



**Regional Innovation Strategy of the Podkarpackie Voivodeship
for smart specialization (RIS3)
2014-2020**

DRAFT

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Authors of the Strategy:

*Leszek Woźniak; Andrzej Sobkowiak;
Sylwia Dziedzic; Wiesław Kąkol; Krzysztof Kud; Marian Woźniak; Dariusz Wyrwa
- Rzeszów University of Technology*

Team of contributing experts:

Piotr Czerepiuk – Marshal’s Office of the Podkarpackie Region; Ewa Draus – Sejmik (Assembly) of the Podkarpackie Region; Zdzisław Nowakowski - Regional Parliament of the Podkarpackie Region; Eugeniusz Bernat – Smak Górno Sp. z o.o.; Marek Cierpiat-Wolan – Statistical Office in Rzeszów; Zbigniew Czerniakowski – Rzeszów University; Marta Czyżewska – University of Information Technology and Management in Rzeszów; Marek Darecki – WSK „PZL-Rzeszów” S.A.; Ireneusz Drzewiecki – Regional Development Agency MARR S.A.; Grzegorz Tabisz – Rzeszów Regional Development Agency S.A.; Krzysztof Kaszuba – School of Management in Rzeszów; Andrzej Rybka – Aviation Valley Association of Aerospace Industry Enterprises; Paweł Wacnik – INNpuls Sp. z o.o.; Bogdan Wierziński – Rzeszów University

In memory of dr Teresa Pasterz, author of the first Regional Innovation Strategy of the Podkarpackie Voivodeship

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Introduction

“Innovation is a new way of doing things that results in positive change. It makes life better”¹

The European Union has specified the vision, new priorities and goals of development in the basic strategic document entitled *Communication from the Commission: EUROPE 2020, A strategy for smart, sustainable and inclusive growth*². A very important issue mentioned frequently in the Strategy is the necessity, at the level of the European Union, member states as well as regions to make smart and informed choices focusing on the so-called *smart specializations*³.

The *Guide to Research and Innovation Strategies for Smart Specialisation (RIS3)* emphasises many shortcomings common for earlier regional development strategies, such as: lack of international and trans-regional perspective; lack of consistency with the industrial and economic fabric of a given region; lack of sound analysis of the region's strengths; the “picking winner's syndrome”; copying the best performing regions without taking into account the local context^{4 5}.

It was pointed out that during the previous planning period no attention was paid to defining priorities; rather than make smart and informed choices, regions would support practically any industry. There was no concentration of resources on operations and in sectors which were likely to be most effective. As a result a significant part of the resources was lost. The main objective should have been to increase effectiveness of spending public money, yet it frequently was neglected.

The aforementioned Guide also specifies the official definition of RIS3 strategy, according to which:

„National/regional research and innovation strategies for smart specialisation (RIS3) are integrated, place-based economic transformation agendas that do five important things

- ***They focus policy support and investments on key national/regional priorities, challenges and needs for knowledge-based development, including ICT-related measures;***

¹ C. Gallo, *Steve Jobs. Sekrety innowacji. Zupełnie inaczej – reguły przełomowego sukcesu* (Polish translation of *The Presentation Secrets of Steve Jobs: How to Be Insanely Great in Front of Any Audience*), Wyd. znak litera nova, Kraków 2011, p. 14.

² European Commission, *Communication from the Commission: EUROPE 2020, A strategy for smart, sustainable and inclusive growth*, Brussels, 3.3.2010, KOM(2010) 2020 final version.

³ Initially the European Commission specified the requirement for each region to define only one smart specialization, at present the acceptable limit is defined as 2-3 smart specializations.

⁴ Foray D., Goddard J., Beldarrain X. G., Landabaso M., McCann P., Morgan K., Nauwelaers C., Ortega-Argilés R., *Przewodnik Strategii Badań i Innowacji na Rzecz Inteligentnej Specjalizacji (RIS3)*, Luksemburg: Urząd Publikacji Unii Europejskiej, European Union 2012, translation into Polish financed by World Bank – April 2013, p. 13.

⁵ Foray D., Goddard J., Beldarrain X. G., Landabaso M., McCann P., Morgan K., Nauwelaers C., Ortega-Argilés R., *Guide to Research and Innovation Strategies for Smart Specialisations (RIS3)*, Publications Office of the European Union, Luxembourg, European Union 2012, p. 11.

- ***They build on each country's/region's strengths, competitive advantages and potential for excellence;***
- ***They support technological as well as practice-based innovation and aim to stimulate private sector investment;***
- ***They get stakeholders fully involved and encourage innovation and experimentation;***
- ***They are evidence-based and include sound monitoring and evaluation systems.”⁶***

The role of smart specializations included in the strategic framework of *EUROPE 2020* was presented in more detail in a document synthesizing and summarizing objectives assumed for the flagship project entitled *Innovation Union*. All of the quoted documents emphasized that both the applied methodology and RIS3 strategies should relate to all three priorities indicated by *EUROPE 2020* document, i.e. smart, sustainable and inclusive growth⁷.

It should be emphasized that each smart specialization should be of great importance from the viewpoint of sustainable development, because in order to achieve the standards of economy based on low emissions and resource efficiency requires a lot of effort in terms of innovativeness, including in particular eco-innovation. The vision of the new model of European economy, presented in *EUROPE 2020 Strategy*, is based on green development and bio-economy⁸. The European Union assumes that this model of growth, as defined by the concept of “bio-economy” will be implemented at the latest by 2020⁹.

The concepts of utmost significance for smart specializations include the so-called *Key Enabling Technologies (KETs)*. In order to ensure consistency in understanding of this important issue, the official documents have defined the concept of key enabling technologies.

„The deployment of Key Enabling Technologies (KETs) can be an important component of a smart specialisation strategy because of their horizontal nature and transformative potential. Many future goods and services will be driven by KETs such as semiconductors, advanced materials, photonics and nanotechnology. Moreover, these goods and services will be crucial in addressing the 'grand societal challenges' facing the EU, including energy supply, public health, ageing and climate change”¹⁰. An interesting supplement to the concept of Key Enabling Technologies is the approach presented in the „Horizon 2020” document. „These multi-disciplinary, knowledge and capital-intensive technologies cut across many diverse sectors providing the basis for significant competitive advantage for European industry. An integrated approach, promoting the combination, convergence and cross-fertilisation effect of KETs in different innovation cycles and value chains can deliver promising research results and open the way to new industrial technologies, products, services and

⁶ Foray D., Goddard J., Beldarrain X. G., Landabaso M., McCann P., Morgan K., Nauwelaers C., Ortega-Argilés R., *Przewodnik Strategii Badań i Innowacji ...*, ibid., p. 10

⁷ European Commission, *Communication from the Commission: EUROPE 2020...*, op.cit., p. 14

⁸ More information on the implementation of the concept of bioeconomy in the European Union in the document *The European Bioeconomy in 2030, Delivering Sustainable Growth by addressing the Grand Societal Challenges*, p. 1-23

⁹ European Commission, *Communication from the Commission: EUROPE 2020...*, op.cit., p. 14.

¹⁰ Foray D., Goddard J., Beldarrain X. G., Landabaso M., McCann P., Morgan K., Nauwelaers C., Ortega-Argilés R., *Przewodnik Strategii Badań i Innowacji ...*, ibid., p. 15.

*novel applications (e.g. in space, transport, environment, health etc.)*¹¹. Key Enabling Technologies, both functional and horizontal in their nature, are innovative solutions which may emerge, to support growth in each and every sector, including each smart specialization. Another example of these, taken into account in the aforementioned document, is related to solutions in ICT and properly understood biotechnology (the European Union defines and narrows down the latter concept to industrial biotechnologies).

As it was emphasized a number of times, the basic concept of smart specialization assumes concentration of resources on selected key priorities. Similarly designed in the European Union, the “Horizon 2020” Programme *“will focus resources on three distinct, yet mutually reinforcing, priorities, where there is clear Union added value. These priorities correspond to those of Europe 2020 and the Innovation Union”*¹².

The priorities include:

- excellent science – *“this will raise the level of excellence in Europe's science base and ensure a steady stream of world-class research to secure Europe's long-term competitiveness. It will support the best ideas, develop talent within Europe”*¹³ etc.;
- industrial leadership – *“this will aim at making Europe a more attractive location to invest in research and innovation (including eco-innovation), by promoting activities where businesses set the agenda. It will provide major investment in key industrial technologies, maximise the growth potential of European companies by providing them with adequate levels of finance and help innovative SMEs to grow into world-leading companies”*¹⁴;
- societal challenges – *“this reflects the policy priorities of the Europe 2020 strategy and addresses major concerns shared by citizens in Europe and elsewhere. A challenge-based approach will bring together resources and knowledge across different fields, technologies and disciplines, including social sciences and the humanities (...) It will include establishing links with the activities of the European Innovation Partnerships”*¹⁵.

The above objectives of *Horizon 2020 Programme* are consistent with the logic underlying the concept of smart specializations; they stipulate a broad and cohesive approach to innovation, to be based on identified set of unique values characteristic for specific countries and regions. This approach is obviously consistent with the priorities of *EUROPE 2020 Strategy*. It is also based on the assumed increase in the involvement of SMEs in generating societal and economic growth, among others resulting from simplification of the existing significant administrative requirements faced by newly established businesses. It also emphasizes the necessity for increased international cooperation.

¹¹ Regulation of the European Parliament and of the Council establishing “Horizon 2020 - The Framework Programme for Research and Innovation (2014-2020)”, European Commission, Brussels, dated 30.11.2011, p.47.

¹² Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, “Horizon 2020 - The Framework Programme for Research and Innovation”, European Commission, Brussels, dated 30.11.2011, KOM(2011) 808 final version, p.1-14

¹³ Ibid., p. 4

¹⁴ Ibid., p.5

¹⁵ Ibid., pp. 5-6

“Designed to support the *Europe 2020* Flagship Initiative ‘*Innovation Union*’, the basic principle of ‘*Horizon 2020*’ and these rules is to adopt a much more strategic approach to research and innovation”¹⁶.

In accordance with the intentions and context of *EUROPE 2020 Strategy*, smart specializations should become a leading element of locally defined innovation strategies. *EUROPE 2020 Strategy* is based on three priorities¹⁷: „*smart growth – developing an economy based on knowledge and innovation; sustainable growth – promoting a more resource efficient, greener and more competitive economy; inclusive growth – fostering a high-employment economy delivering economic, social and territorial cohesion*”.

It was defined that smart growth, or knowledge and innovation based economy, will be supported in the EU by the implementation of three flagship initiatives.

Flagship initiative “*Innovation Union*” aims at effective use of operations focusing on research and development and innovation to address such challenges as climate change, energy and resource efficiency, health and demographic change¹⁸.

Flagship initiative “*Youth on the move*” aims at enhancing the performance and attractiveness of Europe's higher education institutions and at raising the overall quality of all levels of education/training in the EU, combining both excellence and equity, by promoting students’ and trainees' mobility, and improving the employment situation of young people¹⁹.

Flagship initiative “*A Digital Agenda for Europe*” is designed to ensure sustainable economic and social benefits from the use of unified digital market based on ultra fast internet and interoperable applications, which in practice means that by 2013 everyone will have broadband access to the Internet.

The priority of sustainable growth will be supported by two flagship initiatives.

The aim of the flagship initiative "Resource efficient Europe" is to support the changes enabling the society to reduce emissions and use the resources in an efficient and rational way. The aim is to decouple our economic growth from resource and energy use, reduce CO₂ emissions, enhance competitiveness of economy and promote greater energy security²⁰.

Flagship Initiative "An industrial policy for the globalisation era" focuses on solving problems connected with globalisation and the need to adjust production processes and products to a low-carbon economy. Some sectors might have to "reinvent" themselves while others may be presented with new business opportunities²¹.

¹⁶ Proposal for a Regulation of the European Parliament and of the Council laying down the rules for the participation and dissemination in 'Horizon 2020 – the Framework Programme for Research and Innovation (2014-2020)', European Commission, Brussels, dated 30.11.2011, KOM(2011) 810 final version, p.2.

¹⁷ European Commission, *Communication from the Commission: EUROPE 2020...*, op. cit., pp. 11-12.

¹⁸ Ibid., pp. 14-15

¹⁹ Ibid., p. 15

²⁰ Ibid., p. 17-19

²¹ Ibid., p. 19-20

The priority of inclusive growth will be supported by two flagship initiatives.

Flagship Initiative "*An Agenda for new skills and jobs*" focuses on creating conditions for modernising labour markets and ensuring the sustainability of the existing social models by strengthening the position of citizens and providing people with opportunities to acquire new skills²².

Flagship Initiative "*European Platform against Poverty*" aims at ensuring economic, social and territorial cohesion as well as raising awareness of the fundamental rights of people experiencing poverty and social exclusion²³.

These goals and flagship initiatives must be treated as guidelines for developing smart specializations; hence their assumptions have provided the foundations for this Strategy as well.

The process of implementing the smart specialization policy includes a few essential measures, defined by the European Union²⁴:

- Transformation understood as: *“a transition from an existing sector to a new one based on cooperative institutions and processes, i.e. the collective R&D, engineering, and manufacturing capabilities that form the knowledge base for development of the new activity”*.
- Modernization, interpreted as *“technological upgrading of an existing industry, involving the development of specific applications of a Key Enabling Technology to improve efficiency and quality in an existing sector”*.
- Diversification, understood as *“discovery concerning potential synergies (economies of scope and spillovers) which are likely to materialise between an existing activity and a new one. Such synergies make the move towards the new activity attractive and profitable”*.
- Development of a new domain interpreted as *“discovery that R&D and innovation in a certain field can make previously low growth activities suddenly become attractive”*.

It was emphasized in the *Guide to Research and Innovation Strategies for Smart Specialisations (RIS3)* that in spite of its detailed and precise contents, the publication in itself does not constitute a policy document of the European Union. On the other hand this is a collection of methodological guidelines and shows in what way a regional strategy for research and innovation towards smart specialization (RIS3) should be prepared, developed and implemented.

²² *ibid.*, p.21-22

²³ *ibid.*, p.22

²⁴ Foray D., Goddard J., Beldarrain X. G., Landabaso M., McCann P., Morgan K., Nauwelaers C., Ortega-Argilés R., *Przewodnik Strategii Badań i Innowacji ...*, op. cit., pp. 15-16.

The RIS3 approach is consistent with the objectives and tools of the EU cohesion policy²⁵. The concept of smart specialisation is also consistent with the main objectives of the reform of the EU cohesion policy for the period of 2014-2020, published in October 2011²⁶.

In fact, smart specialisations have a strategic and central function within the new Cohesion Policy being a key tool for ensuring its contribution to *EUROPE 2020 Growth Agenda*²⁷.

In accordance with the new *Cohesion Policy*, smart specialisation has been proposed as an *ex-ante* condition. This is a normative provision, which means that regions must have such a strategy in place, before they can receive financial support through the EU Structural Funds for their intended innovation measures²⁸. In simple words, smart specialization strategy must be developed by each region, and this must be done in conformity with the general methodological assumptions designed by the EU.

This condition applies particularly for two out of eleven thematic objectives of the *European Regional Development Fund (ERDF)*:

- Objective 1 *“Increase funding for research, technological development and innovation” – Research and Development objective.*
- Objective 3 – *“Improving competitiveness of small and medium enterprises (SME)”*.

Likewise, the same *ex-ante* conditionality applies to theme one of the European Agricultural Fund for Rural Development (EAFRD):

- *„Fostering knowledge transfer and innovation in agriculture, forestry and rural areas”²⁹.*

In other words, in accordance with the proposal brought forth by the European Commission, smart specialization should also be a precondition for obtaining support from EAFRD, for projects promoting knowledge transfer and innovation in agriculture, forestry and rural areas³⁰.

RIS3 will enable emergence of new jobs, based on knowledge and development, not only in leading centres of research and innovative operations but also in rural areas with lower level of development³¹.

In this context, it is extremely important to identify and understand the strengths of agriculture and rural areas in the region in connection with selecting and supporting smart specializations; it is also necessary to define opportunities and risks, and to identify stakeholders. Involvement of varied stakeholders is a key to specifying priorities, knowledge resources, which in

²⁵ Foray D., Goddard J., Beldarrain X. G., Landabaso M., McCann P., Morgan K., Nauwelaers C., Ortega-Argilés R., *Przewodnik Strategii Badań i Innowacji ...*, op. cit., p 9

²⁶ Ibid., p. 9

²⁷ Ibid., p. 9

²⁸ Ibid., p. 9

²⁹ Ibid., p. 9

³⁰ *Research and innovation strategies for smart specialisation. Cohesion Policy for 2014-2020*,

European Commission, http://ec.europa.eu/regional_policy/sources/docgener/informat/2014/smart_specialisation_pl.pdf

³¹ Ibid.

the case of rural areas also means a need to identify the way to prevent marginalization of such areas enabling inclusion of rural populations.

The European Union emphasizes the need to enhance the trends of rural development. *“A reform is under way which will ensure, with effect from 2013, that this policy feeds directly into the Europe 2020 Strategy for intelligent, sustainable and inclusive growth by promoting an agriculture sector which delivers food security, a sustainable use of natural resources and more dynamic rural areas”*³².

According to the authors of the Green Paper *“The quality of Europe’s agricultural and agri-food products is widely acknowledged. The result of tradition, know-how and the innovative ability of producers, the European model is also the legacy of a strong Common Agricultural Policy (CAP) and of standards of production unmatched anywhere in the world. We should be promoting this model, which plays a crucial role in the European Union’s ability to create growth in local economies, meet the expectations of European consumers and create interest among consumers in other countries”*³³. In the Podkarpackie Region the situation in agriculture and rural areas is similar to that presented above. The generally known fine quality of food products from this Region should be maintained, for the benefit of the local populations and in connection with the growing opportunities for export sales of top quality foods. It is necessary to develop mechanisms to prevent and counteract pathologies in food production, which pose hazard for consumers’ well-being and indeed frequently are linked to operations of global corporations. Such phenomena may also impair the export potential.

The European Union recognizes the importance of endogenous economy and regional as well as local markets in rural areas. *“Regional and local farming has hidden potential that is not currently being fully exploited. Regional and local markets are an essential meeting place for producers and consumers. They enable the former to receive the rewards for their labours more efficiently and the latter to contribute to the development of their local areas, reduce the environmental impact of their consumption habits and access a wide variety of products rooted in their traditions and ways of life”*³⁴.

One of the methods for increasing revenues in agriculture includes direct sales of products. *“Short distribution channels increase the income of producers and ensure the survival of a large number of farms, particularly thanks to higher margins, a reduction in transport costs and greater autonomy with respect to the agro-industrial sector”*³⁵.

The European Union seeks to enhance the ties between Europeans and agriculture by creating internal markets³⁶. The same objective should be adopted in the process of creating food economics in specific regions. One of the important aspects of this approach is to *“encourage a healthier diet and thereby contribute to achieving public health targets”*³⁷.

³² *Green Paper on promotion measures and information provision for agricultural products: a reinforced value-added European strategy for promoting the tastes of Europe*, European Commission, Brussels 14.07.2011, final version, p. 2

³³ *Ibid.*, p.2

³⁴ *Ibid.*, p. 5

³⁵ *Ibid.*, p. 5

³⁶ *Ibid.*, p. 6

³⁷ *Ibid.*, p. 7

Another factor emphasized by the European Union is the biological and health-related quality of produce. *“In a territorial approach, the involvement of producers in quality systems and the promotion of these products plays a key role in meeting growing expectations in relation to local produce, tradition and authenticity, reaffirming the social link between consumers and producers and capitalising on the freshness, innovation and nutritional qualities of produce and product awareness”*³⁸.

Internal European food market, including production of organic food, regional and traditional products, and then their direct sale contribute to creating ties between consumers and agriculture. It also contributes to the quality of life.

