

Regional Smart Specialisations of the Małopolska Province





Cracow University
of Technology



Regional Smart Specialisations of the Małopolska Province

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Table of Content

1. Life sciences	9
1.1. SECTOR DESCRIPTION	9
1.1.1. Assessment of the present situation in Małopolska	9
1.1.2. Perspectives for specialisation development in Małopolska	12
1.1.3. Domestic and international competitiveness	12
1.1.4. Forms of support within a specialisation	15
1.1.5. Key entities	15
1.1.6. Institutions responsible for legal regulations	16
1.2. THE R&D&I MARKET	17
1.2.1. Catalogue of universities	17
1.2.2. The academics' potential	18
1.2.3. Research programmes and supporting initiatives	19
1.2.4. Investments in research operations within a specialisation	20
1.3. TECHNOLOGICAL OFFERS OF ENTERPRISES FROM MAŁOPOLSKA	21
2. SUSTAINABLE ENERGY	23
2.1. SECTOR DESCRIPTION	23
2.1.1. Assessment of the present situation in Małopolska	23
2.1.2. Perspectives for specialisation development in Małopolska	25
2.1.3. Domestic and international competitiveness	25
2.1.4. Forms of support within a specialisation	28
2.1.5. Key entities	29
2.1.6. Institutions responsible for legal regulations	30
2.2. THE B&R&I MARKET	30
2.2.1. Catalogue of universities	30
2.2.2. The academics' potential	31
2.2.3. Research programmes and supporting initiatives	32
2.2.4. Investments in research operations within a specialisation	34
2.3. TECHNOLOGICAL OFFERS OF ENTERPRISES FROM MAŁOPOLSKA	35
3. INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT)	39
3.1. SECTOR DESCRIPTION	39
3.1.1. Assessment of the present situation in Małopolska	39
3.1.2. Domestic and international competitiveness	42
3.1.3. Forms of support within a specialisation	44
3.1.4. Key entities	44
3.1.5. Institutions responsible for legal regulations	45

3.2. THE R&D&I MARKET	46
3.2.1. Catalogue of universities.....	46
3.2.2. The academics' potential.....	46
3.2.3. Research programmes and supporting initiatives.....	47
3.2.4. Investments in research operations within a specialisation.....	48
3.3. TECHNOLOGICAL OFFERS OF ENTERPRISES FROM MAŁOPOLSKA	49
 4. CHEMISTRY	 51
4.1. SECTOR DESCRIPTION.....	51
4.1.1. Assessment of the present situation in Małopolska.....	51
4.1.1. Perspectives for specialisation development in Małopolska.....	54
4.1.2. Domestic and international competitiveness.....	54
4.1.3. Forms of support within a specialisation	55
4.1.4. Key entities.....	56
4.2. THE B&R&I MARKET	57
4.2.1. Catalogue of universities.....	57
4.2.2. The academics' potential.....	57
4.2.3. Research programmes and supporting initiatives.....	57
4.2.4. Investments in research operations within a specialisation.....	58
4.3. TECHNOLOGICAL OFFERS OF ENTERPRISES FROM MAŁOPOLSKA	58
 5. PRODUCTION OF METALS, METAL PRODUCTS AND MINERAL NON-METALLIC RAW MATERIAL PRODUCTS	 61
5.1. SECTOR DESCRIPTION.....	61
5.1.1. Assessment of the present situation in Małopolska.....	61
5.1.1. Perspectives for specialisation development in Małopolska.....	64
5.1.2. Domestic and international competitiveness.....	64
5.1.3. Forms of support within a specialisation	65
5.1.4. Key entities.....	65
5.1.5. Institutions responsible for legal regulations.....	66
5.2. THE R&D&I MARKET	67
5.2.1. Catalogue of universities.....	67
5.2.2. The academics' potential.....	67
5.2.3. Research programmes and supporting initiatives.....	68
5.2.4. Investments in research operations within a specialisation.....	69
5.3. TECHNOLOGICAL OFFERS OF ENTERPRISES FROM MAŁOPOLSKA	69

6. ELECTRICAL ENGINEERING AND MACHINERY INDUSTRY	73
6.1. SECTOR DESCRIPTION.....	73
6.1.1. Assessment of the present situation in Małopolska.....	73
6.1.2. Perspectives for specialisation development in Małopolska.....	75
6.1.3. Domestic and international competitiveness.....	75
6.1.4. Forms of support within a specialisation	77
6.1.5. Key entities.....	77
6.1.6. Institutions responsible for legal regulations.....	77
6.2. THE R&D&I MARKET	78
6.2.1. Catalogue of universities.....	78
6.2.2. The academics' potential.....	78
6.2.3. Research programmes and supporting initiatives.....	79
6.2.4. Investment in research operations within the specialisation.....	80
6.3. TECHNOLOGICAL OFFERS OF ENTERPRISES FROM MAŁOPOLSKA.....	81
 7. CREATIVE AND LEISURE INDUSTRIES.	 87
7.1. SECTOR DESCRIPTION.....	87
7.1.1. Assessment of the present situation in Małopolska.....	87
7.1.2. Perspectives for specialisation development in Małopolska.....	90
7.1.3. Domestic and international competitiveness.....	90
7.1.4. Forms of support within the specialisation	92
7.1.5. Key entities.....	94
7.1.6. Institutions responsible for legal regulations.....	95
7.2. THE R&D&I MARKET	95
7.2.1. Catalogue of universities.....	96
7.2.2. The academics' potential.....	96
7.2.3. Research programmes and supporting initiatives.....	98
7.3. TECHNOLOGICAL OFFERS OF ENTERPRISES FROM MAŁOPOLSKA.....	99
 LIST OF DRAWINGS, TABLES AND GRAPHS.....	 101

Małopolska - Polish centre for innovation and entrepreneurship

Małopolska is a region with high investment, academic and business potential. This is evident in macro and microeconomic data presented herein below as well as qualitative description of the region. A perfect climate to develop business and innovations in the region is confirmed through the presence of the region among finalists of numerous international competitions and ratings. Małopolska has been acknowledged by:

- The Institute for Research on Market Economy by achieving 4th position in the listing "Investment attractiveness of Polish provinces and subregions 2016";¹
- The Centre for Local and Regional Analyses which awarded Małopolska with an at least "B" grade for all sections assessed as per "Investment attractiveness of regions 2016"²
- The Financial Times awarding the second position among the Eastern Europe regions due to the strategy to attract investments, "Cities and Regions of the Future 2014/2015" fDi Intelligence;
- The Standard&Poor's agency and Fitch, which awarded Małopolska with the credit rating "A-";³
- As the most credible, visible, forward-looking and promising political strategy for entrepreneurial development granted the label **European Entrepreneurial Region (EER)**. Twenty-one EU regions and cities have been awarded the EER label so far. Małopolska was one of the three EER winners of the year 2016.

