



JRC TECHNICAL REPORT

Final Report on Qualitative Analysis of preliminary priority areas in the smart specialization process in the Republic of North Macedonia

Economic Chamber of North Macedonia

Authors: Darko Lazarov, Jasmina Majstoroska and Jadranka Arizankovska

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Contact information [optional element]

Name:
Address:
Email:
Tel.:

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Contents

Abstract.....	4
1. Introduction.....	5
1.1 RIS3 Design Process in North Macedonia.....	5
1.2 Summary of the Quantitative Analysis of the Current Economic, Innovation and Scientific Potential.....	6
1.3 Proposed potential areas for smart specialization subject to qualitative analysis.....	8
2. Qualitative analysis and collection of qualitative data.....	11
2.1 Methodology.....	11
2.1.2 Qualitative Interviews.....	11
2.2 Data collection by preliminary areas.....	16
3.1 Analysis of preliminary areas.....	17
3.1.1 Sustainable food and beverage production and value chains.....	17
3.1.2 Information and Communication technologies (ICT) sector.....	29
3.1.3 Smart/Sustainable Buildings and Materials.....	39
3.1.4 Electrical equipment & mechanical parts.....	45
3.1.5 Sustainable tourism and catering.....	55
3.1.6 Energy for the future.....	64
4 Conclusions and Recommendations for future EDP.....	72
4.1 Proposal of areas and sub-areas for EDP.....	72
4.2 Recommendations for future entrepreneurial discovery process (EDP).....	74
4.2.1 Proposed list of stakeholders for future entrepreneurial discovery process (EDP).....	75
References.....	85
Annex 1: JRC proposed methodological guidance.....	87
Annex 2: The list of interviewed stakeholders.....	102

Abstract

The Republic of North Macedonia launched the process for preparation of the smart specialization strategy in accordance with the methodology and guidance provided by the Joint Research Centre.

Smart specialization is of high importance for the future growth of the economy enabling strengthening the innovation potential, competitiveness and unleash of smart growth by defining high priority technological domains in which new added value can be created. The key goal is to identify and apply smarter and more competitive solutions in the domains, having in mind and supporting new challenges for digital and green transition, as well challenges caused by Covid 19. The strategy development process is comprised of bottom-up and top-down activities and involves many stakeholders.

After the quantitative mapping of the country's economic, innovation and scientific potential based mostly on statistical data, 19 industries (grouped in 6 proposed domains) have been identified to have potential for smart specialization.

This paper (Qualitative Analysis) is in-depth analysis and rationale of the emerging key priority domains and creates favorable conditions for the stakeholder dialogue within the Entrepreneurial Discovery Process in North Macedonia. The analysis is based on the input of more than 100 interviews performed with the key stakeholders, focus group meetings and information obtained from additional external analysis.

1. Introduction

Smart Specialisation is a modern approach to place-based innovation policy. Smart Specialisation Strategies (S3) also called Research and Innovation Strategy for Smart Specialisation (RIS3), should concentrate resources on a limited set of R&I sectors, where the state has the critical mass of knowledge, capacities and competencies and in which it has innovation potential for global market positioning. RIS3 maximise the positive impact on competitiveness, growth and jobs.

The Republic of North Macedonia in the process of development of the smart specialization strategy is following the JRC Smart Specialization Framework for the EU Enlargement and Neighbouring Countries. One of the first stages of this process is to complete the analysis of country's economic, innovative and scientific potential through quantitative and qualitative methods that subsequently lead into defining the final list of priority areas of the country during the comprehensive stakeholder dialogue.

The starting point for the qualitative analysis is the completed report on quantitative analysis¹ and additional analysis of the S3 Working group of North Macedonia² and the methodology guideline proposed by JRC³.

The qualitative analysis of the preliminary priority areas is focused on indepth interviews, surveys, focus groups meetings and desk research of existing external studies.

One of the key elements for the successful design and implementation of the strategy, that will follow is the Entrepreneurial Discovery Process (EDP), which in fact represents a continuous public-private dialogue among 4 spheres of the modern innovation society (so-called quadruple-helix), consisting of academia, government sector, economy, and civil society.

The process of S3 development involve design of activities, measures, and instruments for fostering better cooperation between academia, business and the civil sector in the areas of specialisation according to the principles of collaborative innovation. The additional challenges that should be addressed in the process are health and social aspects.

1.1 RIS3 Design Process in North Macedonia

In 2018, the Republic of North Macedonia launched the process for development of Smart Specialisation Strategy (S3), as a comprehensive model for sustainable economic growth based on capacities of the endogenous industry, science, and society. S3 should be linked and add value to the Industrial Policy, Competitiveness Strategy, Innovation Strategy, R&D Strategy, etc⁴. The objective of S3 is to identify the areas of specialisation where the Republic of North Macedonia could build comparative advantages, in order to maximize the effects of public investment.

¹ Mapping economic, innovative and scientific potential in the Republic of North Macedonia, NCDIEL, published by GIZ September 2019

² Working material of the S3WG based on the Mapping economic, innovative and scientific potential in the Republic of North Macedonia

³ The JRC methodological guideline is presented in Annex 1

⁴ <http://konkurentnost.mk>

The initiative for development of Smart Specialisation Strategy of North Macedonia started by an exchange of letters of interest between the Deputy Prime Minister of the Republic of North Macedonia in charge of economic affairs and coordination with the economic sectors and the EC Joint Research Centre as a Commission's science and knowledge service. The Ministry of Education and Science (MES) created the Working Group and jointly with the Ministry of Economy (ME) are coordinating the development process of the Strategy, cooperating intensively with the Cabinet of the PM, Cabinet of the DPM, the Fund for Innovation and Technology Development, as well as other competent ministries, institutions, business representatives, academicians, and non-governmental sector under the quadruple helix governance model. The process is carried out in collaboration and systematic assistance from the JRC providing guidance concerning the implementation of the S3 Framework for the EU Enlargement and Neighbourhood Countries⁵.

Smart specialisation is a tool for concentrating economic investment in areas where the country has a critical mass of knowledge, capacities, and competences and where there is innovation potential to position the country within the global markets and thus enhancing recognition.

The basic concept of smart specialisation is mainly increasing value added of economic activities through public and private investments in research, technological development, and innovation, targeted to the areas with highest potential impact

The potential domains should be supported by targeted, comprehensive and tailored support, through Government programs and measures from the national and local budgets, business investments by business sector funds as well as it is part of the priorities that should be supported by national budget, donors, EU and other international funds

By identifying key priority areas, S3 will put research at the service of business and societal needs.

The key advantage of the S3 concept is the participative role of all stakeholders in the process of design and implementation of the strategy.

1.2 Summary of the Quantitative Analysis of the Current Economic, Innovation and Scientific Potential

In 2019, in close cooperation with JRC and by following their methodology, along with support from GIZ, the National Center for Development of Innovation and Entrepreneurial Learning (NCDIEL) with supervision provided by the expert Mr. Hugo Hollanders, conducted the quantitative mapping as- an assessment of the potential priority domains based on economic, innovation and scientific indicators.

1. The assessment started with collecting data at national level. The data largely originated from the State Statistical Office, State Office of Industrial Property, as well as European and international databases. The applied research methodology for mapping the **economic potential** for smart specialisation in the Republic of North Macedonia was based on analysis of the statistical data elaborated in the descriptive

⁵ Supporting an Innovation Agenda for the Western Balkans - Tools and Methodologies, JRC May 2018

part and the second step was analysis based on comparisons of the statistical economic indicators (growth rate, export value, productivity level, average wage) for the Republic of North Macedonia with respect to the EU average. This was an analytical part of the mapping.

2. The mapping of the **innovation potential** was based on the statistical data originating from the State Statistical Office.
3. The mapping of the **scientific potential** was based on data that originated from various data sources (databases with scientific publications: Web of Science, Scimago Journal and Country Ranking database, National University Library, State Office for Industrial Property, World Intellectual Property Office).

Based on the comprehensive analysis, the final, refined list of industry groups with economic or innovation potential with respect to the industry sections mapped for their scientific potential is as follows:

Table 1: Mapped industries with economic/innovation and scientific potential

Mapped industries with economic/innovation and scientific potential	Pillar
C10.6 Manufacture of grain mill products, starches and starch products	Innovation, Scientific
C10.8 Manufacture of other food products	Innovation, Scientific
C11.0 Manufacture of beverages	Innovation, Scientific
C18.2 Reproduction of recorded media	Economic, Scientific
C22.1 Manufacture of rubber products	Economic, Scientific
C23.7 Cutting, shaping and finishing of stone	Innovation, Scientific
C27.1 Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus	Innovation, Scientific
C27.9 Manufacture of other electrical equipment	Innovation, Scientific
C28.4 Manufacture of metal forming machinery and machine tools	Economic, Scientific
C29.3 Manufacture of parts and accessories for motor vehicles and their engines	Innovation, Scientific
C31.0 Manufacture of furniture	Innovation, Scientific
I56.1 Restaurants and mobile food service activities	Economic, Scientific
I56.2 Event catering and other food services	Economic, Scientific
J58.1 Publishing of books, periodicals and other publishing activities	Innovation, Scientific
J59.2 Sound recording and music publishing activities	Economic, Scientific
J60.1 Radio broadcasting	Economic, Scientific
J61.2 Wireless telecommunications activities	Innovation, Scientific
J61.9 Other telecommunications activities	Innovation, Scientific
J62.0 Information technology service activities	Economic, Innovation & Scientific

Source: Mapping economic, innovative and scientific potential in the Republic of North Macedonia, NCDIEL, published by GIZ September 2019

In this regard, the mapped industry groups possess potential in at least two of the main pillars for S3: economic, innovation or scientific. This set of industry groups is refined in respect to the industry sections mapped in the scientific analyses. In total, as evidence-based selection, **19 industries** were selected as a base for further analysis in the development of the national S3.

Overall, it is evident that the industry C MANUFACTURING is the most dominant industry section, represented by 11 subsequent industrial groups. The second most dominant industry section is J INFORMATION AND COMMUNICATION, represented by 6 subsequent industrial groups. And finally, the last industry section listed in the table is I ACCOMMODATION AND FOOD SERVICE ACTIVITIES, represented by 2 subsequent industrial groups.

1.3 Proposed potential areas for smart specialization subject to qualitative analysis

In order to continue with further analysis based on interviews with key stakeholders, (the Qualitative Analysis), the Interministerial Working Group responsible for leading the process for development of smart specialization strategy in the Republic of North Macedonia, made grouping of the 19 industries identified in Quantitative analysis in 6 areas according to their interrelatedness. The proposed names of the areas for smart specialization, are as a framework, and should be also further discusses and evolved.

Table 2: Grouping of the industrial sectors

Name of the proposed area for S3 qualitative analysis	Sustainable food and beverage production and value chains	Information and Communication technologies	Electrical equipments and mechanical parts	Sustainable tourism and catering	Smart/Sustainable Buildings and Materials	Energy for the future
Industries identified in Quantitative analysis with economic/innovation/scientific potentials	<ul style="list-style-type: none"> -Manufacture of grain mill products, starches, and starch products. -Manufacture of other food products. -Manufacture of beverages. 	<ul style="list-style-type: none"> -Information technology service activities. -Other telecommunication activities. -Wireless telecommunication activities. -Radio broadcasting. -Sound recording and music publishing activities. -Publishing of books, periodicals, and other publishing activities. -Reproduction of recorded media. 	<ul style="list-style-type: none"> -Manufacture of electric motors, generators, transformers, and electricity distribution and control apparatus. -Manufacture of other electrical equipment -Manufacture of metal forming machinery and machine tools. -Manufacture of parts and accessories for motor vehicles and their engines 	<ul style="list-style-type: none"> - Restaurants and mobile food service activities. -Event catering and other food services 	<ul style="list-style-type: none"> -Cutting, shaping, and finishing stone. - Manufacture of furniture. - Manufacture of rubber products. -Civil engineering 	New area proposed for analysis

Source: Working material of the S3WG based on the Mapping economic, innovative and scientific potential in the Republic of North Macedonia, NCDIEL, published by GIZ September 2019

In the Qualitative Analysis stage, the proposed domains will be subject to further analysis for their potentials and interconnections with other sectors/value chains linkages and refined in order to be further discussed in the EDP.

Energy for the future

For the Qualitative analysis additionally was proposed new area, Energy for the future, as an area that was not covered in the quantitative analysis, but has a potential for further growth due to the existing capacities in science, innovation and new business opportunities.

Development of the energy sector, use of renewable energy sources (RES) and enhancement of energy efficiency are one of the main government priorities and strategic objectives.

In January 2020, the Government adopted the new Energy Development Strategy 2020-2040⁶. The recently developed Strategy provides a platform for modernization and transformation of the energy sector in accordance with the EU Energy development processes, enabling better access, integration, and availability of energy services, decrease of the pollution and increased private sector participation.

The Strategy for Energy Development of the Republic of North Macedonia until 2040 relies on the five-dimensional framework of the EU Energy Union - (pillars) - security, solidarity, and trust; fully integrated energy market; energy efficiency; climate action - decarbonising the economy; research, innovation, and competitiveness, taking into account the country's development potentials and domestic specifics.

The Strategy integrates climate and environmental aspects of the energy sector, while proposing affordable, reliable, and sustainable energy for the future.

The vision for 2040 is: A reliable, efficient, environmentally friendly, and competitive energy system capable of supporting the country's sustainable economic growth. The strategy defines six strategic goals for North Macedonia, mapped along five energy pillars: maximize energy savings, maintain current levels of energy dependence, limit the increase of greenhouse gas emissions, increase the share of renewable energy sources, minimize system costs, and ensure continuous harmonization with the EU Acquis. These strategic goals are in line with the new Energy Law and the EU's energy directives.

Energy trends underscore the more ambitious transition to a low-carbon economy, with renewable energy sources (RES) and energy efficiency (EE) being among the most important factors enabling transition.

The Strategy, being a key document defining the growth model for the energy sector, states in the part R&D and Innovation that research, innovation, and competitiveness, cover the following priorities from the Energy Law:

- Stability, competitiveness, and economic functionality of the energy sector.
- Promotion of energy efficiency.
- Promotion of the use of renewable energy sources.

⁶<http://www.economy.gov.mk/doc/2759>

There are several institutions that are focused on R&I in the energy sector. North Macedonia has a broad range of institutions such as: Research Centre for Energy and Sustainable Development of the Macedonian Academy of Sciences and Arts ICEOR – MANU⁷, Faculties of the Ss. Cyril and Methodius University - Skopje (faculty for electrical engineering and information technology; faculty for mechanical engineering; faculty for computer science and engineering), Faculties of the Goce Delcev University - Stip (electrical engineering and mechanical engineering), Faculty of Technical Sciences of the St. Kliment Ohridski University – Bitola, University of Southeast Europe - Tetovo (contemporary science and technologies), Faculty for Technical Science at the Mother Theresa University - Skopje, as well as few NGOs/associations: ZEMAK, MACEF, MAKO CIGRE, North Macedonia Innovation Centre, E-Mobilnost, Analitika, Ekosvest, Front 21/42, Go Green, Solar Association, CeProSARD, etc. It will be essential to boost additional investments in the development and deployment of advanced technological solutions (especially RES and EE), as well that the public sector supports key projects including innovative energy technologies. Since responsibilities for innovation policy are shared between different institutions, institutional mechanisms are expected to ensure a coherent approach and effective policy coordination.

The strong capacities and potentials for research and innovation for this sector is proofed by the number of supported projects by HORIZON 2020⁸ and the number of supported projects through the Fund for Innovation and Technology Development.

⁷<http://iceor.manu.edu.mk/>

⁸ <https://mon.gov.mk/category/?id=2061>

2. Qualitative analysis and collection of qualitative data

The Qualitative Analysis is one of the most important stages in the process of development of smart specialisation strategy. The main aim of the qualitative analysis is to provide more information and evidence about the economic, innovative and scientific potentials of the strategic areas/domains identified in the quantitative analysis.

The collection of the data used to perform the Qualitative Analysis is based on in-depth interviews with the representatives of the business sector, academia, state, and non-governmental institutions. More than 15 interviews were done within each of the identified strategic areas. The main findings of the qualitative analysis based on the interviews conducted and on the results of the 6 focus group meetings are to clarify the previous identified preliminary areas and to go deeper in the process of defining the strategic subsectors that have the highest development potentials within each of the preliminary identified area. Finally, the Qualitative Analysis should be the main input for further discussions within EDP.

The interviews had several purposes. The first one was to collect information to verify the results of the Quantitative Analysis in mapping the current areas and defining the potential sub(area) where the country has latent comparative advantages, as well as to identify the key stakeholders by areas. This should be the main input for the entrepreneurial discovery process (EDP) as a final stage for designing the smart specialisation strategy. The second purpose is to identify "ambassadors" of each priority area, and these are representatives of the business sector, scientific, state institutions and civil sector, which have quickly recognized the usefulness of EDP and which were influential enough to be able to ensure participation of other important stakeholders and prepared to contribute to the quality of the process by frequently providing opinions and recommendations. The third purpose was to identify the key inputs for planning the next phase in the RIS3 design (entrepreneurial discovery process EDP). Finally, the last purpose was to analyse the current impact of the COVID-19 crisis on each strategic area and to identify the influence of the crisis on the future development path of each area in the post-crisis period.

2.1 Methodology

2.1.1 Qualitative Interviews

The Qualitative Analysis was done by an internal team from the Economic Chamber of North Macedonia (ECNM) with support of few external domestic experts. The team worked with the support and guidance of JRC⁹ and in close cooperation with the Smart Specialisation working group of North Macedonia.

Subject to interviews were 10-15 main stakeholders per preliminary priority area, among which at least 50% of interviewed stakeholders must be from business (major companies and SMEs), other 50% are relevant researchers, government officials, business organizations.

⁹The JRC methodological guidance is presented in Annex 1

Questionnaires for the business sector, academia and the governmental sector were developed based on the methodological guidance of JRC concerning the Qualitative Analysis and advised by JRC experts.

The questionnaire is composed of a list of questions which were specifically created for the business sector, academia, and governmental sector according to the specific characteristics of each group of stakeholders.

The structure of each questionnaire was made up of three types of questions: general questions for the sector (status/structure, development stage, perspectives, key players, COVID-19 effects, etc.), EDP-related questions and questions to identify ambassadors.

At the same time, the ECNM organized meetings with internal and external experts, as well as with the coordinator and members of the national working group where the detailed working plan for QA interviews was created according to the defined methodology and the capacities to conduct the interviews were built.

Additionally, the ECNM team, S3 working group and the external experts have created the list of potential stakeholders, prepared the protocol, the email text and the invitation letter from the Minister of Education and Science of the Republic of North Macedonia, and institutional support was secured in order to motivate the participation of the key stakeholders in the Qualitative Analysis.

After every meeting were prepared minutes of the meeting, that have to be confirmed by the interviewed person. After that they were uploaded on the cloud system, that was accessible by the members of the WG and other experts.

Questionnaire structure:

The list of guiding questions that were considered in the interviews are given below. In the interviews, a specific list of questions would take priority, depending on the nature of the stakeholder. It is due to the fact that each stakeholder group (business sector, academia and governmental sector) has different position, role and responsibility in the smart specialization process and in the development process of the country.

1. Standardized questions for the business sector

- Is your sector really as strong as shown by statistics? What makes it strong (export, human resources, innovation...)?
- Which subsectors are developed the most within your sector? Which parts of the value chains of those sectors are present in the country?
- Who are the key players in your industry? Do you collaborate with them and to which extent?
- Who are the key players in science in your area? Do you collaborate with them and to which extent?
- With which other sector(s) does your business sector predominantly cooperate?
- Is the level of internationalisation generally high or low? Which business (sub)sector(s) have the greatest export potential? Which business (sub)sector(s) exercise the best collaboration with the academic community?
- How dynamic is the sector and what is the role of start-up, scale-up and other small and medium enterprises in their development?

- Do you invest in innovation and technology improvement?
- What are the main strengths and challenges of your sector?
- What is the development potential of your sector (grade 1-5)? Why?
- How do you see the future of your sector? In which part of the supply chain within your sector do you see the largest chance for future?
- Could you please identify the state measures that could help your sector grow?
- What are the expected impacts of the economic crisis caused by the COVID-19 pandemic on your sector?
- What are the actions that the government should take in order to address potential effects of the COVID-19 pandemic on your sector?
- Which companies are the most innovative in the sector and what success stories can be used as lessons for other companies?
- Which actors from academia are the most innovative in the sector and what success stories can be used as lessons for others?
- Who are the key stakeholders from the government and civic sectors in the preliminary priority areas?

2. Standardized questions for the academia

- How would you assess the R&I conditions in your institution/department in relation to international centres of academic and research excellence?
- How would you assess the number and quality of research personnel in your institution/department?
- How would you assess the relevance of educational programmes delivered by your institution/department in relation to the business sector needs?
- How would you assess the importance of our state's participation in international publications in your scientific field?
- What are the specialised topics within your scientific field that are most commonly addressed by domestic authors in international publications?
- How would you assess the collaboration of your institution/department with the business sector?
- What are the specialisation topics that your institution/department most commonly addresses in collaboration with the business sector?
- How would you assess the innovation activity within your institution/department?
- Who are the key stakeholders from the governmental and civic sectors in the preliminary priority areas?
- How would you assess the government support to the academia? Do you think the government should have more active role in building stronger research and innovation capacity in this sector?
- How would you assess the innovation and development potential of this sector? How innovative are the companies within this sector?
- How do you see the future of this sector? In which part of the supply chain within this sector do you see the largest chance in the future?
- Could you please identify the state measures that could help this sector grow?
- What are the expected impacts of the economic crisis caused by the COVID-19 pandemic on the construction sector and production of sustainable materials?

- What are the actions that the government should take in order to address potential effects of the COVID-19 pandemic on this sector?

3. Standardized questions for government institutions

- How do you evaluate the development potential and opportunities of the sector?
- Are there any institutional obstacles for the development of the sector?
- Is the government ready to make regulatory and institutional improvements to increase the opportunities of the sector?
- Do you think that the government or other institutions have willingness to eliminate obstacles and improve the business environment to boost the sector development and create opportunities for its advancement?
- What measures do you recommend to increase further development of the sector?
- Who are the key stakeholders from the governmental and civic sectors in the preliminary priority areas?
- How would you assess the government support to the academia? Do you think the government should have more active role in building stronger research and innovation capacity in this sector?
- How would you assess the innovation and development potential of this sector? How innovative are the companies within this sector?
- How do you see the future of this sector? In which part of the supply chain within this sector do you see the largest chance in the future?
- Could you please identify the state measures that could help this sector grow?
- What are the expected impacts of the economic crisis caused by the COVID-19 pandemic on the construction sector and production of sustainable materials?
- What are the actions that the government should take in order to address potential effects of the COVID-19 pandemic on this sector?

The second and third part of the questions in the questionnaires was identical for all stakeholders. The intention was to give recommendations for the EDP process and identify ambassadors.

Standardized questions related to the organization of the EDP process

- How often would you come to the workshops?
- How long should the EDP workshop last?
- Would you attend the EDP workshop in other regions of North Macedonia?
- Would you need a formal invitation to the workshop? Who should be the institution sending the invitation (national ministry, chamber of commerce, academia)?
- What would be an attractive name? What would your suggestion be for a name for a wider area?

4. Standardized questions to identify “ambassadors” within the priority area/sector

- Could you assure the participation of other stakeholders?

- Are you willing to provide in-depth feedback on the process and content between two EDP workshops?
- How often can we contact you regarding the S3?

In order to conduct face-to-face interviews of high quality and within deadlines, the Economic Chamber of North Macedonia (ECNM) has created a team of internal sectoral experts who served as co-coordinators of each priority area and hired external experts from the academia who were the coordinators of each area and were involved in the development of the qualitative analysis.

The lead internal expert is Jadranka Arizankovska from the ECNM who was responsible for coordination of the internal expert team of the Chamber and the external experts engaged as consultants to support the Chamber team. She was also a coordinator of the domain Energy for the future. As part of the ECNM team, Ivana Krsteva was responsible for administrative works and Stevo Serafimov was responsible for developing and administrating the IT system.

Prof. Darko Lazarov was the lead external expert tasked with conducting interviews and writing the qualitative analysis for the Information and Communication Technologies (ICT) sector, Electrical equipment and mechanical parts and Sustainable food and beverage production and value chains was, Jelisaveta Georgieva-Jovevska was the coordinator of Smart/Sustainable Buildings and Materials (civil engineering, sustainable materials, transition to circular economy), while prof. Atanas Kochov, as an external expert, was responsible for conducting interviews concerning Sustainable tourism and catering.

Below you can find the list of internal and external experts who took part in conducting the interviews and preparing the meeting minutes from the interviews:

Prof. Darko Lazarov, coordinator of Sustainable food and beverage production and value chains, Information and Communication Technologies (ICT) sector and Electrical equipment and mechanical parts; Vasko Ristovski, co-coordinator of Sustainable food and beverage production and value chains;

Prof. Atanas Kochov, coordinator of Sustainable tourism and catering;

Daniela Mihajlovska, co-coordinator of Sustainable tourism and catering;

Jadranka Arizankovska, coordinator of Energy for the future;

Pero Avakumovski, co-coordinator of Energy for the future and Electrical equipment and mechanical parts;

Aneta Dimovska, co-coordinator of Information and Communication Technologies (ICT) sector;

Jelisaveta Georgieva-Jovevska, coordinator of Smart/Sustainable Buildings and Materials;

Nena Nikolovska, co-coordinator of Smart/Sustainable Buildings and Materials.

2.2 Data collection by preliminary areas

100 interviews were conducted with representatives of the business sectors and business associations, representatives of the academia and the governmental sector in each of the previously defined preliminary priority areas.

63 interviews were conducted in the Skopje region, 5 interviews were conducted with stakeholders from the Polog region, 5 interviews with stakeholders from the Southwest region, 10 interviews with stakeholders from the Vardar region, 2 interviews with stakeholders from the Pelagonija region, 13 interviews with stakeholders from the East region and 2 interviews with stakeholders from the Southeast region.

Image 1: Regions in the Republic of North Macedonia



The responsiveness of the companies was very high and more than 90% of the interviews were conducted face to face. Some interviews were conducted online due to the limitations of the communication procedures caused by COVID 19 restrictions. All interviews were done in the period September – December 2020 although the situation with the pandemic has caused a serious problem for the teams that were conducting interviews on the spot, by visiting companies in Skopje and other regions in the country as well.

Other identified relevant stakeholders that were not interviewed in this phase, because of the Covid-19 crisis, were additionally invited to participate in the focus groups meetings that were organized in January, as a contribution to the finalization of the qualitative analysis.

The number of interviews that were conducted within each of the defined preliminary areas is presented in the table below¹⁰:

¹⁰In the Annex 2 is presented the Table with all interviewed stakeholders.

Table 3: List of interviewed stakeholders

Preliminary area/sector	Number of conducted interviews				Total
	Business sector	Business Associations	Academia	Governmental sector	
Information and communications technologies (ICT) sector	8	1	3	1	13
Sustainable food and beverage production and value chains	11	1	4	3	19
Smart/Sustainable Buildings and Materials	11	/	2	2	15
Electrical equipment & mechanical parts	14	1	3	2	20
Energy for the future	8	/	3	3	14
Sustainable tourism and catering	14	1	1	2	18
Total	71	4	13	12	100

3. Data analysis by preliminary areas

Based on the data collected by the interviews with the key representatives of the business sector, academia and government institutions, input from the focus group meetings as well as the input from additional sector analysis, the comprehensive analysis of the preliminary areas was prepared that contributed to the identification of subareas for specialisation, key players in the sector, innovation potential, R&D capacity, internalization level and export potential, main strengths and challenges for smart specialisation and government's policies for accelerating the development process of each identified area, proposal for the future EDP process and the influence of COVID 19 on each identified area.

3.1 Analysis of preliminary areas

3.1.1 Sustainable food and beverage production and value chains

The preliminary defined area of Sustainable food and beverage production and value chains included 12 interviews with representatives of the business sector, the Agricultural and Food Industry Association of the Economic Chamber of Macedonia as a business association; 4 representatives of the academia (Faculty of Agricultural Sciences and Food, Faculty of

Veterinary Medicine, and Faculty of Technology and Metallurgy within the Ss. Cyril and Methodius University – Skopje and the Center for Transfer of Technology within the Goce Delchev University, Stip); and with 2 representatives of governmental institutions (the Food and Veterinary Agency and the Cabinet of the Deputy Prime Minister in charge of economic affairs and coordination with the economic sectors). Additionally, answers from the Ministry of Agriculture, Forestry and Water Economy to the questionnaire were received. The interviewed stakeholders are located in different regions of the country: 4 interviewed stakeholders are located in the East region, 2 companies are located in the Pelagonija region, 3 companies in the Vardar region, 1 company in the Polog region, while 9 stakeholders (most of them from academia and governmental sector) are located in the Skopje region.