The above recommendations of the European Union were taken into account at each process of developing this Strategy.

The documents – guides and strategies – connected with RIS3 emphasize the importance of the systems of monitoring, evaluation and defining indicators. In accordance with the *Fifth Report on Cohesion*, the starting point for the result-oriented approach, being another *ex-ante* conditionality, is the process of establishing clear, understandable and measurable targets and indicators³⁹.

A very important issue discussed in *EUROPE 2020 Strategy* is the problem related to the development of bioeconomy. The concept of bioeconomy was presented in detail in a document containing results of works carried out during the Seventh Framework Programme, *BECOTEPS project – Bio-economy Technology Platforms*⁴⁰. Bioeconomy was divided into three essential areas: food production, production other than food, and production of biomass. The essential aspects taken into account in the model of bioeconomy include: energy security, food security, natural resources, economic and social development, public health, sustainable production and climate change⁴¹. *“The Bioeconomy refers to the sustainable production and conversion of biomass into a range of food, health, fibre and industrial products and energy”*⁴².

The logical project structure, taken into account while designing this Strategy, for RIS3 comprises six stages⁴³:

1. Analysis of the regional context and potential for innovation – included in chapters: *Diagnosis of the socio-economic situation and innovation potential of the Podkarpackie Region* and *Demand and supply related conditions for the development of innovation potential of the Podkarpackie Region*.
2. Set up of a sound governance structure including various stakeholders – included in chapter: *Podkarpackie Region innovation system and its implementation*.
3. Production of a shared vision about the future of the region, included in chapter: *Strategic objectives (vision, mission, strategic goals)*.
4. Selection of a limited number of priorities for regional development, included in

³⁸ Ibid., p. 5

³⁹ Ibid., p. 10.

⁴⁰ *The European Bioeconomy in 2030. Delivering Sustainable Growth by addressing the Grand Societal Challenges, White Paper*, p. 1-23.

⁴¹ Ibid., p.6

⁴² Ibid., p. 4

⁴³ Foray D., Goddard J., Beldarrain X. G., Landabaso M., McCann P., Morgan K., Nauwelaers C., Ortega-Argilés R., *Guide to Research and Innovation Strategies...*, ibid., p. 17

chapter: *Smart specialization of the Podkarpackie Region*.

5. Establishment of suitable policy mixes, included in chapters: Objectives for the Operational Programme, Sources of financing RSI and Recommendations.
6. Integration of monitoring and evaluation mechanisms, included in chapter: *System of monitoring and assessing the implementation of RSI 2014-2020*.

This document has been prepared in compliance with the procedure recommended in the European Union.

Regional research and innovation strategy for smart specializations may be understood as a program of economy transformation based on four principles: limited number of priorities based on the region's strengths and international specialization (consequences of difficult choices and critical mass); competitive advantage; communication and clusters (development of world class clusters and developing platforms for various forms of contact); collective leadership⁴⁴.

Many documents – guides related to the smart specialization point out the necessity to create green growth, because one of the priorities defined in *EUROPE 2020 Strategy* is sustainable development which, in accordance with the EU interpretation, means transformation towards economy which is more friendly for the climate and environment. The new paradigm of sustainable development is based on low-carbon and resource-effective economy, with innovations (eco-innovations) making it possible to separate the growth from the previously common methods of exploiting the natural capital. This means that sustainable development is one of the characteristics of smart growth. In accordance with the position adopted by the European Union, innovation strategies for smart specialization will have to promote green growth, which will enable advancement in the competitive value of the EU economy in such areas as prices of energy or in connection with the limited access to resources in the context of the radically increasing competition. This also means greater support of the European Union for new highly resourceful companies focusing on radical eco-innovations enabling implementation of new technologies used for or promoting environment and ecosystems conservation. These objectives assumed by the EU were also taken into account during all stages of designing this document.

It should be emphasized that the trends dominating the European Union's innovation policy, such as generation of green development, support for eco-innovation and bio-economy were recognized in the Podkarpackie Region, at that time the only one in Poland, and included in the *Regional Innovation Strategy* in 2005, as a vision for the region's development. Today we are elaborating this idea in line with the objectives of *EUROPE 2020 Strategy*, taking into account the concept of RIS3 (smart specialization).

⁴⁴ Foray D., Goddard J., Beldarrain X. G., Landabaso M., McCann P., Morgan K., Nauwelaers C., Ortega-Argilés R., *Przewodnik Strategii Badań i Innowacji ...*, ibid., p. 19

Development of regional innovation strategies is one of the measures aimed at improving effective use structural funds⁴⁵.

“Evaluation of research and economy related potential of the regions and construction of strategies for their development based on the opportunities for cooperation between entities involved in scientific research and economic operation – this is the purpose of RIS. Implementation of RIS is particularly important for the processes designed to ensure equal opportunities for regions’ development, which is one of the EU priorities in particular related to support granted from the Structural Funds”⁴⁶.

Regional Innovation Strategy of the Podkarpackie Voivodeship for smart specialization(RIS3) 2014-2020 (RIS 2014-2020), by design, is to be a living and flexible document. We are looking forward to Readers’ opinions, comments and suggestions as these may be helpful in enhancing the processes of implementation and monitoring, as well as in keeping this document up to date. This is what the process of creating the Strategy looked like – its authors paid attention to opinions contributed by all stakeholders; this is reflected by the road which was taken to identify the smart specializations for the Podkarpackie Region, as described below. Obviously, the various opinions were frequently contradictory, therefore it was necessary to balance them logically, particularly taking into account requirements defined by the European Commission.

⁴⁵ *Założenia polityki naukowej, naukowo-technicznej i innowacyjnej państwa do 2020 r. [Objectives of the national policy related to science, technical sciences and innovations until 2020],* Wyd. Ministerstwo Nauki i Informatyzacji, Warszawa, December 2004, p. 3

⁴⁶ *Ibid.*, p. 39

Road to identify the Region's smart specializations

Regional Innovation Strategy of the Podkarpackie Voivodeship for smart specialization (RIS3) 2014-2020 was developed as a joint effort of the community; those involved in the process included a wide range of stakeholders interested in the region's growth; these most importantly included representatives of educational as well as research and development institutions, business enterprises, local administration of various levels, national administration, business support institutions, social as well as consumer organizations, and other.

The process of constructing *Regional Innovation Strategy of the Podkarpackie Voivodeship for 2014-2020* was planned in detail and described in a systemic project entitled "*Strengthening Regional Innovation Strategy's institutional implementation system in Podkarpackie Region in years 2005 – 2013*", carried out in 2007-2013. In the period of 2012-2013 works conducted in the framework of the project, in addition to the continuous focus on tasks connected with *Regional Innovation Strategy of the Podkarpackie Voivodeship for 2005-2013 (RIS 2005-2013)*, also included tasks related to the construction of *Regional Innovation Strategy of the Podkarpackie Voivodeship for 2014-2020*, in line with the concept of RIS 3 (*smart specialization*).

In the framework of the systemic project entitled "*Strengthening Regional Innovation Strategy's institutional implementation system in Podkarpackie Region in years 2007 – 2013*" numerous operations which were carried out focused on preparing *Regional Innovation Strategy of the Podkarpackie Voivodeship for smart specialization (RIS3) 2014-2020*. In that process the implemented operations related to the following tasks:

- Task 2: enhancing the components of RIS implementation system. The purpose was to create conditions for effective management of both innovation oriented development of the region and the process of RIS implementations. The works focused on engaging existing structures established for purposes related to RIS implementation: Podkarpackie Innovation Council, Steering Committee, Panels for Strategic Goals. Regularly organized events called 'innovation forum' were also important as they partly focused on the choice of smart specializations.
- Task 5: drawing up strategic and operational documents of the Podkarpackie Region local government defining innovation and research policy of the region. Works carried out in the framework of this measure included update and operationalization of RIS, developing the document "*Directions for the Podkarpackie Region cluster-based development*", drawing up "*Operational Program for the Regional Innovation Strategy for 2009-2013*". Yet the most important works focused on elaborating new strategic documents, including: *Regional Innovation Strategy of the Podkarpackie Voivodeship for smart specialization (RIS3) 2014-2020* and the document entitled *Trends for the regional research policy for 2014-2020*.
- Task 8: support for entities responsible for developing and implementing RIS. In the framework of this measure persons involved in the implementation of RIS 2005-2013, representing partners of the systemic project, participated in national and international seminars, workshops, conferences as well as study visits. As an example those contributing to *RIS 2014-2020* took part in the Smart Specialization Platform

(S3 Platform)⁴⁷. As it was already mentioned, of great importance was the development of guides containing examples of good practices in innovation-oriented business operations, as well as examples of tools for innovation policy in key innovation areas in the Podkarpackie Region. By assumption, the guide contents are connected with innovation policy of the EU, of Poland and the Region (green growth, bio-economy, eco-innovations), as well as the region's designated smart specializations. These assumptions were met for instance by the following guides:

- *“Smart specialisations and key enabling technologies in regional development – from selection to implementation; from theory to practice in the Podkarpackie Region”, Rzeszów 2013.*
- *„Eco-innovations in food economy – development model for the Podkarpackie Region”, Rzeszów 2013.*
- *„Eco-innovations in environment conservation – water management and power generation. Solutions for the Podkarpackie Region”, Rzeszów 2013.*
- *„Innovative urban vision – guidelines for the region”, Rzeszów 2013.*
- *„Endogenous economics and ecological (green) economy as a support for innovation in the region's development”, Rzeszów 2013.*
- *„Eco-innovation as a priority trend in the Regional Innovation Strategy of the Podkarpackie Region”, Rzeszów 2013.*
- *„Objectives and rules of implementing eco-innovation in business and regional development management”, Rzeszów 2011.*

The above guides are also designed as an introduction to *Regional Innovation Strategy of the Podkarpackie Voivodeship for smart specialization (RIS3) 2014-2020*.

Task 9 – supporting the development of cluster structures in the Podkarpackie Region. The significant effects of this task include the elaborated recommendations for the cluster support policy in the region, mainly in the context of future operations.

Task 11 – establishing international cooperation linked with innovative enterprises and development of Regional Innovation Strategy.

Task 12 – preliminary pilot study focusing on the needs of innovative enterprises, in particular operating in the SME sector. It was assumed that data acquired during preliminary pilot study of the business sector would be essential for adequate update of RIS and for creating the document for the subsequent years.

Task 13 – preliminary pilot study focusing on the analysis of science and research institutions. This task was designed to assess the standing and condition of the science and research sector, including the supply of innovation in the Podkarpackie Region, estimation of the region's research potential and its financial condition, assessment of cooperation and links with enterprises, including

⁴⁷ The Platform was launched in 2011 by the European Commission and was designed to provide support for the Member States and Regions in developing new as well as existing national/regional RIS3 Strategies (<http://s3platform.jrc.ec.europa.eu>)

SMEs, as well as cooperation and links with institutions mediating in and supporting transfer of technologies and innovations. The acquired data provided justification and foundations for defining regional R&D policy for 2014-2020.

Task 14 – preliminary pilot study focusing on the condition of innovation support infrastructure. The task was designed to enable: evaluation of the current condition of innovation support infrastructure; assessment of operational effectiveness of business support institutions in meeting enterprises' needs for innovations; identification of links, as well as information sources and channels related to the flow of innovations and technology transfer; identification of the range of services on offer from support institutions; identification of the sources of financing as well as assessment of barriers for the development of support institutions.

Task 15 – preliminary pilot study focusing on the analysis of attitudes and operations of public administration. The task was designed to enable assessment of the current situation of and the range of innovation-oriented operations performed by local governments; identification of barriers; assessment of administrative personnel in terms of knowledge and skills necessary for managing regional growth, including development of knowledge based economy.

Task 16 – integrated economic analysis of the Podkarpackie Region's economy. The resulting document provided information for adequate update of RIS 2005-2013, as well as for the elaboration of *RIS for 2014-2020*. The task was designed to enable identification of the region's innovative sectors and most rapidly growing areas, and definition of the main fields for specialization, etc.⁴⁸

Regional innovation strategies designed in accordance with the concept of *smart specialisation* should comply with strategic objectives of the European Union, in particular contained in the strategies for the period up to 2020; they should also be compatible with national and regional strategic documents. In accordance with these assumptions and recommendations the process of elaborating *RIS 2014-2020* took into account, inter alia, provisions of the following documents:

- *The Long-term National Development Strategy "Poland 2030. The Third Wave of Modernity* – adopted by the Council of Ministers on 5 February 2013;
- *Strategy of Innovation and Economic Efficiency "Dynamic Poland 2020"* (Ministry of Economy) – adopted by the Council of Ministers on 15 January 2013;
- *Strategy for Social Capital Development 2020* (Ministry of Culture and National Heritage) – adopted by the Council of Ministers on 26 March 2013;
- *Strategy for the development of rural areas, agriculture and fisheries for 2012-2020* (Ministry of Agriculture and Rural Development) – adopted by the Council of Ministers on 25 April 2012;

⁴⁸ *Application for project subsidy. HUMAN CAPITAL OPERATIONAL PROGRAMME, entitled "Strengthening Regional Innovation Strategy's institutional implementation system in Podkarpackie Region in years 2007 – 2013"*, Podkarpacki Urząd Marszałkowski, Rzeszów, p. 4-6.

- *National Development Strategy 2020. Active society, competitive economy, efficient state* - adopted by the Council of Ministers on 25 September 2012;
- *National Strategy of Regional Development 2010-2020, Regions, Cities, Rural areas*, Warszawa, 13 July 2010;
- *National Foresight Programme POLAND 2020. Results of the National Foresight Programme Poland 2020*, Warszawa 2009.
- *Technology Foresight for industry – InSight2030: results update and national strategy for smart specialisation*, Warszawa 2012;
- *Strategy for Human Capital Development* (Ministry of Labour and Social Policy) – draft;
- *Strategy “Energy Security and Environment” Perspective up to 2020*. (Ministry of Economy) – draft.

The process of drawing up *Regional Innovation Strategy of the Podkarpackie Voivodeship for smart specialization (RIS3) 2014-2020* also took into account newly created or updated strategic documents of the Podkarpackie Region:

- *Regional Development Strategy - Podkarpackie 2020*, August 2013;
- *Updated Regional Innovation Strategy of the Podkarpackie Voivodeship for 2005–2013*;
- *Report from foresight study: “Priority Technologies for Sustainable Development of the Podkarpackie Region”*, Rzeszów 2008, perspective up to 2030.
- *Trends in Material technologies development for the Aviation Valley Cluster. Sectoral Foresight. Final project report*, Rzeszów 2008, perspective up to 2030.

The present document (*Regional Innovation Strategy of the Podkarpackie Voivodeship for smart specialization (RIS3) 2014-2020*) also refers to objectives and programmes related to various sources of financing, at the European, national and regional level, inter alia, in order to achieve the effects of synergy. The adopted foundation is *EUROPE 2020 Strategy*, including its priorities and flagship initiatives.

Key European programs had and will continue to have significant impact; many of their provisions made it possible to precisely define *Regional Innovation Strategy of the Podkarpackie Voivodeship for smart specialization (RIS3) 2014-2020*, in accordance with the objectives of the concept of smart specializations. These programmes are designed to reduce the differences in regional development and to enable significant progress in the most disadvantaged regions. Therefore the provisions, objectives and priorities of the following programmes were taken into account:

- *European Regional Development Fund (ERDF);*
- *European Agricultural Fund for Rural Development (EAFRD);*
- *European Strategy Forum on Research Infrastructures (ESFRI);*
- *Programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises (COSME).*

Very important aspects of *Regional Innovation Strategy of the Podkarpackie Voivodeship for smart specialization (RIS3) 2014-2020* include such problems as: development and innovation financing, as well as evaluation, monitoring and analysis of achievements. Presented in the relevant chapters of the document, these issues have been handled in compliance with provisions of such documents as:

- *Financial programming for the period of 2014-2020 – Objectives of partnership agreement; Draft dated 30 October 2012;*
- *Common list of key indicators (CLKI 2014), Ministry of Regional Development, Warszawa, April 2013.*

During the conceptual and editorial stage, many of the authors contributing to *RIS 2014-2020* participated in meetings, seminars, workshops, conferences and work teams which enabled better understanding and the most effective development of the smart specialization strategy.

These included for example the following operations:

- 27.08.2012 Warszawa, presentation of the regional profile no. 9 for the Podkarpackie Region. The results included the Final Assessment Report. Review and analysis of the regional innovation systems (RIS) adopted by Polish regions, in the context of preparations for implementation of the EU Cohesion Policy after 2013;
- 04.09.2012 Warszawa, Trends and objectives of Polish cluster policy until 2020 - recommendations of the Working Group for Cluster Policy;
- 16.10.2012 Warszawa, Ministry of Regional Development, Meeting of representatives of regional governments, focusing on smart specializations;
- 20.11.2012 Ministry of Regional Development Warszawa, Strategic Framework for Smart Specializations, Access path.
- 31.01.2012 Warszawa, National Foresight Programme – implementation of results. Stage of project realization;
- 31.01.2013 Warszawa, Support for the sector of science and higher education in the financial framework 2014-2020;
- 18.03.2013 Katowice, Report from workshops focusing on identification of external and internal determinants of smart specializations in regions, conducted by a team from the Central Mining Institute.

The choice of smart specialization for the Podkarpackie Region was also discussed by the Podkarpackie Innovation Council.

Provisions contained in this documents were also discussed during widespread public consultations in the period of 27.08-30.09.2013, in compliance with relevant regulations.

Entities, which were particularly involved in the process of designing *Regional Innovation Strategy of the Podkarpackie Voivodeship for smart specialization (RIS3) 2014-2020* included: Regional Development Department at Marshal's Office of the Podkarpackie Region, Podkarpackie Innovation Council, Committee in charge of the systemic project entitled "*Strengthening Regional Innovation Strategy's institutional implementation system in Podkarpackie Region in years 2007–2013*" and Department of Entrepreneurship, Management and Eco-innovation at Rzeszów University of Technology.

Executive programs will be drawn up as a supplement to this document, subject to acquiring financial subsidies for the relevant operations.

1. Diagnosis of the socio-economic situation and innovation potential of the Podkarpackie Region – analysis of the regional context and potential for innovation

The concise diagnosis of the socio-economic and innovation potential, presented below, depicts the main factors (phenomena, trends, etc.) impacting innovation development of the Podkarpackie Region; the analysis shows that the situation in the region is significantly varied. Some areas constitute the region's strengths and prove that even today the region is able to adequately manage issues related to innovation; yet, there are also some factors which in the long term may hinder the process.

The analysis carried out in the process of developing the document was designed to identify the Region's strengths and weaknesses, and to enable more effective use of endogenous resources in the future; the findings will also be used in efforts to make up for the delays and strengthen those areas which are currently most disadvantaged in comparison to other regions. Moreover, in accordance with the concept of smart specializations, it is necessary to identify the Region's strengths and potential opportunities, or even the possibility to transform the Region's weaknesses into its assets, when other regions are not be able or willing to identify such options. The analysis also highlights the opportunities and threats encountered by the Podkarpackie Voivodeship. It is particularly important to take advantage of and optimize the emerging opportunities.

The results of the analysis, presented below in Tables 1-3, take into account research findings included in a number of strategic documents related to the Podkarpackie Region, as well as academic studies and reports compiled by the Statistical Office in Rzeszów, and finally, the results of an assessment conducted for the needs of this Strategy, entitled *TOWS/SWOT Analysis of the Podkarpackie Region's Potential for Innovation*⁴⁹.

Table 1 presents findings of in-depth analysis focusing on socio-economic potential of the Podkarpackie Region.