The Małopolska region has a flourishing infrastructure and ecosystem of entities supporting creative and innovative processes and entrepreneurship. The circle of such institutions operating within a general area, without being oriented on an individual Regional Smart Specialisation includes the likes of:

- Enterprise Europe Network at Technology Transfer Centre of Cracow University of Technology (www.transfer.edu.pl);
- Business in Malopolska Centre (www.businessinmalopolska.pl);
- Krakow Technology Park (www.kpt.krakow.pl);
- Małopolska Centre for Investor Service;
- Małopolska Regional Development Agency (www.marr.pl);
- City Development Agency Cracow (www.arm.krakow.pl);
- Cracow Chamber of Commerce and Industry (www.iph.krakow.pl);
- Business Centre Club - Club Małopolska (www.bcc.org.pl);
- American Chamber of Commerce in Poland (AmCham) Cracow division (www.amcham.pl).⁴

This results in the region, with the main cities that create it, being one of key centres for national innovation development. Małopolska province universities are hosts to numerous research studies which cover within their scope all Regional Smart Specialisations of the Małopolska Province [*pl. RISM*] as well as close cooperation with many leading, regional and international enterprises within the RISM sectors..

¹ <http://www.ibnegr.pl/Aktualnosci/Aktualnosci/Atrakcyjnoscinwestycyjna-wojewodztwa-i-podregionow-Polski-2016>, 07.08.2017

² <http://www.paih.gov.pl/publikacje/wojewodztwa>, 07.07.2017

³ <http://www.malopolskapartnership.pl/aktualnosci/79-malopolska-i-krakow-w-swiatowych-rankingach>

⁴ *Investment Attractiveness of Regions 2016, Warsaw School of Economics, 2016*

1. Life sciences

1.1. Sector description

The scope of Life sciences RISM covers two main subject areas: health and life quality as well as bio-economy. In practice Life sciences RISM focuses on interdisciplinary issues related to medical, natural, biological and biochemistry sciences. Examples of branches of science, which are the basis for the specialisation include agro-mechanics, biochemistry, bioinformatics, biology, medicine and pharmacology.

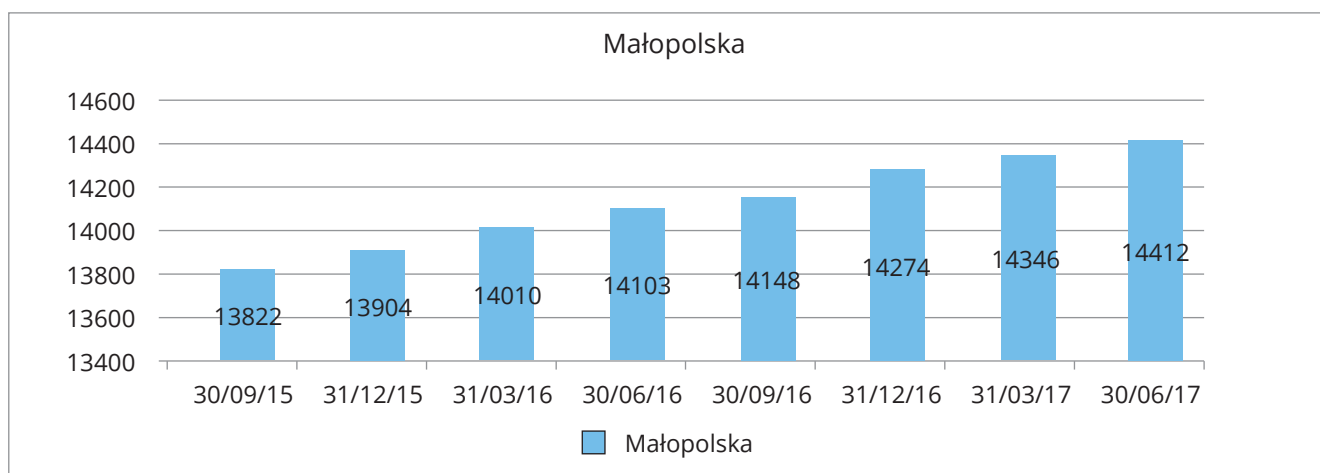
The composition of Regional Smart Specialisations of the Małopolskie Province includes the following detailed areas:

- Active and healthy life;
- Medicinal products and devices;
- Modern diagnostics and therapy, Digital Health;
- New therapeutic technologies and supporting medical devices;
- Innovative Medical Centre (Innovative Hospital);
- Healthy food and nutrition;
- Modern, sustainable agriculture;
- Environment - environmental health factors;
- Bio-economy.⁵

1.1.1. Assessment of the present situation in Małopolska

Małopolska is a region with a concentration of numerous innovative units from the Life sciences area. Among them biotechnological research centres deserve special attention. The biggest centres specialised in conducting clinical research such as Małopolska Medical Centre, Małopolska Clinical Centre or Cracow Medical Centre focus their operations on diseases within the field of: oncology, rheumatology, cardiology, allergology, neurology, immunology, dermatology, pulmonology, ophthalmology, urology. The world of science is completed by a large representation of innovative entities within the business segment.

Graph 1 Number of Life sciences RISM enterprises in Małopolska (units).



Source: Own elaboration based on: National economy entities entered in the register at REGON, GUS, 2017

⁵ Smart Specialisations of the Małopolskie Province (Appendix no. 1 to the Resolution no. 1262/15), Małopolskie Province Management, Cracow, 2015

Currently there operate 14,412 entities within the *Life sciences RISM* area. This constitutes about 8.8% of all enterprises operating within this area on the Polish territory. The sector dynamics features a positive upward trend, in Małopolska (+4.3% in the period 2015-2017) as well throughout the country (+4.5%). A significant specialisation within the *Life sciences RISM* is the area of medicinal activity with about 89.75 % of RISM entities in operation. What is also notable is the dynamically developing specialisation of biotechnological and natural sciences research which in the period 2015-2017 recorded an almost 9% growth.