Table 4: List of key stakeholders and process ambassadors

No	Private sector	Ambassador	Smart agriculture	Food processing with high added value	Beverage	Health food	Cross-sectors
1	MIK SVETI NIKOLE			x			
2	PIVARA AD				x		x
3	PEKABESKO	x		x			
4	BRILIJANT STIP			x			
5	MLEKARA AD BITOLA	x		x		x	
6	KOZUVCANKA KAVADARCI				x		
7	FLOREO KAVADARCI					x	
8	LARS			x			x
9	MAKPROGRES DOO, VINICA	x		x			x
10	VITAMINKA AD	x		x			
11	VESE SHARII		x	x			
12	ASSOCIATION FOR AGRICULTURAL AND FOOD INDUSTRY	x					x
No	Academia						

1	FACULTY OF VETERINARY MEDICINE	x	x	x			x
2	CENTER FOR TRANSFER OF TECHNOLOGY - UGD						x
3	FACULTY OF AGRICULTURAL SCIENCES AND FOOD SKOPJE, UNIVERSITY SS CYRIL AND METHODIUS IN SKOPJE	x	x	x		x	x
4	FACULTY OF TECHNOLOGY AND METALLURGY, SS. CYRIL AND METHODIUS UNIVERSITY IN SKOPJE (TMF-UKIM)	x		x		x	x
No	Governmental sector						
1	FOOD AND VETERINARY AGENCY OF THE REPUBLIC OF NORTH MACEDONIA	x					x
2	CABINET OF DEPUTY PRIME MINISTER RESPONSIBLE FOR ECONOMIC AFFAIRS AND COORDINATION WITH THE ECONOMIC SECTORS	x					x
3	MINISTRY OF AGRICULTURE, FORESTRY AND WATER ECONOMY	x					x

Moreover, a focus group meeting was organized consisting of 3 ambassadors from the business sector (BiMilk Bitola, Veze Sharri Tetovo, and Pekabesko Skopje), 3 representatives of the governmental sector (Cabinet of the Prime Minister, Ministry of Economy and Cabinet of Deputy Prime Minister), and 2 representatives of the academia (professors from the Faculty of Technology and Metallurgy – Skopje and the Faculty of Agricultural Sciences and Food - Skopje).

The focus group participants contributed to the finalization of the strategic subareas and the clarification of some of the open questions from the interviews. The discussion of the participants in the focus group meeting was in the direction that agriculture and food processing is one of the most strategic areas for the future development of the country, while the identified sub-areas have significant economic, innovative and scientific potentials for smart specialization¹¹.

In the broader area, based on systematized data obtained from a number of sources (conducting interviews, focus group meetings, additional existing studies, etc.), a proposal was made to rename the domain to **Smart agriculture and Food processing with high added value**, which will comprise the following subareas:

- Smart agriculture
- Food processing with high added value

The conclusions from the conducted interviews, the organized focus group meeting, and the in-depth sectoral analysis of each defined subarea are described below.

Subarea 1: Smart agriculture

The agricultural sector makes significant contribution to the Macedonian economy in terms of number of employees, contribution to the GDP, investments in new technology and export. The gross added value of this sector in 2019 reached EUR 800 million, which is 7% of the country's GDP and this value is generated by 110,000 workers. Over 110 companies have exported EUR 168 million of agricultural products (of animal and plant origin) in 2019 which is 2.85% of the country's total export and this export value shows an increasing trend in the last several years, which demonstrates that the internalization level of this subarea is increasing¹².

The country has comparative advantages in 50 agricultural products ($RCA > 1$), which is more than 15% of the total export products in which the country specializes (470 products with $RCA > 1$). The top export products of the agricultural sector are brassica (cabbages), fresh grapes, fresh tomatoes, peaches, apples, cucumbers, peppers, cereals, raspberries, blackberries, lamb, milk, and others.¹³ A major part of these export products goes to the Western Balkan region, the EU market and Russia, while a very small part is headed to other regions in the world.

¹¹ Annex 3.

¹²Own calculation based on official statistical data from the State Statistical Office of the Republic of North Macedonia

¹³Identification of development opportunities and potentials for export diversification and structural transformation of the Macedonian economy, Economic Chamber of Macedonia, Skopje, 2020

The country has favorable natural potential (climate, soil quality) for agricultural production. Over the centuries, the Macedonian agricultural sector established a long tradition and accumulated knowledge of production of quality agricultural products (in particular vegetables and fruits, rice, wine and lamb), which are regionally recognized. The untapped potential for further development results from the availability of uncultivated land and abundance of ecological pastures adjoined with the low-cost labor in the rural areas, as well as the location of the country in Europe and the already established traditional trade partners.

According to the representatives of the academia and the business sector that were interviewed, the challenges with climate changes will require strengthening of the collaboration between the academia and the agricultural producers in defining the next steps in the development of new innovative agriculture products with high added value and implementation of new modern technologies and smart production methods. This intention is provided for in the smart specialization concept as a global trend that should be adopted by the local farmers and the agri-food companies. Change in consumer demand, orientation toward modern life and healthy life imply search for new products for which we have potentials such as medical cannabis, different types of flours, avocado and other high-added value fruits and new markets where the Macedonian companies could start exporting such as the Middle East countries. Actually, the transformation of the agricultural sector by starting the production of new products with high added value and investments in new technology and implementation of smart production concepts are the main challenge and opportunity in the smart specialization process of this subarea.

The opportunities to increase the production volume and export offered by several FTAs (mainly CEFTA and SSA with EU) can be unlocked with investments that boost the productivity and modernization, implementation of food quality and safety standards, equalization and concentration of supply coming from numerous small farmers and with improved vertical integration. Better investments in marketing and promotional activities to diversify the limited export destinations can trigger high return considering the current low level.

The introduction of modern technology and innovations, transfer of knowledge and digitalization can increase the production efficiency, the overall competitiveness and income level and combat climate change. This trend of transformation to more high-tech agricultural production (smart agriculture) is continuously growing, and an increasing number of companies such as ZIK Pelagonija Bitola, Veze Sharri Tetovo, Perm Index Gradsko, Fruktana Shtip, Oaza Samantov, Green Food - Sv. Nikole and others are introducing modern techniques in their production processes. There is also a critical mass of individual farmers, farmers' organizations and small agri-business firms with the capacity to adopt innovations and new technology.

The number of modern fruit plantations (apple, peach, cherry, raspberry, and other fruit products), greenhouses for vegetable production (tomato, pepper, cucumber, and other vegetables), as well as the number of modern facilities for production of horticultural products, cereals, wine, and other agricultural products is increasing. Additionally, there are many investments in growing organic agricultural products, as well as investments in production of medical cannabis as one of the sectors with the highest potential. Just as an example, Oaza Samantov, Zaum Struga, Fruktana Shtip and others produce organic agricultural products, Oaza Alkaloidi Stip and several other companies started production of

medical cannabis according to the EU standards; while Antura Kocani produces different types of flours.

Apart from the investments in new technology, another very important segment in the process of transformation from the traditional agricultural sector to high-tech smart agriculture that was pointed out by the interviewed representatives of the academia is building stronger R&D capacities and utilizing the innovative potentials of the academia. The **key players** in the **academia** are the Faculty of Agricultural Sciences and Food and the Institute of Agriculture within Ss. Cyril and Methodius University - Skopje, the Faculty of Agricultural Sciences within Goce Delchev University, the Faculty of Veterinary Medicine – Skopje and the Faculty of Technology and Metallurgy within Ss. Cyril and Methodius University – Skopje. There are more than 200 professors and researchers that work in these state research institutions.

These key players in the academia have significant scientific capacities and innovative potential. They are actively involved in the collaboration projects with the business sector regarding preparation of project application for IPARD, USAID and other EU calls, conducting laboratory experiments and scientific research. A proof of the research and innovative capacities of this subarea is the fact that there are 7 successfully finished H2020 projects in the field of food security, sustainable agriculture, and forestry, more than 25 projects financed under the FITR instruments in the field of agriculture, and over 3% of the innovation vouchers (for collaboration between the academia and the business sector) awarded under the first FITR call were granted in this field. Additionally, according to data from the State Office of Industrial Property 4% of the total number of patent applications in the last decade coming from this area (agriculture and food)¹⁴, while 10.5% of the total approved FITD projects volume coming from this area (1.6 million EUR approved budget for projects from agriculture and 2.9 million EUR approved budget for projects in food processing)¹⁵.

Additionally, the effective upgrade of the knowledge and skills of the farmers and other stakeholders in the sector and the introduction of innovation is going to be stimulated through functional links established with the science and advisory services, achieved within the newly established Agricultural Knowledge and Innovation System of the Government of North Macedonia. The role of the business organizations and clusters is of no less importance. In fact, there are more than 15 active clusters in the field of agriculture and several business associations and organizations, and they make particularly important contribution to deliver the main goal of further developing this subarea.

Although the current position of the country in the value chain of the agricultural sector is not favorable (most of the export products for which the country already built comparative advantages are agricultural products with relatively lower added value), there are opportunities to improve the position in the value chain by protecting the geographical indications and traditional specialties of the products, shift to organic production, increase the value-added substance, produce less-represented non-traditional crops that generate higher yield from limited resources (aromatic and medical herbs, spices, indigenous races and varieties), as well as by linking agriculture with non-farm activities, especially rural tourism.

¹⁴State Office of Industrial Property (SOIP), <http://www.ippo.gov.mk>

¹⁵Reports of the Fond for Innovation and Technology Development <https://fitr.mk/en/#>

High-tech agricultural production requires new resources, thus generating innovations in a range of ancillary activities – production of seeds and crops, production of mineral and microbiological fertilizers, production of infrastructure crop elements (pillars, nets, irrigation systems), production of measurement and control equipment (sensors, data loggers, information systems for data collection, processing and management), growth regulators, biological and chemical agents for combating pests and diseases, as well as modern agricultural equipment. Even though there is development potential in these activities, many of them have not been yet developed in North Macedonia.

Another important segment to develop this subarea is the state support with an active role of the **key governmental institutions** (the Food and Veterinary Agency of the Republic of North Macedonia, the Ministry of Agriculture, Forestry and Water Economy, the Agency for Financial Support in Agriculture and Rural Development, the Ministry of Finance, the Ministry of Economy, and others) in terms of regulation and agricultural policy, as well as building stronger capacities for utilization of the EU Instrument for Pre-accession Assistance– IPA.

Moreover, the government should create new public financing instruments for investments in new production capacities that would be characterized with high EU standards and with fully implemented sanitary and phytosanitary measures, modern technology based on application of ICT tools and solutions (sensors, data loggers, information systems for data collection, processing and management), production of suitable biodegradable packaging, building modern storage and logistic systems which is missing in the current supply chain. Here, the role of academia, clusters, research and innovation centers, as well as start-ups and innovative SMEs is crucial to the future specialization of this subarea.

According to the respondents, there are several **additional challenges** that the Government should face in order to support the further development of this sector. The need for land consolidation and privatization of agricultural land, as well as the investments in infrastructure – roads and irrigation systems and organized cultivation of primary agricultural products along with complete modernization as foundations to increase productivity and yield per hectare of land are some of these challenges.

Additionally, the current approach of segregation of competencies over the agri-food policies between the Ministry of Agriculture, Forestry and Water Economy (MAFWE) - responsible for primary agricultural production, and the Ministry of Economy for food processing and trade is not in line with the concept of the EU's Common Agricultural Policy, which implies integrated policy interventions "from farm to fork". The lessons learnt from the previous period have shown that the disintegration of state policies for primary production, processing and trade of agricultural products leads to partial policy solutions and complicates the process of reaching consensual decisions of common interest of all value-chain stakeholders. This does not help overcome one of the main problems in the agricultural sector - the prominent vertical disintegration in the supply chains.

Therefore, the **horizontal cross-sectoral connection** should be intensified in this regard, especially in segments of marketing promotion, packaging, storage and logistic, implementation of ICT solutions for managing and trading, more joint initiatives with the representatives of the tourism sector to promote local agricultural products, promotion of the mineral and microbiological fertilizers production as well as promotion of the biological and chemical agents production for combating pests and diseases. There are several well-established storage and logistic centers for agricultural products in the country and they have

crucial role in the supply chain of this subarea. However, the missing part of the supply chain that should be developed in the future is the better marketing promotion of domestic products on international markets and the sector for packaging and branding.

Moreover, the horizontal connection with the food processing industry represents another important step in the process of smart specialization and ensuring a circular economy approach by reutilizing agricultural waste and turning it into high added value material. The biogas plants built by ZIK Pelagonija and Veze Sharri are good example of practicing the circular economy model in the agricultural production. There are several other ongoing investments in building biogas plants which indicates that this sub-area is transforming by applying modern and sustainable concept.

Additionally, this subarea is connected with the machinery sector in terms of implementation of new agricultural equipment and new machines for production, as well as with the civil engineering sector in terms of construction of smart facilities for storage and logistic regarding agricultural products. AgroBar Vinica and AgroMehanika Bitola are companies which produce agricultural equipment and machines which is a good example that should be used in other parts within this subarea (production of machines and equipment for production of different agricultural products).

The agricultural sector was largely hit by the Covid-19 crisis though the shutdown of restaurants and the reduced demand for fruit, vegetables, and meat, but there were also problems during the export activities of agricultural products in the first several months (April and May) of the crisis. However, the expected impact of the economic crisis caused by the Covid-19 pandemic on this subsector is not significant in terms of demand for agriculture products, number of workers and the value of export. Moreover, the crisis is not expected to have any serious effects on the future development of this subarea in terms of the smart specialization process and transformation to smart agriculture.

The Government should create a set of post-crisis measures that will be development-oriented with the single aim to boost the process of transformation of this sector in terms of implementation of new technology, production methods, new products, etc. In that regard, the Government should support the investment activities of big companies, as well as the innovative SMEs, which have limited access to finance.

During the health and economic crisis COVID-19, the work of the agricultural and food sector didn't stop or was banned, but only slowed down due to the new rules for restricted movement introduced by the Government of RNM in response to the pandemic. The biggest challenges facing the agricultural and food sector were the organization and logistics of importing and exporting their products, as well as the organization of current agricultural and production processes in enterprises due to limited working hours and movement. 50.98% of companies face cancellations/delays of orders, which shows the significant impact of the COVID-19 crisis on companies. Estimated losses in the agricultural and food sector in the first quarter of 2020, compared to the first quarter of 2019, are calculated at 22-40%. Therefore, the industry expects reduced profitability by 41-60% in 2020. Given that the agricultural and food sector is of vital importance and has the potential to be a driving force in the recovery of the economy, various financial instruments provided in cooperation between banks and the state, especially for export-oriented companies, are proposed in the short term. Also, in the long run, it is necessary for companies to adapt and improve their

technology and application of knowledge, to improve their specificity, and then become more resilient to future similar challenges such as this health economic crisis.¹⁶

Subarea 2: Food processing with high added value

The food processing industry is one of the most important manufacturing sectors in North Macedonia. Even though the country is net-importer of food, the export performance and development potentials of this sector are significant. The majority of the interviewed respondents noted that the most important step for future smart specialization of the country in this sector should be based on moving toward a production of high added-value products, as well as healthy and organic food products and local food brands.

The food processing sector shows **growing trends** in terms of **number of companies, workers, turnover, export**, and other indicators. The number of active companies in the food processing industry was over 1,700 in 2019 (which is almost 23% of the total number of manufacturing companies) and they are located in almost every region (Skopje, Vardar, East, Pelagonija, Polog) in the country. The number of active companies has grown 10% in the period 2016-2019. These companies have created more than 16,000 jobs, which is more than 10% of the total number of workers in the manufacturing sector. This number of workers shows a slight growth in the last several years. At the same time, there is a positive trend in the total turnover of the companies (over 5% growth rate in the period 2016-2019).¹⁷

Moreover, the **export value** of the food processing industry has reached more than EUR 350 million (over 50% of the total turnover of the entire sector), which shows that this subsector has strong export performance, but more importantly, according to the information from the interviewed companies based on the growing trends in the global demand for food products, the export potential of high added-value food products is immense and should be utilized through an active role of the Government in the process of building comparative advantages by exporting these products to new markets and by including the academia in the process of increasing the innovative capacity for transformation of custom (common) products into high added-value products.

The conclusion based on the results from the conducted interviews shows that there are **numerous companies** that successfully produce and sell **wide range of food products** on the domestic and global markets such as Vitaminka Prilep, Makprogres Vinica, Evropa Skopje, Donia Prilep, Cermat Bitola, Swisslion in the **confectionery industry** (wheat snacks, chocolate products, wafers, cookies and cakes, ice-cream, lokum and other products); Diam Gevgelija, Maks Strumica, Lars Stip, Vipro Gevgelija in the **canning industry** (ajver, lutenica, marmalade, jam); Veze Sharri Tetovo, Mik Sv. Nikole, Agria Veles, Pekabesko Skopje in the

¹⁶ Study for the effects on the private sector of the agriculture and food processing industry affected by the health economic crisis by the Covid-19 Pandemic with recommendations for the management of the consequences, <https://biznisregulativa.mk/mk-MK/Pages/Publications>

<https://biznisregulativa.mk/Upload/Documents/THE%20EFFECTS%20ON%20AGRICULTURE%20AND%20THE%20FOOD%20INDUSTRY%20CAUSED%20BY%20THE%20HEALTH%20AND%20ECONOMIC%20CRISIS%20COVID-19%20WITH%20RECOM.pdf>

¹⁷Own calculation based on official statistical data from the State Statistical Office of the Republic of North Macedonia

meat industry (processed meat products – beef salami, smoked beef, chicken fillet, hot dog and breast, pate, and other products); Kadino Skopje, Zito Luks in the **baking industry** (frozen filo dough pastries, pasteurized breads); BiMilk, Zdravje Radovo, Sutash Skopje in the **dairy industry** (milk, buttermilk, yogurt, butter, sour cream, and other products); Brilijant Shtip, Blagoj Gjorev Veles in the **cooking oil industry** (sunflower, olive cookingoil).

Many of these companies could be classified as innovative SMEs that invest in new technologies and innovations, implement the EU standards, have tradition and accumulated knowledge and are well-established on the global markets, which represent their comparative advantages. This indicates that the food processing industry is a very **dynamic sector** from the aspect of **technology and innovation with critical mass of innovative SMEs** that have the capacity to accelerate the future development of this subarea. Additionally, there are **7 active clusters** (Agri-exporters Cluster, Wines of Macedonia, Wine Cluster – Enolozi, Milling and baking industry Cluster, Food confectionary industry Cluster, TWR Tikves wine route and Map F&V Cluster) and several business associations that have an important role in the development of different branches within the food processing industry.

The results of the interviews show that this sub-area has well-established supply chain. There are several wholesale/retail distributors (Dauti Komerc, Kam Market, Atlantic Trade, and others) with well-established distribution networks, storage and logistic capacities and they have an important role in the promotion and distribution of food products in the Western Balkan region, Bulgaria and other EU countries. Additionally, there are several initiatives among the food producers (especially the initiative of the confectionery industry) for creating international distribution networks to better promote the food products which could represent an important step toward further internalization of this subarea. However, the packing and marketing promotion are parts of the supply chain that are crucial in the process of building stronger competitive advantages of the food processing sector on the global markets.

Moreover, it is also of importance that this subarea has significant **R&D and innovative potentials**. The key players from the academia are the Faculty of Agricultural Sciences of the Ss. Cyril and Methodius University and the Goce Delchev University, the Faculty of Veterinary Medicine Skopje, the Faculty of Technology and Metallurgy of the Ss. Cyril and Methodius University – Skopje and the Macedonian Academy of Science and Arts - MANU. There are over 200 professors and researchers active in the institutes and research centers within these institutions. They have an important role in the transfer of new technology, in the implementation of new innovative production techniques and new EU standards, development of new products, as well as in testing product quality, laboratory accreditation, theoretical research and in issuing quality standards for production.

An additional argument for the research and innovative capacities of this subarea is the fact that there are 7 successfully finished H2020 projects in the field of food security, sustainable agriculture, and forestry, more than 20 projects financed within the FITR instruments in the field of food processing in the last four years and over 10% of the innovation vouchers (for collaboration between the academia and the business sector) awarded under the first FITD call were granted to the food processing sector. At the same time, there are many

collaborative and applicative projects financed by the EU programs such as IPARD to support innovative ideas in the food processing industry.¹⁸

The interviewed stakeholders pointed out the **main strengths** of this subarea: 1) increasing number of new modern facilities and production capacities with high flexibility opportunities, 2) accumulated knowledge, experience, and long production tradition, 3) natural resources, 4) CEFTA and other free trade agreements and huge international market opportunities, as well as the existing distribution network. Therefore, the development potentials and untapped opportunities for further production specialization and export diversification of this subarea are significant and should be utilized.

However, the interviewed companies and faculties put forward several recommendations based on the addressed challenges that this subarea is facing in the process of further smart specialization. The main **addressed challenges** and **recommendations** based on these identified challenges are: 1) Increase industrialization – scale of production. Current production is on a smaller scale; we need new investments to increase production capacity, as well as new investments to increase the production capacity for raw materials; 2) Increase diversity in food production and export by using national and EU funds. There are many possibilities that have not been utilized yet in the field of starting production of new products by having a more active collaboration between academia and business sector; 3) Increase automation and competitiveness through new investments in modern technology, new organization and business models; 4) Increase the quality and quality control of final products by implementing new ICT management systems and digitalization; 5) Increase know-how of R&D by enhancing the scientific and research capacities, as well as the cooperation between the business sector and academia and 6) Better marketing promotion of traditional food products that characterize certain regions. This branch is dominated by smaller entities and could be promoted together with cultural and rural tourism. This area has great, but economically untapped potential that should be utilized.

The **production of beverages** as a part of the food industry has plenty of development potential, considering the fact that there is tradition, modern technology, experience in terms of trained labor and engineers for production of high-quality beverages according to international standards. The export opportunities of beer and non-alcoholic beverages are limited to the regional markets, while the export activities of wine are highly internationalized reaching the EU market and beyond. The key players in the **beer production** are Pivara Skopje and Prilepska Pivarnica, while Kozuvchanka Kavadarci, Gorska, Viva Skopje, Pivara Skopje and Prilepska Pivarnica are the key players in the **production of water and non-alcoholic beverages**.

On the other hand, there are many **wine producers**, but the key players are Tikvesh Kavadarci, Bovin, Stobi Gradsko, Popova Kula Demir Kapija, Ezimit Shtip and others. The **wine industry** has a long tradition, and their products are highly praised on the international market.

¹⁸ Official Reports of the Fund for Innovation and Technology Development and the Ministry for Education and Science.

<https://fitr.mk/en/#> and <https://mon.gov.mk/category/?id=2061>

According to the data obtained by the Ministry of Economy there are few active clusters for production and promotion of wine as well promotion of wine tourism. Wines of Macedonia (WoM) is an organization that unites Macedonian wine producers, committed to the promotion of the quality and image of the Macedonian wine across the world. This is a good example of how an important branch of the country should be promoted and further internationalized on the global markets. However, a major part of the producers still sells their products on the foreign markets directly to their trade partners without domestic wholesale companies.

According to the information gathered from interviews there is an institutional obstacle to the development of the beer and wine production/retail sector. Namely, due to some provisions the sale of alcoholic beverages and wines in retail from 19:00 to 06:00 in winter and from 21:00 to 06:00 in summer is prohibited. This had a serious impact on the beer and wine sales on the domestic market, but also on the sales of the filling stations in the summer period, usually generated by the tourist transiting the country. Moreover, the rise of the excises increased the price thus reducing the demand while simultaneously allowing import of foreign beer and wine. In addition, the licenses reduce the interest of the retail network and negatively affect the demand for these products. This subarea was seriously hit by the crisis resulting from the restrictions in the catering and tourism sector.

On the other hand, the main challenge of the wine sector is to build competitiveness and a brand to export more bottled wine with high added value, and the governmental support to brand the Macedonian wine and export bottled wine should be high on the priority list of the Agency for Export Promotion and other competent state institutions.

Health supplements, healthy food and organic products is a very important branch of the food processing industry having in consideration the future global market trends. The key players in this branch from the business sector are Vitalia Skopje, BiMilk Bitola, Zoralek Kavadarci, Nelkoski Organic Food Ohrid, Replek Farm Skopje, Alkaloid Skopje, Agro Fila Shtip and a few smaller producers of organic fruit, vegetables, and other organic products.

The healthy and organic food segment shows positive development trends in the last period in terms of number of companies that produce organic and healthy food, number of products and brands that are developed such as Good Nature – healthy teas from Alkaloid Skopje, Floreo – different types of organic honey and organic honey products, organic dairy products, different types of healthy oils from Agro Fila, ZAUM – organic hazelnut paste and crème, Vitalia – organic and health products such as immune boosters, cereals, oatmeal, bars, snacks, sweeteners, beverages and teas, organic fruits and vegetables from different small producers and oil from cannabis.

According to the data obtained by the Ministry of Economy there are few active clusters: Cluster for Organic Production, Cluster for Honey Products, Cluster for Snail Products.

This branch has critical **strategic strengths** such as natural resources, innovation capacity, geographic position, but there are untapped development potentials that should be utilized by increasing the cooperation between the companies, the Government and the academia. Additionally, the health crisis caused by the Covid-19 pandemic and the increased awareness of the people of the importance of healthy and organic food is another argument that this subarea has significant development potentials.

This subsector is closely related to the ICT sector in terms of implementation of new business and organization models, as well as new production processes based on ICT solutions such as AI, Big Data and Business Analytics, IoT. At the same time, the food processing industry is related to the machinery sector in terms of using new machines and equipment, as well as to tourism in terms of wine tourism, gastronomic tourism and supplying traditional food.

There are links with energy efficiency solutions and greening the industry, with special focus on circular economy.

The impact of the **economic crisis caused by Covid-19** on the food processing industry is not as serious as in other industrial sectors (for example, in tourism). This implies that the domestic demand is stable without any serious negative trends, which largely results from the governmental support by initiating the anti-crisis measure "buy domestic products". At the same time, there are not any negative effects in terms of declining number of workers and export activities. However, the sector experienced some indirect consequences such as problems with sick workers, which leads to lower production; delays in the delivery of raw materials and packaging; decline of purchasing power; slow-down of new investment projects, etc.

On the other hand, the Covid-19 pandemic had positive impact on the sector by increasing the awareness of the consumers of the need to maintain good health, increasing the consumption of healthy supplements and high added-value food products.

The Government and its **key state institutions** (the Food and Veterinary Agency of the Republic of North Macedonia, the Ministry of Agriculture, Forestry and Water Economy, the Ministry of Economy, and others) could assist this sector in the process of recovery and stimulate further development in the post-crisis period through several actions: support the international presentation, promotion and branding; engage foreign experts in all business processes; favorable credit lines for export arrangements and for increasing the competitiveness; assistance in standardization and certification; new free trade agreements; protection against unfair competition and transfer prices; customs and tax relaxation concerning export-oriented products; de-bureaucratization of procedures; stimulation of cluster association and other measures.

3.1.2 Information and Communication technologies (ICT) sector

In the sector of Information and Communication technologies (ICT), interviews were conducted with 9 representatives of the business sector including the ICT chamber of commerce - MASIT as the largest business association within the ICT sector, with 3 representatives of the academia (Faculty of Computer Science and Engineering within Ss. Cyril and Methodius University – Skopje, Faculty of Computer Science of the Goce Delchev University – Shtip and the Center for Technology Transfer and Innovation – INNOFEIT within the Faculty of Electrical Engineering and Information Technologies at the Ss. Cyril and Methodius University – Skopje), and with the Agency for Electronic Communications as a governmental institution. Dominant part of the interviewed stakeholders is located in the Skopje region, while only one academic institution is located in the East region and one company is located in the Vardar region.

Table 5: List of key stakeholders and process ambassadors

No	Private sector	Ambassador	Software Development	Advanced IT services (Big Data & Business Analytics, IoT, Cloud)	Cross-sectoral
1	MACEDONIAN TELEKOM	x			x
2	A1 MACEDONIA				X
3	INBOX		X		
4	KABTEL				X
5	ULTRA UNET GROUP	x	X	x	
6	EDUSOFT DOO SKOPJE		X		
7	INTERWORKS	x	X	x	
8	SEMOS		X		
9	MASIT	x	X		X
No	Academia				
1	UNIVERSITY GOCE DELCHEV, FACULTY OF COMPUTER SCIENCE	x	X	x	X
2	CENTER FOR TECHNOLOGY TRANSFER AND INNOVATION- INNOFEIT, FEIT Skopje	X	X	X	X
3	FACULTY OF COMPUTER SCIENCE AND ENGINEERING AT SS CYRIL AND METHODIOUS – Skopje	X	X	X	X
No	Government sector				
1	AGENCY FOR ELECTRONIC COMMUNICATIONS	x			X

A focus group meeting was organized consisting of 3 ambassadors from the business sector (Ultra, Semos, and Telekom), MASIT as the largest business association within the ICT sector,

4 representatives of the governmental sector (Cabinet of the Prime Minister, Ministry of Economy, Ministry of Education and Science, Ministry of Information Society and Administration and Cabinet of the Deputy Prime Minister), and 2 representatives of the academia (professors from the Faculty of Computer Sciences and Engineering – Skopje and INNOFEIT – Faculty of Electrical Engineering and Information Technologies – Skopje).