Table 1. Socio-economic potential of the Podkarpackie Region, identified as its strengths and weaknesses

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • highly developed aerospace industry, with long history and significant foreign capital involved; associated within the Aviation Valley, a model cluster for the entire country, • well-developed system of higher education; fields of research and study which are important for the region's growth, mainly at Rzeszów University of Technology and at University of Rzeszów, • 12 advanced laboratories for vocational training located at secondary schools, • well-developed organic farming and processing; top quality food with good 	<ul style="list-style-type: none"> • low level of entrepreneurship reflected by the lowest number of economic entities in relation to the number of population in the country, • insufficiently developed telecommunications infrastructure, • still poor accessibility of the region by roads (A4 motor way under construction; plans for construction of north-south S19 road have been postponed indefinitely).

⁴⁹ *TOWS/SWOT Analysis of the Podkarpackie Region*, ConQuest Consulting, Warszawa 2013, p. 1-143

<p>potential for export,</p> <ul style="list-style-type: none"> • health resorts, sanatorium based health care, alternative treatment centres • natural and cultural landscape of excellent aesthetic quality contributing to the region's attractiveness for tourists, • varied structure of economy, with significant proportion of businesses operating in electro-mechanical engineering, food, chemical and mineral and renewable energy industries, • growing investments in SME sector, • large number of jobs in industrial processing based on high and medium-high technology, • potential of management and engineering specialists for aerospace, chemical, electro-mechanical engineering and food processing industries, • location in the border area, the region borders on Slovakia and Ukraine. 	
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Source: compiled by the authors

Table 2 presents findings of in-depth analysis focusing on the Podkarpackie Region's potential for innovation.

Table 2. Innovation potential of the Podkarpackie Region identified as its strengths and weaknesses

STRENGTHS	WEAKNESSES
Drivers of Innovation	
<ul style="list-style-type: none"> • increase in the number of people studying engineering and technical university courses, • increase in the percentage of engineers per 10,000 population, • high percentage of people with secondary education in 25-64 age group, • growing potential of research centres (particularly universities), as a result of such factors as: investments in equipment, cooperation with other centres in Poland and abroad and advancement of personnel, • increased prestige of universities in Podkarpackie, • strong position of Rzeszów University of Technology and University of Rzeszów, • Regional authorities highly aware of the importance of cooperation networks in innovation development, • ongoing improvements in the structure of Regional Innovation Strategy implementation, 	<ul style="list-style-type: none"> • low percentage of people with higher education – ranking at No. 10 in the country – no increase trend in time, • large number of graduates leaving the Region and looking for work in other areas of Poland or abroad; this reduces the potential of highly qualified employees, which is relatively low in comparison with other areas of Poland, • migration of the most talented and highly skilled employees due to low pay rates in the region, • relatively low number of academic teachers per 10,000 population – No. 14 in Poland, • low number of technical universities; in this category the Region ranks at No. 11 in Poland, • the rates of lifelong learners lowest in Poland and the EU regions, • low level of entrepreneurs' satisfaction with services on offer from business support

<ul style="list-style-type: none"> regularly organized events of Podkarpackie Innovation Forum and meetings of Podkarpackie Innovation Council, varied structure of entities involved in the regional innovation system (e.g. public and non-public universities, regional development agencies, commercial chambers, technological and industrial parks, special economic zones, clusters, technology transfer centres, industrial research and development units, pre-incubators and incubators of entrepreneurship, loan funds and credit guarantee funds, entrepreneurs' organizations), ensuring comprehensive support. 	<p>institutions (a 2011 survey showed that every fifth respondent was not satisfied with their performance),</p> <ul style="list-style-type: none"> insufficient cooperation between business and educational sectors reflected by small number of joint projects focusing on innovation (partnerships operate mainly in the framework of clusters), insufficient capacity of regional and local governments to provide financing from their own resources for policies supporting innovation development, and the resulting dependence of EU funds, nationally the lowest involvement of senior academics (with the academic title of professor or habilitated doctor degree) in R&D entities, system of primary, middle and secondary schools insufficiently adjusted to train employees of knowledge based economy (problems encountered particularly by small education centres include overcrowded classes, poorly equipped facilities, and constant emphasis on reducing the costs of school operation), low efficiency of information exchange channels, educational plans and programs insufficiently adjusted to the needs of labour market; low level of teaching related to creativity and innovativeness; insufficient number and dynamics of partnerships and ventures carried out jointly by scientists and entrepreneurs, lack of well-defined advanced instruments of financing (start-up, spin-off, seed-capital, venture capital etc.).
Innovation-oriented operation of enterprises	
<ul style="list-style-type: none"> high percentage of enterprises which have applied for patenting their inventions in Poland – ranking at No. 1 among industrial companies, and at No. 4 among companies which have been granted patent rights, high R&D expenditures per capita, with a tendency for rapid growth – No. 2 in Poland, high internal R&D expenditures actually incurred - ranking at No. 5 in Poland, with a tendency for rapid growth, including high rate of investments - No. 6 in Poland, high innovation potential in industrial enterprises, measured as the number of companies which have incurred innovation-related expenditures out of the total 	<ul style="list-style-type: none"> low number of economic entities per 1,000 inhabitants – the lowest rate in the country, with a tendency for decrease, the high rate of innovation-oriented companies is not reflected by the number of patent applications filed in EPO – No. 11 in Poland, small number of solutions eligible for patent protection.

<p>number of businesses – No. 2 in Poland, and among service companies – No. 5 in Poland,</p> <ul style="list-style-type: none"> • high rate of innovation-related expenditures incurred by enterprises – No. 6 in Poland, • high percentage of innovative companies in relation to the total number of businesses - - 21% - No. 1 in Poland and No. 6 in the category of innovation-oriented service companies, • diversified structure of economy with a significant proportion of enterprises specializing in electro-mechanical engineering (including aerospace sector), chemical and mineral industry (in particular production of glass and ceramic insulators), food industry and agriculture (in particular organic), • existing enterprises with well-established position in the market stimulate growth of cooperation networks and technology transfer, • enterprises to a significant degree finance R&D operations from their own resources, • high total R&D expenditures in enterprises, in absolute values and per one employee, • significant proportion of innovative businesses (above the national average; No. 6 in Poland in 2008) introducing novel products and innovative processes, • entrepreneurs from Podkarpackie show interest in innovation-oriented operation, which is expressed e.g. by the results of “Innowator Podkarpacia” Competition, • high percentage of industrial enterprises conducting joint innovation projects in the framework of cluster initiatives, • the Region’s existing and newly established cluster initiatives increasing opportunities for technology transfer, including the well-developed cluster of the Aviation Valley, • Podkarpackie Cluster Forum designed to initiate networking and international development of the clusters and cluster initiatives from the Podkarpackie Region. 	
Results of innovation-oriented operations	
<ul style="list-style-type: none"> • significant proportion of income earned by industrial enterprises from sales of innovative products in relation to the total income – expressed by position No. 3 in the country, and No. 4 among service companies, • significant rate of export sales of innovative products in comparison with other regions – No. 2 in Poland, 	<ul style="list-style-type: none"> • low impact of innovation oriented operations carried out by enterprises on the overall condition of economy – the region ranks in the final position for GDP per capita, • low proportion of employment in R&D sector – No. 14 in Poland, • high unemployment, including structural – ranking among the highest in Poland,

<ul style="list-style-type: none"> high percentage of companies participating in innovative projects – No. 1 in Poland (industrial entities) and No. 6 among service companies. 	<ul style="list-style-type: none"> low incomes earned by the Region's residents – the lowest rate in Poland, with a tendency for decrease.
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Source: compiled by the authors.

Table 3 presents factors (trends, processes, phenomena, etc.) which constitute opportunities and threats for the socio-economic and innovation potential of the Podkarpackie Region.

Table 3. External determinants impacting socio-economic and innovation development of the Podkarpackie Region

OPPORTUNITIES	THREATS
Political and legal dimension	
<ul style="list-style-type: none"> chances for innovation development enabled by resources from EU 2014-2020, the next financial perspective, taking into account smart specialisation, cohesion of operations related to the implementation of the Regional Innovation Strategy, and with other national and regional strategic documents, increasing the role of the local governments to enable more effective identification of the region's needs. 	<ul style="list-style-type: none"> national policy promoting regions developing more rapidly; science and research policy favourable for a few largest centres in Poland, increased polarization between the regions of the European Union and Poland, and within the Region itself, lack of political stability in the country, leading to changes in innovation support policies and to decreased concentration of funding, political crisis in the European Union and change in its priorities, legal barriers causing uncertainty in the sector of renewable sources of energy, lack of motivation for enterprises to cooperate with R&D sector, administration and support institutions, decreasing aid funds as a result of EU cost reduction programmes pressure from WTO to introduce GMO into food production in Poland.
Economic dimension	
<ul style="list-style-type: none"> increased attractiveness of the Region for investors, possibly leading to new direct foreign investments and, consequently, improved access to know-how, dynamic growth of cluster-type links, development of global cooperation links in aerospace industry, increased interest in financing innovative solutions by entities other than those linked with the public sector, development of non-bank financial support 	<ul style="list-style-type: none"> poor capacity for absorption of EU subsidies for innovation due to low basic potential (lack of ideas, no resources for private contribution), excessive focus on short-term profitability rates and the resulting unwillingness to incur high expenditures linked with innovative operations with long period for return on investment, competition from other regions in tourism sector,

<p>in particular for innovative companies (venture capital, seed- capital, business angels, loan and loan-guarantee funds),</p> <ul style="list-style-type: none"> • increased interest of Polish and foreign tourists in the region, • increased attractiveness of the region as a place for allocating capital and investments, • increased importance of electric vehicles, • decrease in resources of fossil fuels and an increase in prices of energy carriers will foster development of energy-efficient construction and sustainable transport, • increased importance of knowledge, and HR qualifications rather than low labour costs in choosing location for investment. 	<ul style="list-style-type: none"> • increased competition (including innovative solutions) from developing countries, • influx of cheap imported food and fodder.
Social and cultural dimension	
<ul style="list-style-type: none"> • the public's changing attitude towards innovation and development of innovation culture, • increased demand (e.g. due to changing demographics) for ecological solutions, mainly in food production and processing, tourism, and construction sectors, • increased importance of knowledge and skills, • increased demand for innovations, • changes in climate and environment fostering development in technologies ensuring food safety and food quality, • increased demand for preventive health care and novel medical services linked with the aging of the society. 	<ul style="list-style-type: none"> • image of Eastern Poland as a peripheral region persisting in the consciousness of Polish people, • growing phenomenon of brain drain, • growing migration of well-educated human resources from the region, • lack of awareness related to environmental phenomena (hazards) requiring innovative solutions, • areas of long-term social exclusion in numerous sub-regions of the province.
Technical and technological dimension	
<ul style="list-style-type: none"> • increase in the importance of aerospace industry, • development of sustainable and specialized construction – EU policy: after 2020 approvals will be granted only for energy-efficient buildings, • increased importance of electronic means of communications resulting in decreased effects of the Region's peripheral location, • increased importance of IT sector, • higher demand for innovative solutions due to growing competition from other countries, • necessity to develop renewable energy technologies linked with the EU environmental policy (<i>EUROPE 2020 Strategy, 3x20 Programme, concept of bioeconomy</i>), • consumers' greater environmental awareness leading to a change in the model 	<ul style="list-style-type: none"> • growing costs of scientific research and commercialization put large global corporations at an advantage.

<p>of agriculture and food processing towards organic, regional and traditional products,</p> <ul style="list-style-type: none"> • a growing body of scientific evidence showing harmful effects of genetically modified food (GMO), as a trend fostering organic food production, • bioeconomy, and green growth in the EU; development of eco-innovation technologies in construction, power, automotive, food production, and many other sectors. 	
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Source: compiled by the authors

The in-depth analysis of internal and external determinants of the socio-economic and innovation potential of the Region is one of the starting points for defining strategic guidelines for innovation development in the Podkarpackie Region. This is one of the elements enabling accurate definition of smart specializations, vision and missions, as well as strategic goals for the Region.

2. Demand and supply related conditions for the development of innovation potential of the Podkarpackie Region⁵⁰ - analysis of the regional context and potential for innovation

“Ask not what your country can do for you, ask what you can do for your country.”

John F. Kennedy

By reference to the motto, we intend to define what we can and should do for the Region; what should be done to make sure that innovations (in particular eco-innovations) provide the foundations for the development of businesses and regions. Today competitors winning in the market are those entities which most effectively identify and implement solutions based on innovations and eco-innovations, in all areas of life, and indeed this phenomenon in the future will gain even more significance. Today it is possible to notice that customers to a greater extent look for new values linked with purchased products or with life in a specific environment. It is not enough to provide clients with basic products or ensure for them traditional living conditions, because such options are currently on offer from most enterprises and regions. We must go for innovative products and take innovative approach to local communities and the society, in accordance with the rule *“create extraordinary products, extraordinary living conditions for which clients are on the lookout”*; yet we should remember that each customer is different, and each local resident is different. Or as Steve Jobs said, let us not only provide customers with products, but let us make their dreams come true.

It is absolutely necessary to focus on the demand-related aspect of innovation due to the fact that according to research findings it is in fact customers and demand that are responsible for 75% of innovations. For customers value is connected with innovations which emphasize such aspects as: creativity, adaptation, intelligence, personalization, conviction, security, simplicity, connectivity, health, support, capacity and stability.

The supply-demand aspect should take into account interconnected spheres, in which demand impacts supply, while supply is a response to the needs reflected by the demand, mainly in compliance with priorities defined for the development of the Podkarpackie Region. Indeed, support

⁵⁰ Based on: *Operational Programme Regional Innovation Strategy of the Podkarpackie Region, 2005-2013: Year 2013*, Rzeszów, December 2012; *Innovativeness Assessment of the Podkarpackie Region in comparison with other regions of Poland and the European Union*, 2010 Report; *A study of innovative capacity of the Podkarpackie Region*, M. Janiec, A. Lewandowska, Rzeszów 2010; *Innovation-oriented operations in enterprises in 2009-2011*, Central Statistical Office, Statistical Office in Szczecin, Warszawa 2012; *Innovative capacity of economic operations in the regions of Eastern Poland – assessment, impact, and prospects*, Poznań University of Economics, W. M. Gaczek, M. Matusiak, Poznań, November 2011; *Innovation 2010*, Report prepared under the supervision of A. Wilmańska, PARP, Warszawa 2010; *Why should we use demand-based approach to design innovations?*, PARP, Warszawa 2012; *Innovation Scoreboard 2010*: <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/11/114&format=HTML&aged=0&language=PL&guiLanguage=en>; *Innovation Scoreboard 2010*: http://ec.europa.eu/enterprise/policies/innovation/facts-figures-analysis/innovation-scoreboard/index_en.htm

for innovation (eco-innovation) provided by RIS3 is based on this interconnectedness.

Supply-demand related to giving shape to innovation potential is created predominantly by entities of research and development sector, mainly business enterprises and educational sector (universities) as well as the quality of the human capital.

In 2009-2011 in the Podkarpackie Region innovation-oriented operations were carried out by 22.2% of its enterprises, as a result the Region in this category ranked at No. 1 in Poland. The situation is similar in the sector of industrial enterprises which admit they focus on innovations (21%). The situation is worse in the sector of services where 11.4% businesses report having developed or implemented some innovations; in this category the Region ranks at No. 6 in Poland. This analysis allows a simple conclusion – enterprises are well aware of the importance of innovations for their own growth and for improved competitiveness of their products.

In 2011 innovation expenditures were reported by 16.6% of the industrial enterprises from the Podkarpackie Region and 10% of the companies operating in service sector, placing the Region at No. 2 and 5 respectively among all the Polish regions. 34.8% of the industrial enterprises and 44.2% of the companies operating in service sector, which carried out innovation-oriented activity, acquired support from public funds for research related to innovation. In this category the Podkarpackie Region ranked at No. 1 in Poland.

The size of R&D expenditures significantly impacts innovation oriented processes in companies and, indirectly, contributes to the public's quality of life. In 2011 the total of 542.2 million PLN was spent for research and development in the Podkarpackie Region, and the rate per capita amounted to 254.80 PLN. The largest financial support for businesses undertaking innovation oriented activity was provided by the European Union funds.

With the amounts of 1,174.3 million PLN and 193.8 million PLN designated for innovation operations in industrial and service sectors respectively, the Podkarpackie Region ranked at No. 8 and at No. 6 in these categories.

With the expenditures designated by enterprises for research and development in 2007 and 2009 the Region ranked at No. 3 in Poland, with the relevant rates significantly exceeding the national average.

The rate of R&D expenditures in business sector in 2011 placed the Podkarpackie Region at No. 143 among all the regions of the European Union.

In 2009-2011 organizational innovations were implemented in the Podkarpackie Region by 9.5% of the industrial enterprises (No. 5 in Poland) and only 4.6% of the businesses in service sector (No. 12 in Poland). Marketing innovations were introduced by 9.5% of the industrial enterprises (No. 4 in Poland) and 7.8% of the businesses in service sector (No. 6 in Poland).

Income from sales of new or significantly enhanced products constituted 10.5% of the total income in the industrial enterprises (No. 3 in Poland) and 4.1% of the income of the businesses in service sector (No. 4).

As a result of innovation expenditures connected with operations aimed at enhancement of

products and processes, the Podkarpackie Region in the category of the industrial enterprises ranked at No. 7 and in the category of service businesses at No. 6 in the country.

An analysis of internal expenditures related to research and development shows that in 2011 such expenditures increased by 12.2%, in comparison with 2010, and amounted to 11,686.7 million PLN. They constituted 0.77% of GDP and the rate increased by 0.20% in relation to 2007, when the relevant rate amounted to 0.57%. Importantly, we can notice that enterprises tend to provide significantly more financing for research and development processes from their own resources. In 2011 enterprises covered 28.1% of such expenditures, and the rate increased by 3.7% in comparison with 2010. The relevant rate per one resident of the Podkarpackie Region amounts to 254.8 PLN, the 5th highest in Poland. Importantly, in the Podkarpackie Region enterprises had proportionally the largest share in financing such expenditures (52.7%). The rate is almost twice as high as the national average. The Region holds the top position in the national ranking of internal R&D expenditures per one person employed in this sector, with the amount of 190.2 thousand PLN, while the national average totals at 137.1 thousand PLN.

The particularly notable fact is that in the period from 2005 to 2010 the Podkarpackie Region reported extremely high increase in internal R&D expenditures (by 355%, No. 2 in Poland). The number of people employed in research and development operations is an important factor reflecting the nature of the innovation process⁵¹. In 2010 there were 6,044 people employed full-time in R&D sector in the Podkarpackie Region which was nearly twice as many as in 2005. In the Podkarpackie Region the rate of those employed in R&D per 100 working people amounts to 0.77, which is No. 6 in the relevant ranking of all the Polish regions. Research and development operations, in addition to financial resources, require adequate facilities and fixed assets. These are the foundations for building long-term potential for innovation. Suitably prepared R&D facilities and infrastructures attract investors and entrepreneurs and motivate scientists to conduct research works at such locations. In the Podkarpackie Region there has been a rapid increase in investment expenditures which constitute 45% of the total internal expenditures actually incurred in connection with R&D; in the relevant category this is the third highest rate in Poland. Importantly, the percentage of students among the residents is particularly high in Rzeszów - the Region's capital; in fact the highest not only in Poland but also in Europe (2012).

In 2011 the following percentages of companies operating in the Podkarpackie Region applied for proprietary rights: 3.2% - trademarks, 1.2% - industrial designs, 0.7% - utility designs, 2.1% - inventions. 1.4% of them obtained patent rights in the Patent Office of the Republic of Poland.

In the Podkarpackie Region those with completed higher education account for 21.3% of the population in the age group of 25-64; this rate places the Region at No. 10 in Poland. Significantly more people in the same age group have secondary education, accounting for 68.0% of the population. With this rate the Region ranks at No. 5 in Poland.