Good condition of the sector is confirmed with the data on foreign investments. During the period 1989-2014 foreign investors displayed particular interest in the pharmaceutical sector - the expenditure value for that period was USD 312.94m, which constitutes 70% of total investments in the *Life Sciences* area.

Table 1 Size and structure of FDI investments in the Life Sciences RISM area

Subject of the investment	Investment value in USD m in 2014	Investment value in USD m in 1989 -2014
Health care	30.2	86.9
Production of primary pharmaceutical substances and medicines and other pharmaceutical products	13.94	312.94
Activity related to waste collecting, processing and treatment	1	46.5
Total	45.14	446.34

Source: *Foreign investors in Małopolska in 2014. Regional Development Observatory in Małopolska, Regional Policy Department, Warsaw, 2016*

In 2014 enterprises with foreign capital invested over USD 30m in the health and social care section. This value was composed of two initiatives - taking over the Skanmed Multimedis stocks by Life Healthcare Group Holdings LTD from SA and an investment by GMV Carint in the Clinical Diagnostics Centre in Tarnów.

Whereas, in the section of production of pharmaceuticals, medicines and other pharmaceutical products a key investor is an Israeli company Teva, which has been the owner of Cracow Pharmaceuticals Plant since 2009. Moreover, an investment in Trzebinia was made by the company Pharma-Cosmetic K.M. Adamowicz Sp. z o.o., with Fargon from the Netherlands as a shareholder.⁶

Companies with state-of-the-art technology which operate within life sciences area and the academic and research facilities at the disposal of units in Małopolska, create the region's attractiveness from the point of view of foreign investors as confirmed with information hereinabove.

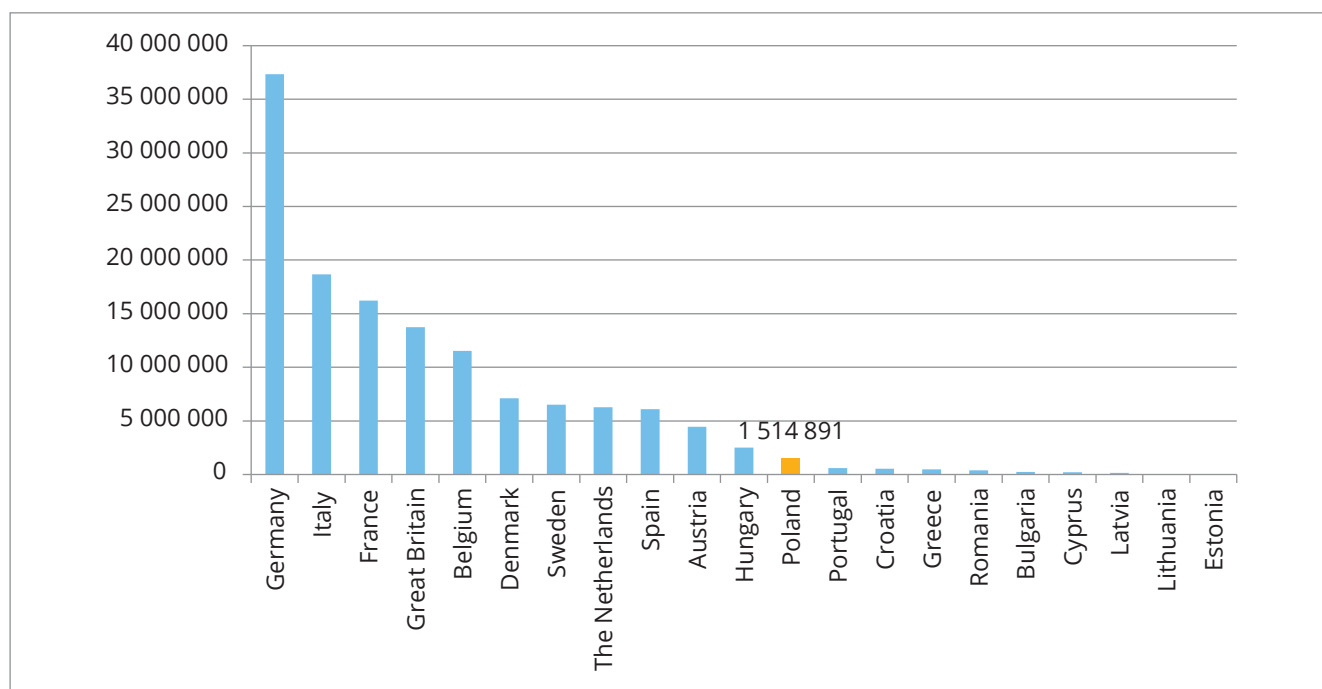
Between 2007-2016 the Polish Patent Office granted 15 patents to entrepreneurs operating within the life sciences area. Among the enhanced companies are the likes of: Selvita, Farmiona, Biocentrum Spółka z o.o., IBSS BIOMED, PROLAB Spółka z o.o. as well as Pharmaceuticals Plant „AMARA” Spółka z o.o..⁷

Due to a dynamic specialization development Poland is among the countries aspiring to the top 10 of the biggest exporters and importers of primary pharmaceutical substances and medicines as well as other pharmaceuticals in the European Union. In 2015 export of pharmaceuticals in Poland amounted to EUR 1,515m while import amounted to EUR 1,887m. This is also indicative of a significant internal demand which currently must be satisfied overseas and hence of the field to carry out new investments.

⁶ *Foreign investors in Małopolska in 2014. Regional Development Observatory in Małopolska, Regional Policy Department, Warsaw, 2016.*