The focus group participants contributed to the finalization of the strategic subareas and the clarification of some of the open questions from the interviews. The discussion of the participants in the focus group meeting was focused on several important questions related to the S3 process such as question about the innovation potentials of start-up society and the role of innovative SMEs in the process of transforming the existing concept based on outsourcing ICT software services toward advanced ICT services and custom software development, as well as the question of building the digital infrastructure and improving the quality of the education¹⁹.

Additionally, several sector studies were consulted in the Qualitative Analysis: General Mapping Report on the ICT industry in North Macedonia 2020, Study of the effects on the private sector of the ICT industry affected by the health economic crisis by the Covid-19 Pandemic with recommendations for the management of the consequences²⁰, ICT Export Report, Current Situation and Potentials, June 2020, Skopje, MASIT, as well international reports from international institutions such as the WB, OECD, JRC, etc.

The results of the qualitative analysis show that the ICT sector is one of the most dynamic and fastest growing sectors in the Republic of North Macedonia in the last decade. The growth rate of this area is roughly 47% in the last 5 years. The IT and software industry are gaining importance in the overall economic development of the country.

According to the national statistical data and the General Mapping Report of ICT industry in North Macedonia this area has significant performance in terms of number of companies, number of employees, added value and export. In 2019, the number of registered ICT companies was 2,198, which represents an increase of 8% relative to 2018. The number of employees in ICT companies in 2019 amounted to 15,514, which is a 7% rise in comparison with 2018 when this figure was 14,541 employees. The average number of employees per company is 7.46 with a possibility to decline soon to 7.17. If the interest in start-ups and new companies intensifies, and there is no solution for the educational (supply) problem, the total number of employees in the next few years may grow even faster, but the average will further decrease. The export is growing continuously from EUR 121 million in 2014 to EUR 210 million in 2019, but the export growth in the IT segment from EUR 60 million to EUR 179 million in the same period is even more impressive. If this trend continues with an average growth of 25%, the IT segment in the next few years will reach nearly EUR 300 million. Moreover, 63% of the total value (generated revenues in 2019) of the IT segment is exported and only 23% imported with 41% share in the trade surplus, which again is highly positive.²¹

Most of the companies or 52% are selling on "Both markets and the other 48% are selling solely on either the domestic or international market. If the answer is both, the international

¹⁹ Annex 4.

²⁰ <https://biznisregulativa.mk/mk-MK/Pages/Publications>

²¹ **ICT INDUSTRY IN NORTH MACEDONIA** GENERAL MAPPING REPORT, Skopje, North Macedonia | **June 2020, MASIT**

market usually dominates since nearly 84% of the total companies are selling there, compared to the 68% selling on the domestic market.

From the type of service portfolio the companies in the ICT industry are divided in 5 subsegments or Software and IT Services, Telecommunication, ICT Manufacturing, ICT Trade and Other IT Services. Most of the companies or 56% of the total are concentrated in the "Software and IT Services" subsegment and 27% in "ICT Trade and Manufacturing".²²

According to the interviewed stakeholders, one part of the IT companies is offering final products by developing own solutions to the final customers while the other part of ICT companies are based on the "Outsourcing" business model. However, the major part of the IT companies tries to combine these two business models of delivering final product and Outsourcing. To a certain degree, it is positive that companies offer "Final Product" in higher percentage, considering that this type of service brings added value, revenues, and profit to the companies.

According to the ICT Export Report and findings from the conducted interviews, the major part of the IT companies is doing business internationally, and they generate the revenues from exporting IT service abroad. The findings show that domestic IT companies are working in many different countries where they mostly have partners or sell directly, while small part of the companies are subsidiaries. It is rather positive that almost all interviewed companies consider that there is future export potential. Considering that export is the most valuable aspect of the IT segment, the previous conclusion follows the same line that the companies will seek the additional export potential for their own companies.²³

The ICT segment in the country received over USD 65 million in FDIs between 2003 and 2017 for custom computer programming services, management services for computer facilities, and software publishing.²⁴

The ICT sector attracted more international companies such as Seavus (Sweden), Netcetera (Switzerland), M Soft (France), 6PM (UK/Malta), which are developing software in North Macedonia for export and others provide customer support to multi-national IT companies.

Major international companies in Southeast Europe that are present in North Macedonia are: S&T AG (Austria), Ness Technologies (Israel), Musala Soft AD (Bulgaria), Melon AD (Bulgaria), Matrix IT Ltd. (Israel), IN2 Group (Croatia), Endava Ltd. (UK), Dekra SE (Germany), Cisco Systems Inc. (USA), Asseco SA (Poland).

A growing number of companies from the neighboring countries enter the Macedonian labor market in the outsourcing industry without owning any offices or subsidiaries by hiring freelancers or remote employees in North Macedonia²⁵

²²ICT INDUSTRY IN NORTH MACEDONIA GENERAL MAPPING REPORT, Skopje, North Macedonia | June 2020, MASIT

²³ICT EXPORT REPORT CURRENT SITUATION AND POTENTIALS June 2020 | Skopje, North Macedonia

²⁴Seizing a brighter future for all, WB Systematic Country Diagnosis 2020

²⁵<https://investnorthmacedonia.gov.mk/invest-ict/>

In a time of Covid-19 crisis, the ICT sector showed to be most resilient. They reorganized themselves very fast, largely working from home. This primarily led to investments in technical equipment and telecommunications infrastructure to create uninterrupted working conditions at home while maintaining the level of the quality set when performing work assignments from the office. On the other hand, the value of the digital transformation has never been more significant. The application of digital technology in the newly created situation is invaluable for both the economy and the general population. Statistics show a massive increase in accomplished activities through digital channels, mainly in the households regarding running the necessary errands and certainly, in businesses, which inevitably moved to the application of specific tools, whether it is communication as a basic need or to improve the business processes and the overall business activity.

This section analyzes the impact of the Covid-19 crisis on specific aspects of ICT companies' operations, such as cancellation of orders, collection of claims, liquidity, productivity, logistics and distribution, and administrative procedures.

The results of the Qualitative Analysis related to Covid-19 effects on the ICT companies states that the cancellation of orders, as a consequence of the Covid-19 crisis, has the biggest negative impact on their operations. As a result of the Covid-19 crisis, most companies expect it to affect their performance results in the near future. This prediction stems from the expectations of the companies of a reduction in sales in 2020. Therefore, the expectations of profitability are similar, with an expected decline. The majority of the interviewed IT companies are export-oriented. Most of them export their services and products to Europe, while others export further to the USA and Asia. Most of the ICT companies that export believe that the consequences of Covid-19 had a significant impact on their operations. Many of them say that their operations are partially affected, followed by companies whose operations are barely affected or have not experienced any impact on exports.

According to the results of the conducted interviews, significant part of the IT companies noted that the Covid-19 crisis does not affect the number of their employees, while the other part had to reduce the number of employees. However, during the crisis, there are a small number of companies which experienced employee growth. Several percent of the companies were severely affected by the crisis with a drop in number of employees.

The predictions about future impact on the number of employees affected by the Covid-19 crisis are similar to the current impact. Major part of the employers believes that the situation will not lead to a reduction in the number of employees in the future, while smaller part of them thinks that they will layoff a relatively small part of the employees. A rather significant percent believes that the number of employees will increase in the post-crisis period.

To mitigate the consequences of the Covid-19 crisis on the employees in the ICT sector, companies believe that the Government can choose from several measures to retain most of the jobs. Moreover, most companies consider that measures with a particular impact include the provision of interest-free loans, reduction of tax burdens, and subsidy on part of the employee salary. Some of the measures concerning the effectiveness of the aforementioned are reduction of social contributions, grant loans to maintain the liquidity and working capital of the companies, exemption from paying pension insurance contributions, reduction of the advance payment of income tax, deferral of income tax payments, provision of low-

interest loans, securing loan guarantees and working capital loan, and accepting sick leave shorter than 30 days by the FHI.²⁶

The start-up community is becoming increasingly organized and active especially in the ICT industry.

A few faculties have developed innovation centers intended to support start-ups in the ICT industry.²⁷

According to the information gathered through interviews and additional related analysis, we can conclude that companies are for the most part involved in outsourcing, but the future lies in further development of custom software for domestic and foreign partners and advanced ICT services in close collaboration with the ICT support centers.

ICT is seen as an important partner of the entire economy and the society in the process of digital transformation of the industry and development of an e-society.

ICT has shown **high innovation capacities**. Projects from the ICT industry have 35% share in the portfolio of projects granted through the Fund for Innovation and Technology Development in the last four years. Furthermore, the sector obtained 17 of the total number of granted projects through the latest instrument for innovation grants for collaboration between the university and the business sector²⁸.

Considering the broader area of the ICT sector, based on systematized data obtained from a number of sources (conducted interviews, focus group meeting, in-depth sectoral analysis, etc.), the following subarea has been proposed:

- **Custom Software Development**

The conclusions of the conducted interviews, organized focus group meeting, and in-depth sectoral analysis for each defined sub-area are presented below.

Sub-area 1: Custom Software Development

Software development is a very dynamic subarea. Start-up, scale-up and other SMEs as innovation driven entities become particularly important in the development process of this sector with a crucial role in the process of smart specialization of this subarea.

In 2019, 1,234 companies were registered under Software and IT Services (which is 2% related to the total number of registered companies in the country) and most of them are located in Skopje. The number of active companies has shown exceptional growth rising by 55% between 2016 and 2019 or an average growth of 16% in the same period. The total revenues in 2019 amount to EUR 272 million which is growth of 80% in 2019 relative to 2016 and an average growth of 22.4% (2016/2019). Most of these revenues (over 85%) are

²⁶Study for the effects on the private sector of the ICT industry affected by the health economic crisis by the Covid-19 Pandemic with recommendations for the management of the consequences, <https://biznisregulativa.mk/mk-MK/Pages/Publications>

²⁷ https://www.eu-startups.com/2020/04/north_macedonia_skopje_ecosystem_at_a_glance/

²⁸Reports of the Fund for Innovation and Technology Development (FITR). <https://fitr.mk/en/#>

generated through export of ICT services (development of software solutions) on the foreign markets. The ICT companies sell software services in more than 60 countries. The growth of the net profit follows the growth of the operating income, from EUR 17.33 million in 2016 to EUR 41.91 million in 2019, and an average net profit margin from 12% to 15%. According to some estimations based on the working hours in 2019, there are more than 8,500 workers in this subarea, which represents a growth of 69% in comparison with 2016²⁹.

The aforementioned growth trends, as well as the existing **potentials and advantages** such as skilled labor, high interest in ICT studies, high-paying positions, English language fluency, vibrant innovation ecosystem, boosted by efforts from the Fond for Innovation and Technology Development (FITR) in particular, high innovativeness in the sector, raising start-up society, experience in outsourcing, experience on international markets, existing support infrastructure at the universities supporting ICT start-ups (for example, INNOFEIT functions as a local hub for tech transfer and extensive contract research at the Faculty of Electrical Engineering and Information Technologies, and several start-ups and spinoffs have been formed and are active in the area), favorable conditions for doing business, good internet infrastructure, show that software development, being one of the fastest growing subareas, has significant development and export potential.

The academia recognized the need to introduce new programs for software development, integrating problem-based learning as a part of the study programs. Over 650 students a year graduate at the universities in the country in the field of ICT and today, it represents the main source of human resources for the rapid development of this subarea. The demand for IT experts is high. In the period 2016-2018, 52 students at the state universities gained PhD in Electrical Engineering, Computer Science and Information and Communication Technologies. Many students continue their MA and PhD studies abroad.

The **R&D section** has very high potential evident in the number of international projects, the local activities in the area of contract research, the digital transformation activities, as well as the support of the entire innovation ecosystem.

The professors and young researchers are involved in many international research projects financed by EU funds (Horizon 2020, and others) and national projects financed by the Fund for Innovation and Technology Development (FITR) and other donors contributing to the process of delivering new innovative software solutions to almost all sectors in the economy (agriculture, manufacturing, energy sector, services).

Just as an example, the ICT sector, under the "Horizon 2020" Program, carried out 10 projects with 11 participations, receiving EUR 1.72 million.³⁰ Furthermore, North Macedonia became the 30th member of the European High Performance Computing Joint Undertaking (2019). The Faculty of Computer Science and Engineering within Ss. Cyril and Methodius University in Skopje, the designated institution in charge of the obligations under this Joint Undertaking, joined by relevant institutions and national SMEs, was also awarded under a Horizon 2020 call with a grant to establish a National High Performance Computing Competence Center.

²⁹ ICT industry in North Macedonia: General mapping report, North Macedonia, 2020, June

³⁰ Reports of the Ministry of Education and Science of North Macedonia. <https://mon.gov.mk/category/?id=2061>

ICT has shown high **innovation capacities**. Projects from the ICT industry have a 35% share in the portfolio of projects granted through the Fund for Innovation and Technology Development (development of new software application and ICT solutions in different industries). Moreover, the sector received 17% of the total number of projects through the latest instrument for collaborative grants between the university and the business.³¹

The **key players** in this sub-area from the business sector are Endava Skopje, Seavus Skopje, Ultra Skopje, Semos Skopje, Interworks Kavadarci, Edusoft Skopje, Nextsense Skopje, Asseco Skopje and others, which are largely located in Skopje.

Relevant stakeholders from the **academia** are the Faculty of Computer Science and Engineering within the Ss. Cyril and Methodius University – Skopje (UKIM), the Faculty of Electrical Engineering and Information Technologies (FEEIT) within Ss. Cyril and Methodius University in Skopje, the Faculty of Computer Science of the Goce Delchev University Shtip, SEE University Tetovo, Faculty of Information and Communication Technologies – UKLO Bitola and their related centers for innovation and business support, focused on solving industrial problems and finding ICT solutions as a custom software development.

Other **relevant stakeholders** are the **institutes, clusters, business accelerators and innovation hubs** such as MASIT – IT cluster, Centre for Technology Transfer and Innovations – INNOFEIT, SEEU Tech Park, New Mans Business Accelerator, X Factor Accelerator, CEED Hub, YES Business Incubator, and others.

Additionally, there are several academies and centers in the informal educational system such as Brainster, Semos Education, Seavus Education Center, and many others, which have an important role in the education of the young ICT professionals in different ICT fields.

An example of close cooperation between the academia and the industry is the “Center for Technology Transfer and Innovations - INNOFEIT” which was established in 2018 by the Faculty of Electrical Engineering and Information Technologies (FEEIT), Ss. Cyril and Methodius University in Skopje (UKIM), as a part of its efforts to close the gap between the academic education and the practical expertise, prepare its students to better cope with the industrial challenges ahead and stimulate and foster intensive contract research services for local and international partners. INNOFEIT is a hub for interaction among FEEIT staff, FEEIT students and industrial partners allowing connections and transfer of technology as well as novel innovative ideas that aid the economic growth of the sector and the society in general. As such, INNOFEIT plays an important part of the Macedonian innovation ecosystem being the catalyst for commercialization of University ideas.

In its 3-year existence, INNOFEIT’s operation can be summarized as:

- 5 research contracts for industrial partners amounting to over EUR 300,000 for R&D and tech transfer,
- 3 developed prototypes currently being commercialized by industrial partners,
- 6 innovation vouchers from FITR (the highest number granted to a single stakeholder in the country),
- Founder of an annual innovative interdisciplinary program among UKIM students (INNO-SAE),

³¹Reports of the Fond for Innovation and Technology Development (FITR). <https://fitr.mk/en/#>

- Founder of Business Accelerator UKIM (BAU),
- Local partner for the EU4TECH and EU4TECH PoC projects,
- Part of regional TT-networking initiative in the Western Balkans,
- The only R&D&I entity in the country mentioned in the EC progress reports published in 2019 and 2020,
- The first and currently the only fully operational Digital Innovation Hub (DIH) in MK.³²

Startup Macedonia as an organization for strengthening the start-up and innovation ecosystem predominantly in the field of ICT, is supporting the further growth of the sector.

This sector is very dynamic with many SMEs being formed. The Fund for Innovation and Technology Development supported the establishment of few accelerators³³. The Business Accelerator UKIM (BAU) was founded at the Ss. Cyril and Methodius University in Skopje (UKIM) to promote entrepreneurship among the students and stimulate them to form start-ups. BAU has already started investing and it is expected that the dynamics will intensify in the next two years.

According to the interviews, outsourcing is dominant at this moment, but many companies are focusing on their specialization related to custom software development in the following industries: e-solutions for production processes and services, banking, insurance, agriculture, energy, etc.

Target market is the domestic market, the region, EU, and other markets.

Custom developed IT solutions have potential for almost all sectors in the economy (agriculture, manufacturing, energy sector, services). This is part of their processes for digital transformation, improving and automation of processes.

Most of the ICT companies do not create full value chains, but only participate in the production of some of the parts of the final software solutions. The number of companies that develop and export custom software increases constantly.

At the interviews, the companies emphasized the following **challenges** as barriers to the further development of the sector and this subarea: 1) Taxation and high taxes and social contributions on top of salary, 2) Regulatory policy – unsuitable and incomplete institutional and regulatory framework concerning building digital infrastructure, 3) Education – unsatisfactory level of skills and knowledge that the younger generations get from the secondary education system, 4) Brain Drain syndrome – emigration of high-skilled labor force to developed economies such as USA and Western Europe.

Furthermore, concerning the further growth and future smart specialization of this subarea, one of the main challenges addressed by the interviews in the field of research and innovation was the need to strengthen the cooperation between academia and private sector in the process of building capacities to develop own software IT solutions to final consumers, instead exclusively delivering outsourcing ICT services.

The existing cooperation predominantly involves the educational program, and it was on project-basis and therefore, the innovation and research potential of the academia is still

³² <http://inno.feit.ukim.edu.mk/>

³³ <https://fitr.mk/en/#>

not utilized enough. The projects financed by FITR, as well as the scientific and research centers in the faculties are a very important step forward, but the Government should assume a more active role by supporting the research and innovation potentials. The Government should increase the national funds for research and should improve the national research infrastructure in the strategic area. The academia has critical innovation and research potentials that should be utilized to further develop this subarea.

However, the general conclusion is that a major part of the Macedonian ICT companies in the software development subarea have applied business model based on delivering software solutions and outsourcing software services for other multinational ICT companies, while a small part of them bases their business activities on development of own IT solutions to the end consumers.

The crisis caused by the Covid-19 pandemic increased the global and domestic demand for ICT services, especially the need for digitalization of the businesses, society, and the public sector. Hence, this is new opportunity to further develop this subarea.

EDP as a following activity under the development of S3 will be supported by the ICT companies. Ambassadors from the business sector, academia and the governmental sector as key players who will participate in the EDP workshops were identified. They have expressed interest to participate in the meetings. The meetings should be concise and productive and should not last an entire day. They prefer online meeting no longer than 2-3 hours.

There were recommendations for further discussions in the EDP process about the potential of an additional sub-specialization area related to Advanced ICT Services, as a new trend on the global market for ICT services (Big Data and Business Analytics, IoT, Cloud) due to the rapid technology improvements and on other hand, increased interest from few domestic start-ups in this subarea. However, the ECNM team has not succeeded to provide sufficient evidence for existence of critical mass innovation and scientific capacities, as well as critical mass of companies during the qualitative analysis. Hence, we suggest this potential to be additionally explored in the EDP process in order to see if this sub-area could be part of the ICT area in the process of smart specialization in the Republic of North Macedonia.

ICT as a horizontal issue – digital transformation of the businesses and society

In the Quantitative Analysis, the ICT was the only sector that appeared to have potentials for smart specialization in all three components: economic, innovative, and R&D potentials. The ICT can be regarded as a vertical sector with support of specialization in the aforementioned subarea, as well as a horizontal issue relevant to the digital transformation of the society and especially the digital transformation of the industry in terms of implementation of a new method of doing business by using the ICT management systems and business solutions.

The ICT can be regarded as a horizontal area of extreme importance for the growth of the entire industry, the so-called Industry 4.0, by developing interconnectivity, utilizing new software, better business processes and models, digitalization, and automation of the industry, creating new added-value products and services, utilizing the new potentials of block chains, improve safety with cyber security in mind.

In particular, there are opportunities in the segment of constructing smart systems for cooling and heating, lighting systems, access control, smart systems for monitoring and

control, digitalization and automatization of the production processes, that is, management of industrial processes. Additionally, there is rapid growth of demand for e-services in the business and public sector, medicine (e-health services), trade (e-commerce), education (e-education), tourism and culture (e-tourism, creative industries), government (e-government) etc.

The ICT is very important for the digital transformation of the society, offering new opportunities for growth and promotion of many sectors such as tourism and creative industries by developing virtual tourism platforms and other ICT solutions for promotion of various e-services.

In the new digitalized world, this sector is interlinked with all segments of the society and therefore, it should receive strong support from the Government.

In that context, the Government should make several steps toward meeting this strategic goal: 1) to build clear regulatory framework harmonized with the EU regulations and to increase the institutional capacity in this field;2) to build strong and modern ICT and digital infrastructure aiming for easier connectivity by developing better wire and wireless network – 5G network; 3) to transform the educational system and set it on a course toward information and technical sciences, as well as to develop lifelong learning;4) to increase the level of digital literacy of the society;5) to increase public investments in building and upgrading research infrastructure in the field of ICT;6) to increase the cooperation between the academia and business in the field of ICT by working on joint projects.

3.1.3 Smart/Sustainable Buildings and Materials

The preliminary defined area of Smart/Sustainable Buildings and Materials involved 14 interviews: 11 interviews were conducted with representatives of the business sector, 2 interviews with representatives of the academia (Faculty of Civil Engineering and Faculty of Technology and Metallurgy within Ss. Cyril and Methodius University - Skopje), and 2 interviews with representatives of the governmental sector (Cabinet of the Deputy Minister in charge of economic affairs and coordination with the economic sectors and the Ministry of Transport and Communications).

The dominant part of the interviewed stakeholders (10 stakeholders from the business sector, academia and governmental sector) are located in the Skopje region, 1 interviewed company is located in the East region, 2 companies in the Vardar region, and 2 companies in the Polog region.

Table 6: List of key stakeholders and process ambassadors

No	Private sector	Ambassador	Infrastructure	Smart buildings	Production of sustainable construction materials	Cross-sectoral
1	CEMENTARNICA USJE				X	

2	BIM SVETI NIKOLE				X	
3	KNAUF RADIKA	X			X	X
4	BETON AD SKOPJE		X			X
5	VARDAR DOLOMIT				X	
6	RENOVA TETOVO				x	
7	ADING	X			X	
8	GD GRANIT AD SKOPJE	X	X			
9	CIVIL ENGINEERING INSTITUTE MACEDONIA JSC SKOPJE	X		X		X
10	AKTIVA STIP	X		X		
11	IGM TRADE KAVADARCI			X		
No	Academia					
1	SS. CYRIL AND METHODIIUS UNIVERSITY, FACULTY OF CIVIL ENGINEERING - SKOPJE	X		x		x
2	SS. CYRIL AND METHODIIUS UNIVERSITY, FACULTY OF TECHNOLOGY AND METALLURGY - SKOPJE	X			X	
No	Governmental sector					
1	MINISTRY OF TRANSPORT	X				x
2	CABINET OF DEPUTY PRIME MINISTER RESPONSIBLE FOR ECONOMIC AFFAIRS AND COORDINATION WITH THE ECONOMIC SECTORS	X				X

Moreover, a focus group meeting was organized consisting of 3 ambassadors from the business sector (Ading Skopje, Granit Skopje, GIM Skopje, and TT Plast Skopje), 3

representatives of the governmental sector (Ministry of Economy and the Cabinet of Deputy Prime Minister) and 2 representatives of the academia (professors and researchers from the Faculty of Civil Engineering– Skopje, and the Faculty of Technology and Metallurgy - Skopje). The focus group participants contributed to the finalization of the strategic subareas and the clarification of some of the open questions from the interviews. The participants of the focus group meeting noted that this area has significant economic and innovative potentials. The representatives from academia have presented arguments about the research and scientific capacities of this area, especially in the field of advanced materials and development of smart construction solutions³⁴.

In the broader area, based on systematized data obtained from a number of sources (conducting interviews, focus group meeting, sectoral studies, etc.), the following subarea had been proposed by the team of the ECM and national working group as strategic for smart specialization:

- **Smart/Sustainable buildings and materials**

Please find the conclusions from the conducted interviews and the recommendations from the focus group meeting below.

Sub-area 1: Smart/Sustainable building materials

This subarea encompasses smart buildings and smart construction solutions, as well as sustainable materials (sustainable building materials; nanomaterials -sensors, composites, coatings; and new polymer-based materials).

The main goals of the process of smart specialization in the field of **sustainable materials** are: 1) more efficient use of natural resources in production of construction materials, especially through their planned exploitation (mining potential) and development of innovative technologies that enable production of construction materials from industrial waste abundant in North Macedonia, which is in correlation with fulfilling the goal of developing a concept of green and circular economy, and 2) structural transformation and export upgrade by commencing production of products/materials with higher added value.

Truly relevant aspect with potential are the new materials, as sustainable materials, utilizing the existing resources and adding value to new construction products with re-use of used construction materials and re-use of waste, as well as renewable, eco-friendly, and healthy materials. This will enable transition to circular economy.

There are 830 active companies (producers and sellers of building materials) in the field of sustainable materials (which is 11% of the total companies in the manufacturing sector)with an upward trend in the last several years and these companies create more than 10,000 jobs, which is more than 6% of the total number of workers in the manufacturing sector.³⁵ The **key players** in the **sustainable building materials** segment from the business sector are Ading

³⁴ Annex 5.

³⁵Own calculation based on official statistical data from the State Statistical Office of the Republic of North Macedonia

Skopje, Renova Djepchishte, Pofix Tetovo, Titan Skopje, Mermeren Kombinat Prilep, Tondah Vinica, Vardar Dalomit Gostivar, Fragmat Kumanovo, which are dominantly located in Skopje, Pelagonija, and the Northwestern region. A major part of these companies is export-oriented with significant comparative advantages in terms of well-established international relations and trade partners in the regional and EU markets, accumulated knowledge, long tradition and adopted modern technology, natural mineral resources and skilled workforce.

As an illustration, the **total export** of building materials in 2019 passed EUR 400 million, which is more than 6% of the total exports of the country³⁶, showing that this subarea is highly internationalized, but much of those exports are made up of products (minerals, stones, cement, marble, dolomite) that are characterized as products with relatively lower added value. However, there are some outstanding export products with higher added value such as: admixtures, grounding and sealing, concrete repair, joint sealants, leveling compounds, decorative coatings and mortars, adhesives, acryl, acryl color, acryl finish, gypsum materials and other building materials.

The results of the conducted interviews show that there are several domestic innovative and high-tech companies such as Microsam Prilep and Plasma Skopje, as well as foreign companies such as Jonson Matty Skopje, Kostal Ohrid, Aptive Skopje and others, which produce **advanced materials** based on the **composites and nanostructured materials** that produce **composite materials**, and several domestic innovative SMEs (TT Plast, VA-PLAST, ING-Plast), which produce **new polymer-based materials** and **products for these companies**.

All these companies are highly innovative and export-oriented with high potential for future development. The export value of the advanced materials and components is more than EU 1.5 billion, which is more than 25% of the total exports of the country and this export segment registers a significant upward trend in the last several years, showing that this subarea is highly internationalized and has a huge export potential³⁷.

However, according to the interviewed companies there are considerable untapped exports that could be exploited by building comparative advantages in production and export of products with higher added value. Such products are plaster articles, additives for concrete and additives for cement, products and systems used for rehabilitation and reconstruction of reinforced concrete structures, protective coating, fire protection for steel construction and electric installations, modified polymer bitumen products for civil construction, waterproofing membranes for building construction, different components based on nanostructures and polymer-based materials.

Hence, the Government should create policies to build innovative and technological capabilities for commencing production of new semi-products and products from the basic chemical industry, which are missing in the supply chain, by promoting the establishment of new innovative SMEs in those fields.