In the academic year 2011/2012 in the Podkarpackie Region there were 16 schools of higher education (including one school of technology) with the main headquarters in the Region as well as 16 organizational units maintained by universities from other regions. They were attended by the total of 67,272 students (including 38,478 females)⁵². The number of university

⁵¹ *Research and development operations in Poland in 2011*, GUS, Statistical Office in Szczecin, Szczecin 2012, p.3.

⁵² *Universities and their finances in 2011. Information and statistical analyses*, GUS, Warszawa 2012, p. 118.

students in the Podkarpackie Region per 10,000 inhabitants decreased from 374 in 2005 to 333 in 2011 as a result of which the Region ranks at the distant No. 13 in Poland.

During 2005-2011 the number of individuals enrolled for doctoral courses in the Podkarpackie Region increased by 333%, the highest increase in the country. In 2005 post-graduate courses were attended by 91 students, and in 2011 by 394. A disturbing fact, however, is that in 2011 there were only 61 students attending doctoral courses at technical universities. In this category the Region ranks as the distant No. 14. Data of the Central Statistical Office (GUS) for 2011 show that only 17 students per 1,000 population are studying medical or engineering and technical specializations; with this rate the Region ranks at No. 10 in Poland.

In 2010 the largest number of students attended university courses in humanities (67%), while those studying sciences and technical courses accounted to 27%.

In the period from 2005 to 2011 in the Region there was a decrease in the number of academic teachers, from 3,379 to 3,264; there was however an increase in the number of professors, senior lecturers, associate professors with a simultaneous significant decrease in the number of teaching assistants. In 2011 there were 15 academic teachers per 10,000 population (No. 14 in Poland).

Eurostat data for 2010 related to life-long learning show that the Podkarpackie Region ranked at the bottom of the list, not only in Poland but also among all 240 regions of the EU. Lifelong learners in the age group of 25-64 in 2010 accounted for only 3.4% of the Region's population. This low figure may suggest the local population's difficulty with effective adaptation to the changing environment. This is a significant problem, particularly in the context of the aging society; the present socio-economic situation is connected with the growing need for flexible approach to one's occupation. Moreover, lifelong learning is of critical importance for the development of innovative economy. It is only those with the most up-to-date knowledge who can introduce innovative products and services into the market.

Of particular importance for innovation development is innovation culture which should find its permanent place among the Region's residents; this can be achieved by:

1. Developing creative thinking in students of secondary schools (or even middle schools); identifying and providing support (e.g. financial) for talented teenagers showing innovativeness. It is also necessary to overcome stereotypical opinions, common among teachers of other subjects, who believe that Introduction to Business is "definitely less important than other subject". Inspiring fascination with technology and promoting interest in sciences - for that purpose it is necessary to build an educational centre similar to Copernicus Science Centre in Warsaw.
2. Regularly conducted monitoring of R&D sector and presenting positive practices to the local population to build the Region's image.
3. Emphasizing the importance of culture as a driver of social cohesion, as well as local identity, tradition and the specific quality which today is "the spirit" of the Region. Innovation culture is the ultimate determinant of innovation and the main creative factor in the society.

4. Advancing innovation culture in enterprises, because once such approach has been well established among employees it may be the starting point for transferring it to the whole society. This may be achieved by: meeting the basic needs of employees (physical, emotional, mental, and spiritual), teaching creativity, supporting passion (appointing people for roles which stimulate their imagination), assignment of meaningful tasks, and giving employees enough time for creative thinking.

The Council of the European Union in its declaration from May 2009 emphasizes that culture is a key to growth. Culture and creativity are inseparably interconnected. On the one hand creativity is a source of culture and on the other culture constitutes the environment enabling development of creativity. Creativity is a process which provides insight to the existing challenges and enables search for new opportunities; as a consequence creativity advances the knowledge and sets direction for it. Creativity is a foundation of innovativeness interpreted as well-designed utilization of new ideas, introduction of new products and new ways of doing business to fully match the needs of the society. The European Union emphasizes that creativity is based on culture (*culture-based creativity*).

Important aspects of the supply-demand determinants of the development of innovation potential in the Podkarpackie Region include outlays designated for research and development operations as well as financial resources of enterprises and the society.

On average, monthly income per capita in the Podkarpackie Region amounts to 907.28 PLN, and mean expenditures per capita total at 821.20 PLN. These rates suggest that the Podkarpackie Region is to a large extent at risk of poverty. In accordance with the rates defining relative poverty thresholds approx. 25% households, due to material reasons, do not create demand for innovative products and services. This is directly linked with the unemployment rate which during 2005-2010 in the Podkarpackie Region oscillated around 15%.

The socio-economic situation of the Podkarpackie Region is greatly varied. The generally poor economic conditions faced by the local population occur simultaneously with the surprisingly high awareness of the importance of creativity and innovativeness for development. This is an important foundation for innovation and an extremely significant element of endogenous potential. Attempting a brief synthesis it is possible to suggest a conclusion, simplified obviously, that in those spheres where the economic rates and innovation related rates are determined by the national policies the results achieved in the region are very low, ranking among the lowest in Poland and Europe; on the other hand in areas in which the rates are impacted by the regional policies and the enterprising attitude and innovative approach of the society (including obviously the entrepreneurs) the Region ranks among those with the greatest achievements, and in fact in some areas it is an absolute leader.

3. Smart specialization of the Podkarpackie Region – selection of a limited number of priorities for regional development

Smart specializations of a region result from a choice, mainly based on the region's assets and endogenous resources, including current and future scientific research and business operations.

Regional innovation strategies, in accordance with the guidelines of numerous documents of the European Union should particularly emphasize the development of research and innovation; this means well-designed and effective support from universities as well as research and development centres is of essential importance.

In accordance with the policy of the European Commission, the investment priorities include: scientific research and innovation; digital development; competitiveness of small and medium enterprises; rural development.

Region's smart specializations should also have an outward dimension, because in the case of innovation strategy for smart specialization analysis focusing exclusively on the inner factors may be insufficient. One of the key issues is the necessity to take strategic decisions by taking into account the region's position within Europe. In other words, a region should identify its competitive advantages through comparison with other regions, looking for examples and performing effective benchmarking. This approach is particularly important in the case of less developed regions that may need to source know-how and technology from outside. Yet, this must not be blind duplication of solutions used by others because in such a case the region would not have the capacity to become a competitive leader in any area, or it would remain a more or less effective imitator and that would mean a lack of capacity to define its own smart specializations⁵³

Important candidates for smart specialization may in fact be identified in areas of experimentation, i.e. areas in which the region can realistically succeed even though earlier they were not treated as priorities⁵⁴. An important factor is also the endogenous research potential and the ability to create advanced innovations (eco-innovations).

In the Podkarpackie Region there are high-opportunity sectors which, after the required conditions are met, may in the future be recognized as subsequent smart specializations of the region. The potential specializations include automotive, chemical, mineral and metallurgical industries.

It is essentially recognized that a region has a competitive advantage in a certain field if there is above-average concentration of related indicators in comparison to the value observed in the country or a group of countries.⁵⁵ In the Podkarpackie Region an example of this, emphasized previously, is the aerospace industry and all the sectors linked with it (electro-mechanical engineering, metal casting and composite materials production).

The present Strategy defines and justifies the choice of two main smart specializations and one ancillary smart specialization.

⁵³ Foray D., Goddard J., Beldarrain X. G., Landabaso M., McCann P., Morgan K., Nauwelaers C., Ortega-Argilés R., *Guide to Research and Innovation Strategies ...*, op.cit, p.19.

⁵⁴ *Ibid.*, p. 22.

⁵⁵ *Ibid.*, p. 29.

Main smart specialization – Aeronautics and Space Technology

Polish aerospace industry today is based on over 120 companies, employing the total of 25,000 people, and its total sales in 2013 will reach the value of 2 billion USD. Approximately 90% of this potential is concentrated in the Aviation Valley cluster with the headquarters in Rzeszów. Aviation Valley ranks among the fastest growing aerospace clusters worldwide. The growth relates to its manufacturing potential, implementation of the most advanced technologies and construction of new research and development centres and design studios. During the last 10 years investments linked with the development of Aviation Valley enterprises exceeded the amount of 1.5 billion USD. These indicators and operations justify the conclusion that this is the main smart specialization of the Podkarpackie Region - **Aeronautics and Space Technology**.

Aviation Valley companies are rightful members of the global supply chain. Aero products from Podkarpackie are installed in the most advanced passenger planes manufactured by Boeing and Airbus, as well as Canadian Bombardier, Japanese Mitsubishi or Brazilian Embraer. They are also used in military aircrafts, namely in the most advanced F-35 fighter jet produced by the American company Lockheed Martin. Aerospace industry from Podkarpackie delivers aircrafts, helicopters, aircraft engines, auxiliary power units (APU), landing gear, aircraft gearboxes, turbine modules, and hundreds of other complex components and units, all of these manufactured with the use of advanced technologies and materials such as monocrystals and composite materials, which in the executed foresight study have been recognized as priority technologies in the development of the sector and Region.

The industry obtains support from the very well adjusted local system of education and universities. Significant part in this is played by the Research and Development Laboratory for Aerospace Materials (LabMatPL), one of the most advanced facilities of this type in Europe, built at the Rzeszów University of Technology. During the next 5 years aerospace industry of the Podkarpackie Region will create over 4,000 new jobs in highly specialized positions. We can also expect that the area will attract new investments and new investors. Aerospace industry is not only a driving force for new technologies and innovations but it also closely cooperates with other industries in the region, such as IT and metal casting, as well as broadly understood electro-mechanical engineering. These sectors and their related key enabling technologies are also closely linked with aerospace industry and therefore they also deserve to be supported.

By reference and comparison to other regions today we can say, and this in fact will not be a great exaggeration, that the Podkarpackie Region is like "*Polish Toulouse*" (Aerospace Valley cluster) or "*Polish Montreal*" (Aero Montreal cluster). By strengthening this smart specialization of the Podkarpackie Region it will be possible to progress towards these global models even more actively.

A definition of aerospace industry limited to the immediate operations connected with the production of aircrafts, their equipment or components would be an excessive simplification. This is a sector of very high technologies, and innovations generated by the sector greatly contribute to progress in other areas of life. In Poland the contribution of aerospace industry to creating added value is not high, during 1996-2007 it oscillated around the value of 0.1%; in relation to industrial

operations it is higher, ranging from 0.4 to 0.56%⁵⁶. In this context impressive results are only achieved by the Podkarpackie Region which has explicitly specialized towards the development of aerospace industry.

Aircraft industry ranks among the most innovation-oriented sectors not only in Poland but also worldwide. The performed analyses, foresight projects, etc. show excellent opportunities for growth and development in this sector. It significantly contributes to advancements in the trends of manufacturing various means of transport, and to enhancing the quality of life. Importantly, the current financial crisis generally did not affect this sector; indeed in comparison with 2011 its revenues in 2012 increased by 5.9%, and in the case of civil aviation sector the increase was even greater, reaching the level of 16.2%⁵⁷.

Aircraft industry is closely linked with the space industry, not only in connection with the essential operations carried out by this sector, but also in the fact that space technologies are also applied in practically every area of life – an obvious example is the use of satellite navigation systems. The fact that Poland has become a member of the European Space Agency opens new opportunities for the Podkarpackie Region regarding the development of this industry.

The choice of aerospace industry as the smart specialization for the Podkarpackie is also justified by the clearly defined science and research as well as educational potential of the Region. Ranking among the leaders in this field, Rzeszów University of Technology includes the Faculty of Mechanical Engineering and Aeronautics, and one of its educational specializations is pilotage. The Podkarpackie Region is home to the globally known cluster – *Association of Aerospace Industry Enterprises „Aviation Valley”*. Polish research related to aircraft industry is supervised by the *Centre for the Advanced Technologies AERONET – Aviation Valley*, which associates eleven scientific research institutions, over 100 companies operating in aerospace industry, and its offices are located at Rzeszów University of Technology. The University also has the most advanced Research and Development Laboratory for Aerospace Materials and WSK „PZL-Rzeszów” S.A. is building its own comprehensive research centre. Notably, all the aforementioned organizations closely cooperate in the area of scientific research and education and this factor is frequently emphasized in the whole country.

The future development trends as well as vision for aviation were defined in a document requested by the European Commission by a specially selected group of eminent representatives of European aircraft industry⁵⁸. The document drawn up by this group of experts specifies goals for the period up to 2050, divided into five categories:

1. social and market needs;
2. maintaining leadership of European aircraft industry in the world;

⁵⁶ I. Świczewska, *Ocena pozycji przemysłu lotniczego w Polsce na tle międzynarodowym – ujęcie makroekonomiczne [Assessment of the position of aerospace industry in Poland in the international context – macroeconomic approach]*, [in:] *Raport o innowacyjności sektora lotniczego w Polsce w 2010 roku [Report on innovativeness of the Polish aerospace sector in 2010]*, scientific editor: T. Baczko, Instytut Nauk Ekonomicznych Polskiej Akademii Nauk, Wyd. Key Text, Warszawa 2011, p. 19-20.

⁵⁷ *Global Aerospace & Defense Industry Financial Performance Study*, June 2013, Deloitte Development LLC, pp. 1-44.

⁵⁸ M. Darecki, Ch. Edelstenne, T. Enders, E. Fernandez, P. Hartman, J.-P. Herteman, M. Kerloh, I. King, P. Ky, M. Mathieu, G. Orsi, G. Schotman, C. Smith, J.D. Wörner, *Flightpath 2050, Europe's Vision for Aviation*, European Union, Luxembourg 2011, pp. 1-24.

3. solutions related to the environment and power supply;
4. security and protection of air traffic;
5. research, innovation, priorities and opportunities for research and education.

As a result of the developments in aircraft industry the Podkarpackie Region has reached the globally recognized standards for the development of high technologies. Hence, the choice of this smart specialization is justified by economy, ecology and society related factors. Development of aerospace industry will provide interesting employment opportunities for graduates of Podkarpackie universities; even today it is possible to notice that the sector attracts talented individuals from all over the country and from abroad.

Main smart specialization – Quality of Life

The other main smart specialization of the Podkarpackie Region is defined as the sphere of the **quality of life**. In this Strategy the term comprises four large areas:

1. production and processing of food with top biological and nutritional quality; organic and sustainable agriculture and processing; regional and traditional food products;
2. sustainable and responsible tourism; health and well-being (clinics, sanatorium health centres, nursing homes, recreation and leisure centres, spa centres, nutrition-based treatment centres);
3. eco-technologies: renewable sources of energy (distributed generation, smart grids, wind turbines, water turbines, solar thermal collectors, solar panels, biomass boilers, geothermal energy, etc.);
4. energy-efficient and smart construction (passive, zero-energy and plus-energy houses, etc.).

Definition of the main smart specialization of the Podkarpackie Region, quality of life – a synthesis:

The main smart specialization, quality of life, for the Podkarpackie Region relates to a number of areas of activity and concepts which are interrelated, and aim at creating a new sustainable model of functioning for the society and the ecosystem, comprising mobility – multimodal transport, climate and energy, food of top biological and nutritional quality, energy-efficient construction, sustainable tourism, information and communication technologies (ICT). This is not a specific sector but a set of complex solutions designed to enable compliance with the EU requirements and to guarantee smart development for the entire Region, in accordance with the new economic and social paradigm of the European Union.

Defined in this way, the main smart specialization ‘quality of life’ also determines directions for research and innovations. Additionally, it shows close link with majority of the key enabling technologies endorsed by the European Union (they are of horizontal nature and have large potential for inducing transformation); key enabling technologies of particular importance for the Podkarpackie Region are related to various areas of photonics (renewable energy, including the revolutionary applications based on perovskites); advanced materials and technologies applied to

obtain them, including monocrystals and composite materials; advanced manufacturing systems; semiconductors; biotechnologies based on findings of biomimetics and bionics. Support for this type of research and projects results in new opportunities for development in practically every sector and industry, and generally growth of the entire society and economy.

- The purpose of strengthening the constituents of the specialization **quality of life**, defined this way for the Podkarpackie Region, is to build eco-innovation oriented Region, to create the foundations for smart, sustainable and inclusive development.
- Only these constituents of **quality of life**, defined this way for the Podkarpackie Region, can be supported with the EU funding from ERDF in the financial framework 2014-2020.
- **Quality of life** should not be equated with the concept of sector. This is a smart specialization comprising the above areas and solutions.
- Applications for subsidies from the EU funds should carefully specify and prove that the proposed solution related to this specialization explicitly matches the definition of **quality of life** adopted by the Podkarpackie Region, or pertains to the aforementioned key enabling technologies.

The Region's excellent potential of the quality of life sector is linked with its beautiful and unpolluted environment as well as the rapidly improving road infrastructure.

Guide to Research and Innovation Strategies for Smart Specializations (RIS3) explicitly specifies that in choosing smart specializations it is necessary to give up the previously typical sector-oriented approach.

Quality of life is a very broad concept. The choice of this smart specialization is fully justified by the endogenous resources of the Region, and it excellently matches the future vision of the Region as a place with the top quality of life. While the smart specialization 'aeronautics and space technologies' relates to and will provide support mainly for a few largest cities of the Podkarpackie, the specialization 'quality of life' is designed to foster smart growth of the entire Region, in particular its rural areas and small towns.

The choice of a smart specialization relating to such broad sphere as the quality of life is fully consistent with the logics of the new paradigm of green growth and bioeconomy, adopted in the European Union. It embraces a number of industries and sectors (including technologies, processes, products and services) which, in accordance with the European objectives related to the growth of the society and economy, aim at improving the quality of life of all the inhabitants (including those in rural areas and small towns, as mentioned before) rather than focus on representatives of one specific sector or consumers of its products. Smart specialization described as the area of the quality of life is to provide support for all the sectors which are characterized by well-defined eco-innovation oriented approach leading to green growth, also consistent with the idea of bioeconomy. This type of support, of very broad, horizontal and functional nature, makes it possible to avoid a problem potentially resulting from instability or crisis in a specific supported sector of economy. It is consistent with the policy of the European Commission which encourages regions to give up both sector-oriented choices and the strategy of supporting former winners. Winnings should be earned by everyone rather than by only a few enterprises representing a specific sector. Such approach to innovation focuses on people, therefore many innovations of this type fully match the definition of

social innovation and the EU priority of inclusive growth.

Quality of life is a result of numerous factors, those of vital importance include: health, satisfying employment opportunities, unpolluted natural environment and its aesthetic quality, etc. It also includes operations aimed at maintaining appropriate mental and physical condition of individuals and the society.

The Podkarpackie Region is known for its unpolluted and beautiful natural environment. Forests cover over 36% of its total area, nearly half of the Region is included in conservation areas. These include the Bieszczady National Park, a fragment of the Magura National Park, a number of landscape reserves such as Ciśniańsko-Wetliński Landscape Park and the San Valley Landscape Park which along with the Bieszczady National Park are comprised within the Eastern Carpathians International Biosphere Reserve established by UNESCO in 1992. Such factors as the well-preserved natural environment, including farming environment, unpolluted soils, and large potential for agricultural biodiversity determine the trends in the development of agricultural production and food processing towards organic farming and production of regional and traditional food products. These factors point to the health-promoting aspect of the specialization 'quality of life'; they enable production of food with top biological and nutritional quality not only for inhabitants of the region but also with enhanced export potential. In this area, in accordance with the concept of initiating trans-regional cooperation it would be possible to team up with the Lubelskie Region. Importantly, focus on these elements related to the quality of life would make it possible to create opportunities for long-term employment, even in small farming estates, contributing to the fulfilment of the EU requirement defined as inclusive growth. In the Podkarpackie Region the number of ecological farms and food processing plants is growing consistently. This trend started much earlier, yet it contains a much greater potential in terms of both economic and social development.