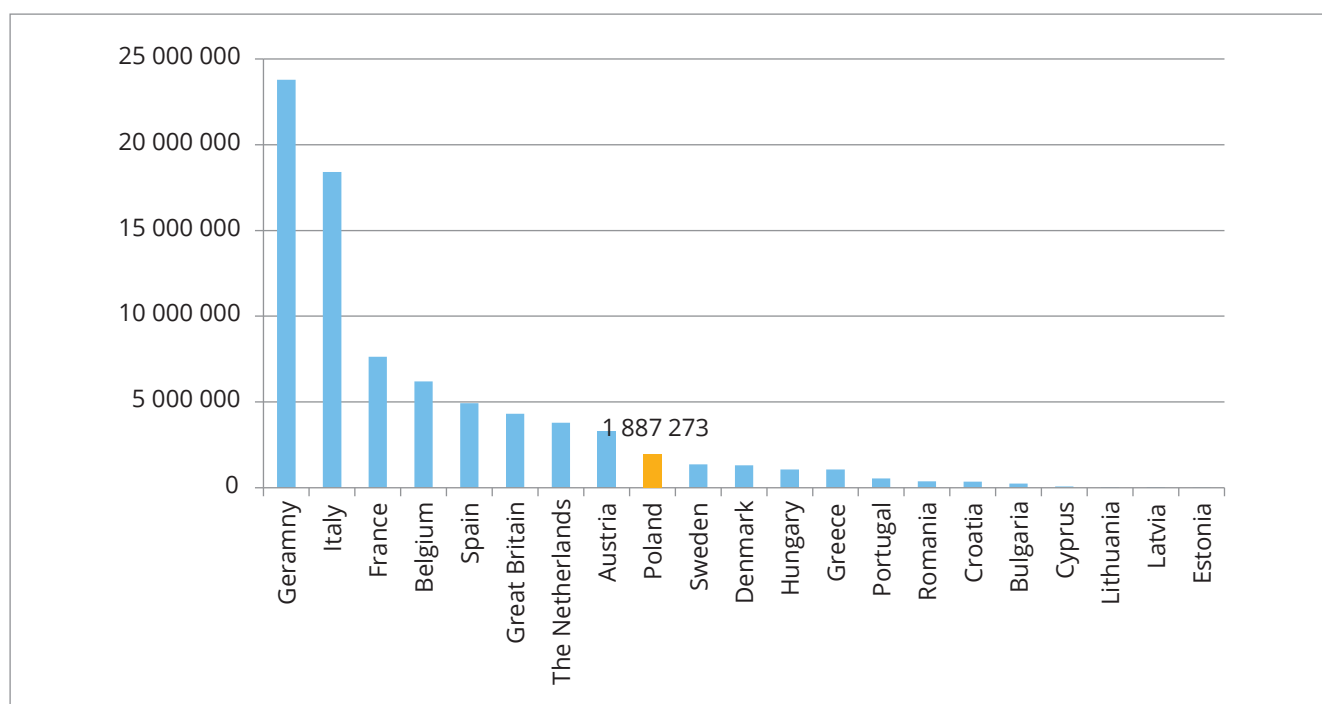
⁷ *Małopolska market analysis, Polish-American Innovation Bridge, Cracow, 2017*

Graph 2 Export of primary pharmaceutical substances and medicines and other pharmaceutical products



Source: Eurostat; Figures in thousands EUR; Data for 2015; The list includes enterprises with a code from section 21 NACE/PKD

Graph 3 Import of primary pharmaceutical substances and medicines and other pharmaceutical products



Source: Eurostat; Figures in thousands EUR; Data for 2015; The list includes enterprises with a code from section 21 NACE/PKD

1.1.2. Perspectives for specialisation development in Małopolska

The scope of life sciences area covers cross-sectoral fields of science and business where each of them features above average growth perspectives. The areas with highest perspectives comprise:

- **Healthy ageing** - this should be singled out as a perspective area because due to demographic changes visible in a decline of the population at the pre-productive and productive age as well as a growth of the population at the post-productive age, this area will see a strong development in the coming years. During the period 1989-2013 the number of population aged 65+ increased by 4.7%.⁸
- **Rehabilitation** - due to technical progress this sector sees the rise of a significant niche to implement advanced solutions and potential to implement innovations. Higher awareness in the society as well as care about health result in an increasing demand for services rendered by rehabilitation centres. Plenty of quantitative data reflect this trend, including increase of the level of education of physiotherapists (the number of people holding a higher education degree in 2010-2015 increased by 12%), increase of number of beds in rehabilitation wards (2.7% in the period 2014-2015), increase of the number of patients in rehabilitation wards (4.2% in the period 2014-2015), length of the patients' stay in rehabilitation wards (2nd result among all specialisations), increasing number of stationary therapeutic rehabilitation facilities commissioned for use every year (in 2015 there were 14 more than in 2014), etc.⁹
- **Pre-clinical and clinical research**- economic and demographic conditions pose for Małopolska an opportunity to become a clinical research centre on a European scale. The number of units with impressive technological facilities to carry out clinical research and the condition of the health care system constitute an essential combination of factors driving development of the area.
- **E-Health**- sector where ICT technology is used in medicine. This area combines two extraordinarily developing fields and features a significant long-term potential to implement innovations. Health care system in Poland is an area with insufficient E-health solutions - due to a market niche their implementation faces a great opportunity to succeed. As a result this sector develops at a superior pace. The forecasts show that by 2020 its value will increase by over 160% compared to 2015.¹⁰
- **Healthy food**- social changes and effective awareness increase result in a growing significance of ecological and nutrition-related aspects of food at the consumer's decision level. Therefore research and development work within natural sciences, in particular those focused on nutrition and organic food, are in a higher demand on the market. Poland and the Małopolska province still have an enormous potential to grow. In Europe, the healthy food segment constitutes about 2-8% of the food market, while in Poland it still is about 0.5%. At the same time the Polish market increases dynamically at the rate of 10-20% per annum.¹¹
- **Ecological and effective agriculture**- a search for new solutions in this field is a global trend which in Poland has a notable development potential (relatively high significance of agriculture, potential to implement innovations within this area, increasing consumers' awareness). Additionally, academic centres such as the University of Agriculture in Cracow robust in their operations support sectoral development in the Region. Ecological agriculture is one of the most dynamically developing segments. The number of ecological farms in 2003-2013 increased over 11 times and the upwards trend continues.¹²

1.1.3. Domestic and international competitiveness

Poland and the Małopolska region hold a strong position in the entire Life sciences sector. In some specialisations this advantage becomes particularly dominant. Due to the social and economic features, Poland is one of the key European centres of clinical research. The number of clinical research studies in Poland in the period 2011-2016 more than quadrupled.