³⁶Own calculation based on official statistical data from the State Statistical Office of the Republic of North Macedonia

³⁷Own calculation based on official statistical data from the State Statistical Office of the Republic of North Macedonia

There are several **research institutions** such as the Faculty of Technology and Metallurgy, the Faculty of Civil Engineering, the Faculty of Architecture, the Faculty of Mechanical Engineering within Ss. Cyril and Methodius University in Skopje, SDEWES Centre, and MANU, which work on scientific and research projects for technological innovations and production of new building and advanced materials, as well as improvements of the quality of the existing materials. The interviewed representatives from academia pointed out that the research institutions in the country related to this area have remarkable results in terms of research projects (several finished and ongoing H2020 projects), number of published papers and editing in highly ranked international scientific journals, well established links and cooperation with other national stakeholders (municipalities, governmental institutions, NGOs, businesses), which shows that the innovation and research capacities and potentials in this field are crucial to the further development of this subarea. The role of start-ups and SMEs in the development of this subarea is still quite limited and we do not have information about any outstanding start-ups or other innovative SMEs in the field of building materials.

Moreover, the international partnerships have already been established, in particular through active involvement in CEEPUS, MATERA, ERA-NET, EU-Robotics, etc. Links with similar clusters in European countries (Italy, Germany, Austria, Poland, the Czech Republic, Slovenia) and the Balkans (Croatia, Serbia, Romania, Bulgaria) have also been established in the field of sustainable materials. Such links will serve as the basis for cooperation, in particular in the framework of territorial cooperation projects.

Furthermore, it is rather important that the academia is involved in educational programs for professional development of human resources, as well as in delivering trainings and lectures in this field of energy efficiency.

The final conclusion based on the results of the conducted interviews, focus group meeting and in-depth sectoral analysis is that the field of sustainable building materials has high development potential stemming from the strategic strengths such as accumulated knowledge and adopted technology, critical mass of companies competitive on international markets, research and innovation capacities, natural resources that can be used appropriately for further development and smart specialization.

The second branch of this priority subarea is **smart buildings and smart construction solutions** as an especially important segment to increase the energy efficiency, being one of the country's strategic goals. Smart buildings have unquestionable development potential as there are huge investments in infrastructure projects, as well as construction of industrial facilities, new/modern individual and collective buildings, tourism accommodation facilities, malls and business representative offices by using sustainable and energy-friendly materials and developing new engineering designs and solutions.

The **key players** from the **business sector** in the field of infrastructure are Granit Skopje, Beton Skopje, Strabag, Pelagonija Gostivar, Ilinden Struga, while the key players in the field of civil engineering and smart buildings are Torax Skopje, Aktiva Shtip, Adora Inzenering Skopje, Golden Art Skopje, Nastel Skopje, Cevahir Skopje. They have extensive experience and tradition, accumulated knowledge and adopted modern technology.

The **innovation and scientific potential** is limited to some extent, but the Faculty of Civil Engineering and the Faculty of Architecture within Ss. Cyril and Methodius University in Skopje as **key academic institutions** in this field have the capacity to deliver professional services related to design and planning of specific infrastructure projects such as seismic

tests and designing routes, measuring energy efficiency of buildings, as well as research capacity concerning construction-related techniques and modern design of buildings. The Civil Engineering Institute Macedonia - Skopje is also worth mentioning, with expertise and knowledge in the field of infrastructure and civil engineering, especially in the field of designing new and smart construction solutions.

However, the **collaboration** between the **academia** and the **business sector** should be intensified, especially in the field of searching for new construction techniques and materials for energy efficient and smart buildings. There are already some attempts made under projects financed by FITD and EU funds. An example of a successful collaboration between the academia and the business sector in the field of innovation and implementation of innovative idea in business that was pointed out during the interviewing process is the project of the Center for Transfer of Technology and Innovation - INNOFEIT and TORAX as innovative SME that is into development and installation of new smart photovoltaic module for more energy efficient buildings. This project involved several young researchers from the Faculty of Electrical Engineering and Information Technologies – Skopje. This case of collaboration between the academia and the business sector in the field of innovation and creating new innovative products should be applied by other companies (start-ups and spin-offs), as well as innovators, researchers and scientists.

Additionally, according to data from the State Office of Industrial Property 5% of the total number of patent applications in the last decade coming from this area³⁸, while 4.9% of the projects finance by FITD coming from this area³⁹.

On the other hand, the **key players** in this subarea from the **governmental sector** are the Ministry of Transport and Communication, the Cabinet of the Deputy Minister in charge of economic affairs and coordination with the economic sectors, the Ministry of Finance, the Ministry of Economy and the Technology Industrial Development Authority. At the same time, there are several active NGOs and business associations such as the Association of Construction, Building Materials and Non-metal Industries within the Economic Chamber of North Macedonia, the Macedonian Chamber of Certified Architects and Certified Engineers.

The participants of the focus group meeting pointed out **several challenges** that this subarea is facing in the process of future development: digitalization, modernization, and building a high level of skills with all types of construction workers. In that regard, it was mentioned that the Economic Chamber of Macedonia has implemented a project from the framework program of the EU – HORIZON 2020, part of Energy Efficiency, the Project “Toward market-based skills for Sustainable Energy Efficient Construction” (TRAINEE). The activities of the project aimed at further promotion of the skills of middle and senior level professionals and blue-collar workers in the area of sustainable and energy efficient construction (400 people trained and certified), throughout the entire value chain of the construction sector. In order to enhance the multidisciplinary approach to sustainable construction, there were activities to initiate the Building Information Modeling concept at national level.

Additionally, the interviewed stakeholders noted that the new innovative energy efficiency business models should be further stimulated with an adequate financial mechanism for

³⁸ State Office of Industrial Property (SOIP), <http://www.ippo.gov.mk>

³⁹ Reports of the Fond for Innovation and Technology Development <https://fitr.mk/en/#>

investment in energy efficient buildings, and a new regulation framework should be adopted that will promote the innovations by supporting new innovative SMEs since they are crucial for the further development of this field.

This subarea has **strong horizontal connections** with several other sectors such as the ICT sector in the field of applying new ICT business solutions in smart buildings (the aforementioned example of TORAX and FEIT), as well as production of sustainable materials. Additionally, this subarea is closely related to the energy sector (the aforementioned example of the TRAINEE project), chemical and mining industry (the example of Ading Skopje, which used chemical raw materials/inputs and Vardar Dolimit, Renova Tetovo and Knauf Radika which used non-metallic minerals as inputs for production of sustainable construction materials), transport, metalworking and machinery (the successful story of Activa Shtip and IGM Kavadarci concerning the construction of new modern industrial facilities based on the metal parts and structures that they produce was noted by the interviewed stakeholders as a good example of cross-connections between metalworking and smart buildings). These horizontal connections exist also in the field of research and innovation, not only in the business sector. There is successful collaboration of joint research projects among the Faculty of Chemistry - Skopje, Faculty of Technology and Metallurgy – Skopje, Faculty of Civil Engineering – Skopje, Faculty of Mechanical Engineering – Skopje and the Faculty of Mining and Geology - Stip.

This subarea is hit by the **crisis** caused by the **Covid-19 pandemic** in terms of declining construction activities as a result of disrupted supply chains and delayed construction projects. Meanwhile, there are downward trends in the export of building and other materials due to the decreasing global demand for these materials. However, there is not decrease in the number of workers partly due to the Government's measures for salary support of company workers that have been affected by the crisis.

The interviewed companies suggest a **set of measures** to support the companies in this subarea in the period of the crisis and actions to boost the development in the post-crisis period. Some of those potential measures are increasing Government's spending on infrastructure projects, considering the local experienced contractors, we can promote local companies to major infrastructure and governmental projects, governmental support for R&D activities to develop new, efficient, durable and high added-value materials, covering the cost of issuing CE certification for products and Government's support for the promotion of the export of domestic SMEs.

3.1.4 Electrical equipment & mechanical parts

The qualitative analysis involved 15 interviews with representatives of the business sector, dominantly export-oriented companies, including MAMEI - Macedonian Association of Metal and Electrical Industry as a business association, with 3 representatives of the academia (Faculty of Electrical Engineering and Information Technologies and Faculty of Mechanical Engineering within Ss. Cyril and Methodius University in Skopje, and the Faculty of Mechanical Engineering of the Goce Delchev University – Shtip), and with 2 representatives of the government institutions (Department for Industrial Policy within the Ministry of Economy and the Cabinet of Deputy Prime Minister in charge of economic affairs and coordination with the economic sectors).

The dominant part of the interviewed stakeholders (10 stakeholders from the business sector, academia and governmental sector) are located in the Skopje region, 4 interviewed companies are located in the East region, 4 companies in the Vardar region, and 2 companies in the Southwest region.

Table 7: List of key stakeholders and process ambassadors

No	Private sector	Ambassador	Metal and machinery	Electrical and automobile parts	Cross-sectoral
1	RADE KONCHAR SERVICE			X	x
2	RADE KONCHAR TEP	X	X	X	x
3	FAKOM		x		
4	SMELT-ING		X		x
5	BRATSTVO INOX-OHRID		x	X	
6	KOSTAL OHRID	X		x	
7	TM STIP		x	X	
8	AKTIVA STIP		x	x	X
9	RADE KONCHAR – KONTAKTORI AND RELEI			X	X
10	ZAVAR COMPANY				
11	IGM TRADE		X		
12	LEOV COMPANY VELES		X	X	
13	DINAMO HIT VELES		X	X	
14	AGRO BAR VINICA		X		
15	MAMEI	x	X	X	x
No	Academia				
1	UNIVERSITY GOCE DELCHEV, FACULTY OF MECHANICAL ENGINEERING-SHTIP	x	x	x	x
2	FACULTY OF ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGIES- SKOPJE	X	x	X	X

	UNIVERSITY SS CYRIL AND METHODIUS IN SKOPJE				
3	FACULTY OF MECHANICAL ENGINEERING, UKIM SKOPJE	X			X
No	Government				
1	MINISTRY OF ECONOMY	X			X
2	CABINET OF DEPUTY PRIME MINISTER RESPONSIBLE FOR ECONOMIC AFFAIRS AND COORDINATION WITH THE ECONOMIC SECTORS				

Moreover, a focus group meeting was organized consisting of 3 ambassadors from the business sector (Kostal Ohrid, IGM Kavadarci, and Rade Konchar TEP Skopje), 3 additionally invited innovative SMEs (TT Plast, VA-Plast, ING-Plast), 3 representatives of the governmental sector (Cabinet of the Prime Minister, Ministry of Economy, and Cabinet of the Deputy Prime Minister), and 2 representatives of the academia (professors from the Faculty of Mechanical Engineering – Skopje and the Faculty of Technology and Metallurgy - Skopje).

The focus group participants have contributed to the finalization of the strategic area and the clarification of some of the open questions from the interviews. The participants of the focus group meeting noted that this area has significant economic and innovative potentials.

The representatives from the academia have presented arguments about the research and scientific capacities of this area, especially in the field of machinery and electrical engineering, while the participants from the business sector noted that there is a critical mass of innovative and export-oriented companies which show that North Macedonia has comparative advantage in this area⁴⁰.

In addition, the results from the depth sectoral analysis of the Macedonian export performance and export opportunities based on products space methodology conducted by the Economic Chamber of North Macedonia were used to support the findings from the qualitative interviews and the recommendations from the focus group meeting.

Based on systematized data obtained from the conducted interviews, the recommendations from the focus group meeting and the results of the in-depth sectoral analysis, a proposal was made about the following subarea:

- **Electrical equipment & mechanical parts**

⁴⁰ Annex 6.

This proposed domain for smart specialization with the defined subarea includes metal parts and products; electrical components and equipment; machinery, machinery tools and engine parts; mechanical appliances, as well as automotive parts and components.

However, the proposed subarea in the qualitative analysis is defined rather comprehensively, so the ECM team proposed to the national working group to take into consideration the possibility for redefining the preliminary proposed subarea in two subareas (metal & mechanical parts and electrical equipment & automobile components) during the EDP process.

Subarea 1: Electrical equipment & mechanical parts

This subarea includes transformation and upgrade of several strategic industries (metalworking, machinery, electrical engineering industry, and others) by automation and digitalization of the production and the business processes.

There are more than 1,080 active companies in this subarea, 831 companies in the metalworking sector, 153 companies in the machinery sector, 102 companies in the electrical engineering industry, which covers 13,5% of the total number of companies in the manufacturing sector. The major part of these companies is SMEs that continually invest in new technology and adopt new methods of production. This subarea creates more than 18,599 jobs, which is over 12% of the total number of workers in the manufacturing sector. Additionally, there is a significant growth in the number of workers in the last period. More than 7,500 jobs were created in the period 2016-2019, which represents an annual growth of 22% in the analyzed period⁴¹.

The production of metals and metal products (metal structure, steel pipes in various shapes, storage tanks, heat exchangers, mixers, metal furniture parts) makes significant contribution to the Macedonian economy in terms of added value, export, employment, and other indicators. There are over 870 companies in this sector, which is 11% of the total registered companies in the manufacturing sector⁴². A major part of the companies is located in Skopje, North Macedonia and the Vardar region.

The **key companies** in the sector are: Fakom Skopje, IGM Kavadarci, FZC 11 October, Dojran Steel, Brako Veles, RZ Institute Skopje, Zavar Skopje, Metalopromet Strumica, Smelt-ING Veles, and other companies. IGM Kavadarci, Brako Veles and Fakom Skopje are an example of success stories noted in the interviewing process in the field of automation and digitalization of the production and business processes as a step towards Industry 4.0. IGM started constructing a smart factory for production of sophisticated metal pipes, while Brako and Fakom invested in new cutting-edge technology for production of high added-value metal products based on fully automated system management.

This branch has generated EUR 66 million **gross added value** (GVA) in 2019 and the annual growth rate averaged at 11% through the last five years. Such a significant growth had a positive impact on the relative share of the sector's GVA in the manufacturing sector from

⁴¹Own calculation based on official statistical data from the State Statistical Office of the Republic of North Macedonia

⁴² Own calculation based on official statistical data from the State Statistical Office of the Republic of North Macedonia

4% in 2015 to 4.5% in 2019. Concerning the number of workers, the trends are considerably positive. According to the official data, over 4.000 jobs in the metalworking sector were created in the last five years⁴³.

These growing trends are expected to continue in the next period considering the rising demand for metal products on the global markets and the current investments in new technology and production capacities on the part of several domestic companies such as IGM Kavadarci, Brako Veles, Fakom Skopje, and others.

This branch has significant **export performance**. Total exports in 2019 generated by 158 export companies have reached EUR 230 million, which is more than 80% of the total turnover of the entire sector. Additionally, the sector has comparative advantages⁴⁴ in the production and export of 20 products (metal structures, steel pipes in various shapes, storage tanks, heat exchangers, mixers, pressure vessels, and other metal parts). However, the main weaknesses are the high export concentration (the top 10 exporting products create more than 90% of the total export) and the unfavorable position of the export products in the global value chain.⁴⁵

There are many products in the supply chain for which the companies possess latent comparative advantages and potentials to start production and export. Such products are: different metal parts for constructions (railway or tramway track constructions from iron or steel; rails, check and track rails, switch blades, crossing frogs, point rods, sleepers, fish-plates, chair wedges, sole plates, bedplates, ties), machinery (metal machine parts), furniture (sanitary, table, kitchen, other household articles and part thereof), energy (tubes, radiators for central heating), as well as other metal products such as tanks, casks, drums, cans, boxes and similar containers.

The machinery sector which includes the production of machinery parts and tools, as well as mechanical appliances makes significant contribution to the Macedonian economy in terms of added value, export, employment, and other indicators. There are over 153 companies in this sector, which represent 2% of the total registered companies in the manufacturing sector. A major part of the companies is located in Skopje and other regions in the country.

The **key companies** in the sector are Johnson Matty, Mikrosam Prilep, Zavar Skopje, Rade Konchar Services, Agrobar Vinica, Dinamo Hit Veles, and other companies, while the main products are machinery for filtering or purifying gases, parts of the machinery of heading, polyester and metal boxes, metal cable trays and other metal products, stainless-steel household dishes, composite machining, machineries for agriculture production, pressure reactors, vacuum vessels, and other products.

The machinery sector has generated EUR 145 million **gross added value** (GVA) in 2019 and showed an annual average growth rate of 5% through the last five years. The relative share of the sector's GVA in manufacturing has dropped, but it is still high (around 34%). Concerning the number of workers, the trends are considerably positive. According to the

⁴³Own calculation based on official statistical data from the State Statistical Office of the Republic of North Macedonia

⁴⁴According to the estimations based on Reveal Comparative Advantages (RCA) index.

⁴⁵ Identification of development opportunities and potentials for export diversification and structural transformation of the Macedonian economy, Economic Chamber of Macedonia, Skopje, 2020

official data, more than **16,000 jobs** were created in the machinery sector in the last five years (from 12,500 workers in 2015 to 28,000 workers in 2019)⁴⁶.

This branch shows significant **export performance**. Total exports in 2019 generated by 48 exporting companies reached EUR 677 million, which is over 90% of the total turnover of the entire sector. Additionally, there are more than 40 export products with value above EUR 200,000, while only 12 with comparative advantages⁴⁷. This shows that there is high export concentration in terms of number of export products (the top 10 export products create more than 95% of the total exports) and export companies (the top 10 export companies create over 90% of the total exports).⁴⁸

Even though the main export products are well positioned in the value chain and are characterized as products with medium complexity, there is plenty of room in the supply chain that could be covered by export diversification (increasing the number of export products) and export upgrade (export products with higher added value). Some of these products are different types of machines or parts/accessories for machines such as parts and accessories suited for use solely/principally for the machines; plates, cylinders and other printing components; winches and capstans; machine-tools for working wood, cork, bone, hard rubber, hard plastics or similar hard materials; agricultural, horticultural, forestry, poultry-keeping, bee-keeping machinery; machine-tools for working stone, ceramics, concrete, asbestos-cement; machinery for washing, cleaning, wringing, drying, ironing, pressing, bleaching, dyeing, dressing, finishing, coating or impregnating textile yarn; machine-tools for working any material by removal of material, and other products.

The strategic strengths of the companies in this branch such as the accumulated knowledge, human capital, extensive experience and tradition, adopted cutting-edge technology and established global market relations, provide immense opportunities for further export promotion by starting production of the aforementioned products that are missing in the supply chain.

The **production of electrical parts and products** is one of the priority branches in this subarea represented by capital- and high-technology intensive industries. The country has a long history of electronic component manufacturing dating back to the 1960s when Rade Konchar Skopje and Emo Ohrid were established. They were privatized and transformed during the period of transition and today several successful companies stem from these two Yugoslavian brands. Rade Konchar TEP, Rade Konchar Services, Rade Konchar Relei and Kontraktori Skopje, Dast Ohrid, part of Bratstvo Ohrid and TM Shtip are the key players in this sector. They produce different types of electronic parts for electricity networks such as insulators, low voltage distribution switch boards, distribution transformers, disconnectors, automatic power factor correction devices, etc.

Additionally, there are several producers (Dinamo Hit Veles, Leov Veles, Frinko Bitola) of electrical apparatus such as electric heaters, boilers, refrigerators, boasting with long

⁴⁶ Identification of development opportunities and potentials for export diversification and structural transformation of the Macedonian economy, Economic Chamber of Macedonia, Skopje, 2020

⁴⁷According to the estimations based on Reveal Comparative Advantages (RCA) index.

⁴⁸ Identification of development opportunities and potentials for export diversification and structural transformation of the Macedonian economy, Economic Chamber of Macedonia, Skopje, 2020

tradition, which are well established on the foreign markets. Finally, the entry of several multinational companies (Dräxlmaier Kavadarci, Gentherm Prilep, Key Safety Systems Kichevo, Kondevo Shtip, and others) as producers of electrical cables, sound signaling equipment, electrical capacitors, other electrical products and parts for the automotive industry, has dramatically changed the structure of this branch.

Total exports of this branch reached EUR 862 million in 2019, which represents 15% of the total exports of the country. This illustrates that this subarea has strong export performance, and it is one of the most important export sectors for North Macedonia. However, there is high export concentration in terms of number of export companies (only 37 export companies, the top 10 of which create more than 92% of the total exports) and number of export products (only 34 export products with value above EUR 200,000)⁴⁹.

The interviewed stakeholders noted many **products** that the companies in this branch produce and export with comparative advantage. Some of those products are: relays, switches, contractor assemblies, suspension and jointing equipment for electrical distribution networks, consoles and insulation sockets, electrical epoxy insulators, measuring transformers, and other electrical parts and products. This shows that this branch is dominantly export-oriented and has high internalization level. However, a part of the production of electrical components and equipment is sold on the domestic market, intended especially for EVN Macedonia, which is the national company for energy distribution and supply.

The **production of automotive parts** is the most dynamic emerging subarea in North Macedonia in the last decade. The results of the conducted interviews show that there are more than 20 companies such as Lear Tetovo, Technical Textiles Shtip, Key Safety Systems Kichevo, Amphenol Kochani, Adient Shtip, Van Hool Skopje, Kondevo Shtip, ODV Electric Struga, LTH Ohrid, Kostal Ohrid, Dräxlmaier Kavadarci, Gentherm Prilep, Kemet Skopje, Kromberg & Schubert Bitola, Marquardt Veles and many others that have set up large export-oriented production facilities in the country as a Tier 1 and Tier 2 suppliers of electrical components and parts to the European, Russian, and Turkish markets, among others. Many of these companies have already reinvested multiple times, which indicates that this sector has development potentials.

The investments of the foreign companies in and outside the Technological Industrial Development Zones (TID zones) have created more than 30,000 jobs, which is 20% of the total manufacturing jobs and generate EUR 187 million of added value in the economy, which is 13% of the added value of the entire manufacturing sector⁵⁰.

More importantly, this sector is highly export-oriented and the export value in 2019 reached EUR 350 million, excluding the export of electrical and machinery parts that are used in vehicles. The electrical and automotive parts are one of the fastest growing export sectors with high internalization level, primarily as a result of the FDIs located in and out of the Technological Industrial Development Zones (TIDZs) in the country.

⁴⁹ Identification of development opportunities and potentials for export diversification and structural transformation of the Macedonian economy, Economic Chamber of Macedonia, Skopje, 2020

⁵⁰ Reports of the North Macedonia Free Zones Authority, <http://investnorthmacedonia.gov.mk>

The **key institutions** from the **academia** are the Faculty of Mechanical Engineering and the Faculty of Technology and Metallurgy within Ss. Cyril and Methodius University - Skopje, the Faculty of Mechanical Engineering within Goce Delchev University – Shtip and the Faculty of Technical Sciences of St. Kliment Ohridski University - Bitola. Over 150 professors and researchers are active in these research institutions.

They have an important role in the transfer and adaptation of new technology, implementation of new innovative methods and processes, development of new products, implementation of total Quality Management Systems (TQM), as well as in the creation of qualified engineers. The academia is actively involved in many research and applicative projects in cooperation with the business sector. There are several completed and ongoing H2020 projects in the field of mechanical engineering, over 84 projects financed by the FITR instruments in the field of engineering and technology in the last four years, and more than 17% of innovation vouchers (for collaboration between the academia and the business sector) awarded under the first FITR call which were granted in the field of Industry 4.0⁵¹. One of the successful stories of collaboration between the academia and the business sector is the project “Increasing the export competitiveness by building production and technological capabilities of selected SMEs for metalworking, machinery and electro sector” financed by FITR and the World Bank, where four innovative SMEs (Rade Konchar TEP, Bratstvo Ohrid, Agrobar Vinica and TM Shtip) have transferred new technology and implemented new production methods through the technical support of the academia. Additionally, according to data from the State Office of Industrial Property⁵², 13% of the total number of patent applications in the last decade coming from this area⁵², while 19% of the approved FITD projects volume coming from this area.

At the same time, there are several collaborative and applicative projects financed by EU programs such as IPA to build the capacities of the domestic SMEs in this subarea. Good examples are FENI Industry Kavadarci, BUCIM Radovish, Makstil Skopje as companies which have already participated in few EU-financed projects in cooperation with the Faculty of Technology and Metallurgy – Skopje, as well as the project financed through IPA – Competitiveness and Innovation Program – “Increase the competitiveness of the local Macedonian SMEs in order to improve the cooperation with foreign companies” where several domestic innovative SMEs were involved in cooperation with the Faculty of Mechanical Engineering - Skopje. However, there is plenty of room to improve the R&D capacity in this subarea by building stronger research networks, creating national research fund that will support research and applicative projects, and by motivating young researchers in the technical sciences. These successful stories show that this subarea is very dynamic from technological and innovation point of view and the innovative SMEs have a crucial role in its development.

The cooperation of the private sector with the vocational secondary schools such as SSU Koce Metalec – Skopje and SSU 8 Septemvri – Skopje regarding the development of qualified workforce for the requirements of the industry is of great importance. The companies from this sector actively participate in the process of developing educational

⁵¹Reports of the Fund for Innovation and Technology Development and Ministry of Education and Science.<https://fitr.mk/en/#> and <https://mon.gov.mk/category/?id=2061>

⁵²State Office of Industrial Property (SOIP), <http://www.ippo.gov.mk>

programs, which involves practical classes in the production plants and factories. This is quite important for the creation of qualified workers that will be able to participate in the new production process based on the concept of Industry 4.0.

Concerning the representatives of the business sector, MAMEI - Macedonian Association of Metal and Electrical Industry and the Association of the Metalworking, Mechanical and Electrical Engineering Sector of the Economic Chamber of Macedonia have an important role to offer support and quality business services that would accelerate the development process of this subarea. On the other hand, there are several important governmental institutions that support the development of this subarea: the Ministry of Finance, the Ministry of Economy, Technological Industrial Development Zones, the Cabinet of Deputy Prime Minister in charge of economic affairs and coordination with the economic sectors, the Agency for Foreign Investments and Export Promotion, the Fund for Innovation and Technology Development (FITD).

The results from the interviewed stakeholders and the additional existing studies conducted by ECM show that this subarea has significant development and export potential considering the strategic strengths such as its geographic location in Europe and attractiveness for FDIs, appropriate business climate, macroeconomic stability, and low tax rates. Additionally, the main comparative advantages of the domestic companies in this subarea are the production flexibility and the capabilities for quick adaptation in accordance with the market requirements and the regional opportunities for connection with companies from the immediate region, with the aim of exporting to third markets, as well as the accumulated knowledge and long tradition in manufacturing, skills and resource endowments, relatively cheap labor relative to other EU countries.

However, quotas imposed by the EU on steel pipes and sections, institutional weaknesses, and inefficiency of the public institutions (Public Revenue Office, Customs Administration, Regulatory Bodies), as well as the shortage of qualified workforce (engineers) are the main challenges for the further development of this subarea. Another challenge is the weak industrial links between the domestic SMEs and the foreign investors, and the need for further technological modernization of the domestic companies through more active involvement of the academia.

According to the interviewed stakeholders, the government should have more active role in building competitiveness of the domestic companies by supporting investments in new technology, machinery and equipment in order to optimize the production process and to implement the concept of Industry 4.0 based on AI, IoT, Big Data and Analytics as global trends; investments in building skills and qualified workforce by improving the vocational education system; installation of new quality management systems are the key steps toward a structural transformation and further smart specialization within this subarea.

Additionally, the Government should support the development of modern R&D infrastructure (R&D and innovation centers, knowledge alliance, and science parks), support start-ups and innovative SMEs by creating friendly environment, and stimulate young researchers by financing industrial master and doctoral degrees related to the real business and industrial problems.

The crisis caused by the Covid-19 pandemic had serious negative implications on this subarea both on domestic and global markets. There was a massive decline in industrial production and exports (more than 30%) in the second and third quarter of 2020 (March-

October), while the situation is much better in the last quarter of the last year. Nevertheless, the companies have succeeded in saving most of the jobs as a result of the government's support, but it remains unpredictable how long the crisis will persist on a global level, and how it will reflect on the companies in this subarea. On the other hand, companies in this subarea view this crisis as an opportunity for additional development and transformation according to the new trends, which would inevitably come to the global supply chains. In that regard, the Government should support this subarea in the post-crisis period through several actions such as:

- 1) Provision of favorable credit lines through the Development Bank of North Macedonia intended for supporting the investment projects in modernization and digitalization of the production processes, and for supporting export activities including provision of guarantees, purchase of export receivables, and customs debts;
- 2) Seriously consider the possibility to coordinate and reduce the tariff rates to the level of the EU import rates. This is essential given that some companies pay high import duties on raw materials coming outside the EU, which significantly increases the cost of their production process. In terms of customs charges, the reduction of duties on machinery from non-EU countries should be seriously considered. This can provide a powerful impetus to the companies in their technological modernization and production upgrade;
- 3) Change the VAT calculation and collection method while importing materials and raw materials used in the production and export. Thereby, the funds that companies pay in advance related to VAT will be reduced while they wait for the return for several months. This will have a positive effect on the cash flows and will help companies increase their liquidity, especially in conditions when it is significantly impaired;
- 4) Facilitate all bureaucratic procedures in these conditions and, at the same time, increase the cooperation of the competent institutions with the companies to reduce the administrative-bureaucratic barriers the companies are facing, including those in the TID zones;

Cross-sectoral connections: The individual industries in this priority subarea are horizontally linked in the supply chain, which increases the opportunities for structural inter-sectoral transformation, avoiding shifting from only one product with lower added value to other product with high added value, by upgrading the production and technological capabilities. The interviewed companies noted that there are strong industrial backward and forward linkages between the metalworking and machinery sector, the metalworking sector and the production of transport equipment, as well as between the machinery and electrical engineering sector. However, some branches of this subarea such as the machinery sector are closely related to agriculture and the food processing sector, as well as the civil engineering sector. Several examples were presented in the interviewing process as argument for the strong cross-sectoral correlations, and an example for this is AgroBar Vinica that produces agricultural equipment and parts for transportation equipment, then Zavar Skopje that produces equipment for food processing industries, Brako Veles that produces mechanical part for the automobile industry and for small hydro power plants, while Fakom Skopje, Metalopromet Strumica, Aktiva Shtip, IGM Kavadraci produce metal parts and structures for the construction industry.