A significant element of the sphere defined as quality of life is the development of tourism. It is recognized the Podkarpackie Region has a large potential of this type. The major factors contributing to its attractiveness, in addition to the aforementioned protected areas, include the four health resorts located here: Horyniec Zdrój, Iwonicz Zdrój, Polańczyk, and Rymanów Zdrój. Tourists may also be motivated to visit the area by the large cultural potential of the Region. The register of the National Heritage Board lists over 3,800 historical monuments protected by law, and thousands of historical artefacts, works of art and craft. The attractions well-known in Poland and abroad include the Open Air Museum in Bóbrka near Krosno, location of the oldest oil wells, as well as Glass Heritage Centre in Krosno⁵⁹.

Quality of life also depends on the aesthetic and other features of the place of residence, preferably linked with economic aspects. Because of this the elements defining quality of life include support for adequate type of construction (passive, zero-energy and plus-energy housing), particularly related to energy supply. **Support for this type of operations directly translates into improved living standards; it also enables financial and organizational aid for many vital sectors, such as power supply related to renewable energy sources; production of top quality, A-category home appliances; sector of construction materials based on eco-innovations; comprehensive support for environment conservation sector.**

⁵⁹ *Tourism in the Podkarpackie Region in 2010-2011*, Statistical Office in Rzeszów, Rzeszów 2012, p. 21.

Improved quality of life will also be enabled by land restoration, including ecological restoration of waterways, of vital importance from the viewpoint of the Region's water resources, and the most effective method of preventing floods.

The choice of quality of life as a smart specialization was favourably assessed and described in Deloitte report "*What is the secret of innovation leaders?*"⁶⁰. According to the Report, consecutive steps in the development of a new cluster focusing on the quality of life are well-designed and planned; this would be based on broad cooperation between various groups and adequate diagnosis of the region's situation. The expected results, pointed out by Deloitte's experts, include a success similar to that achieved by the Aviation Valley; dynamic growth of the region; improved standard of life for the inhabitants; reduced differences in the development of the specific districts of the Region. Other aspects which were emphasized include the long term cooperation of the Aviation Valley members (the regional authorities, enterprises, research centres), and the advantages based on the cooperation model and experiences of the Aviation Valley for the operations focusing on improvements in the quality of life. The Report also emphasizes the fact that the authors of this Strategy have conducted in-depth assessment of the region and its potential, and the operational model has been based on three-year research⁶¹.

The characteristics of the objectives and goals of the smart specialization 'quality of life' as well as the comparison with other European regions have inspired the authors of the Strategy to use the term "Polish Bavaria" with reference to the Podkarpackie Region. Defining highly ambitious goals is a method of and road to achieving excellence.

Ancillary smart specialization – Information and Telecommunications

ICT sector has been specified as a horizontal area of significant importance for each specialization and sphere of life in the Region. This choice is justified by the explicitly defined needs of the society and economy related to the digital development. It is also justified by the European Union policy. Additionally, it is linked with stimulating the demand for affordable, good quality interoperable services. Development of broadband Internet is of particular importance.

The Podkarpackie ranks among regions with excellent resources and potential for scientific research in information and telecommunications technologies. Employees and students of universities in Rzeszów are successful in specialist competitions worldwide. It should be emphasized that the region is home to the largest Polish IT company which has already achieved a status of a large international corporation.

In 2011 Asseco Poland S.A. celebrated its 20th anniversary; during this time it has become the largest IT company in Poland with operations in most countries of the European Union and other areas of the world. It creates employment opportunities in all of its locations, yet it should be emphasized - it is registered in Rzeszów.

⁶⁰ Deloitte, *What is the secret of innovation leaders? Benchmarking analysis of innovative capacity of Polish regions – Audit report*, Warszawa, 23.09.2013, p. 23.

⁶¹ Ibid., p. 23

Moreover the Podkarpackie Region is a national leader in terms of the number of patent applications filed by entities operating in telecommunications sector⁶².

Defining information and telecommunications as an ancillary smart specialization is of great importance for each sphere of social and economic development of the Region. This will make it possible to provide support for high technology sectors, in compliance with the European Union policy, such as development of broadband Internet, ICT technologies and products as well as varied categories of e-services which are based on innovations related to ICT, but also contribute to improvements in the quality of life in accordance with its contemporary definitions.

In summary, it should be emphasized that the two main smart specializations are interrelated and mutually strengthen each other's effects. Rapidly growing aerospace industry will enable development of the middle class and will bring a growing number of business visitors, and consequently potential clients for tourism sector. Yet, this industry is located only in some of the largest cities of the Region. Therefore, taking into account the actual potential of the Region as well as identified research and development opportunities, in order to improve territorial cohesion and enhance the development of smaller towns and rural areas, the other smart specialization was defined at the area of the quality of life. Operations linked with the sphere of the quality of life will result in creating excellent conditions for leisure for the hard working employees of industry. They will also provide organic, regional and traditional food products of top quality, both for the population of the Region and for export. Aerospace technologies and the engineering know-how will find their way to eco-technologies. Companies associated within other clusters, focusing on such areas as IT or renewable technologies, will closely cooperate e.g. with tourism centres or health care clinics.

The two main smart specializations and the ancillary smart specialization are strongly justified by the Region's scientific and research potential. Aeronautics and Space Technologies are a leading course of education and field of research at Rzeszów University of Technology. Similarly, research works focusing on renewable energy, energy-efficient and smart construction as well as on ICT conducted at that University have significant potential. Research carried out at Rzeszów University of Technology and University of Rzeszów provides scientific foundations for production and processing of organic food, tourism, as well as health care. Yet the research potential should be strengthened by building or modernizing research infrastructures.

Designed this way, the Strategy for two main smart specializations and one ancillary smart specialization is consistent with development guidelines adopted by the European Union. The EU recognizes particular importance of three priorities: smart development, sustainable development and inclusive development. Aerospace sector is obviously an innovation-oriented and smart industry. By developing new, low carbon technologies it seeks to reduce the environmental impact of air traffic, thereby contributing to sustainable development. Today this is also a clean industry, which does not cause degradation of local natural environment.

⁶² T. Sierotowicz, R. Wiśła, *Identyfikacja trendów technologicznych w obszarze ICT z wykorzystaniem statystyki patentowej [Identification of ICT related technological trends with the use of patent related statistics]*, Kraków 2012, p. 13.

The area of the quality of life by its nature promotes ecology (it incorporates the concept of bioeconomy), hence it contributes to sustainable development; by its diffusion throughout the region, and possible location in villages and small towns it will enable reduction of social exclusion and will activate local communities. As a result of its ecology-based approach it will foster development of economically backward areas, yet ensuring respect for the natural environment, local culture and tradition. It may also produce remarkable ecological solutions, possibly of marketable value.

The area of information and telecommunications will not only support developments in the main smart specializations but will also play a significant role in all aspects of the Region's growth.

Hence, the future of the Podkarpackie is contained in the clearly defined vision of the Region as a place with beautiful natural environment, unpolluted and well-tended, which is home to cutting-edge innovative technologies and solutions of aerospace industry, and electro-mechanical engineering sector (high technology sectors), as well as production of ecological, regional and traditional food, sustainable tourism, biological regeneration and health, renewable energy, and advanced energy-efficient construction. The full use of these assets and opportunities will be supported by the development of information technologies, in particular broadband Internet. This is a Region motivating its inhabitants from large industrial centres as well as those living in remote villages and towns. This is a Region of sustainable permanent development, and green growth.

Hence, this approach to smart specialization does not exclude anyone from the model of development envisaged by the Strategy. It matches the current conditions, and most of all is consistent with the logically justifiable vision of development stipulated for the Podkarpackie Region which fully reflects development priorities adopted by the European Union.

Clusters are an important part of a smart specialization. By their nature they have the capacity to foster and support cooperation between economic entities and other organization, including those operating in research sector; they are an instrument enabling competitiveness of industry, innovation and growth of the region. At the stage of strategy implementation clusters should provide effective platform for achieving the goals of the smart specialization⁶³.

A very important part of each smart specialization, schools of higher education play a significant role in the process of generating knowledge and applying it in creating innovative products and services, in cooperation with other research centres (R&D&I) and enterprises⁶⁴.

„It is of crucial importance that RIS3 governance bodies focus on a limited number of innovation and research priorities in line with the potential for smart specialisation detected in the analysis phase that is anchored in entrepreneurial discoveries. These priorities will be the areas where

⁶³ Foray D., Goddard J., Beldarrain X. G., Landabaso M., McCann P., Morgan K., Nauwelaers C., Ortega-Argilés R., *Przewodnik Strategii Badań i Innowacji ...*, op. cit., p. 71.

⁶⁴ *Ibid.*, p. 82

*a region can realistically hope to excel*⁶⁵. The choices are consistent with *EUROPE 2020 Strategy*.

Table 4 presents smart specializations, support areas and priority operations and technologies.

⁶⁵ Ibid., p. 24

Table 4 Model of *Regional Innovation Strategy of the Podkarpackie Voivodeship for 2014-2020* for smart specialization (RIS3)

Priority				
Smart, sustainable and inclusive development				
Smart specialization:				
1. AERONAUTICS AND SPACE TECHNOLOGIES main specialization		2. QUALITY OF LIFE main specialization		
3. INFORMATION AND TELECOMMUNICATIONS (ICT) ancillary specialization				
Smart specialization oriented areas of operation (activity) requiring smart support:				
MOBILITY	CLIMATE AND ENERGY	SUSTAINABLE TOURISM	HEALTH, FOOD, NUTRITION	COMMUNICATION
Enabling instruments of horizontal and functional importance for the development of smart specializations, requiring support:				
<ul style="list-style-type: none"> • Key enabling technologies • Education, science, research infrastructure, higher education, innovation and research potential of universities <ul style="list-style-type: none"> • Clusters • Internationalization, regional and trans-regional cooperation <ul style="list-style-type: none"> • Social innovations and eco-innovations • New models of development financing 				

Priority operations and technologies for the support areas:

<p>Technologies and products of aerospace industry</p> <p>Multimodal, sustainable transport</p>	<p>Sources of renewable energy and related technologies</p> <p>Smart grids</p> <p>Smart and sustainable construction (buildings, residential areas, towns)</p> <p>Biodegradable plastics</p> <p>Electro-mechanical industry</p>	<p>Educational tourism</p> <p>Leisure tourism</p> <p>ecotourism</p> <p>agritourism</p> <p>Qualified tourism</p> <p>Health tourism</p> <p>Business tourism</p> <p>Religious tourism</p> <p>Culinary tourism</p> <p>Enotourism</p>	<p>Organic, regional and traditional food</p> <p>Healthy highly-nutritious GMO-free diet</p> <p>Preventive medicine</p> <p>Care for the elderly</p>	<p>Broadband Internet</p>
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Paradigm, objectives common for the development and economy model and supported trends:

GREEN GROWTH, ECOINNOVATIONS, BIOECONOMY

Source: compiled by the authors.

4. Strategic objectives (vision, mission, strategic goals) – production of a shared vision about the future of the region

The main goal at this stage of designing the strategy is to create a shared and compelling vision for the economic and social development of the region. The main quality of the vision is its mobilizing power: it should attract regional stakeholders around a common bold project, or a dream⁶⁶.

The following section presents the vision and the mission, as well as the strategic, tactical and operational goals (Table 5) for the *Regional Innovation Strategy of the Podkarpackie Voivodeship for 2014-2020*, elaborated in accordance with the concept of smart specialization – RIS 3.

Vision for the Region: ecologically and socially sustainable, innovation-oriented and competitive economy – leader in creating eco-innovations. Region of top quality of life.

Mission of the Strategy: Support for development of innovative and competitive economy of the Region, focusing on social well-being and protection of the eco-system, as a foundation for the functioning of the society and the economy. Support for smart specializations, smart areas of activity, priority operations and technologies.

Effective management of innovation in the Region should be carried out in a systematic and process-oriented manner.

Generally, a system is defined as a set of interconnected elements, functioning as a whole. Therefore, systematic approach is understood as joint management of the interrelated processes leading to enhanced effectiveness of the Region in achieving its goals. The related requirements in particular are connected with the need to define the system by means of the processes and their goals, and then to specify the goals in detail so that they can be achieved effectively, also as a result of improvements in the system based on research and monitoring as well as review of the available resources.

Trying to define the concept of innovation management system it can be assumed it is a sub-system of regional governance.

Hence, the system-based approach demands that the region's innovation policy should be implemented in accordance with the priority objectives set forth by *EUROPE 2020 Strategy*, treated as a whole rather than as isolated goals. The same relates to fostering green growth in the entire system of economy, mainly by means of eco-innovations, hence it is assumed close links should exist not only between the defined smart specializations but also within the entire system of designing and managing innovations.

Process-based approach may also be recommended as a method of implementing the innovation management system. A process is as a rule defined – in very general terms – as a set of interconnected operations designed to transform information, raw materials and resources into a result. Process-based approach includes activities aimed at identifying the processes and the relations between them, determining the sequence, criteria and methods of ensuring and assessing effectiveness, as well as regularly performed monitoring, measurements and reviews, and introducing necessary corrective actions in order to achieve the defined results and improvement.

⁶⁶ Ibid., p. 49.

Innovation-oriented process in the region can be classified among the main processes, which is reflected by the innovation policy adopted by the European Union. It should be treated as a primary process, which must be shrewdly organized and managed in a way which will stimulate and animate the region.

According to J. Tidd, J. Bessant⁶⁷ „*innovation is then a typical race forward in the struggle to survive and grow in the market*”.

Model of innovation process proposed by the above authors includes the following phases:

- *„Search – penetration of the surrounding (internal and external) to find hazards and opportunities for change, and adequate processing of these signals.*
- **Selection** – *decision (based on long-term vision of the future growth of the company (region – note of the authors of the Strategy) about what the response to these signals should be like.*
- *Implementation – changing a potential contained in an innovative idea into a new quality and bringing it into the market at home and abroad. Success should not be seen as an isolated event but as a sequence of events, which require finding sources of knowledge facilitating innovation and leading to the project completion in uncertain conditions. All this involves great effort linked with solving challenges in order to make the innovation visible in foreign and domestic markets.*
- *Capture the value derived from innovation – both in its capacity for adaptation and further distribution, and in learning the lessons from a series of innovations – so that it is possible to expand the knowledge base of the company (region – note of the authors of the Strategy) and improve the method of innovation process management”⁶⁸.*

The model fully matches the EU methodology for selecting smart specializations.

⁶⁷ J.Tidd, J. Bessant, *Zarządzanie innowacjami. Integracja zmian technologicznych, rynkowych i organizacyjnych* (Polish translation of: *Managing Innovation: Integrating Technological, Market and Organizational Change*), Wyd. Oficyna Wolters Kluwer Polska Sp. z o.o., Warszawa 2011, p.89-90

⁶⁸ *Ibid.*, p. 89-90.

Table 5 Strategic, tactical and operational goals of the *Regional Innovation Strategy of the Podkarpackie Voivodeship for 2014-2020*

Priority				
Smart, sustainable and inclusive development				
Strategic goals of smart specializations:				
I strategic goal of smart specialization AERONAUTICS AND SPACE TECHNOLOGIES: development of the Podkarpackie Region as a leading centre for innovative aerospace and transport technologies in Poland.	II strategic goal of smart specialization QUALITY OF LIFE: development of the Podkarpackie Region as an area with the top quality of life. Energy security. Food security and independence.	III strategic goal of smart specialization INFORMATION AND TELECOMMUNICATIONS (ICT): widespread use and development of information and communications technologies		
Tactical goals of the areas of operation (activity) requiring smart support				
MOBILITY 1 tactical goal Increased potential of aerospace industry resulting from the use of innovative technologies and products. Full accessibility of the Region.	CLIMATE AND ENERGY 2 tactical goal Improved quality of the climate resulting from the use of eco-innovation technologies for acquiring and more efficient use of energy.	SUSTAINABLE TOURISM 3 tactical goal Increased activity of the tourism sector in the Region as a result of newly developed tourism products based on eco- innovations and social innovations. Conservation of environmental resources and biodiversity.	HEALTH, FOOD, NUTRITION 4 tactical goal Improved health of the population as a result of support for organic sustainable agriculture and food processing, support for regional and local products as well as medical innovations related to preventive medicine.	COMMUNICATION 5 tactical goal Promotion of widespread use of broadband Internet. Increased potential of ICT sector.

Operational goals for areas of support linked with the smart specializations

Operational goals	Operational goals	Operational goals	Operational goals	Operational goals
<p>Increased quantity and quality of products manufactured by aerospace industry.</p> <p>Increased quantity and quality of technologies and products of the sector manufacturing means of transport.</p> <p>Innovative solutions for mobility in towns and in rural areas, e.g. urban monorail system.</p>	<p>Increased proportion of energy from renewable resources in the total power production and consumption.</p> <p>Increased number of buildings and other facilities with the applied sustainable and smart technological solutions. Passive, zero-energy and plus-energy buildings.</p> <p>Development of smart power supply networks (smart grids).</p> <p>Increased revenues from production and sales of A-class, energy-efficient home appliances.</p>	<p>Increased number of sustainable employment opportunities in rural areas.</p> <p>Development of eco-innovation based, customized tourism services.</p> <p>Restoration of the natural landscapes, including ecological restoration of rivers.</p>	<p>Improved health of the population.</p> <p>Increased proportional volume of organic, regional and traditional food products in total production.</p> <p>Ecological restoration of farming land. Creating barriers for the use of GMOs in food production – GMO-free region.</p> <p>Rural areas as a place of fair and satisfying employment opportunities.</p> <p>Ensuring wholesome aging.</p>	<p>Broadband Internet in every company and in each household.</p> <p>Increased quantity and quality of products and services on offer from ICT sector.</p>

Paradigm, objectives common for the development and economy model and supported trends:

GREEN GROWTH, ECOINNOVATIONS, BIOECONOMY.

Source: compiled by the authors.

5. Podkarpackie Region innovation system and implementation concept – Set up of a sound governance structure including various stakeholders

The concept of innovation system is based on the assumption that innovation-oriented region must continuously learn. The process of generating knowledge is interdisciplinary and heterogeneous; hence, it requires collaboration of varied institutions, called RIS actors. Relations between RIS actors are based on voluntary and intentional exchange and cooperation. Therefore the method of implementing and managing the regional innovation system must first of all encourage as many entities as possible to become involved by showing direct and indirect benefits for all interested parties. Building an innovative economy is an extremely complex process which requires complementary knowledge, skills and experiences owned by various entities. No RIS actor has resources or competences to implement such strategy single-handedly. Due to this the implementation system suggests that a wide range of partners should be involved to ensure synergistic effect in relations with entities directly involved in creating innovations, i.e. enterprises, as well as science and R&D sector.

The innovation system, by applying adequately selected tools, will strengthen potential for innovation in the areas of operation corresponding with the smart specializations.

Functions of the innovation system:

1. monitoring and evaluation - ongoing monitoring and review of the trends in the innovation-oriented development of the Podkarpackie Region, in particular related to the areas of the smart specializations;
2. information and education – creating conditions, programs and tools for communicating and disseminating information about model innovative operations, with particular focus on the areas of the smart specializations;
3. financial support for innovative undertakings;
4. cooperation: promotion and organization of joint efforts in all types of activities:
 - related to the specializations and areas of operation – promoting and establishing frames of cooperation between enterprises involved in the specific area related to the smart specialization, by providing technical or financial support for existing clusters or cooperation links and by establishing new ones;
 - transversal – establishing links between enterprises, public administration, universities and non-governmental organizations (NGOs) operating in various sectors;
 - trans-regional or international – enabling wide ranging cooperation links between companies or clusters, across the borders of the region and Poland;
 - cooperation between R&D sector and enterprises related to key enabling technologies linked with the smart specializations.