⁸ *The demographic situation of the elderly and consequences of ageing of Polish population in the light of forecasts for 2014-2050*, GUS, Warsaw, 2014

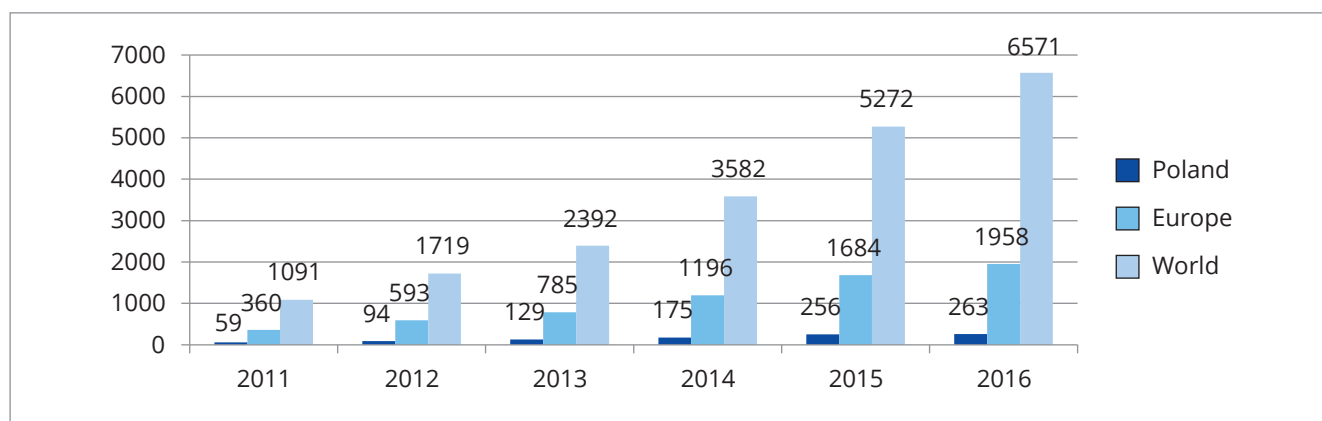
⁹ *Health and health care in 2015 r.* GUS, Warsaw, 2017

¹⁰ <https://www.statista.com/statistics/387867/value-of-worldwide-digital-health-market-forecast-by-segment/>, 20.09.2017

¹¹ <https://www.wiadomoscihandlowe.pl/artykuly/rynek-zywnosci-ekologicznej-w-polsce-w-2017-r,40373>, 20.09.2017

¹² <http://www.minrol.gov.pl/Jakosc-zywnosci/Rolnictwo-ekologiczne/Rolnictwo-ekologiczne-w-Polsce>, 20.09.2017

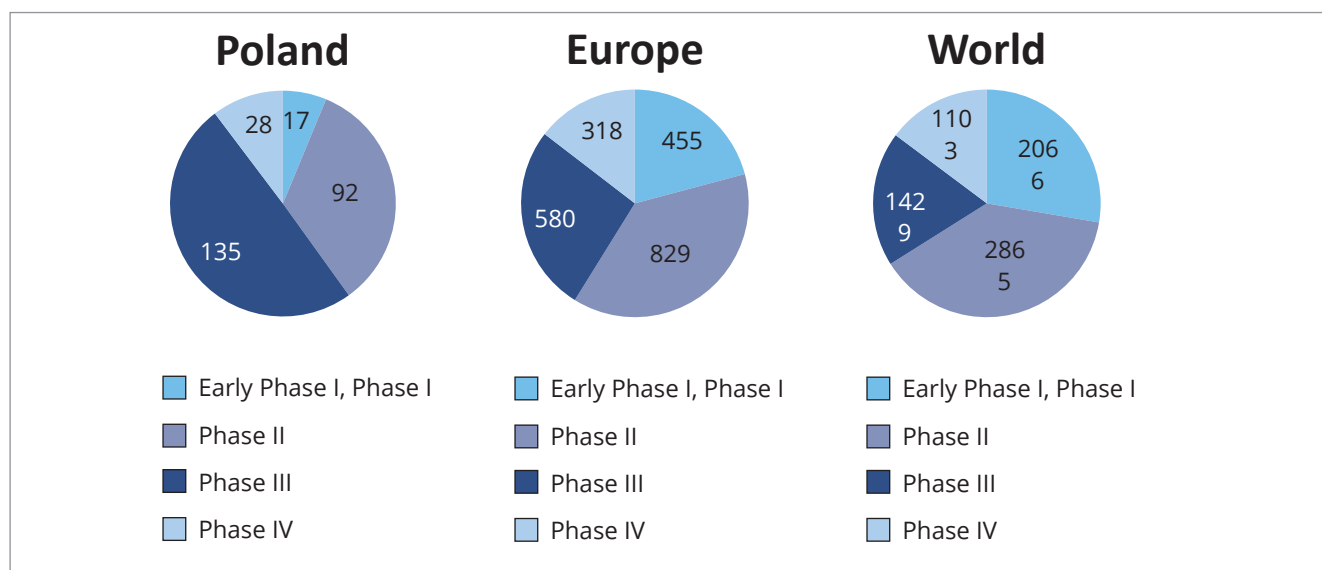
Graph 4 Number of clinical research studies



Source: Database ClinicalTrials.gov, research number with status: Recruiting, Active (not recruiting) divided into geographical regions

In Poland, research in phase II and III is visible as dominating; such research is considered key in the process of creation of new medicines and research requiring vast financial investment.