Moreover, there are enormous opportunities concerning digitalization and automation of business and industrial processes by using advanced ICT services such as AI, IoT, Big Data,

and others. In particular, there are opportunities in the segment of constructing smart systems for cooling and heating, lighting systems, access control, smart systems for monitoring and control, digitalization and automatization of the production processes, that is, management of industrial processes. There are also success stories of cross-sectoral relations between this subarea and the ICT sector in the field of integration of ICT solutions to optimize industrial processes. Examples are Duna Computers, Cabtel Skopje and other ICT companies that carry out successful industrial projects with the companies from this subarea.

Finally, the defined subareas have huge development potentials that could be utilized by overcoming the addressed challenges, for example, reforms in the educational system with focus on the practical and technical skills, increasing the technological and production capabilities of the domestic companies as a quite important step toward Industry 4.0, bridging the gap between foreign investors and the domestic companies, increasing the innovation and R&D capacity and boosting the cooperation between the academia and the business sector.

3.1.5 Sustainable tourism and catering

The preliminary defined area of Sustainable tourism and catering involved 18 interviews: 15 interviews were conducted with representatives of the business sector, 1 interview with representative of the academia (Faculty of Tourism and Hospitality - Ohrid), and 2 interviews with representatives of the governmental sector (Ministry of Economy and Agency for Promotion and Support of Tourism). The interviewed stakeholders are located in different regions of the country: 2 interviewed stakeholders are located in the Southwest region, 1 company is located in the East region, and 1 company is located in the Vardar region, while 13 stakeholders (most of them from the academia and the governmental sector) are located in the Skopje region.

Table 8: List of key stakeholders and process ambassadors

No	Private sector	Ambassador	Lake tourism	Mountain tourism	Alternative tourism	Cross-sectoral
1	MAKEDONIJA TOURUST	X				
2	HOTEL AMBASSADOR M	X				
3	TA FIBULA AND HOTEL IZGREV STRUGA	X	x			
4	TA SIMONIUM TRAVEL (INCOMING)	X		x	x	
5	TA BALKAN PRIME (INCOMING)			x	x	

6	HOTEL ALEKSANDAR PALAS					
7	TOURIST GUIDE		x	x	x	
8	HOTEL ARKA	X				
9	ENJOY BALKANS	X		x	x	
10	HOTEL SIRIUS					
11	NEGORSKI BANJI					
12	HOTEL STONE BRIDGE AND HILTON	X				
13	MOUNTAIN EXPERIENCE LLC	X		x	x	
14	AURORA RESORT AND SPA	X			x	
15	RESTAURANT OREOV LAD					
No	Academia					
1	FACULTY OF TOURISM AND HOSPITALITY	X				X
No	Government Institution					
1	MINISTRY OF ECONOMY	X				X
2	AGENCY FOR PROMOTION AND SUPPORT OF TOURISM	X				X

Moreover, a focus group meeting was organized consisting of 3 ambassadors from the business sector (Makedonija Tourust, TA Fibula, Metropol Ohrid), 2 representatives of the governmental sector (Ministry of Economy and the Cabinet of Deputy Prime Minister) and 2 representatives of the academia (professors from the Faculty of Tourism and Hospitality Ohrid and the Faculty of Tourism and Business Logistic - Shtip).

The focus group participants contributed to the finalization of the strategic subareas and the clarification of some of the open questions from the interviews. The main conclusion of the participants in the focus group meeting was in direction that this area is very important for the Macedonian economy in terms of number of companies, total turnover, number of workers and other indicators. Additionally, the participants conclude that tourism is one the

most strategic sector for the country with huge opportunities and significant potential for future development⁵³.

In the broader area, based on systematized data obtained from a number of sources (conducting interviews, focus group meeting, sectoral studies etc.), the following subarea is proposed:

- **Sustainable tourism**

Below are presented the main findings of the conducted interviews and the focus group meeting conclusions related to this preliminary priority area. Even though the findings indicate that this area has significant contribution to the Macedonian economy and it has critical mass of firms with development potential, sufficient evidence has not been found for innovation and scientific potentials. Hence, the ECM team and the national working group suggest these issues to be additionally explored during the EDP process in order provide a clearer picture whether this preliminary area has enough potential for smart specialization.

Subarea 1: Sustainable tourism

The tourism sector has a significant role in the national economy. The most developed types of tourism in North Macedonia are: Lake tourism; Mountain tourism; Cultural and religious tourism (churches, monasteries, mosques, museums, archaeological sites); Event tourism; Alternative tourism; City tourism; Wine tourism; Health and spa tourism and other types of tourism.

Rural, village, and mountain tourism have great potential as tourism categories, considering that even international statistics on the growth rate of these activities in the domestic market before the coronavirus period, and even during the coronavirus period, showed that mountain tourism registers high growth rates (30-40% before the coronavirus crisis, against 4% of mass tourism)⁵⁴.

The interviewed stakeholders noted that North Macedonia offers various types of mountain products, being a generally mountainous country. Foreign tourists always award positive and high grades to these types of organized tourism arrangements in North Macedonia. National parks, the advantage of having endemic species of birds and animals that live there, the thriving flora and fauna, still represent untapped potential in terms of developing tourist attractions in the national parks, adhering to all measures for nature protection.

The tourism sector in the past ten years has been on the rise and has seen an increase of about 140%. The average annual increase of tourists is 15%⁵⁵. These growing trends are result of the fact that the country has established new approach toward building modern and sustainable tourism with active role of the governmental institutions.

⁵³ Annex 7.

⁵⁴ Own calculation based on official statistical data from the State Statistical Office of the Republic of North Macedonia

⁵⁵ Own calculation based on official statistical data from the State Statistical Office of the Republic of North Macedonia

In the past years, the **number of tourists** in the country registers has been continuously growing where the number of tourists in 2010 amounted to 586,241 to go up to 1,126,935 in 2018, which is a 92% increase. Concerning the domestic tourists, their number in 2010 was 324,545, and 419,590 in 2018, or a 29% increase. In 2015, our country was visited by 485,530 foreign tourists, whereas in 2019, their number amounted to 757,593. We can conclude that in the last five years, the number of foreign arrivals is constantly increasing, whereas the number of domestic tourists, although showing growth, is still unsatisfactory.

Concerning the **number of nights** spent in the analyzed period, we can say that the figure reached 2.4 million in 2015, going up to 3.3 million in 2019. In 2015, domestic tourists spent 1.3 million nights in total, and 1.7 million in 2019. On the other hand, foreign tourists in 2015 spent 1,036,383 nights in total, reaching a number of 1.5 million in 2019⁵⁶. Similar to the number of visitors, there is an evident increase in the number of nights spent by foreign tourists on account on the nights spent by domestic tourists. In this regard, comprehensive analyses are necessary in order to undertake measures for domestic tourists to extend their stay, but also to maintain the upward trend of nights spent by foreign tourists in this country.

Major destinations that attract tourists in the Republic of North Macedonia are the lakes, mountain resorts, spa centers, wine regions and the city of Skopje. Basically, most of the domestic and foreign tourists visit the two most important destinations in the country, Ohrid and Skopje. The touristic offer in Ohrid is characterized by lengthier stay owing to the organized holidays, and tourists that visit Skopje stay for a shorter period (tourism related to business activities).

According to the official national statistics, the total **number of enterprises** in the tourism and hospitality sector in 2018 was 4,494, 3,899 of which are into activities of meal preparation and food services, being activities with the largest share, followed by accommodation facilities and travel agencies – 305, travel organizers (tour operators) and other booking services, as well as related activities – 290.

The results of the interviewed process show that the **key players** from the **business sector** are Metropol Ohrid, Hotel Drim Struga, Inex Gorica, Izgrev Struga, Sileks Ohrid Istatov Dojran, Romantic Dojran, Lateraca Dojran, Polin Dojran in the field of Lake tourism; Aurora Resort and Spa Berovo, Manastir Berovo, Fershped Mavrovo, Slavia, ELEM Popova Shapka, Montana Palas Krushevo in the field of Mountain Tourism; Tikvesh Restaurant Kavadarci, Stobi Gradsko, Popova Kula, Vila Marija – Demir Kapija, Kamnik Skopje, Dalvina Strumica in the field of wine tourism. There are many professional tourist guides in almost every tourist destination in the country, as well as incoming travel agencies such as Fibula Travel, Karaci Skopje, Badem Tour, Maksan, Ohrid Holiday, and others.

The companies in this subarea have strong comparative advantages to attract domestic and foreign tourists. Some of those advantages are: rich culture and tradition, natural resources for different kinds of tourism, favorable climate conditions, gastronomy and traditional food, UNESCO destinations, qualified working force and favorable geographic location of the country.

⁵⁶Own calculation based on official statistical data from the State Statistical Office of the Republic of North Macedonia

The largest share in the **turnover** generated by the enterprises in the tourism and hospitality sector including activities of meal preparation and food service in 2017 is EUR 220 million, the turnover of the travel agencies, tour operators and other booking services in the same year is EUR 110 million, while the accommodation facilities come third with a turnover of EUR 77 million. The total turnover of the entire sector including all services has passed EUR 470 million, which shows how important this sector is to the national economy⁵⁷. More importantly, the majority of these revenues are based on foreign tourists indicating that this sector has high internationalization level. There are foreign tourists from many countries, but predominantly they are coming from Serbia, Albania, Bulgaria, Germany, the Netherlands, and other countries.

According to the official national statistics concerning the **size of the enterprises** in this sector in 2019, most of the accommodation facilities and food service activities are micro-, small, and medium-sized enterprises, predominantly enterprises with 1-9 employees, followed by enterprises with 10-19 employees, as well as enterprises with 20-49 employees. Observing the structure of the enterprises, those with 50-249 are the least common, and in 2015 there was only one existing enterprise with over 250 employees⁵⁸.

According to the **number of employees** in the tourism and hospitality sector in 2019, the activities of meal preparation and food service claim the largest share, followed by accommodation facilities, and the travel agencies, tour operators and other booking services, while related activities come in third place.

The results of the interviewed stakeholders in the area of tourism being an activity with potential for **innovative solutions and potential for rapid growth**, there are companies that invest in innovative and creative solutions, aiming to establish tourism and certain locations in the country as attractive tourist destinations, with the Faculty of Tourism and Hospitality in Ohrid, with the Agency for Promotion and Support of Tourism and the Tourism and Hospitality Sector within the Ministry of Economy in the Government of Republic of North Macedonia.

“Plans for tourism development regarding ten destinations across Macedonia” were developed under the Local and Regional Competitiveness Project (LRCP), (based on the program for support of innovation and the Macedonian competitive activities), financed by the European Union and carried out through the office of the World Bank in the Republic of North Macedonia, with a goal to “improve the contribution of tourism to the local economic development and improve the capacity of the Government and the public entities to stimulate the growth of tourism and facilitate the management of the destinations.” There is also functional National Tourism Strategy of the Republic of North Macedonia.

In perspective, the tourism sector should support Research and Innovation activities that will focus on social innovation based on rich cultural heritage and local creativity by promoting a complex of environmentally friendly activities and consumer-friendly services that will consider sustainable use of natural resources and introduction of Innovative Tourism programs.

⁵⁷Own calculation based on official statistical data from the State Statistical Office of the Republic of North Macedonia

⁵⁸ Own calculation based on official statistical data from the State Statistical Office of the Republic of North Macedonia

The tourism sector is a multidisciplinary sector with great potential for structural transformation of many subsectors. It contributes to the preservation of local traditions and culture including handicrafts and heritage structures. In addition, tourism activities create entrepreneurial environment and increase the number of SME opportunities and job opportunities. Equally important are the opportunities created by the increasing demand for local products, especially in relation to the domestic tourism sector (using ecotourism as a tool to foster the transition to organic farming).

This subarea is characterized by well-established supply chain including retailers of agricultural products and food, transportation firms, marketing and travel agencies, tourist guides, hotels, restaurants, traditional and small local stores (food service and local products), firms for entertainment services.

Travel agencies (primarily in the segment of incoming tourism) as a particularly important part of the supply chain invest in new trends, in new websites on tours that tourists follow on their own, connected via GPS. Together with the ICT Faculty (FINKI), they invest in destination mapping, ICT technology mountain guides (with mobile GGARMIN), they are mapping the track and supplement it with the places to be visited. The package is formed, and the tour is investigated independently. It concerns young people that travel by themselves with low-cost carriers, book by themselves and investigate by themselves.

To conquer market segments that have not been tapped yet, travel agencies (incoming) invest in innovations, aiming to automate part of the processes. By following the processes in tourism, new and attractive services are being created called "creating experiences", which are part of the programs of the tourism arrangements and which provide competitive advantage. They also invest in human capital aiming to create services and programs that attract tourists.

Travel agencies play a very important role in attracting tourists. However, the Government should support the capacity-building process of the domestic tour operators where they would undertake larger organization and groups and bring foreign tourists directly and independently to North Macedonia, but also to the regional economies, Albania, Bulgaria, Serbia, Kosovo, Romania, Montenegro, etc., instead of doing that via intermediaries. Concerning the attraction offer, the travel agencies in Ohrid are the most developed ones.

The second part of the supply chain is hospitality. According to the budget, hospitality is the largest domain, but not according to product offer, although there is potential.

According to the information of the conducted interviews, there are investments in gastronomy, innovative solutions to save electrical energy and regulate wastewater in accordance with the environmental protection.

There are no proper records about the turnover and the effects of tourists in the segment of restaurant operations, which complicates the perception of the visibility of the role and the impact of the restaurant operations on the development of the sector.

The third parts are hotels located in the tourist places such as Ohrid, Dojran, Mavrovo, Berovo, Krushevo and Skopje. According to statistics, hotels have the largest share in the tourism and hospitality sector, and they are the most developed ones. According to the interviewed stakeholders, hotel capacities invest in innovative solutions, for example in wastewater treatment plants with broader impact on the environment, in infrastructure to secure water from rainwater, in electricity by placing photovoltaic panels, in heating and

cooling systems that apply the highest international standards for energy conservation and environmental protection.

Through stimulation and cooperation with the population in rural areas, they use the products from the domestic agricultural and food production. They make procurements from the local population which contributes to the reduction of the emigration of the people from the region. However, the main challenge for intensifying this cooperation and building capacity for development of rural tourism is the weak infrastructure network and undeveloped rural areas in many potential touristic regions among the country.

Hotel operators also invest in promotion of the service quality by process automation, IT solutions, installation of property management systems (integration of all aspects related to the guest) from the moment of booking to the moment of departure. Larger automatic system, lesser engagement of human factor. Facilities in Skopje are still at their highest level of development.

The chain-brand hotels and several large hotels in the capital city meet infrastructural preconditions for congress tourism. The brands transfer know-how to the country, which positively reflects on the development of human resources. Active programs are being followed on how to treat guests, employee trainings to increase the market value of the very employees.

However, there is a shortage of high-category hotels in the tourist centers, Ohrid, Mavrovo, Dojran. There is also a shortage of spa hotels across the country.

Tour guides are a very peculiar part of the supply chain. This part is very influential as it is essential to the level and quality of the travel experience. The findings of the conducted interviews related to this part of the supply chain show that tour guides are operating individually so most of their job is based on collaboration. Apart from the business sector, the tour guides' work quality often relies on collaboration with institutions such as museums, attractions, municipal sectors, national agencies and tour boards, NGOs and other that are contributing to the offer, but are very inert toward adaptation to the ever-changing travel trends and tourist preferences.

When it comes to tour guides, the state institutions should upgrade the regulations; provide continuous and professional further education, which we lack. North Macedonia maintains the global standard with the mountain guides. They are well trained and high quality people; they keep pace with global benchmarks.

There are continuous investments in new products, however, new premises, new products and implementation of new technologies are investment activities with continuous flow (especially in adventure tourism, whether implementation of electric bicycles, new communication technology or navigation, a large portion of the investments are headed for that direction).

Cross-sectoral relations: Tourism and hospitality are tied to over 15 other economic branches through their operations. Cooperation with the agricultural and food sector, apart from the business entities, involves individual farmers, participating as part of the value chain of our products. The development of organic agriculture and tourism is also a related priority.

There is untapped cooperation potential between the hotels and the wine producers. Wine routes have been mapped and they have promotional potential, especially along Corridor 10, for developing into wine roads that would represent attractive tourism offers. In addition, connecting wine tourism with accommodation in rural areas also holds potential for wine tourism.

The eco-friendly hotels, through cooperation and communication with the agriculture and forestry, initiated a possibility for combining several species of flora that may survive in the hotel. Cooperation with medicine in terms of practicing medical massage (spa and wellness) and introducing medical technologies. Only the spas from all thermal water resources are being utilized, and they are classified as health rehabilitation. There is informal health tourism in the bordering regions.

Key players in the field of science are the Faculty of Tourism and Hospitality – Ohrid, the Faculty of Tourism and Business Logistic within Goce Delchev University in Shtip, Skopje and Gevgelija, as well as the Faculty of Tourism and Management – Skopje. There are over 80 professors and researchers working in these research institutions. They carry out scientific and research projects concerning the promotion and development of the tourism sector. Development of series of guidebooks (on religious tourism, tourism potentials in the region, significant events in the Republic of North Macedonia, Ottoman monuments, guidebook on rock climbing, flavors of North Macedonia, gastronomic experience, Via Ignatia), with active engagement of professors. There are also several research projects of the Faculty of Tourism and Business Logistic – Shtip in the field of Tourism and Gastronomy financed by EU programs, as well as 16 projects in the field of Tourism and Hospitality financed by FITR⁵⁹. However, there is no trace of the H2020 projects in this subarea.

Additionally, the Faculty of Tourism and Hospitality - Ohrid contributes significantly to the protection of the cultural and historical monuments by conducting applicative research. If we consider that one of the EU strategies (strategic plans) is in the segment of protection of the cultural heritage, then many of the buildings in Ohrid are cultural heritage and perhaps, we should point this out as our strength.

The key players from the civil sector are the Tourism and Hospitality Association of the Chamber of Commerce of North Macedonia, Association of Hotels – HOTAM, Chamber of Commerce of Tourism, National Association for Incoming Tourism – NAITM. They have active role in the development of this sector and could be important segment for smart specialization of this sector.

The interviewed stakeholders noted the necessity for connection with the ICT sector in order to implement new innovative solutions to develop tourism and hospitality. The hospitality and tourism sector should pay special attention to this segment. Diverse building architecture should initiate value added activities, with the objective to increase the attractiveness, save energy, protect the environment, etc., which would contribute to a sustainable development.

The connection with the ICT sector may contribute to a new innovative approach in the sector offer and achieve economic prosperity by applying big data analytics and artificial intelligence. Developing offers in accordance to the needs and requirements of the individual

⁵⁹The reports from Found for Innovation and technology Development (FITR)

users in the tourism sector, which could be in the segment of science and research or EU funded projects, intended exclusively for the development of the hospitality and tourism in North Macedonia.

Concerning science and research and EU funded projects to develop hospitality and tourism, the segment of augmented reality is of special importance in terms of using 3D animations to visit cultural heritage and monuments.

The connection between the tourism and hospitality and the industry of furniture, construction, craftsmanship, art, transport, banking sector, education is of no less importance in terms of provision and creation of suitable workforce.

The tourism and hospitality sector were seriously hit by the health and economic crisis caused by the Covid-19 pandemic in terms of dramatic decline of the number of tourists, revenues and number of workers. According to the official statistical data and the conducted analyses of the effects of the Covid-19 crisis, the revenues have decreased by over 30% in 2020 relative to 2019; many jobs in this sector were lost, while the number of tourists has sharply reduced.⁶⁰

The recovery process of this sector is still unpredictable, and it depends on the country's ability to deal with the pandemic (the process of vaccination), as well as the situation with the virus globally. However, the impact of the crisis on tourism and hospitality will be the main challenge for further development of this subarea and will slow down the process of smart specialization of this subarea.

The interviewed companies suggest a set of measures that the Government should take in order to mitigate the negative effects in this sector. Some of those measures are: extension of the favorable credit lines through the Development Bank of North Macedonia to maintain the liquidity of the companies in the tourism and hospitality sector, decreasing the VAT from 18% to 10%, providing salary subsidies for the companies that show a decline in their revenues of over 20-30% during 2021, providing health protocols for some of the branches such as wedding organizers, issuing new tourist vouchers for domestic tourists, as well as providing favorable conditions for foreign tourists in the upcoming tourist season.

General conclusion: Strengths that stimulate growth of the sector in the general economy of the country are the road connection E75 north-south with Greece, Serbia, and central Europe; high awareness of the destination in the regional countries; transit tourism, relatively good price-quality ratio and competitive tourism product; natural resources and cultural heritage.

This high potential for tourism development is predetermined by the scale and the diversity of the tourism resources (natural, anthropogenic, and man-made), MTB and infrastructure. If these resources are adapted, they will be used in support of tourism, which will ensure dispersion in the tourism production and which will represent a considerable potential for multiplication of the economic effects of tourism via the designated destination export, ensuring that a larger number of municipalities and citizens feel economic benefits from tourism.

⁶⁰The Economic Chamber of North Macedonia study about the effects of Covid-19 crisis on tourism sector.

Prospects in regional context offer significant opportunities. Initially, considering its location, much of the traffic of regional tourists passes here, which provides an opportunity for offers that would attract transit tourists to stay a day or two on their road to or from Greece. The strong demand for regional (Balkan) tours is another indicator for the attractiveness of the cross-border offers in the area of culture, history and religion. Balkan countries share a common history and largely shared culture, making the development and promotion of these experiences at regional level quite beneficial for the entire region, especially for North Macedonia, being situated in the center. A third important opportunity is the access to good practices from the region by sharing good examples from the area of rural tourism and nature activities, culinary and traditional living offers. Drawing from ideas and models from the neighboring countries is more effective and easier to implement due to the similarity of the culture and the surroundings.

Tourism is the sector with the largest economic potential for this country, which represents a possibility for quick and positive results even after the end of the crisis such as the ongoing global pandemic, but it requires support to open new markets, develop GIS tourist maps for urban and rural areas, development of applications for various themes from tourism with electronic maps according to interest, for example, wine routes, mountain and biking trails, religion and the designated development loans for tourism in rural areas and marketing.

Amid a situation of global pandemic caused by the coronavirus, the negative effect on this sector amounts to 70-80%. In order to survive and maintain the value of the destination at the international market, support measures for the employees, logistics, grants, exemption of the sector from taxes during the current period of crisis are required.

3.1.6 Energy for the future

The preliminary defined area of Energy for the future involved 14 interviews: 8 interviews were conducted with representatives of the business sector; 3 interviews with representatives of the academia (Faculty of Mechanical Engineering and Faculty of Engineering and Computer Sciences within Ss. Cyril and Methodius University – Skopje, and the Macedonian Academy of Science and Arts - MANU), and 3 interviews with representatives of the governmental sector (the President of Energy and Water Services Regulatory Commission, the Director of Energy Agency of the Republic of North Macedonia, and the Head of the energy department under the Ministry of Economy).

The major part of the interviewed stakeholders are located in the Skopje region (13), 1 company is located in the Vardar region, and 1 company is located in the Polog region.

Table 9: List of key stakeholders and process ambassadors

No	Private sector	Ambassador	Photovoltaic/ solar power	Hydro power	Wind power	Biomass/ biogas	Cross- sectoral
1	PIXEL GROUP	X	x				
2	EMK MALI HIDRO ELEKTRANI	X		x			X

3	CAMEL SOLAR	X	x				
4	MALI HIDRO ELEKTRANI –FERO INVEST			x			
5	FONKO HIDRO			x			
6	THOR				x		
7	ARESE SOLUTIONS		x				
8	ELEKTRO SHARI					x	
No	Academia						
1	SS. CYRIL AND METHODIUS UNIVERSITY, FACULTY OF MECHANICAL ENGINEERING- SKOPJE	X	x	x			X
2	SS. CYRIL AND METHODIUS UNIVERSITY, FACULTY OF ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGIES	X	x	x			X
3	MACEDONIAN ACADEMY OF SCIENCE AND ARTS - MANU	X	X	X	X	X	X
No	Governmental sector						
1	ENERGY AND WATER SERVICES REGULATORY COMMISSION	x					X
2	ENERGY AGENCY OF THE REPUBLIC OF NORTH MACEDONIA						X
3	MINISTRY OF ECONOMY	X					X

Moreover, a focus group meeting was organized consisting of 3 ambassadors from the business sector (Fero Invest, Camel Solar and Pixel Group), 3 representatives of the governmental sector (Energy Agency of the Republic of North Macedonia, Ministry of Economy and Cabinet of the Deputy Prime Minister) and 2 representatives of the academia (professors from the Faculty of Electrical Engineering and Information Technologies – Skopje, and MANU).

The focus group participants contributed to the finalization of the strategic subareas and the clarification of some of the open questions from the interviews. The main conclusion of the participants in the focus group meeting was in the direction that this area has huge development opportunity that should be used. There are several aims that were pointed out: the first one is transformation to green energy by using the renewable energy sources, the second aim is increasing the energy efficiency and environmental protection, while the third aim that was noted is building production capacities of some parts of energy equipment such as turbines, electrical equipment, photovoltaic panels and other parts⁶¹.

In the broader area, based on systematized data obtained from a number of sources (conducting interviews, focus group meetings, additional studies, etc.), the following subarea has been proposed:

- **Eco-smart energy sources**

Within this subarea, the following potential aspects needing additional research have been identified: biomass/biogas, solar energy, hydro energy, wind energy.

Below are presented the main findings of the conducted interviews and focus group meeting related to this preliminary priority area. The overall conclusion for this area is that there is economic, scientific, and innovative potential, but the main problem is that this area does not have capacity for creating higher added value, it is not export-oriented and there is not critical mass of firms in each branch.

However, this area has strong cross-sectoral connections with other defined strategic areas (ICT, smart agriculture and food processing, electrical equipment, and mechanical part, as well as smart/sustainable buildings and materials). Due to this cross-sectoral links with other vertical priorities, the ECNM team and the national working group suggest this area to be horizontally supported within the EDP workshops. The companies within the different branches of the defined subarea could contribute to successful implementation of the smart specialization concept in North Macedonia by creating additional value to other strategic areas.

Subarea 1: Eco-smart energy sources

Developing the sustainable energy sector by using renewable energy sources (RES) is one of the main priorities of the Government and a strategic objective. Hence, the new 2020-2040 Energy Development Strategy will focus on the transition to a low-carbon economy by

⁶¹ Annex 8.

developing every renewable energy source (hydro, wind, solar, biomass/biogas, etc.). The total nameplate capacity of the country from renewable energy sources is 730.5 MW, 562 MW of which stem from big hydroelectric power stations (over 10 MW), 109 MW are derived from small hydroelectric power stations (under 10 MW), 36.8 MW come from wind parks, 18.5 MW from photovoltaics, and 6.9 MW from biogas, making North Macedonia one of the leading countries in the region in the renewable energy sources segment. The total nameplate capacity of renewable energy sources passed 40% of the total installed capacity of the entire energy sector or 35% of the total gross production of electricity in the country from all sources⁶².

This area has significant impact on the national economy in terms of its contribution to GDP, number of companies, jobs and other indicators. Actually, the relative share of energy sector in the national GDP is around 3.5%, while dominant part of this added value is generated by renewable energy source. Additionally, this area generated more than 9.000 jobs and 3% of the total number of companies in the whole industry sector are companies from this area.

The growth of this subarea through investments in new renewable energy projects will have significant multiplicative effects on the national economy because it is horizontally related to many sectors such as construction, machinery, trade, and others. Additionally, it will have positive effects on environmental protection and benefits in terms of substituting the import of electricity.

