marketing and organisational innovations. Thus, there are no obstacles to including broad-based innovations in operational programmes.

However, Ukraine is going through a very difficult period of transformation. Thus, social innovation in different areas is urgently needed for successful reformation. In principle, Ukrainian society is ready for serious changes, but clear goals of implementing such innovations must be shown, and instruments of reform, aimed at transformation in social and economic circles, must be defined. The country is lagging behind its neighbours in the implementation of energy-saving or environmentally friendly technologies.

Step 4 — Identification of priorities

The State Law of Ukraine 'On Priorities in Science and Technology Development' of 2012 states the current priorities for S&T development:

- basic research of prominent multidisciplinary scientific problems
- environmental studies
- ICTs
- energy generation and energy-saving technologies
- new materials
- life sciences, including methods of fighting leading causes of illness and disease.

Unfortunately, no data are available on the corresponding proportion of the total government budget appropriations or outlays for research and development (GBAORD) allocated to such research priorities. Indeed, it is evident that effective development of the S3 strategy, and in particular its corresponding roadmap, will require revision of these broadly defined priorities.

Priorities in innovation and S&T were established without proper coordination with the general priorities of social and economic development of Ukraine. They were formulated on the basis of propositions of different participants without proper analysis of the corresponding potential in specific areas.

[54] http://nbnews.com.ua/ru/news/132934/

Only in some sectors, such as biotechnology, ICT and energy technologies, were special Foresight-type studies conducted in early 2010s at the national level. Corrections must be made to make priorities better grounded and more operational. On the basis of these newly formulated priorities, specific programmes must be prepared in coordination with the industry.

Step 5 — Policy mix

Ukraine has no specific action plan for innovation and S&T despite a draft of such a plan being prepared in 2011 with the assistance of EU experts (Innovation Policy, 2011).

The majority of support measures for R&D and innovation are not sector specific. However, Ukraine has a tradition of initiation of S&T programmes in different areas. These programmes correspond with the priority areas of development. The existence of too many programmes and permanent underfinancing were persistent problems for these initiatives. The initiation of new programmes has been strictly limited since the start of the 2010s. The national budget for R&D remains relatively low, and, as surveys show, the role of international grants is growing. The State Fund for Basic Research of Ukraine distributes grants for research projects in different disciplines. More than 50 different calls, some of them with international partners, were announced between 1994 and 2015. The level of financing of these projects was relatively low: average support was not higher than several thousand euros per year in 2005-2014 in nominal terms. Research policy in Ukraine is driven by annual budget cycles. Block grants dominate the system for the allocation of funds devoted to R&D. However, in recent years the competitive principles of fund allocation are introduced more often. Companies rarely take part in such competitions, but are trying to explore opportunities related to the innovation project support within technology parks, industrial parks or science parks.

In general, horizontal and vertical measures of industrial, innovation and S&T policies are not well coordinated in Ukraine. While horizontal public interventions, such as provision of education and lowering the costs of starting-up businesses, are at a satisfactory level, horizontal measures for the business sector (e.g. R&D tax credit, training subsidies and other financial measures) are not working in Ukraine. The situation for vertical measures is very similar. The Ukrainian government provides funding for some thematic areas in R&D, it supports technological consortia and the creation of new forms of industrial activities. The promotion of vertical market input measures, including support of specific sectors (defence, first of all), public procurement and other similar instruments were less developed in recent years. However, the main problem was the poor coherence in implementation of corresponding instruments. To find a balance between different measures some could be introduced as pilot projects to allow experimentation.

Step 6 — Evaluation and monitoring

Since 2016, M&E in S&T and innovation at the national level can be made on the basis of indicators of the IUS and with the assistance of traditional statistical indictors.

Two types of evaluation are used in the public sector. The first is based on the evaluation of activities of the state research organisations. This evaluation includes a qualitative assessment and some selected indicators (e.g. number of research papers and patents, participation in international conferences, etc.) for the research activities of the institute. Recently, the National Academy of Sciences has started to use an approach that is based on experience of the German Leibnitz Association. The second type of evaluation is associated with the assessment of research projects and programmes implemented by research institutes.

The projects are evaluated by an assessment committee formed by the relevant ministry at least once per year and at the end of the project. If the project has identified key performance indicators, the project results are compared to these indicators. However, very often the objectives of innovation projects are not defined in sufficient detail. In addition, very few projects have sufficient budget to achieve their proclaimed objectives. This is frequently cited as the reason why project results are inadequate.

The State Auditing Chamber, a division subordinate to Parliament, examines the activities of different ministries and state-sponsored academies of sciences approximately once every two years. Auditors typically focus on the relevance of R&D expenditure compared with the announced goals, and also fix violations of existing legislative acts. The Parliament of Ukraine arranges regular hearings on problems of S&T and innovation development. However, the system of evaluation has to be modified to meet the standards that are used in EU countries. M&E have to be directed more towards the output indicators. These indicators reflect the outcome of corresponding policy measures and overall results of RIS3. Such indicators would be important for gaining higher efficiency in project implementation and for improving the transparency of selection procedures.