Graph 5 Number of clinical research studies divided into individual phases

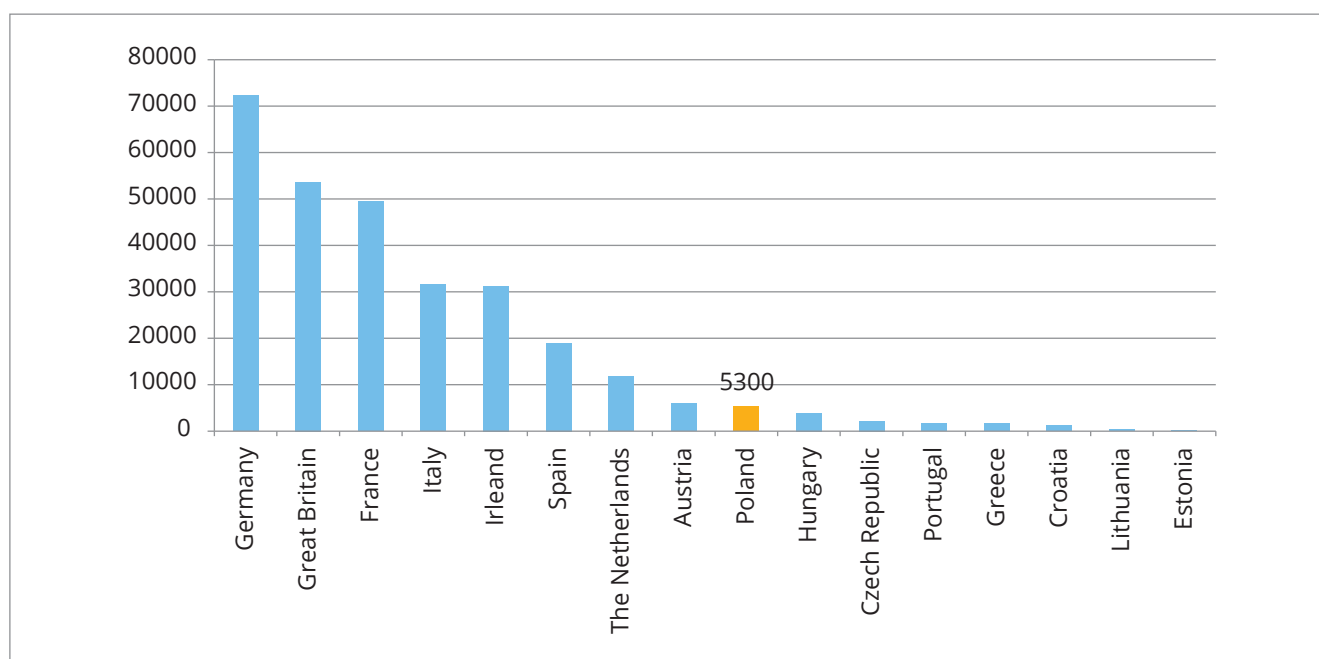


Source: Database ClinicalTrials.gov, research number with status: Recruiting, Active (not recruiting) divided into geographical regions

In the general view of the entire specialisation the Polish position is visible in an analysis of the size of production as well as employment. Poland is a country with above average potential in comparison to other 28 European Union member states. In the period 2009-2015 the value of production of *Life sciences RISM*¹³ in Poland increased by 41% with an average annual increase recorded at the level of 6.3% (CAGR) and amounted to EUR 5.3bn. With regards to employment those parameters were as follows: 13.9%; 2.2% and 69,203 FTE.

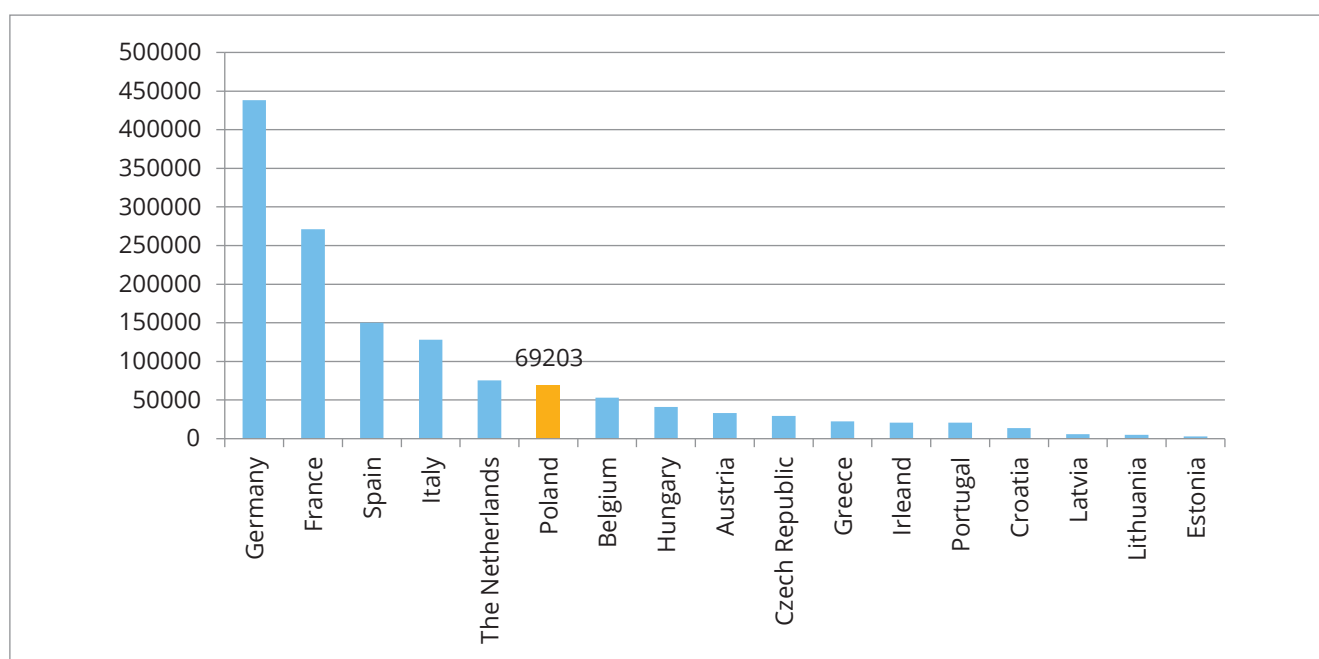
¹³ Statistics refer to the codes 21.10.Z, 21.20.Z, 71.20.A, 72.11.Z, 72.19.Z, 75.00.Z

Graph 6 Production value of Life sciences RISM



Source: Eurostat; Figures in in millions of EUR; Data for 2015; The following codes were excluded from the comparison 86.10.Z, 86.21-23.Z and 86.90.A

Graph 7 Employment rate in Life sciences RISM



Source: Eurostat; Figures in millions of EUR; Data for 2015; The following codes were excluded from the comparison 86.10.Z, 86.21-23.Z and 86.90.A

Poland's share of total production in the European Union is 1.3%. For comparison, neighbouring countries such as Austria or Czech Republic record values at the level of 1.49% and 0.5%. With respect to employment Poland's share in the total number of FTEs in the European Union is 3.8%, while for Austria or Czech Republic those levels are 1.83% and 1.63% respectively.

Stepping down from the international level to the regional level, particular attention should be given to the fact that Małopolska Region raises high interest among investors. A plethora of factors compose its attractiveness, however with respect to the operations within the Life Sciences area, they mainly are:

- significant percentage of students in biology courses - 18% of all students reading those courses in Poland;
- Cracow, as a flagship city of the region and a biotechnology sector centre with a growing potential;
- vast interest in the region among renown companies, such as” Selvita, TEVA Group, BioCentrum, Bielenda Natural Cosmetics, Farmina, LuxMed, MicroBioLab, Silvermedia – laureate of the INNOVATOR Małopolski 2016 competition , Herbapol;
- abundant scientific and research and development facility, well developed infrastructure.¹⁴

1.1.4. Forms of support within a specialisation

The government recognised the biotechnology sector in Poland as a priority. Companies considering investing in this sector may use numerous forms of support. One of key, dedicated forms is EU and governmental financing.