The findings of the qualitative analysis show that the significant progress in the **hydroelectric energy sector** has been made in the past 15 years under the plan to increase the share of renewable energy sources. Over 100 small hydroelectric power stations have been built and today North Macedonia is a regional leader in hydropower energy in terms of the relative share in the total installed energy capacity. Concerning the utilization of the hydropower potential, the strategic projects of the country are Chebren and Galishte. The last tender bidding for the Chebren project showed considerable interest on the part of private investors, however, the state should have a clear strategy to select the optimal model and technical solution that would provide the largest long-term benefit to the country.. Additionally, granting concessions concerning small hydroelectric power stations undergoing a stage of design, planning or construction and the potential for new concessions regarding this type of hydroelectric power stations across the country is a significant component of the development of the energy sector with renewable energy sources.

Key players from the **business sector** in this branch are: ESM AD Skopje as national energy company, EMK Skopje, Fero Invest Skopje, FONKO Hydro, and other smaller investors. FONKO Hydro and Fero Invest Skopje are both investors in small hydroelectric power stations, as well as companies for designing, construction, and managing of hydroelectric power stations. Additionally, Fero Invest manufactures some metal (metal structures) and mechanical parts (turbines) for the hydroelectric power stations, and it has already accumulated knowledge and expertise for designing and developing unique solutions, building, optimizing, managing and maintaining the small hydroelectric power stations.

According to the interviewed stakeholders and conclusions from the focus group meeting, the main strategic advantages of this subarea are: the hydropower potential of

⁶²Strategy for Development of Energy Sector in Republic of North Macedonia until 2040

the country, the accumulated know-how and experience of the existing investors that could be used for further development of this sector, the interest from foreign investors, existing historical database on hydrology, which provides foreseeability and consistency to the projections about the production of electrical energy, and the considerable profitability of the investments in small hydroelectric power stations.

Considering the strategic advantages pointed out during the interviewing process, it could be concluded that this branch has great development potential. Namely, according to certain studies about the hydropower potential of the country, 150 new small hydroelectric power plants can be constructed or around 200-250 MW nameplate capacity.

However, there are several obstacles noted by the interviewed companies, which must be overcome to meet the goals of the green scenario of the Energy Strategy in the segment of hydropower energy. The first obstacle is the lack of consensus among the stakeholders in the country (Government, environmentalists, investors, local population) regarding the potential benefits of the renewable energy sources and the nearly marginal harm to the environment. The second problem is the insufficiently regulated institutional framework and the poor inspection capacity to implement the legal regulations in order to protect the environment and meet all environmental requirements and standards. Thereby, all investors are classified as potential disruptors of the environment and a general image is created that the hydroelectric power stations are a potential environmental problem, which is certainly far from the truth. Furthermore, there is a problem in the legal regulation related to issuing construction permits, paying municipal charges, certain legal provisions, and other institutional obligations. These obstacles seriously impede the investment cycle and create considerable legal uncertainty that might negatively affect the interest of the potential investors and therefore the utilization of the investment and development potentials. Hence, the government should build a stronger institutional and regulatory framework and harmonize the legislation as soon as possible in order to speed up the development process of this subarea.

The new Law on Energy established the framework to develop the **photovoltaic sector** where by introducing premium tariffs, tenders were put out for granting concessions related to investments on a state land with projected nominal power of 35 MW where the state had the obligation to facilitate the institutional procedures, including the obligation of MEPSO to provide appropriate connection to the photovoltaic power station⁶³.

According to the information collected during the interviewing process, there are several companies and investors which showed keen interest at the bidding to construct the photovoltaic power station in the Municipality of Makedonski Brod, which generated an inflow in the state budget of EUR 28 million. There was lesser interest in the concessions concerning investments in photovoltaic power stations on private land due to the larger risk to ensure connection and numerous institutional obligations that are quite complex and demand longer periods of time. Nevertheless, premium tariffs and concessions were granted for construction of photovoltaic power stations, which render the development of this sector increasingly certain.

⁶³Law of energy and Law on energy efficiency, <https://economy.gov.mk>

Moreover, the state company ESM AD Skopje is starting a project to transform TEC Oslomej into photovoltaic power station with nameplate capacity of 2x40 MW, following the principle of public-private partnership. There is an ongoing process of construction and commissioning of a photovoltaic power station with nameplate capacity of 10 MW, investment by ESM. Additionally, the company's plan is to use the same principle to gradually transform TPP Bitola, initially by shutting down the first unit and eventually, the remaining two units in the following 15 years, whereby the country would completely abandon production of electrical energy from fossil fuels. However, this plan must proceed together with the provision of suitable alternative in the segment of ensuring security and stability of the energy sector.

According to the interviewed stakeholders, the new Energy Law laid down installation of photovoltaic panels of up to 4 MWh on individual households and of up to 400 MWh on commercial buildings is of no less importance for the development of this branch. These possibilities for additional institutional facilitation and bylaws could be a chance for the households and legal entities to secure proprietary energy source that are cheaper, which would certainly reduce the burden of the entire energy system. In this regard, increasing the nominal power from 4 to 6 MWh for collective buildings by using the new technologies for combining thermal pumps to heat water would increase the interest in investments in photovoltaic systems on collective buildings. Additionally, there is an increasing number of companies (such as Arese Solution Skopje, Solar Spektar, Sector Cert Macedonia, Tim Inzenering, EKO Solar Shtip, and others) with critical mass of accumulated knowledge and experience in engineering and installation of photovoltaic and thermal systems.

The **main strategic strengths** to develop this branch are the accumulated knowledge and innovation capacity of several manufacturers/producers of thermal collectors and photovoltaic panels. A good practice in the field of innovation is the case of Plasma as scientific and research center the innovations of which are commercialized together with Camel Solar. Moreover, the cooperation between Plasma as manufacturer of solar collectors and Pixel Group as manufacturer of photovoltaic panels resulted in the development of an innovative product Hybrid Photovoltaic Collector and combined hybrid systems, a project supported by the Fund for Innovations and Technology Development – FITR. This illustrates that the innovative SMEs have a crucial role in the development of this branch.

On the other hand, the key obstacles to the further development of this sector are the unsatisfactory level of scientific and research capacities, lack of qualified workforce, incomplete harmonization with the EU standards in terms of issuing certificates for fitters of solar and photovoltaic systems, lack of institutional and regulatory capacity, etc.

Concerning **wind power**, the national energy company ESM AD Skopje has already installed a wind park with nominal power of 36.5 MW, which proved to be an exceptionally profitable project and the company now plans to expand the capacity to 50 MW. Additionally, concessions with feed-in tariffs were granted to three private investors with foreign capital on locations in the Municipalities in Sveti Nikole, Demir Kapija, and Gevgelija with projected nominal power of 100 MWh. These investments are in their initial stages, however, in accordance with the dynamics, they are expected to start realization soon. Moreover, there is an interest of a foreign company to invest in a huge wind park with nameplate capacity of 400 MW in the Municipality of Kriva Palanka, but there are ongoing preliminary examinations and analyses regarding this potential investment. All these upcoming and potential investments might surpass EUR 500 million in the next period, which shows the development

potential of this subarea. This will also stimulate the construction and machinery sector, being cross-connected sectors.

Concerning **biogas and biomass** as a renewable energy sources, two power stations already exist with total nameplate capacity of 7 MW (Elektro Sharri Tetovo and ZIK Pelagonija - Novaci) and concessions were granted (temporary status of preferential producers) for construction of new such power stations with additional nameplate capacity of 11 MW. These ongoing projects are in strategic partnership between domestic companies and foreign companies where the possibilities for transfer of technology and knowledge are certain having in consideration the capacity of the domestic companies.

However, we should highlight that the capacities are limited due to the limited amount of waste as a main input material in the production process. In this regard, study should be conducted to investigate the total amount of waste of all farms in the country, its power density, and certainly, the amount of the other materials from plant origin in order to define the future development opportunities of this sector.

The **key institutions** from the **academia** are the Faculty of Mechanical Engineering – Skopje, the Faculty of Electrical Engineering – Skopje and the Macedonian Academy of Science and Arts (MANU). We do not have detailed information about the number of researchers in the field of renewable energy, but there are several prominent professors/researchers with high international scientific references.

The information collected from the interviewing stakeholders show that the cooperation between the business sector and the academia is primarily in the field of development feasibility and other types of technical studies (searching for new innovative technical solutions in design, planning and construction of hydroelectric power stations), as well as few R&D projects. Such an example is the Horizon 2020 project on redesigning turbine assembly for greater flexibility in the production process, a project carried out by the Faculty of Mechanical Engineering within Ss. Cyril and Methodius University along with other European universities. There are also several other H2020 projects in the field of renewable energy, climate action, environment and 20 projects financed by FITD in the field of energy and energy resources. Additionally, there are several new NGO initiatives for programs for social innovation in the field of renewable energy and energy efficiency⁶⁴. For illustration, in the period 2014-2020, according to an internal database review of the Ministry of Education and Science, 37% (EUR 5.06 million) of the total EU financial contributions (EUR 13.7 million) under Horizon 2020 for North Macedonia were associated with projects focused on various topics from energy thematic area (28 participations or 25% of the total number of awarded projects). Most of the spending was used for the following themes: secure, clean, and efficient energy EUR 3.8 million (21 participants), and the rest of the projects covered activities under climate action, environment resource efficiency and raw materials and smart, green, and integrated transport (EUR 1.3 mil). In terms of sector involvement, most of the spending was used by the private sector, i.e., 9 SME subjects participated with net contributions of EUR 1.6 million. Public sector and research institutions (e.g., education) have participated with 10 projects and EUR 1.5 million while higher education took part in 5

⁶⁴Reports from Fund for Innovation and technology development (FITR) and the Ministry for Education and Science.

projects with EUR 0.9 million. Other institutions such as associations or chamber of commerce participated with EUR 1 million.

Additionally, according to data from the State Office of Industrial Property 6% of the total number of patent applications in the last decade coming from this area⁶⁵, while 6.6% of the total approved budget of the FITD for financing projects coming from this area⁶⁶.

This indicates that there are already existing **scientific and research capacities**, but with insufficient evidence on the innovation potentials of the startups and other innovative SMEs. However, the case of Thor in the field of wind power and Fero Invest in the field of biogas which are in the initial phase of building capacities by accumulating and transferring knowledge from abroad shows that in one branch of this subarea North Macedonia has not yet created critical mass of innovation capacities. On the other side, in the field of hydroelectric and photovoltaic/solar branch several innovative SMEs possess critical knowledge of designing solutions, manufacture, and installation of hydroelectric and photovoltaic/solar systems.

The findings obtained from the interviewing process show that the **Government and regulatory institutions** including the Energy Agency of the Republic of North Macedonia, the Ministry of Transport and Communications are willing to eliminate the addressed obstacles and to improve the business environment in order to boost the development of the renewable energy sector.

The **key players** in the **civil sector** are the Macedonian Energy Association – MEA, Association of Power Supply Industry, Macedonian Solar Association PVMAK, and others.

The level of internationalization is low in terms of exporting electricity. Concerning export of equipment for hydropower stations and technical services of design and construction, Fero Invest has export experience and makes internationalization efforts, boasting with several successful projects in Georgia, Albania, Kosovo and other countries in the region. Moreover, investing in small new hydroelectric power stations is a rather attractive business for the foreign investors, which could have positive contribution to the national economy. Additionally, Pixel Group and Plasma are companies with successful international experience in the field of production and installation of photovoltaic and solar power stations and systems. However, we do not have detailed information on the export value of these systems for hydroelectric and photovoltaic/solar stations.

The main findings of the interviews conducted and focus group meetings is that the objective of this area is to apply the innovation and scientific potential in order for the country's dependence on the import of electrical energy to be reduced by using renewable energy sources, to provide greater environmental protection by applying smart-eco solution systems, as well as to boost the local economic development by new investments in renewable energy projects in local regions.

This subarea has **cross-sectional cooperation** with the construction sector concerning the construction activities related to investments in renewable power stations, as well as strong connection with smart buildings in the field of energy efficiency. There are several good examples of such kind of cross-sectoral cooperation: the collaboration between Granit

⁶⁵ State Office of Industrial Property (SOIP), <http://www.ippo.gov.mk>

⁶⁶ Reports of the Fund for Innovation and Technology Development <https://fitr.mk/en/#>

Skopje as a biggest construction company in the country and Fero Invest in the field of hydro power, as well as the cooperation between Intebako and Torax in the field of smart and energy efficient buildings. Additionally, this area has strong horizontal links with machinery and electro-sector in the field of production different parts such as turbines and other mechanical parts of the hydroelectric, photovoltaic power stations, metal structures for wind power stations, as well as, electrical equipment for all renewable power stations. The cooperation between Fero Invest and Brako Veles in the field of production turbines and other metal parts for hydro power stations, as well as, the cooperation between Bratstvo Ohrid, TM Shtip, Rade Konchar Kontraktori and relei as producers of electrical equipment, and EVN and MEPSO as national energy companies for distribution of electricity. At the same time, the management and control systems of the hydroelectric, photovoltaic, wind, biomass/biogas power stations are supported by the ICT software solutions, which imply that there is also close connection with the ICT sector. In addition, biomass/biogas is closely related to the circular economy, while the photovoltaic/solar power is connected to smart agriculture and food processing.

There are not any direct effects caused by the Covid-19 pandemic on the development of this subarea. However, the reduced institutional activities as a result of the pandemic create problems in the implementation of the institutional procedures.

Climate change and the challenges that we will face as a global trend are also opening new opportunities for innovation and development of the sector for renewable sources of energy.

This subarea is not directly hit by the crisis caused by Covid-19 pandemic in terms of production, number of workers, investment, and other indicators. However, this subarea could be one of the most important sectors for the economic recovery of the country in the post-crisis period because there are several ongoing investment projects which will have positive effects on the national economy.

In that context, the government and state institutions should create a set of measures to boost the development of this subarea in the post-crisis period. Some of those measures are improvements of the institutional and regulatory capacity, more public investments in renewable energy, improvements in the vocational education system, increasing the state capacities to better utilize the EU funds for renewable energy.

The new energy law and the established framework for renewable energy sources, the natural resources of the country, the high interest of domestic and foreign investors in renewable energy projects, as well as the Government's development strategy for this sector and the commitment of the state institutions (agency, regulatory body, ministries) guarantee that the development potentials of this sector will be utilized.

However, there are several serious deficiencies in the energy sector: 1) the country is still a net importer of electricity; 2) the use of fossil fuels for electricity production causes serious environmental problems; 3) there is a notable loss of electricity within the electricity distribution system as a consequence of problems in the transmission infrastructure the costs for which are covered by the consumers, which increases electricity price; 4) the renewable energy sources are still insufficiently used (solar, wind, and hydropower potential).

4 Conclusions and Recommendations for future EDP

4.1 Proposal of areas and sub-areas for EDP

The Republic of North Macedonia continued the process for development of smart specialization strategy, showing commitment to evolve their policies for economic growth based on innovation and specialization.

The qualitative analysis was performed in the period September 2020 – March 2021. The analysis involved more than 100 stakeholders in further discussion and analysis on the proposed specialization areas, derived from quantitative mapping of economic, innovative and research potentials.

The interviews were done in difficult circumstances, due to the negative socio-economic effects of the Corona crisis and changes in the priorities for companies, their way of functioning and unclear growth perspectives.

The main aim of the qualitative analysis was to better elaborate the proposed priority areas of smart specialization in North Macedonia, that should be further subject to entrepreneurial discovery process.

The qualitative analysis used input from interviews with relevant actors from the business, scientific and governmental sector; focus group meetings for each proposed area; and the findings from different existing sectoral studies.

Other objective of the qualitative analysis was to understand the challenges caused by the Covid crisis as well collection of information for the development of EDP process. After processing all information obtained from a number of sources (conducted interviews, conclusions from focus group meetings, in-depth sectoral analysis and additional studies etc.) the ECNM team, proposes the following vertical priority areas and subareas as a subject to further elaboration within EDP process:

1. Smart agriculture and Food processing with high added value
 - Smart agriculture
 - Food processing with high added value
2. Information and Communication technologies (ICT) sector
 - Custom Software Development
3. Smart/Sustainable buildings and materials
 - Smart buildings and sustainable materials
4. Electrical equipment & machinery parts
 - Electrical equipment & machinery parts

In general, the gathered information confirmed the relevance and importance of the proposed areas for smart specialization.

For the last proposed area **Electrical equipment & machinery parts** the proposed subarea **Electrical equipment & machinery parts** is relatively widely defined, so the ECNM team propose during the EDP process to be additionally explored the opportunities for redefining

the preliminary proposed subarea in two subareas: 1) metal & mechanical parts, and 2) electrical equipment & automotive components. Also, it can be discussed either this area will be renamed as Industry 4.0.

These four areas are proposed as vertical areas for smart specialization, having enough economic, innovative and research capacities to be further elaborated in order to create a new niche market for their specialization.

ECNM team analysed the area for smart specialization named **Energy for the future** with their economic, scientific, and innovative potential. After the deeper analysis we have not succeed to find enough information for existing critical mass of firms that will create a base for the vertical area for smart specialization. There are a lot of initiatives in research sector, that present a good base for further growth. However, this area has strong cross-sectoral connections with other defined strategic areas (ICT, smart agriculture and food processing, electrical equipment, and mechanical part, as well as smart/sustainable buildings and materials). Due to this cross-sectoral links with other vertical priorities, the ECNM team suggests, this area to be considered as a horizontal approach for smart specialization. That means that the component for climate change, decarbonization, energy efficiency, green economy and new ways of energy production, should be discussed in all proposed areas for smart specialization within the EDP workshops. The companies within the eco-smart energy sources as a defined subarea could contribute to successful implementation of the smart specialization concept in North Macedonia by creating additional value to other strategic vertical areas.

Finally, the findings of the qualitative analysis related to **Sustainable tourism and catering** as a preliminary proposed area in the quantitative analysis indicate that this area has significant contribution to the North Macedonian economy, and it has critical mass of firms with development potentials. However, there have not been found sufficient evidence for innovation and scientific potentials. Hence, the ECNM team suggests these issues to be additionally explored during the EDP process in order to provide a clearer picture whether this preliminary area has enough potentials for smart specialization.

In the EDP process have to be taken into consideration the link of smart specialization with digital and green transition of the economy, environment protection, skills, societal challenges and especially the health challenges.

Adequate identification of S3 development priorities may enable consolidation of research capacities and infrastructure, gathering a critical mass of researchers and innovators that would work together on strategically important topics of research and development, with a view to achieving research excellence and strengthening the potential of domestic products for commercialisation. In addition, S3 may also enable the development of the new economic sectors through investments in research and innovation in areas that contain strategic potential within the national framework.

4.2 Recommendations for future entrepreneurial discovery process (EDP)

EDP as a process is a new topic for all interviewed individuals and they are willing to learn about it. All of them expressed interest to be part of the dialogue and discussions, understanding that there are opportunities for strengthening and creation of new networks

and collaboration partnerships between business, academia, civil society and government, that will result in finding new market opportunities.

EDP is enabling their active participation in creation of forward-looking document. This will bring new innovation and growth opportunities for them, for the domain and for the region. Jointly they are willing to discuss about their potentials (resources) and finding solutions for facing the challenges of global competition, green and digital transition of the economy and society as well as new challenges caused by Covid-19 crisis. Key benefit is bringing together all relevant stakeholders in development of joint vision for growth and concrete measures and actions needed to reach the pre defined goals.

As a challenge is the identification and involvement of the right representatives from the business, academia, public institutions and civil society, willing to share their knowledge and ideas. Challenge is to provide sufficient finances for implementation of the defined priority actions, after EDP. In the same time, the restrictions in personal communication in the time of Covid-19 pandemic is identified as an additional challenge. This will impose on-line communication, and the need for very well organised and focused meetings that will last few hours.

According to the information collected in the interview process, there are several recommendations for EDP process in order to be adjusted to the needs and abilities of stakeholders: 1) EDP workshops should be organised once per month and last half day (not more than 2-3 hours); 2) Regarding invitation for participation on the meeting the interviewed stakeholders have different expectations: some prefer non-official invitation, send by the Chamber (especially members of the Chamber, for the majority of the SMEs), some prefer formal invitation by the government institution. The invitation can be sent by mail; 3) Regarding the preferential place of the EDP workshops, the majority of stakeholders prefer the workshops to be organized in Skopje, but some of them prefer outside the capital city, and they are ready to come to the workshops in different regions of North Macedonia; 4) On the other hand, for almost all stakeholders it is not desirable to organise workshops in the regions of the country where are no stakeholders; 5) Due to Covid-19 crisis and needed restrictions in personal communications, (if this situation continues) most of the stakeholders would prefer on-line meetings; 6) The discussions must be productive so the content and details regarding the method of work, should be prepared accurately prior to the workshop in dialogue with the stakeholders; 7) The stakeholders are ready to send in-depth feedback from any workshops and they are ready to give suggestions and comments in order to improve the efficiency of the workshops.

4.2.1 Proposed list of stakeholders for future entrepreneurial discovery process (EDP)

Below are presented the list of stakeholders for future entrepreneurial discovery (EDP) process. The list is based on the information collected by the interview process, focus group meeting, as well as consultation with external experts.

Table 10: List of key proposed stakeholders and process ambassadors for EDP process for Information and Communication Technologies (ICT) priority area

No.	BUSINESS SECTOR	Ambassadors	Custom software development	Cross-sectoral
1.	MAKEDONSKI TELEKOM, Skopje;	x		x
2.	A1 MACEDONIA, Skopje;			x
3.	INBOX, Skopje;		x	
4.	KABTEL, Skopje,			x
5.	ULTRA UNET GROUP, Skopje;	x	x	
6.	EDUSOFT DOO, Skopje;		x	
7.	INTERWORKS, Kavadarci,	x	x	
8.	SEMOS, Skopje;	x	x	
9.	ELEVATE GLOBAL, Skopje;		x	
10.	NEOTEL, Skopje;		x	
11.	NEOCOM, Skopje;		x	
12.	ASSEKO SEE, Skopje		x	
13.	INPLAYER, Skopje;		x	
14.	ELIKOSOFT, Skopje;		x	
15.	PIKSEL, Skopje;		x	
16.	SIMIT, Skopje;		x	
17.	ITLABS, Skopje;		x	
18.	ELEVATE GLOBAL, Skopje;		x	
19.	NEXTSENSE, Skopje;	x	x	
20.	GIS DATA, Skopje;		x	
	ACADEMIA	Ambassadors	Custom software development	Cross-sectoral
21.	UNIVERSITY GOCE DELCHEV, FACULTY OF COMPUTER SCIENCE, Stip;		x	x
22.	CENTER FOR TECHNOLOGY TRANSFER AND INNOVATION-INNOFEIT, Skopje;	x	x	x

23.	SS. CYRIL AND METHODIUS UNIVERSITY IN SKOPJE, FACULTY OF ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGIES, Skopje	x	x	x
24.	FACULTY OF COMPUTER SCIENCE AND ENGINEERING, SS CYRIL AND METHODIUS UNIVERSITY, Skopje;	x	x	x
	BUSINESS ASSOCIATION			
25.	START UP MACEDONIA, Skopje	x		x
26.	MASIT-ICT CHABER, Skopje;	x		x
	GOVERNMENT SECTOR			
27.	CABINET OF PRIME MINISTER IN THE GOVERNMENT OF THE REPUBLIC OF NORTH MACEDONIA, Skopje;			x
28.	MINISTRY OF INFORMATION SOCIETY AND ADMINISTRATION;	x		x
29.	FOND OF INNOVATION AND TECHNOLOGY DEVELOPMENT, Skopje;	x		x
30.	AGENCY FOR ELECTRONIC COMMUNICATIONS, Skopje;	x		x

Table 11: List of key proposed stakeholders and process ambassadors for EDP process for Smart/Sustainable Buildings and Materials priority area

No.	BUSINESS SECTOR	Ambassadors	Smart/Sustainable Buildings and Materials	Cross-sectoral
1.	PIXEL GROUP, Skopje;	x		x
2.	APTIVE, Skopje			
3.	CAMEL SOLAR, Skopje;	x		x
4.	MALI HIDRO ELEKTRANI –FERO INVEST, Skopje;		x	
5.	VA-PLAST, Ohrid;		x	
6.	INGPLAST DOOEL, Ohrid;		x	
7.	TETEPLAST, Skopje;		x	

8.	TECHNICAL TEXTILES, Stip		x	
9.	ARESE SOLUTIONS, Skopje;			x
10.	KEMET ELECTRONICS, Skopje		X	
11.	CEMENTARNICA USJE, Skopje;	x	x	
12.	TORAX, Skopje;	x	x	
13.	BIM SVETI NIKOLE, Sveti Nikole;	x	x	
14.	KNAUF RADIKA, Skopje;	x	x	
15.	BETON AD Skopje			x
16.	VARDAR DOLOMIT, Gostivar;		x	
17.	RENOVA, Tetovo;		x	
18.	ADING, Skopje	x	x	
19.	GD GRANIT AD Skopje;	x		x
	ACADEMIA	Ambassadors	Smart/Sustainable Buildings and Materials	Cross-sectoral
20.	CIVIL ENGINEERING INSTITUTE MAKEDONIJA JSC Skopje;	x		x
21.	SS. CYRIL AND METHODIUS UNIVERSITY, FACULTY OF MECHANICAL ENGINEERING-Skopje;	x		x
22.	SS. CYRIL AND METHODIUS UNIVERSITY, FACULTY OF CIVIL ENGINEERING, Skopje	x		x
	GOVERNMENT SECTOR	Ambassadors	Smart/Sustainable Buildings and Materials	cross-sectoral
23.	MINISTRY OF TRANSPORT AND COMMUNICATIONS, Skopje;	x		x
24.	ENERGY AND WATER SERVICES REGULATORY COMMISSION OF THE REPUBLIC OF NORTH MACEDONIA, Skopje	x		x
25.	CABINET OF PRIME MINISTER IN THE GOVERNMENT OF THE REPUBLIC OF NORTH MACEDONIA, Skopje;			

26.	MINISTRY OF ECONOMY, Skopje	x		x
27.	FOND OF INNOVATION AND TECHNOLOGY DEVELOPMENT, Skopje;	x		x
28	ENERGY AGENCY OF THE REPUBLIC OF NORTH MACEDONIA, Skopje;	x		x
	BUSINESS ASSOCIATION	Ambassadors	Smart/Sustainable Buildings and Materials	Cross-sectoral
29.	MACEDONIAN ENERGY ASSOCIATION - Skopje;	x		X
30.	MACEDONIAN SECTION OF THE INTERNATIONAL CENTER FOR SUSTAINABLE DEVELOPMENT OF ENERGY, WATER AND ENVIRONMENT SYSTEMS (SDEWES, Skopje	x		X

Table 12: List of key proposed stakeholders and process ambassadors for EDP process for Electrical equipment & machinery parts priority area

	BUSINESS SECTOR	Ambassadors	Metal & mechanical parts	Electrical equipment & automobile components	Cross-sectoral
1.	RADE KONCAR SERVICE, Skopje;			x	
2.	RADE KONCAR-TEP, Skopje;	x		x	X
3.	FAKOM, Skopje	x	x		
4.	SMELT-ING, Skopje		x		
5.	BRATSTVO INOX, Ohrid;		x		
6.	KOSTAL, Ohrid;	x		x	
7.	TM STIP, Stip;			x	
8.	AKTIVA, Stip;	x	x		X
9.	RADE KONCAR – KONTAKTORI AND RELEI, Skopje	x		x	

10	ZAVAR COMPANY, Skopje;	x	x		
11	IGM TRADE, Kavadarci;	x	x		
12	LEOV COMPANY, Veles			x	
13	DINAMO HIT Veles		x		
14	AGROBAR, Vinica;		x		
15	BRAKO, Veles;	x	x		X
16	MIKROSAM, Prilep;	x	x		
17	MALI HIDRO ELEKTRANI –FERO INVEST, Skopje;				X
18	APTIVE, Skopje			x	
19	TECHNICAL TEXTILES, Stip			x	
20	KEMET ELECTRONICS, Skopje			x	
21	ATOM SANTEX, Kochani;			x	
22	PN METAL, Ohrid;		x		
23	TAB-MAK, Probistip;			x	
	ACADEMIA	Ambassadors	Metal & mechanical parts	Electrical equipment & automobile components	Cross- sectoral
24	UNIVERSITY GOCE DELCEV, FACULTY OF MECHANICAL ENGINEERING, Stip;				X
25	SS. CYRIL AND METHODIUS UNIVERSITY FACULTY OF MECHANICAL ENGINEERING, Skopje;	x			X
	BUSINESS ASSOCIATION	Ambassadors	Metal & mechanical parts	Electrical equipment & automobile components	Cross- sectoral

26	MAMEI, Skopje;				X
27	START UP MACEDONIA, Skopje	x			X
	GOVERNMENT SECTOR	Ambassadors	Metal & mechanical parts	Electrical equipment & automobile components	Cross- sectoral
28	CABINET OF PRIME MINISTER IN THE GOVERNMENT OF THE REPUBLIC OF NORTH MACEDONIA, Skopje;				x
29	FOND OF INNOVATION AND TECHNOLOGY DEVELOPMENT, Skopje;	x			X
30	MINISTRY OF ECONOMY, Skopje;	x			X