Summary

Based on the analysis of S&T and innovation policy, the conditions for developing an S3 strategy for Ukraine are summarised below indicating the recent developments and the main barriers that need to be tackled while introducing the S3 concept in Ukraine.

The current status of these developments can be evaluated following the RIS3 Assessment Wheel procedure and the outcome of this assessment is provided in the Annex II. It should be noted that these assessments are made on the basis of analysis of recent events and in the rapidly changing situation the scores need to be adjusted, consulting a broader range of specialists.

National context — main developments and barriers

New political forces came to power in early 2014 and declared a pro-Western orientation of foreign policy and liberal reforms within the country. According to the plans of the government, the purpose of economic reforms is to promote innovation in the economy, and to provide better utilisation of S&T potential to achieve technological upgrading of the national industrial and agricultural sectors. This creates favourable preconditions for the development and implementation of an S3 strategy in the country. Such a strategy could be a key element in the country's catch-up policy. At the same time, there exist significant internal barriers to its implementation.

- Legislation is not sufficiently harmonised.
- The general economic situation is complicated.
- The labour market is not sufficiently flexible. It is still strictly regulated, especially in the state sector, and mobility of the workforce remains low.
- Regional innovation and industrial policies are underdeveloped.

Governance — main developments and barriers

The Ukrainian government is making serious efforts to harmonise and enforce legislative acts. A number of laws and regulatory acts in the area of S&T and innovation have been revised or are under revision. Functions of management of the R&D and innovation area are better distributed between

different ministries and agencies than in the past. However, substantial efforts will be needed to overcome the barriers hindering the establishment of the governance models and mechanisms required by the S3 approach.

- The lack of cooperation between different participants in the innovation system remains a serious problem.
- The Ukrainian state is not very active in promoting cooperation between key internal and external participants, including EU partners.
- There is low involvement of Ukrainian companies in joint scientific and innovation projects.
- R&D assets are viewed largely as a liability. This is partly the result of structural and organisational mismatches, and partly because of their low immediate relevance to the realities of the market economy.

Shared vision — main developments and barriers

There is a broad consensus in Ukrainian society regarding the importance of innovation. Policy documents declare that innovation is considered a key factor in the modernisation of the country. Thus, implementation of a broader concept of innovation will not be rejected by the Ukrainian scientific community, business sector or the government. Although opposing approaches and lack of consensus constitute some challenges.

- The main participants have different approaches to the mechanisms by which innovation and R&D should be promoted.
- The Ministry of Finance is not ready to introduce supportive measures for innovation.
- Two other ministries — the Ministry of Economic Development and Trade and the Ministry of Education and Science — have divergent positions on some provisions in the new version of the Law on Innovation.
- The business sector is not actively involved in discussions on innovation issues.

These obstacles are problematic, but could be overcome if all parties would demonstrate their willingness to compromise.

Identification of priorities — main developments and barriers

Ukraine has several laws that are aimed at establishing priorities in S&T and innovation. At the same time:

- These laws have not been properly implemented so far.
- Other problems are related to the very broad definition of priorities and the lack of financial resources for implementation of corresponding government programmes. It is important to focus on specific areas that have high potential for development;
- Coordination between innovation and industrial policies in priority setting at the state and regional levels remains poor.

Policy mix — Main developments and barriers

The country has had several innovation plans and strategies in the past. The last high-level plan, Strategy 2020, was introduced in 2014. Previous action plans and measures had to face difficulties and shortcomings.

- Financial barriers remain the most important obstacle to innovation.
- Different measures do not articulate the need to attract both national and international financial resources. These measures must include the initiation of special state programmes, the creation of venture funds and strong guarantees for intellectual property rights protection.
- The situation with business climate remains difficult. It is important to create conditions where entrepreneurs will be willing to sell a significant proportion of their shares to outsiders and will also be willing either to be acquired or to participate in public offerings.

The assistance of EU experts will be needed in developing the new action plans for innovation that would constitute a roadmap for an S3-based R&I strategy.

Monitoring and evaluation — main developments and barriers

Ukraine has some positive experience in M&E. The country has started to use results of the Innovation Scoreboard and other instruments, developed within the EU, for formulation, implementation and evaluation of national innovation policy in 2015-2016. It would be also useful to prepare an annual state report on the status of S&T and innovation in Ukraine.

- A comprehensive system of M&E in S&T and innovation in Ukraine has not been created, despite a special state law on evaluation in S&T in Ukraine.
- Key evaluation problems are the non-transparent procedures and the use of administrative resources for obtaining the required results.
- Evaluation is not focused on output indicators, while resource indictors are playing a key role in decision-making processes.

It is evident that the implementation of the S3 concept in Ukraine will face a number of barriers but the country has to find its place in a quickly changing world. The correct selection of future specialisation based on existing potential is crucial for innovation-driven economic growth.

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