Table 2 Selected financing RISM 1

National level		
Competition	Amount of allocation	Contact
Strategic programmes of the National Centre for Research and Development: BIOSTRATEG	PLN 500,000,000	www.ncbr.gov.pl
Strategic programmes of the National Centre for Research and Development: STRATEGMED	PLN 800,000,000	www.ncbr.gov.p
Regional level		
Competition	Amount of allocation	Contact
ROP of the Małopolska Province Sub-measure 9.2.1 Social and health services in the region	PLN 216,354,146.64	www.rpo.malopolska.pl
ROP of the Małopolska Province Sub-measure 9.2.3 Welfare services and emergency intervention – SPR	PLN 53,940,956.33	www.rpo.malopolska.pl
ROP for the Małopolska Province Sub-measure 12.13 Infrastructure of health care of subregional significance	PLN 137,563,412.27	www.rpo.malopolska.pl

Source: Own elaboration

1.1.5. Key entities

■ MedCluster - Cluster Medicine Poland South – East

The coordinator for the platform in the Polish Medicine Association. The cluster is composed of 42 entities, universities as well as medical equipment producers, health spas, IT companies, PR agency and a consulting company. Apart from the Małopolska province, this initiative also includes the Śląskie, Podkarpackie, Świętokrzyskie, Lubelskie provinces. Such a broad scope of the cluster translates to its stability as well as increase of competitiveness of entities cooperating within 10 projects, such as:

- Open Health Care System – constitutes a combination of the most important elements of health care system and offers electronic exchange of health data,
- Health Programme - loyalty program facilitating patients’ identification at medical institutions, which offers personalised medical services,

¹⁴ <http://www.paih.gov.pl/regiony/wojewodztwa/malopolskie>, 16.08.2017

- InfoTechMed - assumes cooperation of scientific and research circles and business circles from the medical, technological, educational sector within implementation of innovative solutions allowing to improve quality and efficiency of therapeutic processes.¹⁵

More information on the website: www.medcluster.pl

■ Cluster Life Science Cracow

The primary objective of an individual entity is to form a cooperation network among companies and organisations with the biggest market potential in Poland within sectors such as medicine, cosmetics, biotechnology and to facilitate intensification of their cooperation with the LifeSciences market on the international arena.¹⁶ Projects implemented by the Cluster are of a regional and international range and currently they cover:

- AMICI – Anti Microbial Coating Innovations to prevent infectious disease;
- BFCC – Baltic Fracture Competence Centre;
- Life Science Open Space;
- ProBio Małopolska;
- LifeScience Services in PL-Grid.

More information on the website: www.lifescience.pl

The Cluster Innovation Team has created a platform Technology Transfer Offer which presents the technological offer of the Cluster partners. This is a specific tool providing innovative project management in order to commercialise it. Projects are subdivided into categories as per technology and application, then as per the project development stages, intellectual property rights and strategies regarding partnership and availability of cooperation, etc.

Detailed information on Technology Transfer Offer is available on the website: www.tto.lifescience.pl

1.1.6. Institutions responsible for legal regulations

Due to its key nature, the Life sciences specialisation offers a broad institutional representation on the central level. It includes, but is not limited to:

- **President of the Office for Registration of Medicinal Products, Medical Devices and Biocidal Products** - some of the tasks include: issuing marketing authorisations for a medicinal product, authorisation to conduct clinical research or veterinary clinical research, conducting Clinical Research Inspection, issuing marketing authorisation for biocidal products, issuing certificates for free sale, supervision over goods produced or marketed.

More information on the website: www.urpl.gov.pl

- **Chief Pharmaceutical Inspectorate - Chief Sanitary Inspectorate** - some of its competences cover decisions to withdraw a medicinal product from the market, grant authorisation to produce or import medicinal products and production of HE-ATMP, issuing Good Practice of Production Certificate and the CPP certificate.

More information on the website: www.gif.gov.pl

- **Province Pharmaceutical Inspectorate in Cracow** - main tasks of this institution include supervision over medicinal products - issues decisions on suspending marketing of individual batches of a medicinal product on their territory.

More information on the website: www.wif.malopolska.pl

¹⁵ <http://medcluster.pl/projekty/>

¹⁶ <https://www.malopolska.pl/biznes/bizneswmalopolsce/instytucje-wspierajace-biznes/klastry-w-malopolsce>

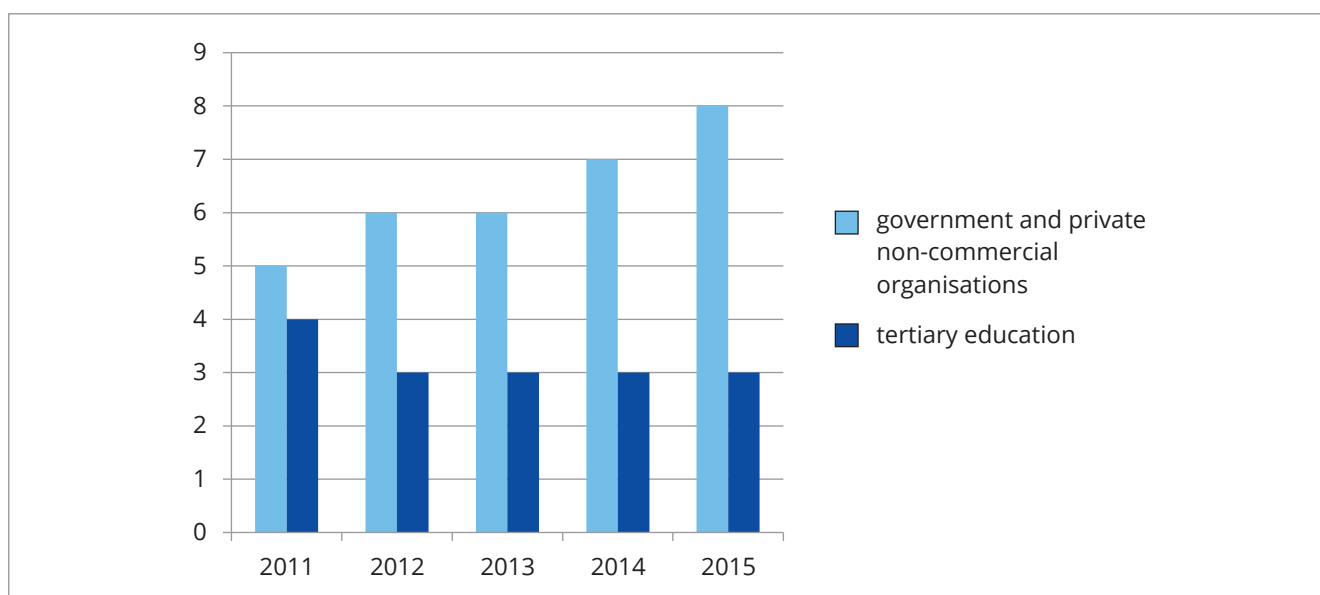
- **State Sanitary Inspection in Cracow** - some of its responsibilities cover epidemiological analyses and assessments, supervision over execution of obligatory vaccination, issuing orders and decisions in instances defined in the regulations on control of contagious diseases.