Table 13: List of key proposed stakeholders and process ambassadors for EDP process for Smart agriculture and food processing with high added value priority area

	BUSINESS SECTOR	Ambassadors	Smart agriculture	Food processing with high added value	Cross- sectoral
1.	MIK SVETI NIKOLE, Sveti Nikole;	x		x	
2.	PIVARA AD, Skopje;			x	
3.	PEKABESKO, Skopje;	x		x	
4.	BRILIJANT Stip;			x	
5.	MLEKARA AD BITOLA , Bitola;	x		x	
6.	KOZUVCANKA, Kavadarci;			x	
7.	FLOREO, Kavadarci			x	
8.	LARS, Stip;	x		x	
9.	MAKPROGRES DOO, Vinica	x		x	

10.	VITAMINKA, Prilep;	x		x	
11.	VEZE SHARRI, Tetovo;	x	x		
12.	VITALIA, Skopje;			x	
13.	VIVAKS, Skopje;			x	
14.	EVROPA, Skopje;				
15.	EKO OAZA SAMANTOV, Stip;		x		
16.	OAZA ALKALOIDI, Stip;		x		
17.	SWISSLION, Skopje;			x	
18.	SOLETA, Skopje			x	
19.	MLEKARA ZDRAVJE RADOVO, Skopje;			x	
20.	KADINO INDUSTRY GROUP, Skopje;			x	X
21.	VV TIKVESH, Skopje;			x	X
22.	ZITOLUKS, Skopje;			x	X
23.	ZIK PELAGONIJA Bitola;		x		
	ACADEMIA	Ambassadors	Smart agriculture	Food processing with high added value	Cross- sectoral
24.	FACULTY OF VETERINARY MEDICINE, Skopje;	x			X
25.	FACULTY OF TECHNOLOGY AND METALLURGY, Skopje;	x			X
26.	FACULTY OF AGRICULTURAL SCIENCE AND FOOD, Skopje;	x			
27.	CENTAR FOR TRANSFER OF TECHNOLOGY – UGD, Stip;				X
	BUSINESS ASSOCIATION	Ambassadors	Smart agriculture	Food processing with high added value	Cross- sectoral

28.	ASSOCIATION FOR AGRICULTURAL AND FOOD INDUSTRY, Skopje;	x			X
	GOVERNMENT SECTOR	Ambassadors	Smart agriculture	Food processing with high added value	Cross-sectoral
29.	CABINET OF PRIME MINISTER IN THE GOVERNMENT OF THE REPUBLIC OF NORTH MACEDONIA, Skopje;				X
30.	MINISTRY OF AGRICULTURE, FORESTRY AND WATER ECONOMY, Skopje	x			X
31.	FOOD AND VETERINARY AGENCY OF THE REPUBLIC OF NORTH MACEDONIA, START UP MACEDONIA, Skopje;				x
32.	FOND OF INNOVATION AND TECHNOLOGY DEVELOPMENT, Skopje;	x			X

Table 14: List of key proposed stakeholders and process ambassadors for EDP process for Sustainable tourism and catering priority area

	BUSINESS SECTOR	Ambassadors	Sustainable tourism	Cross-sectoral
1.	MAKEDONIJA TOURUST	x	x	
2.	HOTEL AMBASSADOR M		x	
3.	TA FIBULA AND HOTEL IZGREV STRUGA	x	x	
4.	TA SIMONIUM TRAVEL (INCOMING)		x	
5.	TA BALKAN PRIME (INCOMING)		x	
6.	HOTEL ALEKSANDAR PALAS		x	
7.	TOURIST GUIDE	x		X
8.	HOTEL ARKA		x	

9.	ENJOY BALKANS		x	
10.	HOTEL SIRIUS	x	x	
11.	NEGORSKI BANJI		x	
12.	HOTEL STONE BRIDGE AND HILTON		x	
13.	MOUNTIN EXPERIENCE LLC			X
14.	AURORA RESORT AND SPA	x	x	
15.	METROPOL OHRID		x	
16.	AURORA SPA AND RESORT		x	
17.	SILEKS OHRID		x	
18.	MONTANA PALAS KRUSHEVO		x	
19.	ISTATOV DOJRAN		x	
20.	STOBI		x	
21.	BISTRA MAVROVO	x	x	
	ACADEMIA	Ambassadors	Sustainable tourism	Cross-sectoral
22.	FACULTY OF TOURISM AND HOSPITALITY - OHRID	x		X
23.	FACULTY OF TOURISM AND BUSINESS LOGISTIC - STIP			X
24.	FACULTY OF TOURISM AND BUSINESS - SKOPJE			X
	BUSSINES ASSOCIATION	Ambassadors	Sustainable tourism	Cross-sectoral
25.	ASSOCIATION OF TOURISM AND HOSPITALITY - SKOPJE	x		X
26.	ASSOCIATION OF HOTELS - HOTAM			X
27.	CHAMBER OF COMMERCE FOR TOURISM - SKOPJE			X
28.	NATIONAL ASSOCIATION FOR INCOMING TOURISM – NAITM	x		x

	GOVERNMENT SECTOR	Ambassadors	Sustainable tourism	Cross-sectoral
29.	AGENCY FOR PROMOTION AND SUPORT OF TOURISM	x		X
30.	MINISTRY FOR ECONOMY			X

References

1. FYR Macedonia Systematic Country Diagnostic: Seizing a Brighter Future for All, WB Group, Nov.2018
2. ICT industry in North Macedonia: General mapping report, North Macedonia, 2020, June
3. ICT EXPORT REPORT CURRENT SITUATION AND POTENTIALS June 2020 | Skopje, North Macedonia
4. Identification of development opportunities and potentials for export diversification and structural transformation of the Macedonian economy, Economic Chamber of Macedonia, Skopje, 2020
5. Industrial strategy of the Republic of North Macedonia 2018-2027, Government of RNM, 2018
6. Law of energy and Law of energy efficiency, <https://economy.gov.mk>
7. Mapping economic, innovative and scientific potential in the Republic of North Macedonia, NCDIEL, published by GIZ September 2019
8. Reports of the Ministry of Education and Science of North Macedonia for Horizon 2020 projects 2014-2020, <https://mon.gov.mk/category/?id=2061>
9. Reports of the Fund for Innovation and Technology Development (FITR) <https://fitr.mk/en/#>
10. Reports of the North Macedonia Free Zones Authority <https://investnorthmacedonia.gov.mk/invest-ict/>
11. State Statistical Office of the Republic of North Macedonia, <https://www.stat.gov.mk/>
12. Strategy for Development of Energy Sector in Republic of North Macedonia until 2040
13. Study for the effects on the private sector of the ICT industry affected by the health economic crisis by the Covid-19 Pandemic with recommendations for the management of the consequences, <https://biznisregulativa.mk/mk-MK/Pages/Publications>
14. Study for the effects on the private sector of the agriculture and food processing industry affected by the health economic crisis by the Covid-19 Pandemic with recommendations for the management of the consequences, <https://biznisregulativa.mk/mk-MK/Pages/Publications>
15. Study for the effects on the private sector of the Metal, Machinery and Automobile industry affected by the health economic crisis by the Covid-19 Pandemic with recommendations for the management of the consequences, <https://biznisregulativa.mk/mk-MK/Pages/Publications>

16. Smart Specialisation and the Wider Innovation Policy Context in the Western Balkans, JRC Nov 2019
17. Supporting an Innovation Agenda for the Western Balkans - Tools and Methodologies, JRC May 2018
18. Unleashing the Transformation Potential for Growth in the Western Balkans, OECD, 2019
19. Working material of the S3WG based on the Mapping economic, innovative and scientific potential in the Republic of North Macedonia

Web sites:

<http://www.economy.gov.mk/doc/2759>

<http://iceor.manu.edu.mk/>

<http://inno.feit.ukim.edu.mk/>

<https://www.eu-startups.com/2020/04/north-macedonia-skopje-ecosystem-at-a-glance/>

<https://mon.gov.mk/category/?id=2061>

<https://fitr.mk/>

<https://biznisregulativa.mk/>

<https://konkurentnost.mk>

Annex 1: JRC proposed methodological guidance

Overall and specific goals

The overall goal of the local team engaged to conduct the quality analysis is to provide better description and justification of the promising priority domains in North Macedonia in terms of value chains, existing critical mass and/or future potential, cross-innovation potential and macro-regional competitiveness and to provide the list of Key stakeholders and their preferences for the design of EDP.

One set of specific goals for In-depth definition and decision on preliminary priority domains is to collect information on the following matters related to the preliminary priority areas:

1. What are subspecialisations within the area? What are the outstanding products and services?
2. Where in the value chain was the largest value created globally and what is the position of national players in global value chains?
3. Which subsectors/parts of the value chain of the identified sectors are present in the country and what are the regions with their strongest presence? Are there any parts that are missing?
4. How competitive are the companies from the identified sectors in North Macedonia at the international and regional level?
5. What are the main international/regional comparative strengths and challenges of the preliminary priority areas?
6. Is the level of internationalisation generally high or low?
7. How dynamic are the identified sectors and what is the role of start-up, scale-up and other small and medium companies in their development?
8. What are the future trends that are significant for the development of the identified sectors?
9. What is the potential for cross-sectoral innovation of the identified sectors?

Another set specific goals to provide the list of key stakeholders as the INPUT FOR THE composition of EDP working groups is to collect information on:

1. Which companies are the most innovative in each identified sector and what success stories can be used as lessons for other companies?
2. Which actors from academia are the most innovative in each identified sector and what success stories can be used as lessons for others?
3. Who are key stakeholders from government and civic sectors in the preliminary priority areas?

Due to the specific situation caused by the COVID-19 pandemic additional assessment of possible effects of the COVID-19 pandemic on the economic, innovation and scientific

potential of the promising priority domains is to be conducted. In line this these additional questions need to be answered:

1. What are the expected impacts of the economic crisis caused by the COVID-19 pandemic on the preliminary priority areas in North Macedonia, in terms of employment, wages, innovation, research, exports, value chains, foreign direct investments and other relevant economic indicators?
2. What are the actions that the economy should take in order to address potential effects of the COVID-19 pandemic to preliminary priority areas in North Macedonia?

To mitigate the risk of low participation of stakeholders in the following stages of RIS3 design the additional objectives should also be reached. Specifically, for the process in the Republic of North Macedonia, the goal of qualitative analysis should be also to collect key information for developing adequate entrepreneurial discovery process (EDP) to adjust it to the needs and capabilities of representatives.

1. How often would respondent come to the workshops?
2. How long should the EDP workshop last?
3. Would they attend to the EDP workshop in other regions of North Macedonia?
4. Would you need a formal invitation to the workshop? Who should be the institution sending the invitation (European union, National Ministry, chamber of Commerce)?
5. What would be an attractive name How do they suggest a name for a wider area?

Additionally, the goal should be to identify "ambassadors" of processes in every priority area. Ambassadors are representatives of the economic, scientific and civil sector, who quickly recognized the usefulness of S3 process and who are influential enough to be able to ensure participation of other important stakeholders and are prepared to contribute to the quality of the process by frequently providing feedback and recommendations.

1. Could the respondent secure the participation of other stakeholders?
2. Is the respondent willing to provide in-depth feedback on the process and content between two EDP workshops?
3. How often can we contact them regarding the S3?

Preparation before data collection

To ensure the lasting participation of stakeholders as the key success factor of the RIS3 design process, a quality preparation of local team before execution of quality analysis interviews is essential. **Namely, the local team will be the first who will have face-2-face contact with key stakeholders which need not to only to agree to the quality analysis interview, but also become and remain active participants of the whole RIS3 process.**

National WG has to provide reliable information on scope and resources for RIS3, while

the local team members have to build the capacity to become the main promoters of the smart specialisation process!

Decisions that need to be made by the government sector in order to have firm foundations for the success of the future RIS3 process are the following:

- What is the position of the key policy stakeholders on how RIS3 policy mix will be harmonized with other relevant policies (industrial strategy, SME strategy)? Where is the place for horizontal measures? How is this connected with the RIS3?
- To motivate the key stakeholders an estimation of allocated financial resources for implementation is needed at least to the order of magnitude.

To become the main promoters of the smart specialisation and ensure the future participation of key stakeholders in the RIS3 design process the following capacity of the local team needs to be developed prior to execution of the quality analysis interviews.

- General framework and principles of the RIS3 design process
- Scope of measures that can be a part of RIS3 policy mix
- Available resources for implementation
- Required stakeholder engagement

Together with the local team the following elements of the quality analysis stage should be co-created:

- Quality analysis action plan
- Identification and harmonised list of stakeholders:
 - from business sector, academia, civil sector and the government/public institutions that should be interviewed.
 - Coordination in preparation of the list is important as overlapping (same important stakeholder to be disturbed twice) needs to be avoided.
- Questionnaire for stakeholders from the identified preliminary priority areas.
- Standardized templates for invitations: pitches, email templates, formal supporting letters
- Preparation for documenting process: tables, report templates for minutes, documenting system, access setting
- Quality analysis management protocols: reporting, communication and documenting & approving procedures

To support the quality analysis execution and provide much needed visibility, credibility and transparency the WG needs to organize resources for the supporting activities including at least:

- PR campaign
- IT support

Data collection and documentation

Qualitative data is collected on the basis of in-depth interviews and focus groups with experts representing key and most innovative companies, sectoral experts and researchers who work closely with the business sector.

Interviews

In the first step of the quality analysis individual face-to-face interviews with key stakeholders should be conducted. Interviews should be executed by a pair of local team members where at least one person should be expert in the field, enabling sophisticated conversation and understanding of the respondent's sector specific input. The other person conducting the interview should be focused on taking notes.

Invitations should not be sent all at once, but gradually. Don't contact the most important stakeholders first, but rather test your questions and assumptions with those that you know best. Later on, with more experience and insights approach the big game. All members of the local teams should use the predefined email templates, formal invitation letters or phone "pitches" when inviting stakeholders.

At least 10-15 face-to-face interviews per preliminary priority area should be conducted with main stakeholders from the identified preliminary priority areas, among which are: Managers of the major companies and SMEs (at least 50% of interviewed stakeholders must be from this category), Relevant researchers, Government officials and Business organizations.

1. Introduction of S3 and general value proposition (scope and resources for the implementation)
2. The predefined questions should not be asked in a formal way but rather through a conversation. Sequence is not that important, but the questions asked should be the same to enable structured documentation of answers.
3. Explanation of the future (EDP) process and planned stakeholder engagement
4. Testing the willingness to participate and getting feedback on the planned EDP
5. Ask for other key stakeholders that should be invited to the interviews and to the EDP. If possible, ask for referrals and introduction.
6. Ask for the feedback on the interview and possible recommendations for improvements
7. After the document try to document data as soon as possible while impressions are still fresh.

Documenting stakeholder input from interviews

Data collected during interviews should carefully and promptly be documented in the uniform manner, typically a spreadsheet that supports structured input of answers on the above defined questions.

Personnel conducting interviews should compose the input as a team. They should also compile joint conclusion on the go, thus improving their qualitative insights in the sector,

which will contribute to the quality of further interviews and facilitate the overall analysis and preparation of the intermediate report.

Picture X: Spreadsheet for transparent and unified documenting of interviews for each priority area

Stakeholder Name	Stakeholder type (Academia, Business, Govt, Civil)	Narrow priority	Amabassador (Y/N)	QA question 1	QA question 2	...	EDP Question 1	EDP Question 2	...	Comments
Stakeholder 1										
Stakeholder 2										
Stakeholder 3										
Stakeholder 4										
Stakeholder 5										
...										

The input from each interview should be compiled into minutes (report based on the predefined template) which should be approved by corresponding respondent to ensure the consistency. These minutes will be attached to the Quality analysis report to ensure transparency and traceability of fact-based decisions made. The whole process of inviting, conducting, documenting and approving finding from an interview should not take more than half a day, allowing a team to perform 2-3 interviews per day.

The IT platform (typically an IT cloud) used to store these data and documents should be secure and should allow limited access management, document sharing, traceability and revisions.

Focus groups

The findings from the intermediate report should be confirmed within the focus groups' meetings for each preliminary priority area. Additionally, the focus groups' meetings should be used to clarify comments on the intermediate report given by the JRC.

Each focus group should ideally be composed of up 5-6 key stakeholders that were identified as possible ambassadors. The composition of these groups should be agreed between the WG and the local team and should also follow the similar structure as the population of the respondents in the interviews:

- a. Managers of the major companies and SMEs (* at least 50% of stakeholders)
- b. Relevant researchers
- c. Government officials
- d. Business organizations.

Documenting stakeholder input from focus group

Data collected during focus groups' meetings should be documented in the form of minutes with proposal of main conclusions. The minutes must be approved by the participants to ensure the consistency.

Only after the approval, the conclusions should be used for the appraisal of the interim report into the final quality analysis report. The approved minutes will be attached to the Quality analysis report to ensure transparency and traceability of fact-based decisions made

The IT platform (typically an IT cloud) used to store these data and documents should be secure and should allow limited access management, document sharing, traceability and revisions.

Data analysis and expected results

In-depth definition on preliminary priority domains

To justify the identification of sectors as potential areas of specialisation a detailed sector analysis should be conducted. The main source of **data must be answers gathered during the interviews** and quantitative data from official sources. Additional studies can only be used to support the findings.

Answers from the interviews within each priority area should be analysed in terms of:

- identifying common denominators
- identifying major deviations and suggesting explanations (e.g. answers from stakeholders coming from different sectors, narrow priorities, regions, etc.)

As a result, the following categories for each priority area should be presented:

1. Main products / services
2. Positions in the value chain
3. Human resources/skills
4. Regional distribution of stakeholders
5. Internationalisation level (Domestic vs. Export, Export vs Import)
6. Main statistics and trends to demonstrate critical mass per identified sector, i.e. number of companies, employees, turnover of researchers, competitive projects in H2020, national collaborative projects, etc.
7. Main comparative strengths that could make the sector successful at an international market
8. Innovation and cross-innovation potential
9. National and International R&D projects awarded
10. International intellectual property pending or approved

To propose the subsectors / specific priorities within one priority area the existing industrial groups as identified within quantitative analysis need to be (re)clustered based on the

findings of the above analysis. The number of subsectors / specific priorities should ideally be between 2-4. An important criterion is that stakeholders within one subsector are similar enough that they can produce joint SWOT analysis, however there must be a balance as too much fragmentation will make it difficult to coordinate future EDP workshops.

List of Key stakeholders

The list of key stakeholders is needed as the most important input for the stakeholder dialog phase that will follow the mapping phase after the completion of the qualitative analysis. The composition of the list should follow the similar structure as the population of the respondents in the interviews:

- a. Managers of the major companies and SMEs (* at least 50% of stakeholders)
- b. Relevant researchers
- c. Government officials
- d. Business organizations.

At least 30 stakeholders for each priority area should be listed and the list should be composed from:

- the union of all referenced stakeholders indicated in the interviews or focus groups' members,
- extended with proposal of the local team.

Preferences for the design of EDP

The answers on future EDP should be analysed in terms of identifying the mode, value that appears most often. The goal is namely to identify what are the main parameters that suit most of the key stakeholders. These parameters will lately be used to customise the future RIS3 design process to the likings of the key stakeholders.

Expected results

There are 3 expected results in the first two sub-stages of quality analysis stage:

- D1: Conduct face-to-face interviews, analyse the data from the interviews and prepare and deliver complete compilation of data from the interviews in the structured form in English.
- D2: The interim report on the qualitative analysis based on the conducted interviews and subsequent analysis in English.
- D3: The final report on the qualitative analysis based on the additional focus groups' meetings and additional analysis in English.

To deliver complete compilation of data from the interviews in the structured form (D1) all interviews should be documented as described under the section 5.3.2 *“Documenting stakeholder input from interviews”*. Additionally, an indication of analysis described under the section 5.4.1 *“In-depth definition on preliminary priority domains”* should be conducted to test the quality of raw data.

The result presented in the Interim report (D2) and the Final Quality analysis report (D3) should provide an indication of possible attractive name for each preliminary priority of specialisation and in-depth description of feedback and desk research including:

- Description of subsectors/specific priorities:
 - with main products and services, IP, value chains, target markets, data demonstrating critical mass and / or potential, internationalisation impact, human resources/skills requirements and availability and regional distribution of stakeholders
 - Cross innovation potential within specific priorities and within preliminary priority areas and main comparative strengths
 - Indication of attractive name of the priority area and subsectors/specific priorities

- Table listing of stakeholders for each of the preliminary priority areas with indication:
 - corresponding subsector(s)/ narrow priority(ies),
 - geographic region
 - potential “ambassador” status
 - indication whether the referral came from the stakeholder or a local team

- Summary of general findings on future EDP for each preliminary priority area
 - Average preferred number of EDP workshops and indication of maximum number.
 - Average preferred duration of each EDP workshop and indication of maximum duration.
 - Willingness to attend to the EDP workshops in other regions and indication of most preferred destinations
 - Indication of the need for formal invitation to the EDP workshops and preferred institution sending the invitation (European union, National Ministry, Chamber of Commerce)
 - Indication of different proposals of an attractive name for the priority area

List of other sources to be consulted

The main source of data is feedback from quality analysis interviews. Additional sources can be used to support the conclusions from the interviews. These resources could be:

- Recent National sectoral analysis, product space analysis, etc.
- Recent National statistical databases regarding the IP
- Recent Financial sheets of key stakeholders
- Smart specialization platform of the European Commission
- The macroregional specialisation analysis like is “The economic, scientific and innovation landscape of the Western Balkans” published within the document “Supporting an Innovation Agenda for the Western Balkans” from 2018⁶⁷.
- National analyses on the effect of COVID-19 pandemics
- Etc... Depending on the input of the local team - chamber

Timeframe

Presented are two versions of the timeframe for execution of quality analysis stage in line with the JRC Framework and recommendation based on the regional experience:

1. A version based on the deadlines set to local team by the JRC
2. An optimised version based on the local resources and expectation of the WG

For the deliverables defined by the JRC, the deadlines are 27.10.2020 for the deliverable D1, 27.12.2020 for the deliverable D2 and 27.2.2021 for the deliverable D3. The timeframe below displays the process developed top-down, focusing on these deadlines as the main milestones. **In general, this timeframe is less restrictive, but also less fluid, with time gap of almost 6 months between QA interviews and beginning of the EDP workshop. As such it allows the beginning of EDP stage only at the end of 2021 Q1, more likely in the beginning of 2021, Q2.**

Table X: Timeframe based on the demanded deliverables and deadlines by the JRC

Nr	Tasks	Duration (weeks)	Start date	End date
1	Identification of stakeholders for QA for each preliminary priority area	5	27.07.2020	31.08.2020
2	Capacity building for interviews and development of detailed	2	31.08.2020	14.09.2020

⁶⁷<https://s3platform.jrc.ec.europa.eu/documents/20182/201464/Supporting+an+Innovation+Agenda+for+the+Western+Balkans+-+Tools+and+Methodologies/f7a54003-7e75-449f-8a66-f9caeadfc59e>

	working plan for QA interviews according to the methodology	analysis stage			
3	Contacting stakeholders and conducting face-to-face interviews	Collection and documentation of results	5	14.09.2020	19.10.2020
4	D1 - Deliver structured compilation of data and the first analysis: - justification of possible preliminary priority domains - identification of missing data to be acquired during the focus groups meetings - outline and structure of the Interim report		1	19.10.2020	26.10.2020
5	Feedback from the JRC on the first analysis and outline of the Interim report		1	26.10.2020	2.11.2020
6	D2 - Development and delivery of the Interim report on the analysis of the preliminary priority domains - based on the conducted interviews and subsequent analysis - in line with the feedback of JRC		7	2.11.2020	21.12.2020
7	JRC Feedback on the interim report		1	21.12.2020	28.12.2020
8	Correction of the report by the local team and approval of the interim report by JRC		1	28.12.2020	4.01.2021
9	Invitation to and establishment of focus groups		1	4.01.2021	11.01.2021
10	Meeting of focus groups per priority domain: - discussing the interim reports findings - collection of meeting minutes from the focus groups		1	11.01.2021	18.01.2021
11	Reports on conclusions from the focus groups and approval by participating stakeholders		2	18.01.2021	1.02.2021
12	D3 - Preparation and delivery of the final report on the qualitative analysis of the preliminary priority domains – QA report - incl. verification of findings and justification of priority areas based on the approved interim QA		3	1.02.2021	22.02.2021

	report and input from focus groups			
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The second version of the time frame is developed bottom-up, taking into account available local resources for execution of quality analysis (2 local experts per preliminary area) and the desired beginning of the EDP expressed by the WG.

The process is optimised regarding the time for execution and documentation of interviews and development and delivery of the Interim and Final report. In the eyes of participating stakeholders, the time gap between the QA interviews and beginning of the EDP workshop is shortened to 3 months, keeping the process more fluid.

Provided there is proactive coordination of publication of the QA report and the Decision on priority domains for EDP, this time frame allows the beginning of EDP stage at the end of 2020.

Table X: Timeframe based on the expectation of the national S3 working group

Nr	Tasks	Duration (weeks)	Start date	End date	
1	Identification of stakeholders for QA for each preliminary priority area	Secure political, IT and PR support for the Quality analysis stage	5	27.07.2020	31.08.2020
2	Capacity building for interviews and development of detailed working plan for QA interviews according to the methodology	Preparation of IT and PR support for the Quality analysis stage	2	31.08.2020	14.09.2020
3	Contacting stakeholders and conducting face-to-face interviews	Collection and documentation of results	2	14.09.2020	28.09.2020
4	D1 - Deliver structured compilation of data and the first analysis: - justification of possible preliminary priority domains - identification of missing data to be acquired during the focus groups meetings - outline and structure of the Interim report		1	28.09.2020	5.10.2020
5	Feedback from the JRC on the first analysis and		1	5.10.2020	12.10.2020

	outline of the Interim report			0
6	D2 - Development and delivery of the Interim report on the analysis of the preliminary priority domains - based on the conducted interviews and subsequent analysis - in line with the feedback of JRC	2	12.10.2020	26.10.2020
7	JRC Feedback on the interim report	1	26.10.2020	2.11.2020
8	Correction of the report by the local team and approval of the interim report by JRC	1	2.11.2020	9.11.2020
9	Invitation to and establishment of focus groups	1	9.11.2020	16.11.2020
10	Meeting of focus groups per priority domain: - discussing the interim reports findings - collection of meeting minutes from the focus groups	1	16.11.2020	23.11.2020
11	Reports on conclusions from the focus groups and approval by participating stakeholders	2	23.11.2020	7.12.2020
12	D3 - Preparation and delivery of the final report on the qualitative analysis of the preliminary priority domains – QA report - incl. verification of findings and justification of priority areas based on the approved interim QA report and input from focus groups	1	7.12.2020	14.12.2020

Outline structure

The structure of the final report is presented below. The interim report can include only chapters 2, 3 and 5.

1. Introduction

- a. RIS3 Design Process in North Macedonia
- b. Summary of the Quantitative Analysis of the Current Economic, Innovation and Scientific Potential
- c. Decision on preliminary areas
- d. Decision on the National Dimension

2. Qualitative analysis and collection of qualitative data
 - a. Methodology
 - i. Qualitative Interviews
 - ii. Complementary studies and desk research
 - b. Data collection by preliminary areas
 - i. Qualitative Interviews
 - ii. Other...
3. Data analysis by preliminary areas
 - a. Current and potential (sub)areas
 - i. Preliminary area 1
 - ii. Preliminary area 2
 - iii. Preliminary area 3
 - iv. Preliminary area 4
 - v. Preliminary area 5
 - vi. Preliminary area X...
 - b. Key stakeholders and identified process ambassadors
 - i. Preliminary area 1
 - ii. Preliminary area 2
 - iii. Preliminary area 3
 - iv. Preliminary area 4
 - v. Preliminary area 5
 - vi. Preliminary area X...
 - c. General findings on future entrepreneurial discovery process
 - i. Preliminary area 1
 - ii. Preliminary area 2
 - iii. Preliminary area 3
 - iv. Preliminary area 4
 - v. Preliminary area 5
 - vi. Preliminary area X...
4. Conclusions
5. Annex I: Confirmed minutes from the quality analysis interviews

6. Annex II: Confirmed minutes from the quality analysis focus groups

Governance

The timeframe tables presented above demonstrate that QA stage is composed of many tasks and activities that will be assigned to different actors in different institutions and sectors. This will demand ongoing coordination and intensive communication which should be regulated with protocols agreed between WG and the local team.

Due to the fact that there will be a lot of operational management, it is recommended that only tactical matters are discussed within the WG, while operational issues are coordinated between the S3 coordinator and the local team.