The foundation for the system of RIS implementation is provided by the current knowledge concerning the level of the region's innovativeness particularly in the areas of the smart specializations. For this purpose it is necessary to build a system of acquiring information and a model of forecasting socio-economic changes, informing in advance about trends and possible risks related to the realization of the innovation processes. The task will be carried out by means of regularly performed research based on operations of the Regional Territorial Observatory, with the support from other institutions such as the Central Statistical Office, the Statistical Office in Rzeszów and the Podkarpackie Labour Market Observatory.

Another function of the innovation system involves dissemination of information. One of the important aspects of innovation oriented development is the increase in public awareness of the significant role of innovation. This objective relates to both business enterprises and the society at large. In comparison with the rest of Poland, the Podkarpackie Region stands out for the high percentage of innovative enterprises, yet economic entities which are not involved in innovative operations account for approx. 80% of the total number. Hence, it is necessary to initiate activities to increase innovation-related awareness in those businesses, particularly in the areas of the smart specializations. It is also necessary to convey the relevant information to the entire population of the Region, i.e. the final users of innovative solutions, given the fact that the smart specializations are directly linked with eco-innovations designed for households and individuals. Well-informed society should not only take advantage of novel technologies by using them but, as a result of choices made by consumers, it should stimulate and motivate enterprises to implement eco-innovations. Operations addressed to the general public should include large promotional events focusing on innovations, such as trade fairs, radio and TV campaigns to be carried out in the framework of each specialization.

In order to implement the policy stipulating inclusion of the general public in innovation oriented activity, it is necessary to ensure that information campaigns are not only addressed to adults, no longer attending schools, but they should most of all be designed for young people who will develop the Region's innovations in the coming years. Therefore it is important to continue efforts to supplement teaching curricula with subjects and issues connected with implementation of innovations (particularly eco-innovations), and related to creative thinking, innovation management and intellectual property protection. Educational initiatives of this type should be carried out practically at all the stages of education, from primary schools to universities, and during courses designed for life-long learners.

Financial support function provides existing and newly established innovation oriented enterprises with wide access to various sources of financing:

- repayable and non-repayable support for investment processes carried out by enterprises, and designed to increase the level of innovation (including subsidies, loans and guarantees) -
- integration of RIS goals with operations stipulated for implementation at the level of the Regional Operational Programme of the Podkarpackie Voivodeship (RPO WP);
- implementation of projects designed to establish networks for seed capital and venture capital funding as well as networks of business angels, to provide financial and technical support in the process of building innovative businesses – integration with RPO WP, as well as support in applying for national funding.

Importantly, innovation implementation system should envisage activities promoting multidimensional cooperation with innovation oriented enterprises as the focal element. By defining smart specializations and related areas of activity as well as key enabling technologies it is possible to ensure support for the existing and to establish new cooperation linkages, of various types, including cluster organizations. The Podkarpackie Region in fact is home to successfully growing cluster initiatives. Yet, only some of them are able to independently succeed in achieving the ambitious goals they define for themselves. Therefore, it is necessary to support their endeavours, mainly those related to innovation (especially eco-innovation) development. In relation to this, the regional innovation system will focus on developing non-financial forms of support for innovations. Implementation of the relevant operations will be based on the existing structures such as: the Regional Centre for Innovation Transfer with the existing and new branches, centres of the National Service System, Chamber of Crafts and Craft Guilds, as well as the Chambers of Commerce.

Innovation system is a network of cooperation between various entities designed to support innovation potential in enterprises. In the Podkarpackie Region cooperation in this area is initiated by:

- entities linked with the smart specializations,
- regional authorities and local governments at the level of the Region,
- local governments at the level of districts and large cities,
- universities,
- centres of the National Innovation System and National Service System, including the Regional Centre for Innovation Transfer,
- financing institutions: loan funds, and credit guarantee funds,
- advisory centres, consulting companies,
- chambers of commerce, Chamber of Crafts, and craft guilds,
- professional and specialist associations,
- industry clusters,
- enterprises.

Innovation system implementation is based on:

- operations of the Podkarpackie Innovation Council which associates representatives of various interested parties,
- operation of a digital platform for the exchange of data, requests for cooperation and support of various entities,
- three smart specialization panels:– Panel for “Aeronautics and Space Technologies”, Panel for “Quality of Life” and Panel for ancillary specialization "Information and Telecommunications".
- conferences promoting cooperation between research and business sectors, based on good practices (including in particular Podkarpackie Innovation Forum),
- thematic seminars focusing on challenges related to implementation of innovations,
- cooperation oriented meetings (trade fairs), including international events of this type.

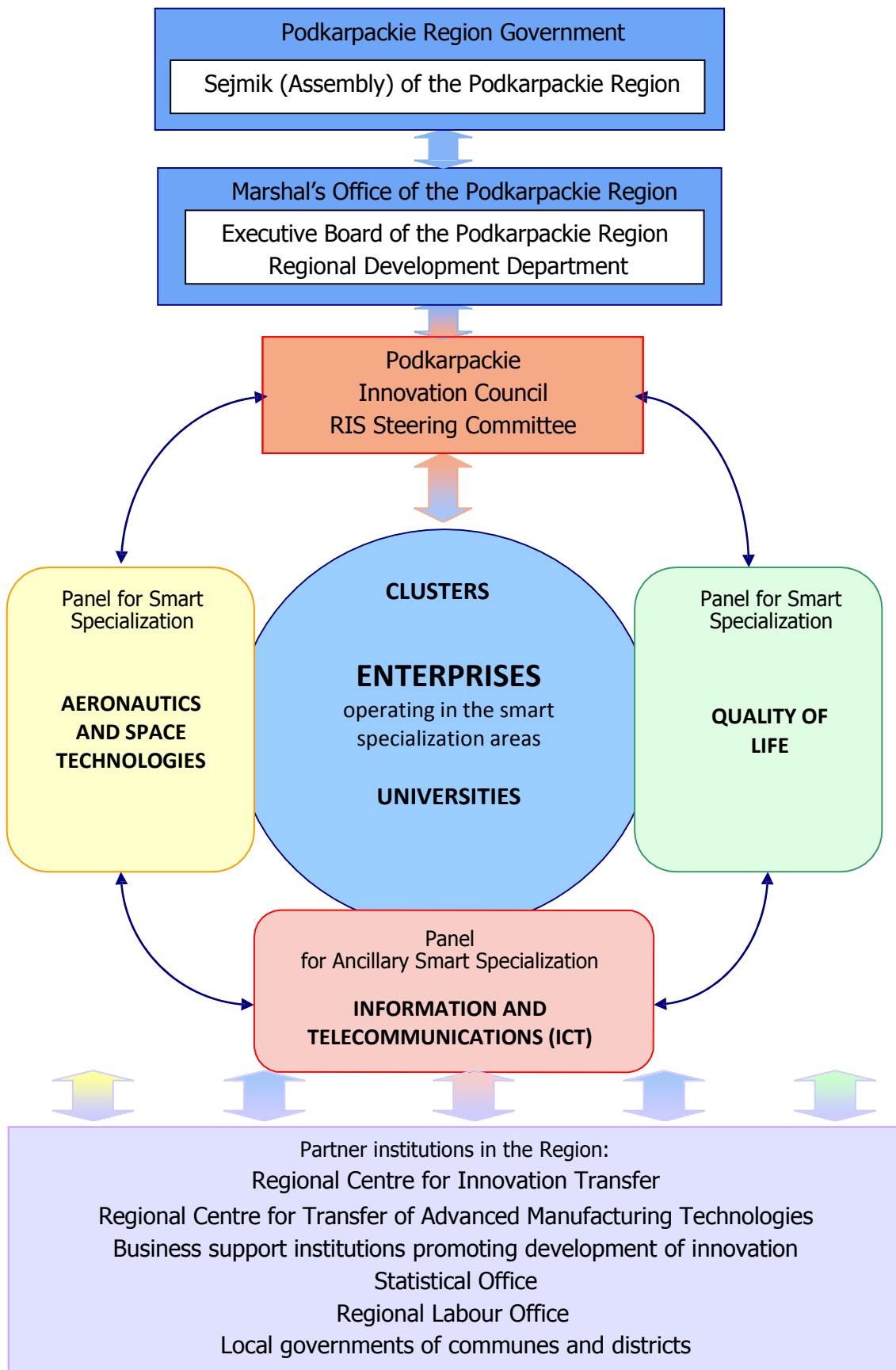


Figure 1. Concept of the Podkarpackie Innovation System
 Source: compiled by the authors.

6. System of monitoring and assessing the implementation of RSI 2014-2020 – integration of monitoring and evaluation mechanisms

Region's competitiveness can be defined as "the capacity to compete, seek to win and to cooperate, aiming to achieve the expected level of socio-economic growth by improved productivity and by creating new jobs"⁶⁹. More and more attention is paid to the role of innovation, which may contribute to increased competitive advantage; on the other hand R&D investments are the most powerful growth factor⁷⁰.

Operations, carried out at the level of the Region, designed to stimulate innovativeness and consequently increase the region's competitive advantages, require adequate tools enabling assessment of the achieved results and providing opportunity to introduce corrective measures to increase effectiveness of the regional innovation system.

Monitoring of the *Regional Innovation Strategy of the Podkarpackie Voivodeship for 2014-2020* will be carried out at three levels:

1. Benchmarking of the regional innovation at the level of the European Union and Poland (group I and II indicators).
2. Monitoring at the level of the region's smart specializations (group IIIa indicators).
3. Monitoring of the achievement of operational goals (groups IIIb and IV indicators and rates stipulated in RIS operational programmes).

Regularly published in the European Union, European Innovation Scoreboard (EIS) is a review of results achieved in this area of development. Carried out from 2001, the review enables assessment and comparison of the innovation potential of the EU Member States with the main competitors, such as the USA, Japan, and Switzerland. EIS is "a synthetic instrument for evaluating the effectiveness of innovation policy implementation and for monitoring of changes in the innovation rates in the specific Member States of the EU and EFTA"⁷¹.

Assessment of innovation with the use of *European Innovation Scoreboard* methodology focusing on European Regions at NUTS 2 level, or the *European Regional Innovation Scoreboard (ERIS)*, has been conducted a few times so far. Unfortunately, the number of applied rates changed frequently. The first review, carried out in 2002, took into account only 7 factors characterizing regional innovation. In 2003 the list of indicators was expanded to include the total of 13 factors, yet in 2006, when the assessment of regions included 10 new Member States, the list of indicators again

⁶⁹ M. Poniatowska-Jaksch, *Przemysłowe bezpośrednie inwestycje zagraniczne źródłem konkurencyjności regionu [Direct foreign investments in industry as a source of region's competitive advantage]*, „Monografie i Opracowania” No. 544, Szkoła Główna Handlowa, Warszawa 2006, p. 21.

⁷⁰ T. Baczek, *Od diagnozy do strategii innowacji dla Polski [From diagnosis to innovation strategy for Poland]* [in:] *Raport o innowacyjności gospodarki Polski [Report in innovativeness in Polish economy]* editor T. Baczek, Instytut Nauk Ekonomicznych PAN, Warszawa 2010, p. 16.

⁷¹ G. Niedbalska, *European Innovation Scoreboard* [in:] *Innowacje i transfer technologii. Słownik pojęć [Innovations and technology transfer. Glossary of terms]*, editor K.B. Matusiak, PARP, Warszawa 2008, p. 83.

was reduced to 7 factors only.⁷² The review carried out in 2009 applied 16 indicators out of 29 proposed in *European Innovation Scoreboard 2009* methodology for the state level⁷³. These differences result from the availability of data related to indicators aggregated at the regional level. Yet, this is not the only explanation of these changes. The reason is that the European Commission is seeking to achieve greater consistency of these reviews with the methodology of innovation assessments carried out by OECD. The set of data applied in EIS 2009 assessment was modified the following year and reduced to 25 factors (and renamed to *Innovation Union Scoreboard – IUS*)⁷⁴. These changes also reflect the attempts to develop a model of assessing innovation based on most effectively selected indicators.

The published report of *Regional Innovation Scoreboard 2009* applied the total of 16 indicators divided into the following groups⁷⁵:

1. Innovation enablers:

- 1.1.3. Population with tertiary education per 100 population aged 25-64 (%);
- 1.1.4. Participation in life-long learning per 100 population aged 25-64 (%) – not included in ERIS 2012;
- 1.2.1. Public R&D expenditures (% of GDP);
- 1.2.4. Broadband access available for enterprises (% companies) - not included in ERIS2012⁷⁶.

2. Firm activities:

- 2.1.1 Business R&D expenditures (% of GDP);
- 2.1.3 Non-R&D innovation expenditures (% of total turnover);
- 2.2.1. SMEs innovating in-house (% of all SMEs);
- 2.2.2. Innovative SMEs co-operating with others (% of all SMEs);
- 2.3.1 Number of EPO patents.

3. Outputs:

- 3.1.1. Technological (product or process) innovators (% of all SMEs);
- 3.1.2. Non-technological (marketing or organisational) innovators (% of all SMEs)
- 3.1.3. Resource efficiency innovators, by means of

⁷² J. Kaźmierczak, A. Wilińska, *Uwagi na temat sposobów oceny poziomu innowacyjności z uwzględnieniem uwarunkowań polskich [Notes on the methods of assessing innovation level taking into account Polish determinants][in:] Komputerowo Zintegrowane Zarządzanie [Computer integrated management]*, editor R. Knosali. Oficyna Wydawnicza Polskiego Towarzystwa Zarządzania Produkcją, vol. I, Opole, 2010, p. 638.

⁷³ H. Hollanders, S. Tarantola, A. Loschky, *Regional Innovation Scoreboard 2009. Methodology report*, INNO Metrics Thematic Paper, European Commission, Brussels 2009, p. 4.

⁷⁴ *Innovation Union Scoreboard 2010. The Innovation Union's performance scoreboard for Research and Innovation*, European Commission, Brussels 2011, p. 3.

⁷⁵ Taking into account the fact that one indicator, 3.1.3 is calculated as a mean of two rates, it can be assumed there are 17 indicators. The applied numbers reflect the system of indicators used in EIS 2009 methodology. Three groups of indicators are additionally divided as follows: 1.1. Human resources, 1.2. Finance and support, 2.1. Firm investments, 2.2. Linkages and entrepreneurship, 2.3. Throughputs, 3.1. Innovators, 3.2. Economic effects. RIS indicators are not in sequence because they relate to numbers H. Hollanders, S. Tarantola, A. Loschky, *Regional Innovation Scoreboard 2009. Methodology report*, Pro Inno Europe, 2009, p. 4.

⁷⁶ At the regional level, the RIS 2009 analysis measured the percentage of households with broadband access.

- 3.1.3a. Reduced labour costs (% of SMSs) and 3.1.3b. Reduced energy and materials consumption (% SMS) - not included in ERIS 2012;
- 3.2.1. Employment in medium-high and high-tech manufacturing (% of total workforce) - not included in ERIS 2012;
- 3.2.2. Employment in knowledge-intensive industries and services (% of total workforce);
- 3.2.5. Sales of new-to-market products (% of total turnover);
- 3.2.6. Sales of new-to-firm products (% of total turnover).

Unfortunately, the process of elaborating the next Report was based only on 12 indicators available for the regions of the European Union at the regional level. Four of the ERIS 2009 indicators were disused, while one indicator was added, namely 2.2.3. Public-private co-publications. Moreover the indicator showing sales of products new-to-the-market and new-to-the-firm was calculated jointly. The indicators based on ERIS methodology, for the needs of Regional Innovation Scoreboard Report, in the following sections will be classified in Group I.

An analysis of the aforementioned indicators shows that the Regional Government does not directly impact majority of them, because they result from operations initiated either centrally or by enterprises directly. There may be different ways to achieve a certain level in terms of a selected indicator. Yet, the use of ERIS rating system does not provide complete information regarding the practices employed in regions, because some of the rates, particularly those in the first group, in Poland depend on decisions taken by the national authorities.

While considering the usefulness of ERIS for regional innovation policy benchmarking it is necessary to remember about the nature of the process, which is adequately reflected by the definition proposed by K. Zimniewicz suggesting that it involves „making comparisons with the best, striving to match their results, orientation towards the world-class products or services and learning from the competition”⁷⁷.

The specificity of developing regional innovation policy suggests that the process will be assessed with the use of competitive benchmarking which typically compares the specific area of operation with that in a model entity⁷⁸.

It is necessary to point out that *Regional Innovation Scoreboard*, as a source of information related to results achieved by other regions, may effectively be used to choose those which could be the best models (e.g. due to the similarity of selected indicators) and to analyze the changes occurring over time in the region’s position in relation to others. Even though, as it was mentioned before, the sets of adopted indicators are changed, still the same approach is applied to all the regions; hence it is possible these changes do not significantly impact the ranking position. Benchmarking of results, carried out in this way, makes it possible to identify the region’s strengths and weaknesses by comparing basic indicators with those achieved by selected competitors, i.e. other regions which, given the adopted smart specialization policy, actually do not have to be treated as competition.

⁷⁷ K. Zimniewicz, *Współczesne koncepcje i metody zarządzania [Contemporary concepts and methods of management]*, PWE, Warszawa 2009, p. 11.

⁷⁸ U. Kobylńska, *Benchmarking [in:] Koncepcje i metody zarządzania [Concepts and methods of management]*, editor Matwiejczuk, Politechnika Białostocka, Białystok 2009, p. 87.

Taking into account results of inter-regional comparisons, we must be aware of the limitations and challenges connected with attempts to measure the level of regional development, also in terms of innovation.

While using ERIS findings it is necessary to remember about the significant differences between the regions of the European Union. In accordance with the Common Classification of Territorial Units for Statistics (NUTS) adopted in the European Union, and based on Regulation (EC) No. 1059/2003 of the European Parliament and of the Council of 26 May 2003 (Official Journal of the EU, L 154 dated 21 June 2003, as amended), NUTS2 level regions, which include Polish voivodeships, should have populations in the range from 800,000 to 3 million. This fact alone shows the regions significantly vary in size; additionally in accordance with Eurostat data approximately 100 regions do not meet this criterion. **Due to this the acquired scores are not fully comparable and it may be necessary to carry out additional analyses.**

Another aspect of regional benchmarking which raises considerable doubts is the use of Gross Domestic Product (GDP) as a reference value for expenditures or incomes. While taking it into account it is necessary to ensure comparability of the relevant information⁷⁹.

In such a case *Regional Innovation Scoreboard* may meet the expectations of regional authorities because it provides information about positions occupied by the specific assessed regions and shows their assets and weaknesses. **Another advantage of the tool is that its results are generally accessible and no high costs are linked with using them.**

***Regional Innovation Scoreboard* is a highly valued and commonly used tool for assessing and comparing the regions of the European Union. Given this, the tool should be taken into account in the process of monitoring the implementation of the Regional Innovation Strategy of the Podkarpackie Voivodeship for 2014 – 2020, with the use of the widest possible set of indicators applied in *Regional Innovation Scoreboard* and collected by Eurostat.**

By applying regional innovation indicators published by Eurostat it will be possible to effectively evaluate the overall progress related to those indicators and to fully answer the question how effectively, in general terms, the innovation policy is being implemented in the Podkarpackie Region. This way it will also be possible to measure the progress in implementing the vision of the Region and its strategic goals.

Important tools for accessing innovation potential of the region will include the reports of the Regional Innovation Monitor.

Local Data Bank enables regional innovation policy benchmarking at the national level; it is based on a wider set of indicators than those applied in ERIS reports. The system of monitoring for the Regional Innovation Strategy of the Podkarpackie Voivodeship should take into account those indicators which make it possible to show changes in the level of innovation and competitiveness of the region. These mainly include:

⁷⁹ For example according to 2010 Eurostat data, the total R&D expenditures in all sectors in Germany amounted to 2.82% GDP, and in Poland only 0.74%. Hence the apparent relationship between these values is like 3.8:1. Yet, the level of these expenditures expressed in Euro/per capita in Germany amounted to 853.4 Euro, and in Poland only 68.3 Euro, i.e. the relationship amounts to 12.5:1.