For easier monitoring of the progress, key performance indicators should be implemented and frequently updated. Also, weekly or bi-weekly meetings between S3 coordinator and the local team are recommended, and should be dedicated to reporting on progress, exchange of experience from the interviews and first findings.

Annex 2: The list of interviewed stakeholders

SUSTAINABLE FOOD AND BEVERAGE PRODUCTION AND VALUE CHAINS						
No	Stakeholders	Business sector	Business association	Academia	Government sector	Region
1.	MIK SVETI NIKOLE	x				Vardar
2.	PIVARA AD	x				Skopje
3.	PEKABESKO	x				Skopje
4.	BRILIJANT STIP	x				East
5.	MLEKARA AD BITOLA	x				Pelagonija
6.	KOZUVCANKA KAVADARCI	x				Vardar
7.	FLOREO KAVADARCI	x				Vardar
8.	LARS	x				East
9.	MAKPROGRES DOO, VINICA	x				East
10.	VITAMINKA AD	x				Pelagonija
11.	VESE SHARII	x				Polog
12.	ASSOCIATION FOR AGRICULTURAL AND FOOD INDUSTRY		x			Skopje
13.	FACULTY OF VETERINARY MEDICINE			x		Skopje
14.	CENTAR FOR TRANSFER OF TECHNOLOGY - UGD			x		East
15.	FACULTY OF AGRICULTURAL SCIENCES AND FOOD SKOPJE			x		Skopje

	UNIVERSITY SS CYRIL AND METHODIUS IN SKOPJE					
16.	FACULTY OF TECHNOLOGY AND METALLURGY, SS. CYRIL AND METHODIUS UNIVERSITY IN SKOPJE (TMF-UKIM)			x		Skopje
17.	FOOD AND VETERINARY AGENCY OF THE REPUBLIC OF NORTH MACEDONIA				x	Skopje
18.	CABINET OF DEPUTY MINISTER RESPONSIBLE FOR ECONOMIC AFFAIRS AND COORDINATION WITH THE ECONOMIC SECTORS				x	Skopje
19.	MINISTRY OF AGRICULTURE, FORESTRY AND WATER ECONOMY				x	Skopje
INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT) SECTOR						
No	Private sector	Business sector	Business association	Academia	Government sector	Region
1.	MACEDONIAN TELEKOM	x				Skopje
2.	A1 MACEDONIA	x				Skopje
3.	INBOX	x				Skopje
4.	KABTEL	x				Skopje

5.	ULTRA UNET GROUP	x				Skopje
6.	EDUSOFT DOO SKOPJE	x				Skopje
7.	INTERWORKS	x				Kavadarci
8.	SEMOS	x				Skopje
9.	MASIT		x			Skopje
10.	UNIVERSITY GOCE DELCHEV, FACULTY OF COMPUTER SCIENCE			x		East
11.	CENTER FOR TECHNOLOGY TRANSFER AND INNOVATION- INNOFEIT, FEIT Skopje			x		Skopje
12.	FACULTY OF COMPTER SCIENCE AND ENGINEERING AT SS CYRIL AND METHODIOUS – Skopje			x		Skopje
13.	AGENCY FOR ELECTRONIC COMMUNICATIONS				x	Skopje

SMART/SUSTAINABLE BUILDINGS AND MATERIALS

No	Private sector	Business sector	Business association	Academia	Government sector	Region
1.	CEMENTARNICA USJE	x				Skopje
2.	BIM SVETI NIKOLE	x				Vardar
3.	KNAUF RADIKA	x				Polog
4.	BETON AD SKOPJE	x				Skopje
5.	VARDAR DOLOMIT	x				Polog

6.	RENOVA TETOVO	x				Polog
7.	ADING	x				Skopje
8.	GD GRANIT AD SKOPJE	x				Skopje
9.	CIVIL ENGINEERING INSTITUTE MAKEDONIJA JSC SKOPJE	x				Skopje
10.	AKTIVA STIP	x				East
11.	IGM TRADE KAVADARCI	x				Vardar
12.	SS. CYRIL AND METHODIUS UNIVERSITY, FACULTY OF CIVIL ENGINEERING - SKOPJE			x		Skopje
13.	SS. CYRIL AND METHODIUS UNIVERSITY, FACULTY OF TECHNOLOGY AND METALURGY - SKOPJE			x		Skopje
14.	MINISTRY OF TRANSPORT				x	Skopje
15.	CABINET OF DEPUTY MINISTER RESPONSIBLE FOR ECONOMIC AFFAIRS AND COORDINATION WITH THE ECONOMIC SECTORS				x	Skopje
ELECTRICAL EQUIPMENT & MECHANICAL PARTS						
No	Private sector	Business sector	Business association	Academia	Government sector	Region

1.	RADE KOCAR SERVICE	x				Skopje
2.	RADE KONCAR TEP	x				Skopje
3.	FAKOM	x				Skopje
4.	SMELT-ING	x				Vardar
5.	BRATSTVO INOX-OHRID	x				SouthWest
6.	KOSTAL OHRID	x				SouthWest
7.	TM STIP	x				East
8.	AKTIVA STIP	x				East
9.	RADE KONCAR – KONTAKTORI AND RELEI	x				Skopje
10.	ZAVAR COMPANY	x				Skopje
11.	IGM TRADE	x				Vardar
12.	LEOV COMPANY VELES	x				Vardar
13.	DINAMO HIT VELES	x				Vardar
14.	AGRO BAR VINICA	x				East
15.	MAMEI		x			Skopje
16.	UNIVERSITY GOCE DELCEV, FACULTY OF MECHANICAL ENGINEERING-STIP			x		East
17.	FACULTY OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE - SKOPJE UNIVERSITY SS CYRIL AND METHODIUS IN SKOPJE			x		Skopje

18.	FACULTY OF MECHANICAL ENGINEERING, UKIM SKOPJE			x		Skopje
19.	MINISTRY OF ECONOMY				x	Skopje
20.	CABINET OF DEPUTY MINISTER RESPONSIBLE FOR ECONOMIC AFFAIRS AND COORDINATION WITH THE ECONOMIC SECTORS				x	Skopje
SUSTAINABLE TOURISM AND CATERING						
No	Private sector	Business sector	Business association	Academia	Government sector	Region
1.	MAKEDONIJA TOURUST	x				Skopje
2.	HOTEL AMBASSADOR M	x				Skopje
3.	TA FIBULA AND HOTEL IZGREV STRUGA	x				SouthWest
4.	TASIMONIUM TRAVEL (INCOMING)	x				Skopje
5.	TA BALKAN PRIME (INCOMING)	x				Skopje
6.	HOTEL ALEKSANDAR PALAS	x				Skopje
7.	TOURIST GUIDE	x				Skopje
8.	HOTEL ARKA	x				Skopje
9.	ENJOY BALKANS	x				Skopje

10.	HOTEL SIRIUS	x				SouthEast
11.	NEGORSKI BANJI	x				Vardar
12.	HOTEL STONE BRIDGE AND HILTON	x				Skopje
13.	MOUNTIN EXPERIENCE LLC	x				Skopje
14.	AURORA RESORT AND SPA	x				East
15.	RESTAURANT OREOV LAD	x				Skopje
16.	FACULTY OF TOURISM AND HOSPITALITY			x		SouthWest
17.	MINISTRY OF ECONOMY				x	Skopje
18.	AGENCY FOR PROMOTION AND SUPORT OF TOURISM				x	Skopje

ENERGY FOR THE FUTURE

No	Private sector	Business sector	Business association	Academia	Government sector	Region
1.	PIXEL GROUP	x				Skopje
2.	EMK MALI HIDRO ELEKTRANI	x				Skopje
3.	CAMEL SOLAR	x				Skopje
4.	MALI HIDRO ELEKTRANI –FERO INVEST	x				Skopje
5.	FONKO HIDRO	x				Skopje
6.	THOR	x				Skopje

7.	ARESE SOLUTIONS	x				Skopje
8.	ELEKTRO SHARI	x				Polog
9.	SS. CYRIL AND METHODIUS UNIVERSITY, FACULTY OF MECHANICAL ENGINEERING- SKOPJE			x		Skopje
10.	SS. CYRIL AND METHODIUS UNIVERSITY, FACULTY OF ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGIES			x		Skopje
11.	MACEDONIAN ACADEMY OF SCIENCE AND ARTS - MANU			x		Skopje
12.	ENERGY AND WATER SERVICES REGULATORY COMMISSION				x	Skopje
13.	ENERGY AGENCY OF THE REPUBLIC OF NORTH MACEDONIA				x	Skopje
14.	MINISTRY OF ECONOMY				x	Skopje

Annex 3: Minutes from focus group on Sustainable food and beverage production and value chains

On 3rd February 2021, online Focus group on the smart agriculture and food sector was held, as part of preparation of Qualitative analysis under the process of development of Smart Specialization Strategy

The meeting was attended by 11 participants from the ECNM, business sector, Academia and Government sector as follows: 3 ambassadors from the business sector (BiMilk Bitola, Veze Sharri Tetovo, and Pekabesko Skopje), 3 representatives of the governmental sector (Cabinet of the Prime Minister, Ministry of Economy and Cabinet of Deputy Prime Minister), and 2 representatives of the academia (professors from the Faculty of Technology and Metallurgy – Skopje and the Faculty of Agricultural Sciences and Food - Skopje) and 3 representative from the ECNM expert team.

The main issues and problems faced by the smart agriculture and food sector were discussed at the meeting.

Below are the main conclusions and recommendations:

- The agricultural sector has significant contribution to Macedonian economy in terms of number of employees, added value, export and other indicators. The gross added value of this sector in 2019 has reached 800 million euros which is 7% of the country's GDP and this value is generated by 110.000 workers.
- The food processing industry is one of the most important manufacturing sectors in North Macedonia. Though country is net-importer of food, the export performance and development potentials of this sector is significant.
- There is an increasing number of companies such as ZIK Pelagonija Bitola, Veze Sharri Tetovo, Perm Index Gradsko, Fruktana Stip, Oaza Samantov, Green Food - Sv. Nikole and others which have done successful transformation by investments in modern technologies and innovations, transfer of knowledge and digitalization of their production processes based on the concept of smart agriculture.
- There are several important institutions from academia (the Faculty of Agricultural Sciences and Food and the Institute of Agriculture at the Ss. Cyril and Methodius University, the Faculty of Agricultural Sciences at Goce Delchev University, the Faculty of Veterinary Medicine - Skopje, the Faculty of Technology and Metallurgy at the Ss. Cyril and Methodius University – Skopje) which have significant research and innovation potentials. They are actively involved in the collaboration projects with business sector in the segments of preparation project application for IPARD, USAID and other EU calls, conducting some laboratory experiments and scientific research.
- There is strong horizontal cross-sectoral connection of agricultural sector with other activities and fields such as marketing promotion, packaging, storage and logistic, implementation of ICT solutions for managing and trading, tourism sector for promotion of local agriculture food, mineral and microbiological fertilizers production as well as, biological and chemical agents production for combating pests and diseases.

- The key companies are dominantly innovative SMEs which invest in new technologies and innovations, implement the EU standards, have tradition and accumulated knowledge and are well established at the global markets as their comparative advantages. This indicate that food processing industry is very dynamic sector from technological and innovation perspectives with critical mass of innovative SMEs which have capacity to accelerate the future development of this sub-area.
- The food processing sector has critical strategic strengths such as natural resources, innovation capacity, geographic position, but there are untapped development potentials that should be utilized by increasing the cooperation between companies, government and academia.
- The economic crisis caused by COVID – 19 does not have any serious impact on the food processing industry.
- The government with the key state institutions (the Food and veterinary Agency of the Republic of North Macedonia, the Ministry of Agriculture, forestry and water economy, the the Ministry of Economy and others) could help this sector in the process of recovery and stimulation of the further development in the post-crisis period

The final conclusion of the meeting based on the discussion and elaborated arguments is that this area is one of the most strategic areas for the future development of the country, while the identified sub-areas have significant economic, innovative and scientific potentials for smart specialization.

Annex 4: Minutes from focus group on Information and Communication technologies (ICT) sector

On 1st February 2021, online Focus group on on ICT sector was held, as part of preparation of Qualitative analysis under the process of development of Smart Specialization Strategy

The meeting was attended by 10 participants from the business sector, Academia and Government sector as follows: 3 ambassadors from the business sector (Ultra, Semos, and Telekom), MASIT as the largest business association of the ICT sector, 5 representatives of the government sector (Cabinet of the Prime Minister, Ministry of Economy, Ministry of Education and Science, FITR, Ministry of Information Society and Administration and Cabinet of the Deputy Prime Minister), and 2 representatives of the academia (professors from the Faculty of Computer Sciences and Engineering – Skopje and INOFEIT - Faculty of Electrical Engineering and Information Technologies - Skopje). Additionally, as part of the focus group meeting, internal and external experts from Economic Chamber of Macedonia were present.

The discussion of the participants in the focus group meeting was focused on several important questions related to the S3 process such as question about the innovation potentials of start-up society and the role of innovative SMEs in the process of transforming the existing concept based on outsourcing ICT software services toward advanced ICT services and custom software development, as well as the question of building the digital infrastructure and improving the quality of the education.

Below are the main conclusions and recommendations:

- ICT is one of the fastest growing industries, growing at the rate of roughly 47% in the last 5 years. The IT and software industry are gaining importance in the overall economic development of the country.
- In a time of Covid-19, the ICT sector showed to be most resilient. They reorganized themselves very fast, largely working from home. This primarily led to investments in technical equipment and telecommunications infrastructure to create uninterrupted working conditions at home while maintaining the level of the quality set when performing work assignments from the office
- The start-up community is becoming increasingly organized and active especially in the ICT industry.
- A few faculties have developed innovation centers intended to support start-ups in the ICT industry
- The growing trends, as well as the existing potentials and advantages such as skilled labor, high interest in ICT studies, high-paying positions, English language fluency, vibrant innovation ecosystem, boosted by efforts from FITR in particular, high innovativeness in the sector, raising start-up society, experience in outsourcing, experience on international markets, existing support infrastructure at the universities supporting ICT start-ups

- The R&D section has very high potential evident in the number of international projects, the local activities in the area of contract research, the digital transformation activities, as well as the support of the entire innovation ecosystem.
- One good example for cooperation between academia and business sector is the "Center for Technology Transfer and Innovations - INNOFEIT" established in 2018 by the Faculty of Electrical Engineering and Information Technologies (FEEIT), Ss. Cyril and Methodius University in Skopje (UKIM), as a part of its efforts to close the gap between academic education and practical expertise, prepare its students to better cope with the industrial challenges ahead and stimulate and foster intensive contract research services for local and international partners.
- Most of the ICT companies do not create full value chains, but only participate in the production of some of the parts of the final software solutions. The number of companies that develop and export custom software increases constantly. However, the general conclusion is that a major part of the Macedonian ICT companies in the software development subarea have applied business model based on delivering software solutions and outsourcing software services for other multinational ICT companies, while a small part of them bases their business activities on development of own IT solutions to the end consumers.

Annex 5: Minutes from focus group on Smart/Sustainable buildings and materials

On 1st February 2021, online Focus group on Smart/sustainable buildings and materials was held, as part of preparation of Qualitative analysis under the process of development of Smart Specialization Strategy

The meeting was attended by 12 participants from the business sector, Academia and Government sector as follows: 3 ambassadors from the business sector (Ading Skopje, Granit Skopje, GIM Skopje, and TT Plast Skopje), 3 representatives of the governmental sector (Ministry of Economy and the Cabinet of Deputy Prime Minister), 2 representatives of the academia (professors and researchers from the Faculty of Civil Engineering– Skopje, and the Faculty of Technology and Metallurgy - Skopje), and 4 representatives from the ECNM experts team.

The participants of the focus group meeting noted that this area has significant economic and innovative potentials. The representatives from academia have presented arguments about the research and scientific capacities of this sub-area, especially in the field of advanced materials and development of smart construction solutions.

Below are the main conclusions and recommendations:

- This subarea encompasses sustainable building materials, nanomaterials (sensors, composites, coatings), and new polymer-based materials.
- There are several research institutions such as the Faculty of Technology and Metallurgy, the Faculty of Civil Engineering, the Faculty of Architecture, the Faculty of Mechanical Engineering of the Ss. Cyril and Methodius University in Skopje, SDEWES Centre, and MANU, which work on scientific and research projects for technological innovations and production of new building materials, as well as improvements of the quality of the existing materials. These research institutions have remarkable results in terms of research projects (several finished and ongoing H2020 projects), scientific publications and editorship in highly ranked scientific journals, establishing links and cooperation with other national stakeholders (municipalities, governmental institutions, NGOs, businesses), which shows that the innovation and research capacities and potentials in this field are crucial to the further development of this subarea. The role of start-ups and SMEs in the development of this subarea is still quite limited and we do not have information about any outstanding start-ups or other innovative SMEs in the field of building materials.
- The international partnerships have already been established, in particular through active involvement in CEEPUS, MATERA, ERA-NET, EU-Robotics, etc. Links with similar clusters in European countries (Italy, Germany, Austria, Poland, Czech Republic, Slovenia) and the Balkans (Croatia, Serbia, Romania, Bulgaria) have also been established in the field of sustainable materials. Such links will serve as the basis for cooperation, in particular in the framework of territorial cooperation projects.
- This subarea has strong horizontal connections with several other sectors such as the ICT sector in the field of applying new ICT business solutions in smart buildings (the aforementioned example of TORAX and FEIT), as well as production of sustainable materials.

Additionally, this subarea is closely related to energy sector (the aforementioned example of the TRAINEE project), chemical industry, mining industry, transport, metalworking and machinery (the example of Activa Shtip and IGM Kavadarci concerning the construction of new modern industrial facilities based on the metal parts and structures that they produce).

- The main missing part in the supply chain is the lack of chemical base industry which is the main input for production of high added value construction materials. Additionally, there is lack of vocational educational programs as important segment for building qualified working force.

- The main challenges in the future smart specialization of the smart construction and buildings are digitalization, modernization, and building a high level of skills with all types of construction workers. In that regard, the Economic Chamber of Macedonia has implemented a project from the framework program of the EU – HORIZON 2020, part of Energy Efficiency, the Project “Toward market-based skills for Sustainable Energy Efficient Construction” (TRAINEE). The activities of the project aimed at further promotion of the skills of middle and senior level professionals and blue-collar workers in the area of sustainable and energy efficient construction (400 people trained and certified), throughout the entire value chain of the construction sector.

Annex 6: Minutes from focus group on Electrical equipment & mechanical parts

On 2nd February 2021, online Focus group on Electrical equipment & mechanical parts was held, as part of preparation of Qualitative analysis under the process of development of Smart Specialization Strategy

The meeting was attended by 11 participants from the business sector, Academia and Government sector as follows: 3 ambassadors from the business sector (Kostal Ohrid, IGM Kavadarci, and Rade Konchar TEP Skopje), 3 additionally invited innovative SMEs (TT Plast, VA-Plast, ING-Plast), 3 representatives of the government sector (Cabinet of the Prime Minister, Ministry of Economy, and Cabinet of the Deputy Prime Minister), 2 representatives of the academia (professors from the Faculty of Mechanical Engineering – Skopje and the Faculty of Technology and Metallurgy - Skopje). and 3 representatives from the ECNM expert team.

The focus group participants have contributed to the finalization of the strategic subareas and the clarification of some of the open questions from the interviews.

The participants of the focus group meeting noted that this area has significant economic and innovative potentials. The representatives from the academia have presented arguments about the research and scientific capacities, especially in the field of machinery and electrical engineering, while the participants from the business sector noted that there is a critical mass of innovative and export-oriented companies which show that North Macedonia has comparative advantage in this area.

Below are the main conclusions and recommendations:

- This area includes transformation and upgrade of several strategic industries (metalworking, machinery, electrical engineering industry, automotive industry, advanced materials and others) by automation and digitalization of the production and the business processes.
- The production of metals and metal products (metal structure, steel pipes in various shapes, storage tanks, heat exchangers, mixers, metal furniture parts), machinery sector (production of machinery parts and tools, as well as mechanical appliances), electro sector, advanced materials and automotive components/parts have significant contribution to the Macedonian economy in terms of added value, export, employment, and other indicators.
- The key institutions from the academia are the Faculty of Mechanical Engineering and the Faculty of Technology and Metallurgy of Ss. Cyril and Methodius University - Skopje, the Faculty of Mechanical Engineering of the Goce Delcev University – Shtip and the Faculty of Technical Sciences of St. Kliment Ohridski University - Bitola. Over 150 professors and researchers are active in these research institutions. They have an important role in the transfer and adaptation of new technology, implementation of new innovative methods and process, development of new products, implementation of total Quality Management Systems (TQM), as well as in the creation of qualified engineers. The academia is actively involved in many research and applicative projects in cooperation with the business sector.

- Within the civil sector, MAMEI - Macedonian Association of Metal and Electrical Industry and the Association of the Metalworking, Mechanical and Electrical Engineering Sector of the Economic Chamber of Macedonia have an important role to offer support and quality business services that would accelerate the development process of this subarea.
- There are several important governmental institutions that support the development of this subarea: the Ministry of Finance, the Ministry of Economy, Technological Industrial Development Zones, the Cabinet of Deputy Prime Minister in charge of economic affairs and coordination with the economic sectors, the Agency for Foreign Investments and Export Promotion, the Fond for Innovation and Technology Development (FITR).

Annex 7: Minutes from focus group on Sustainable tourism

On 2nd February 2021, online Focus group on Sustainable tourism was held, as part of preparation of Qualitative analysis under the process of development of Smart Specialization Strategy

The meeting was attended by 11 participants from the business sector, Academia and Government sector as follows: 3 ambassadors from the business sector (Makedonija Tourust, TA Fibula, Metropol Ohrid), 2 representatives of the governmental sector (Ministry of Economy and the Cabinet of Deputy Prime Minister), 2 representatives of the academia (professors from the Faculty of Tourism and Hospitality Ohrid and the Faculty of Tourism and Business Logistic - Shtip), and 5 representatives from the ECNM team. The focus group participants contributed to the finalization of the strategic subareas and the clarification of some of the open questions from the interviews.

The main conclusion of the participants in the focus group meeting was in direction that this area is very important for the Macedonian economy in terms of number of companies, total turnover, number of workers and other indicators. Additionally, the participants conclude that tourism is one the most strategic sector for the country with huge opportunities and significant potential for future development.

Below are the main conclusions and recommendations:

- The tourism sector has a significant role in the national economy. The most developed types of tourism in North Macedonia are: Lake tourism; Mountain tourism; Cultural and religious tourism (churches, monasteries, mosques, museums, archaeological sites); Event tourism; Alternative tourism; City and MICE tourism; Wine tourism; Health and spa tourism and Other types of tourism. Rural, village, and mountain tourism have great potential as tourism categories, considering that even international statistics on the growth rate of these activities in the domestic market before the coronavirus period, and even during the coronavirus period
- The key players from the business sector are Metropol Ohrid, Hotel Frim Struga, Inex Gorica, Izgrev Struga, Sileks Ohrid Istatov Dojran, Romantic Dojran, Lateraca Dojran, Polin Dojran in the field of Lake tourism; Aurora Resort and Spa Berovo, Manastrir Berovo, Fershped Mavrovo, Slavia, ELEM Popova Shapka, Montana Palas Krushevo in the field of Mountain Tourism; Tikvesh Restaurant Kavadarci, Stobi Gradsko, Popova Kula, Vila Marija – Demir Kapija, Kamnik Skopje, Dalvina Strumica in the field of wine tourism. There are many professional tourist guides in almost every tourist destination in the country, as well as incoming travel agencies such as Fibula Travel, Karaci Skopje, Badem Tour, Maksan, Ohrid Holiday, and others.
- The companies in this subarea have strong comparative advantages to attract domestic and foreign tourists. Some of those advantages are rich culture and tradition, natural resources for different kind of tourism, favorable climate conditions, gastronomy and traditional food, UNESCO destinations, qualified working force, favorable geographic location of the country.

- Tourism sector is multidisciplinary sector with great potential for structural transformation of many subsectors. It contributes to the preservation of local traditions and culture including handicrafts and heritage structures. In addition, tourism activities create entrepreneurial environment and increase the number of SME opportunities and job opportunities. Equally important are the opportunities created by the increasing demand for local products, especially in relation to the domestic tourism sector (using ecotourism as a tool to foster the transition to organic farming).
- This subarea is characterized by well-established supply chain including retailers of agricultural products and food, transportation firms, marketing and travel agencies, tourist guides, hotels, restaurants, traditional and small local stores (food service and local products), firms for entertainment services.
- There are continuous investments in new products, however, new premises, new products and implementation of new technologies are investment activities with continuous flow (especially in adventure tourism, whether implementation of electric bicycles, new communication technology or navigation, a large portion of the investments are headed for that direction).
- Tourism and hospitality are tied to over 15 other economic branches through their operations. Cooperation with the agricultural and food sector, apart from the business entities, involves individual farmers, participating as part of the value chain of our products. The development of organic agriculture and tourism is also a related priority.

Annex 8: Minutes from focus group on Energy for the future

On 3rd February 2021, online Focus group on Sustainable energy sector was held, as part of preparation of Qualitative analysis under the process of development of Smart Specialization Strategy

The meeting was attended by 14 participants from the business sector, Academia and Government sector as follows: 3 ambassadors from the business sector (Fero Invest, Camel Solar and Pixel Group), 3 representatives of the governmental sector (Energy Agency of the Republic of North Macedonia, Ministry of Economy and Cabinet of the Deputy Prime Minister), 2 representatives of the academia (professors from the Faculty of Electrical Engineering and Information Technologies – Skopje, and MANU), and 5 representatives from the ECNM expert team.

The focus group participants contributed to the finalization of the strategic subareas and the clarification of some of the open questions from the interviews. There are several aims that were pointed out: the first one is transformation to green energy by using the renewable energy sources, the second aim is increasing the energy efficiency and environmental protection, while the third aim that was noted is building production capacities of some parts of energy equipment such as turbines, electrical equipment, photovoltaic panels and other parts.

Below are the main conclusions and recommendations:

- Developing the sustainable energy sector by using renewable energy sources (RES) is one of the main Government priorities and a strategic objective. Hence, the new 2020-2040 Energy Development Strategy will focus on transition to a low-carbon economy by developing every renewable energy source (hydro, wind, solar, biomass/biogas, etc.).
- There are several important investors and companies in the field of hydro power. However, FONKO Hydro and Fero Invest Skopje are companies with already built capacity and knowledge for designin, construction, managing and maintaining the hydroelectric power stations. Additionally, Fero Invest manufactures some metal (metal structures) and mechanical (turbines) parts for the hydroelectric power stations, and has accumulated knowledge for designing and developing unique solutions, building, optimizing, managing and maintaining the small hydroelectric power stations.
- The main challenge for further development of this field within the renewable energy sector is the problem with the legal regulation related to issuing construction permits, paying municipal charges, certain legal provisions, and other institutional obligations. These obstacles seriously impede the investment cycle and create considerable legal uncertainty that might negatively affect the interest of the potential investors and therefore the utilization of the investment and development potentials. Hence, the government should build stronger institutional and regulatory framework and harmonize the legislation as soon as possible in order to speed up the development process of this subarea.
- The other important field within the renewable energy sector in photovoltaic/solar. The main strategic strengths to develop of this branch are: the accumulated knowledge and

innovation capacity of several manufacturers/producers of thermal collectors and photovoltaic panels. A good practice in the field of innovation is the case of Plasma as scientific and research center whose innovations are commercialized together with Camel Solar. Moreover, the cooperation between Plasma as manufacturer of solar collectors and Pixel Group as manufacturer of photovoltaic panels resulted in the development of an innovative product Hybrid Photovoltaic Collector and combined hybrid systems, a project supported by the Fund for Innovations and Technology Development – FITR. This illustrates that the innovative SMEs have a crucial role in development of this branch.

- The key institutions from the academia are the Faculty of Mechanical Engineering – Skopje, the Faculty of Electrical Engineering – Skopje and the Macedonian Academy of Science and Arts (MANU). We do not have detailed information about the number of researchers in the field of renewable energy, but there are several prominent professors/researchers with high international scientific references.

- The cooperation between the business sector and the academia is primarily in the field of development feasibility and other types of technical studies (searching for new innovative technical solutions in design, planning and construction of hydroelectric power stations), as well as few R&D projects. An example is the Horizon 2020 project on redesigning turbine assembly for greater flexibility in the production process, a project carried by the Faculty of Mechanical Engineering of the Ss. Cyril and Methodius University along with other European universities. There are also several other H2020 projects in the field of renewable energy, climate action, environment and 20 projects financed by FITR in the field of energy and energy resources. Additionally, there are several new NGO initiatives for programs for social innovation in the field of renewable energy and energy efficiency.

- The main conclusion of the participants in the focus group meeting was in the direction that this area has huge development opportunity that should be used.