1. School enrolment ratio: basic vocational schools, vocational and general vocational schools, post secondary schools (gross, net),
2. University students and graduates (in courses of study: technical, engineering, medical, health care, environment conservation, services) in the total number of students and graduates,
3. University students per 10,000 population,
4. Number of post-graduate students per 10,000 population,
5. Students of primary and middle schools per 1 computer with Internet access, designated to be used by students,
6. Students of secondary schools per 1 computer with Internet access, designated to be used by students,
7. R&D expenditures per capita,
8. R&D expenditures in relation to GDP,
9. R&D expenditures related to engineering and technical sciences, in relation to the total expenditures,
10. Economic entities incurring R&D expenditures in the total number of entities,
11. Enterprises which have incurred innovation-related expenditures in the total number of enterprises,
12. Applications related to domestic inventions; awarded domestic patents,
13. Applications related to utility designs and granted related proprietary rights,
14. GDP per capita (constant prices),
15. Percentage of enterprises with Internet access,
16. Percentage of enterprises with their own websites,
17. Enterprises with means for automating production processes in the total number of enterprises.

The above indicators constitute Group II.

In addition to the above indicators which enable benchmarking of the regional innovation policy (in comparison to other regions of Poland) **it is also necessary to consistently monitor specific rates which enable evaluation of progress achieved in implementing the Regional Innovation Strategy linked with the region's smart specializations.** These include electro-mechanical industry, and more specifically advanced aerospace industry, as well as the broad concept of the quality of life mainly based on the attributes and potential of unpolluted environment.

Electro-mechanical industry comprises the following sections of Polish Classification of Activity (PKD 2007):

- 25 manufacture of finished metal goods, excluding machines and equipment;
- 26 manufacture of computers, electronics and optical products;
- 27 manufacture of electric equipment;
- 28 manufacture of machines and equipment not classified otherwise;
- 29 manufacture of motor vehicles, trailers, and semi-trailers, excluding motorcycles;
- 30 manufacture of other transport equipment.

The quality of life area is defined in a slightly different way because it comprises mainly operations connected with production of organic, regional and traditional food, sustainable tourism, and health care. Therefore, it is not possible in many cases to include complete sections defined in the Polish Classification of Activity.

The System of monitoring for the Regional Innovation Strategy of the Podkarpackie Voivodeship, with respect to the smart specializations of the region will take into account basic indicators enabling assessment of the development dynamics in these areas.

The monitoring system will take into account the following basic indicators, classified as Group IIIa:

1. Number of entities of national economy listed in REGON (National Business Register) in PKD sections 25-30;
2. Dynamics of sold production of industry in PKD sections 25-30;
3. R&D expenditures in PKD sections 25-30;
4. Percentage of renewable energy in the total electrical power production;
5. Employed individuals per basic type of business operation: accommodation and catering, health care and social care, culture and recreation, organic farming;
6. Number of organic farms;
7. Area comprised by organic farms;
8. Number of organic processing plants;
9. Number of registered regional and traditional products;
10. Number of agritourist farms and ecotourism facilities;
11. Number of domestic and foreign visitors;
12. Bed occupancy rate per type of accommodation establishment;
13. Population per one bed in general care hospitals;
14. Number of physicians per 10,000 population;
15. General rate of the quality of life (based on Social Diagnosis Report).

Monitoring may be expanded to include rates representing achievement of operational goals, provided that it is possible to obtain/access relevant data and sources of financing. These indicators include:

1. Number of enterprises and employment rates in aerospace industry;
2. Number of enterprises and employment rates in the sector manufacturing means of transport;
3. Number of urban and rural locations which have implemented innovative mobility systems;
4. Energy from renewable resources in the total power consumption;
5. Number of public and private buildings certified as passive, zero-energy and plus-energy structures;
6. Revenues on sales of A-class energy efficient home appliances – data from companies in the Region;
7. Number of jobs in rural areas in sustainable sectors (organic, regional, and traditional production);

8. Number of ecotourism facilities, agritourist farms and other innovative forms of tourism;
9. Length of ecologically restored waterways, in kilometres;
10. Public health – rates published by the Central Statistical Office;
11. Number of certificates acquired by organic farms and processing plants; number of registered regional and traditional products;
12. Number of farms implementing environmental management schemes;
13. Available documents confirming the Region’s status of GMO-free zone;
14. Number of facilities and places dedicated to wholesome aging.

These indicators also enable assessment of progress in achieving some of the operational goals stipulated in this Strategy.

As a supplement to the proposed system of indicators, quantitative and qualitative evaluations will assess the entities involved in developing and operating the regional innovation system as well as innovation leaders and data related to services designed to foster innovation, provided by the Regional Centre for Innovation Transfer and a network of Consulting Desks.

RSI 2014-2020 monitoring will be based on operational programmes, which will define priorities and indicators reflecting achievement of operational goals for each period of implementing the Strategy. It is assumed two operational programmes will be elaborated.

Table 6. Mechanism of measuring RSI WP monitoring indicators

Group of indicators		Source	Scope and frequency of measurement
I	According to European Regional Innovation Scoreboard	EUROSTAT, ERIS report	<ul style="list-style-type: none"> - EUROSTAT data to be analyzed annually, if available, in order to make comparison with specified EU regions, mainly in terms of the dynamics of rate changes, - assessment of the region’s position with respect to other Polish regions, with the use of Perkal’s method, - assessment of the region’s status, in accordance with the synthetic indicator of ERIS, after the report is published; RIS implementation will be assessed positively if the Region has been qualified at least in the category of „moderate innovator”.
II	Regional innovation policy benchmarking	Local Data Bank	the dynamics of rate changes and the region’s position with respect to other Polish regions will be

				assessed at least once a year; positive assessment will be based on an improvement in the region's position with respect to the indicators analyzed with the use of Perkal's method.
IIIa	Smart specialization and operational goals monitoring	basic	Local Data Bank	the dynamics of rate changes and the region's position with respect to other Polish regions will be assessed at least once a year; positive assessment will be based on an improvement in the region's position with respect to the indicators analyzed with the use of Perkal's method.
IIIb		supplementary	Primary research	assessments carried out in the region, as permitted by the available financial resources, minimum three times during RIS implementation(ex-ante, mid-term and ex-post) in order to identify the dynamics of changes and verify the objectives adopted in operational programmes
IV	Supplementary (qualitative) indicators		Primary research	<ul style="list-style-type: none"> - continued assessment of "innovation leaders" and CATI survey carried out by UITM (once a year), - data concerning services provided by RCIT and network of CDs (updated quarterly), - other indicators related to goals specified in operational programmes.

Source: compiled by the authors.

Podkarpackie Innovation Council will play an important role in monitoring the process of implementing *Regional Innovation Strategy of the Podkarpackie Voivodeship* and it will be responsible for defining the guidelines for the monitoring as well as reviewing and assessing annual reports related to its implementation. The reviews will provide data for formulating conclusions and recommendations to be submitted to the Regional Development Department at Marshal's Office of the Podkarpackie Region.

RIS Steering Committee will supervise the process of compiling the reports, to be based on information and data coming from the Regional Territorial Observatory and the IT Platform developed for the purposes of the Regional Innovation Strategy; these will also be sent to the Podkarpackie Innovation Council. The platform will contain essential information related to the progress in implementing the Strategy, as well as the reports from monitoring assessments performed by designated entities, and will enable exchange of information between the partners involved in the implementation process.

Partners actively involved in implementing projects designed to foster regional innovation will constitute an important element of the system of monitoring for the Regional Innovation Strategy of the Podkarpackie Voivodeship. Podkarpackie Innovation Council and Steering Committee will be responsible for close cooperation with all partners in order to acquire current data reflecting the progress in implementing the Strategy.

To ensure comprehensive assessment of the progress in implementing the Regional Innovation Strategy it will be necessary to analyze quantitative data, which can be mainly provided by the partners. The IT Platform will make it possible for them to forward information which may be used by the Podkarpackie Innovation Council to make recommendations to the Executive Board regarding criteria for strategic assessment of innovative projects to be subsidized with funds available in the framework of the regional operational programme, so that they can be as consistent as possible with the objectives of the strategy for smart specializations (RIS3).

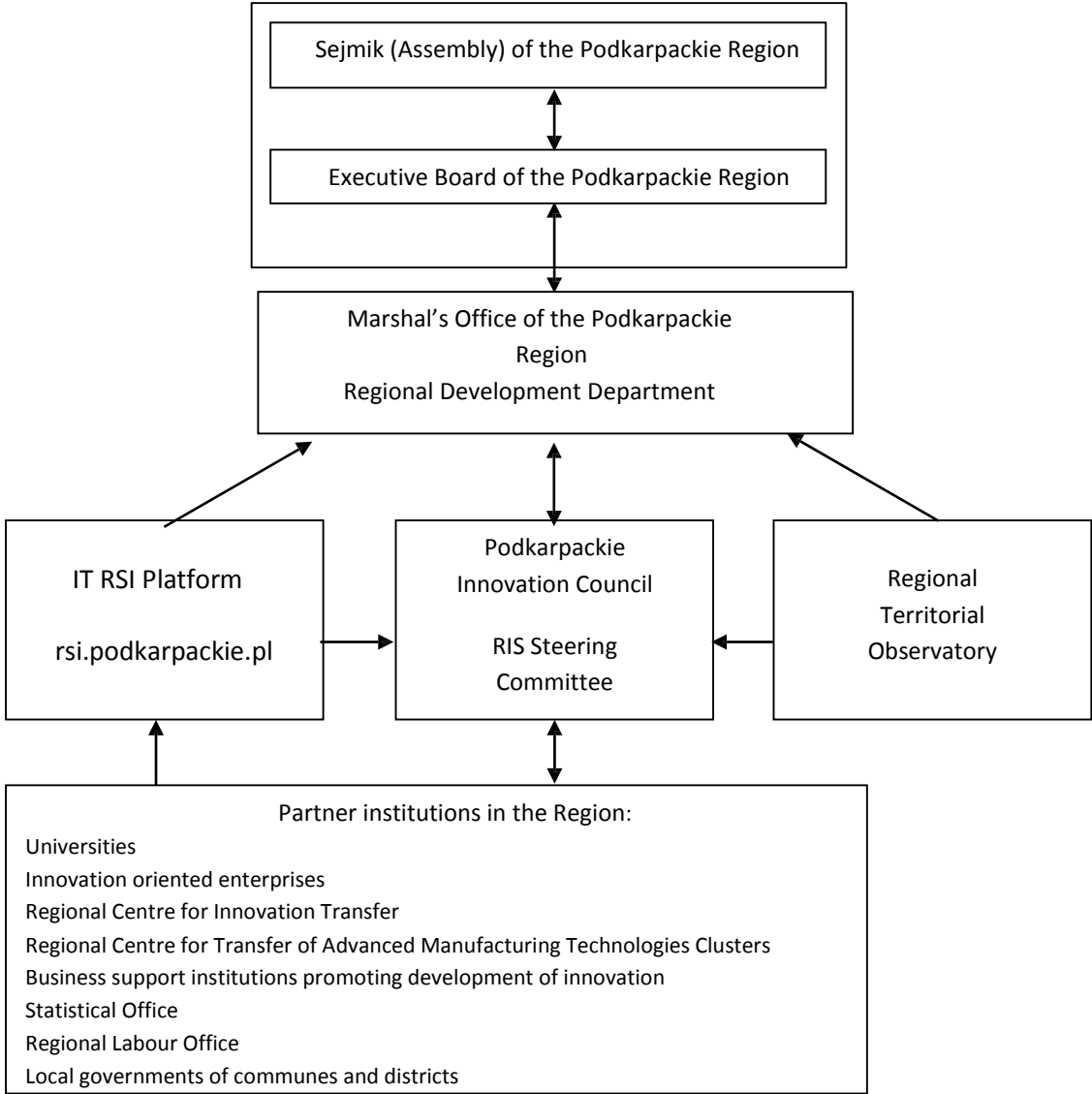


Figure 2. Structure of RSI WP monitoring system
Source: compiled by the authors.

Close cooperation between the Podkarpackie Innovation Council, the Executive Board of the Podkarpackie Region as well as Marshal's Office should be carried out in such a way as to ensure prompt response to any changes which might pose risk to the achievement of the stipulated goals. Due to this the aforementioned bodies will have to adopt adequate procedures to enable ongoing assessment of specific projects and operations in terms of their impact for the development of innovation in the Region.

To ensure that the mechanism of assessing the effects of the Strategy implementation operates adequately, the Podkarpackie Innovation Council will be required to prepare annual reports assessing the effectiveness of the operations and to put forth recommendations for necessary corrective actions; these will be submitted to the Executive Board of the Region via the Regional Development Department not later than by the end of April each year and they will include all the indicators available at this time.

To comply with the requirements of the European Commission regarding progress in green growth and bioeconomy, it will also be necessary to define indicators which will enable measurement of progress in implementation of eco-innovations.

7. Objectives for the Operational Programme – Establishment of suitable policy mixes

To ensure optimum conditions, the period designed for the implementation of *Regional Innovation Strategy of the Podkarpackie Voivodeship* should be divided into two stages, each of which would implement a detailed operational plan defining necessary initiatives and measures, and specifying calls for proposal to be announced in the framework the Regional Operational Programme of the Podkarpackie Voivodeship in connection with the implementation of the *Regional Innovation Strategy*.

As a result it would be possible to take into account any changes in circumstances and potential of the region and introduce necessary amendments at the operational level in plans of activities aimed at the realization of the basic objectives of *Regional Innovation Strategy of the Podkarpackie Voivodeship*. It is suggested the period of *Regional Innovation Strategy* implementation should be divided into two sub-periods:

1. Years 2014 – 2017
2. Years 2018 – 2020.

This division mainly results from the schedule of works focusing on preparing and launching operational programmes for European funds in the new programming framework. It should be expected that financing in accordance with the “n+2” rule will also be expended after 2020. Therefore the second operational plan should take into account the extended time horizon and include the period up to 2022.

The detailed operational plans should be reviewed by the Podkarpackie Innovation Council and finally approved by the Executive Board of the Podkarpackie Region. Adequate flow of information between the Podkarpackie Innovation Council and the Executive Board will be ensured by the Regional Development Department at Marshal’s Office of the Podkarpackie Region.

The success of the process of implementing *Regional Innovation Strategy of the Podkarpackie Voivodeship* depends mainly on the timely performance of the specific activities and on clear division of competencies of all entities engaged in the process.

Presented below, the outline schedule for Regional Innovation Strategy of the Podkarpackie Voivodeship at the operational level, defines the entities playing the leading roles in the process of its implementation. The schedule will provide the foundation for elaborating detailed operational plans.

Table 7. Schedule of RSI WP implementation

Year	2014				2015				2016				2017				2018				2019				2020				Responsible entity		
Quarter	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV			
Stage/task																															
Approval of current membership of PRI																															ZWP
Establishment of Smart Specialization Panels																															PRI, ZWP
Defining base values for indicators used in monitoring																															DRR, PZ
Elaboration and approval of operational plan 1																															PRI, ZWP
Defining strategic assessment criteria for innovation oriented projects																															PRI
Defining the Podkarpackie regions' own projects																															DRR
Defining sources of financing for key operations under RSI WP																															DRR
Detailed distribution of duties between specific entities involved in the structures implementing RSI WP																															ZWP

8. Sources of financing RSI – establishment of suitable policy mixes

Due to the fact that currently the final versions of operational programs for the planning framework 2014-2020 are still being developed, it is not possible to explicitly specify the financing options and expected amounts for specific operational initiatives under *Regional Innovation Strategy of the Podkarpackie Voivodeship*. It is only possible to generally point out programmes and priorities which in the future can provide financing for implementation of specific operations.

Basically financing for initiatives envisaged by the operational plans will be provided from resources of the *Regional Operational Programme for the Podkarpackie Voivodeship*. This is mainly because of the close link between this instrument of financing and the regional innovation policy as well as due to the potential possibility to adjust detailed rules and specified areas of support envisaged for projects to be proposed by beneficiaries. It is also important that calls for projects will be settled at the level of the Region and they will be directly linked with problems faced by the Region.

The first priority axis "*Competitive and advanced economy*" will be most important for implementation of Regional Innovation Strategy of the Podkarpackie Voivodeship as it aims at increasing competitive advantage of the Region as a result of smart specialization based development of entrepreneurship and innovation.

This priority axis stipulates the following operations, which are closely linked with the objectives of Regional Innovation Strategy of the Podkarpackie Voivodeship:

- 1.1. Support for scientific research and its commercialization.
- 1.2. Development of business support institutions.
- 1.3. Enhancement of the region's attractiveness for investors and tourists.
- 1.4. Promotion of entrepreneurship.

Given the smart specializations selected for the Region, the financial resources of significant importance for the implementation of the Regional Innovation Strategy of the Podkarpackie Voivodeship also include the funds allocated under the third priority axis "*Clean energy, and unpolluted environment*", stipulating the following activities which are consistent with the strategic goals:

- 3.1. Promotion of renewable energy sources.
- 3.2. Effective low carbon economy.
- 3.3. Development of low carbon, integrated public transport within Rzeszów Functional Area and in the growth poles of the Podkarpackie Region.
- 3.4. Conservation of environment and biological diversity.
- 3.5. Improved condition of the natural environment within Rzeszów Functional Area and in the growth poles of the Podkarpackie Region.
- 3.6. Waste management.
- 3.7. Sewage management.
- 3.8. Conservation of cultural heritage.

The remaining priority axes of the Regional Operational Programme for the Podkarpackie Voivodeship will also contribute to the achievement of goals defined by the Regional Innovation Strategy as they will enable removing potential barriers for its implementation, they will increase social and economic cohesion of the Region and improve access to knowledge and educational system.

The processes of planning the region's own projects and stimulating external projects designed to implement the strategic objectives should also take into account financial resources available in the framework of national and trans-regional operational programmes, i.e.:

- operational programme for innovation, research and the links between these and the business sector (working name "Smart Development"),
- operational programme for low carbon economy, environment conservation, counteracting and adaptation to climate change, transport and energy security,
- operational programme for development of competencies and skills, social inclusion and good management (working name "Knowledge, Education, Growth"),
- operational programme for Eastern Poland (working name "Eastern Poland"),
- operational programme for digital development (working name "Digital Poland").

Each of the above programmes is to a certain extent linked with the objectives of the Regional Innovation Strategy of the Podkarpackie Voivodeship. They will play a particularly important role in implementing large trans-regional projects.

The process of planning Strategy-related operations should also take into account the possibility to apply for financing in the framework of the new financing instrument of the European Union, i.e. "Horizon 2020" Programme. This is a mechanism designed to provide financing for operations supporting the concept of Innovation Union in Europe 2020 strategy. The new initiative aims at increasing Europe's competitive advantage in the world.

It is necessary to adequately define the system of managing the operational program of the Regional Innovation Strategy. Given the close link between activities carried out at the operational level and strategic or tactical activities, implementation of the specific operational plans for Regional Innovation Strategy should be supervised directly by the Podkarpackie Innovation Council in cooperation with the Regional Development Department. The Council's involvement is important since it comprises representatives of all interest groups and types of entities directly constituting the regional innovation system. This will impact the comprehensive scope and accuracy of assessments and decisions recommended to the Executive Board of the Podkarpackie Region by the Podkarpackie Innovation Council.

Specific activities will be delegated to adequate entities and individuals, including partners involved in the performance of specific tasks in the framework of Regional Innovation Strategy of the Podkarpackie Voivodeship.

Implementation of operational plans will be assessed during a process comprising a few stages. Ad-hoc analysis, or ongoing assessment, will be carried out on a regular basis during the

operational program implementation. Directly responsible for evaluating the implementation of each plan, the Regional Innovation Strategy Steering Committee will perform ongoing analysis of the progress in works and the achievement level for the assumed goals and indicators. Assessment results will be submitted to the Podkarpackie Innovation Council and the Executive Board of the Region.

Ex-post assessment will be performed after the operational plan has been completed. This process includes qualitative and quantitative analysis of the objectives achieved by the project, evaluation of the effectiveness of the implemented operations and assessment of the operational plan realization in relation to the progress in implementing Regional Innovation Strategy of the Podkarpackie Voivodeship.

Importantly, the assessment will define factors enabling success or contributing to a failure in achieving specific objectives of the operational plan so that it provides data for risk analysis at the stage of designing the operational plan for the next period.

9. Recommendations – establishment of suitable policy mixes

Recommendation 1

It is necessary to pay particular attention to the **two main smart specializations and the ancillary smart specialization**.

Goal:

Operations towards smart sustainable development will always take place in the conditions of limited availability of natural and financial resources. To ensure these are divided and distributed wisely, it is necessary to thoroughly assess the potential; this has been done in the process of elaborating this document. Support for the defined specializations will result in the effective use of the resources in areas constituting the region's endogenous potential and will enable achievement or strengthening of world-level competitive advantage in these areas.

Recommendation 2

The fact that the smart specializations have priority status should significantly impact **the process of subsidizing proposed projects**, yet this does not rule out developments in other areas, because in economic system they frequently constitute horizontal and functional support. Accordingly, support for **key enabling technologies** is of critical importance.

Goal:

Allocation of financial streams for smart specialization related projects will enable more effective use of the region's potential and its development in the desired direction. While the smart specializations make efficient use of the regional potential, equally smart solutions are required for innovative operations in other spheres than those specified in the Strategy as they provide horizontal and functional support for the priority areas.

Recommendation 3

Part of the public funding should be allocated to projects envisaged jointly by **the key clusters and to provide support for the functioning of clusters**.

Goal:

Entities operating within clusters, i.e. enterprises, educational and research entities, universities, business support institutions, etc. in addition to the obvious benefits resulting from innovation-oriented operations, would also increase the linkages within the cluster, contributing to the synergy effect.

Recommendation 4

It is necessary to develop a transparent and simple **algorithm of assessing subsidized projects** to enable evaluation of their compliance with the trends supported by the Region, including mainly the smart specializations.

Goal:

The innovations by their nature should not only generate benefits for the entities, which implement them, but as a result of their overall impact they should also lead to improved quality of life, green growth, development of eco-innovation and bio-economy, social growth and conservation of ecosystem resources.

Recommendation 5

Universities constitute the most essential part of the smart specializations, as they are a tool for the diffusion of knowledge towards innovation, in particular eco-innovation.

Goal:

Support for innovation does not only involve the development of innovation potential in enterprises, but also (or in particular) the development of R&D sphere. The European Commission emphasizes the significant role of universities in the knowledge triangle showing the relationship between education, research and innovation. Research conducted by universities may lead to development of innovations, and this type of operation crosses regional borders, while educational activity of these institutions significantly influences regional potential. Educational curricula should be designed in cooperation with business enterprises in the framework of the regional partnership for education; this should facilitate the flow of information between business sector and universities. Research projects linked with the smart specializations should be treated as a priority in decisions related to subsidies.

Recommendation 6

Small and Medium Enterprises (SMEs) are another key to the Region's success. Companies representing the smart specializations should receive particularly significant support for creating new technologies and innovations.

Goal:

Financial support should be provided for the most innovative small and medium enterprises (SMEs), including start-ups, as well as spin off/out companies.

Recommendation 7

Support for operations which in a comprehensive way contribute to building **the culture of innovation** (this also relates to education at all levels), resulting in an **atmosphere favourable for innovation**.

Goal:

To ensure smart, sustainable and inclusive development it is necessary to promote all operations with the characteristics of innovation (particularly eco-innovation). Innovation-oriented attitudes should be fostered and shaped even at the early stages of schooling, to enable out-of-the-box thinking, and creativity in approaching design process.

Recommendation 8

Implementation of the Regional Innovation Strategy involves the necessary ongoing **monitoring and assessment of achievements**, including the results of the provided support. The expended resources are to enable the desired effects, from the viewpoint of smart sustainable development, which as a process is characterized by a certain variability of priorities.

Goal:

In the planning framework 2014–2020 the European Commission emphasizes the importance of effects achieved by subsidized projects. Therefore, the Regional Government must have good knowledge related to this, which will be enabled by the conducted monitoring. At the same time due to socio-economic changes it is necessary to verify and update the priorities, and monitoring related to the Regional Innovation Strategy may prove very useful in this respect.

Recommendation 9

It is necessary to develop an executive program for each identified smart specialization in order to define detailed distribution of funds for the priorities set forth by the Strategy.

Goal:

By elaborating executive plans for all three specializations it will be possible to ensure more effective monitoring of achievements, which in longer timeframes will also provide information necessary for introducing adequate changes.

Recommendation 11

It will be very important to perform **regional technology foresight** for each smart specialization.

Goal:

Identification and updating of priority solutions, including research technologies and programs focusing on future developments in smart specializations.

Recommendation 10

It is necessary to promote and provide financial support for operations which are consistent with the paradigm and development priorities adopted by the European Union, and expressed in *EUROPE 2020 Strategy*. The key words defining the course of development in regional economies of the European Union include: **green growth, bio-economy, and eco-innovation**.

Goal:

Smart, sustainable and inclusive growth rather than any kind of economic growth.

Think digital, act analog: Use every digital tool at your disposal to create great products and services. But never lose sight of the fact that the purpose of innovation is not cool products and cool technologies but happy people. Happy people is a decidedly analog goal.

Guy Kawasaki

10. Glossary of Terms

Bio-economy – comprises practically all the sectors, and related services, which produce, process or utilize biological resources of any type. It combines research in various areas of science with innovative and comprehensive use of renewable raw materials generated by plants, animals and microorganisms. Additionally, bio-economy is a strategic type of operations, transcending and integrating varied sectors, and consistent with the interdisciplinary approach to planning and financing scientific research, dominant today. Bio-economy also comprises issues related to energy obtained from renewable resources, as well as manufacturing processes used for instance in textile, paper, chemical (to a degree), cosmetics and pharmaceutical industries. This integrating function of bio-economy will be of critical importance for the business and technology related future of the EU, which was accessed by Poland in May 2004.

E. K. Chyłek, M. Rzepecka, *Biogospodarka – konkurencyjność i zrównoważone wykorzystanie zasobów [Bioeconomy – competitiveness and sustainable consumption of resources]*, Polish Journal of Agronomy, 2011, 7, pp. 3–13

R&D&I operations – a term designed to additionally highlight the close link between R&D and implementation of innovations: works focusing on R – research, D – development, I – innovation.

Eco-innovations are new or significantly improved products, processes, methods of organization and management, as well as marketing solutions, which are distinguished from conventional concept of innovation by their positive effects for the environment, comprised in the solution as a whole, or constituting a significant decrease in the adverse impacts produced by the previous solutions. Hence, eco-innovations, as suggested by many definitions, in addition to the obligatory aspect of novelty, comprise the distinctive feature showing environment (ecology) oriented valorisation of the solutions. Eco-innovations relate to assessed company or region.

Woźniak L., Dziedzic S., Woźniak M., Kud K. *Cele i zasady ekoinnowacji w zarządzaniu firmą i rozwojem regionu [Goals and objectives of eco-innovation in management of company and regional development]*, Politechnika Rzeszowska, Rzeszów 2011, p. 25.

M. Carley and P. Spapens define **eco-innovation** as “intended enterprising operation, including the stage of product design and integrated management during its life cycle, which contributes to green modernization of the industrial-age societies by taking into account environmental problems in the development of products and related processes. Eco-innovations lead to integrated solutions to reduce capital and energy expenditures and at the same time increase the quality of product or service. Technological innovation is one of the ways to eco-innovation”. Eco-innovations are designed to eliminate or reduce consumption of toxic compounds during the products’ life.

Carley M., Spapens P., *Dzielenie się światem (Polish translation of Sharing the World)*, Wyd. Instytut na Rzecz Ekorozwoju, Białystok – Warszawa 2000, p.157.

European Regional Innovation Scoreboard – is a basic tool for measuring innovation potential and its diversity in specific regions. Along with the Community Innovation Survey (CIS) and European Innovation Scoreboard (EIS) it is the essential source of information on the course of innovation processes in European economy. This is a synthetic measure of regional innovation resources, indispensable for effective development of regional innovation policies.

A. Nowakowska, [in:] K. B. Matusiak, [ed.], *Innowacje i transfer technologii. Słownik pojęć* [Innovation and technology transfer. Glossary of Terms], PARP, Warszawa 2008, p. 89.

Spin-off/out ventures – new companies based on knowledge acquired during, and concept solutions designed as a result of research carried out at universities and R&D institutions. Economic entities of this type are established to enable commercial utilization of concepts and technologies developed in academic centres. In literature we can encounter narrow and broad definitions of economic ventures of this type. In the first case the ventures are established by researchers (post-graduate students) who utilize ideas and technologies, constituting intellectual property developed at the original institution. (...) In this type of ventures we can distinguish the so-called spin-offs, having ownership, financial and organizational links with the original university, and the so-called spin-outs, with no such linkages.

Innowacje i transfer technologii. Słownik pojęć [Innovation and technology transfer. Glossary of Terms], [ed.] K. B. Matusiak, PARP, 3rd Edition, updated, Warszawa 2011, p. 15.

Foresight – a systematic and participatory process designed to collect information related to the future and involving assessment of the envisioned development in medium and long-term timeframes. The process is oriented towards current decisions and enforces joint operations.

K. Borodako, *Foresight a zarządzaniu strategicznym* [Foresight in strategic management], Wyd. C.H. Beck, Warszawa 2009, p. 12.

Innovations – According to Oslo Manual, innovation is an implementation of a new or significantly improved product (goods or services), new or significantly improved process, new marketing method or new organizational method in business practices, organization of workplace or relations with the external environment. For the needs of technological research policy, and to ensure comparability in time with findings of previous statistical studies focusing on innovation, in many cases it may be practicable to also use the narrow definition of innovation, in particular the definition specified in the second edition of Oslo Manual in accordance with which innovations are only “technical” innovations, i.e. new or significantly improved products and processes (Technological Product and Process innovations, in short “TPP innovations”). Products (goods and services), processes and methods (technological, organizational or related to marketing) are recognized as innovation, if they are new or significantly improved at least from the point of view of the implementing firm. This means that the definition of Innovation according to Oslo Manual applies to the full spectrum of novelties - new to the world (or absolute novelties), new to the market (in which the relevant company conducts its business) or new to the firm (introducing the novelty).

E. Stawasz, G. Niedbalska, [in:] K. B. Matusiak, [ed.], *Innowacje i transfer technologii. Słownik pojęć* [Innovation and technology transfer. Glossary of Terms], PARP, Warszawa 2008, p. 142.

Smart specialization – component of the new regional policy of the European Union, it plays strategic function of central importance in implementing three priorities defined by *EUROPE 2020 strategy*, namely:

- smart growth, based on knowledge and innovation;

- sustainable growth, promoting a more resource efficient, greener and competitive economy;
- inclusive growth, fostering a high employment economy delivering economic, social and territorial cohesion.

It matters for the future of Europe because the development of an economy based on knowledge and innovation remains a fundamental challenge for Europe as a whole. Smart specialisation is also relevant to achieve sustainable growth, as an important innovation effort and considerable investment is required to shift towards a resource-efficient and low carbon economy, offering opportunities in domestic and global markets. Finally, smart specialisation contributes to inclusive growth between and within regions by strengthening territorial cohesion and by managing structural change, creating economic opportunity and investing in skills development, better jobs and social innovation.

D. Foray, J. Goddard, X. G. Beldarrain, M. Landabaso, P. McCann, K. Morgan, C. Nauwelaers, R. Ortega-Argilés, *Guide to Research and Innovation Strategies for Smart Specialisations (RIS3)*, Publications Office of the European Union, Luxembourg, European Union.

Ancillary smart specialization – it has functional and horizontal nature and relates to most spheres of economic and social life; it comprises a number of science and technology sectors generating solutions which contribute to improvements in all aspects of looking for and implementing innovations.

Cluster – a specific form of organizing production where flexible enterprises conducting complementary type of business are located in close proximity. These entities both cooperate and compete with one another, while maintaining relations with other institutions operating in a given sphere. The foundations for launching a cluster include cooperation links existing between entities, generating the processes of creating specific knowledge and increasing adaptation capacities. Cluster can be understood as a spatial concentration of businesses, institutions and organizations interconnected by a well-developed network of formal and informal relations and based on common development trajectory (e.g. technology, common target markets, marketing strategy, etc.), simultaneously competing and cooperating in certain aspects of activity. Cluster is a cross-sectoral network of formal and informal links between manufacturers, their suppliers and customers, institutions of science and technology sector. Cluster is characterized by dynamic information and knowledge exchange and a high level of simultaneous competition and cooperation.

Innowacje i transfer technologii. Słownik Pojęć [Innovation and technology transfer. Glossary of Terms]. [ed.] Krzysztof B. Matusiak, publ. Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2011, p. 137.

Know-how – in accordance with the definition set forth in Regulation of the European Commission No. 772/2004 of 7.04.2004 on the application of Article 81, clause 1 of the Treaty to categories of technology transfer agreements, the term means: a package of non-patented practical information, resulting from experience and testing, which is

- secret (that is to say, not generally known or easily accessible),
- substantial (that is to say, significant and useful for the production of the contract products)
- identified (that is to say, described in a sufficiently comprehensive manner so as to make it possible to verify that it fulfils the criteria of secrecy and substantiality)

K. Gulda, [in:] K. B. Matusiak, [ed.], *Innowacje i transfer technologii. Słownik pojęć* [Innovation and technology transfer. Glossary of Terms], PARP, Warszawa 2008, pp. 170–171.

National/regional research and innovation strategies for smart specialisation (RIS3) “are integrated, place-based economic transformation agendas that do five important things

- They focus policy support and investments on key national/regional priorities, challenges and needs for knowledge-based development, including ICT-related measures;
- They build on each country's/region's strengths, competitive advantages and potential for excellence;
- They support technological as well as practice-based innovation and aim to stimulate private sector investment;
- They get stakeholders fully involved and encourage innovation and experimentation;
- They are evidence-based and include sound monitoring and evaluation systems”

Guide to Research and Innovation Strategies for Smart Specialisations (RIS3), Publications Office of the European Union, Luxembourg, European Union, 2012 p. 10

Regional Innovation Strategy – an essential tool for giving shape to innovation policy at the regional level. Based on a review of the region's innovation potential, RIS defines strategic goals of innovation policy and specifies the tactical assumption for achieving these. It indicates a sequence of operations and tasks necessary for enhanced dynamics of innovation oriented growth. RIS aims at building an effective system for supporting innovation in the region. This is a foundation for initiating cooperation and partnership as well as building the consensus of all regional actors involved in creating and providing support for the innovation processes. This is a tool providing support for regional and local authorities in their efforts to stimulate innovation capacities of the region. Regional innovation strategies, consequently, are the foundation for the construction of effective regional innovation systems.

A. Nowakowska, M. Klepka, [in:] K. B. Matusiak, [ed.], *Innowacje i transfer technologii. Słownik pojęć* [Innovation and technology transfer. Glossary of Terms], PARP, Warszawa 2008, p. 298.

Start-up – newly launched companies conducting their business online. Dictionary, e-Business support platform, http://www.web.gov.pl/wiedza/slownik/617_39_slownik.html

Ex Ante Conditionalities - The rationale for strengthening ex ante conditionality for the funds is to ensure that the conditions necessary for their effective support are in place. Past experience suggests that the effectiveness of investments financed by the funds have in some instances been undermined by weaknesses in national policy, and regulatory and institutional frameworks. The Commission therefore proposes a number of ex ante conditionalities, which are laid down together with the criteria for their fulfilment in the General Regulation. Some conditions are directly related to the thematic objectives of the policy (for example, smart specialisation strategies, or appropriate regulatory framework for business support), while others apply horizontally (for example, public procurement).

European Commission, *Cohesion Policy 2014 -2020. Investing in growth and jobs*, Publications Office of the European Union, Luxembourg, European Union 2011, p. 5, <http://ec.europa.eu/info/region>.

Green growth – Countries rapidly developing their economy face a number of social and environmental challenges and in longer timeframes damage the balance of ecosystems. Green growth may solve such problems and make it possible to avoid copying costly, ineffective and harmful solutions. A means to achieve sustainable development, the concept explains and solves

numerous problems. Green growth is a qualitative change in development trend, focusing on sustainability and stability of ecosystems.

OECD Green Growth Studies Putting Green Growth at the Heart of Development, Please cite this publication as: OECD (2013), OECD Publishing, <http://dx.doi.org/10.1787/9789264181144-en>.

Sustainable development – the form of socio-economic growth in which political, social and economic operations are integrated in such a way as to maintain the balance in the natural environment and sustain basic natural processes, in order to guarantee that specific communities or citizens, today and those of future generations, will have the opportunity to have their needs met.

T. Borys, [ed.] Wskaźniki zrównoważonego rozwoju [Indicators of sustainable development], Wyd. Ekonomia i Środowisko, Warszawa- Białystok 2005, p. 59.

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Streszczenie

Regionalna Strategia Innowacji Województwa Podkarpackiego na lata 2014-2020 na rzecz inteligentnej specjalizacji (RIS3) została przygotowana zgodnie z zaleceniami dotyczącymi kolejnej perspektywy finansowania rozwoju Unii Europejskiej, których głównym wyznacznikiem była konieczność kreowania inteligentnych specjalizacji regionu.

Rezultatem prac, w tym także konsultacji społecznych, było wyznaczenie trzech inteligentnych specjalizacji:

- Inteligentnej specjalizacji wiodącej – lotnictwo i kosmonautyka
- Inteligentnej specjalizacji wiodącej – jakość życia
- Inteligentnej specjalizacji wspomagającej – informacja i telekomunikacja (ICT).

Wizją Regionu jest ekologicznie i społecznie zrównoważona, innowacyjna i konkurencyjna gospodarka – Lider w kreowaniu ekoinnowacji. Region najwyższej jakości życia. Wizja ta odpowiada nowemu paradygmatowi rozwoju Unii Europejskiej, przedstawionemu w Strategii Europa 2020, będącej strategią na rzecz inteligentnego i zrównoważonego rozwoju, sprzyjającego włączeniu społecznemu. Nowy paradygmat rozwoju Regionu, odpowiadający europejskiemu, wyznaczają: zielony wzrost, ekoinnowacje, biogospodarka.

Summary

Regional Innovation Strategy of the Podkarpackie Voivodeship for 2014-2020 for smart specialization (RIS3) was prepared in compliance with the guidelines for the next framework of financing the EU development, where the main determinant was the necessity to define smart specializations for the region.

As a result of these works, which also included public consultations, the following three smart specializations have been defined:

- leading smart specialisation – Aeronautics and Space Technologies
- leading smart specialisation – Quality of Life
- ancillary smart specialisation - Information and Telecommunications (ICT).

The vision of the Region is based on ecologically and socially sustainable, innovative and competitive economy - Leader in eco-innovations and a Region of the highest quality of life. The vision is connected with the new paradigm of the EU development stipulated by Europe 2020 Strategy for smart, sustainable and inclusive development. The new paradigm of the Region's development, corresponding with the European policy is defined by: green growth, eco-innovations, bioeconomy.