More information on the website: www.powiat.krakow.pl

1.2. The R&D&I Market

The R&D market in Małopolska within biotechnology and related sciences develops well. The universities in Małopolska are a dynamically developing source of new innovations. Apart from their own operations they constitute an excellent ecosystem for the business world within scientific and infrastructural support for enterprises interested in gaining competitive advantage through innovations as well as for investors interested in placing their production plants in the region. Moreover, apart from universities, governmental units and private non-commercial institutions show an increasing interest in activities in this area. An increasing involvement of those entities puts the Life Sciences RIS sectors on a fast track of an effective development.

Graph 8 Number of entities conducting biotechnology R&D operations



Source: Local Data Bank, Central Statistical Office of Poland [pl. GUS]

1.2.1. Catalogue of universities

Jagiellonian University

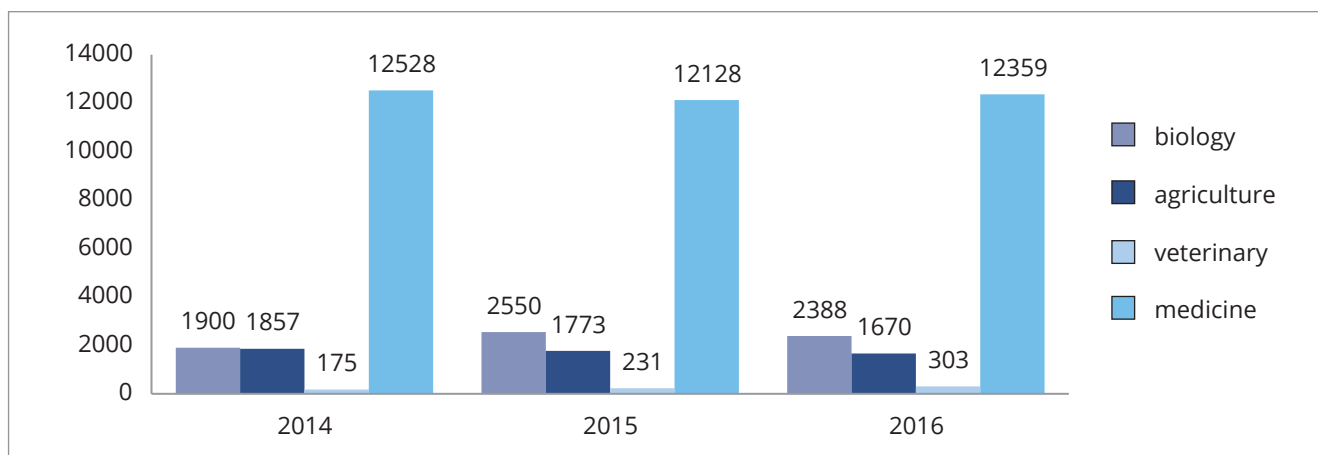
- Faculty of Biochemistry Biophysics and Biotechnology
 - Laboratory for Cellular Biophysics
 - Laboratory for Molecular Genetics and Virology
 - Analytical Biochemistry Institute
 - Cellular Biochemistry Institute
 - General Biochemistry Institute
 - Biophysics Institute
 - Cellular Biology Institute
 - Medical Biotechnology Institute
 - Plant Physiology and Biochemistry Institute

- Molecular Genetics Institute
- Immunology Institute
- Microbiology Institute
- John Paul II University hospital in Cracow
- AHG University of Science and Technology in Cracow
 - Faculty of Electronics, Automation, Information Technology and Biomedical Engineering
- Collegium Medicum at the Jagiellonian University
 - Faculty for Pharmaceuticals Collegium Medicum Department for Technology and Biotechnology of Drugs
- Cracow University of Technology
 - Faculty of Chemical Technology and Engineering
- University of Agriculture in Cracow
 - Biotechnology - Interdisciplinary Course
 - Faculty of Food Engineering and department for Food Biotechnology

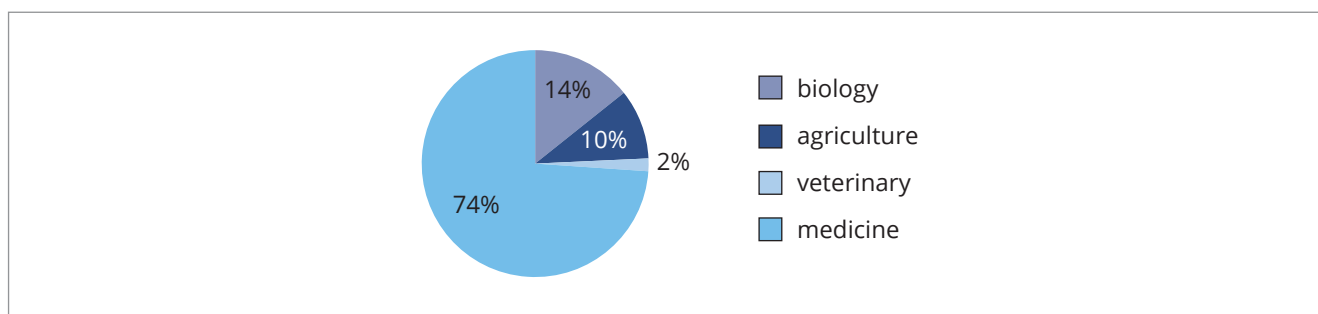
1.2.2. The academics' potential

There are many units in the Małopolska province which have a diverse educational offer within medical, natural and related sciences. Attractive faculties and specialisations attract a crowd of students from all over the country and thus year by year Małopolska becomes an even more competitive and representative region, thus being a flagship region of Poland on the international Life Sciences market.

Graph 9 Students in the Life sciences faculties

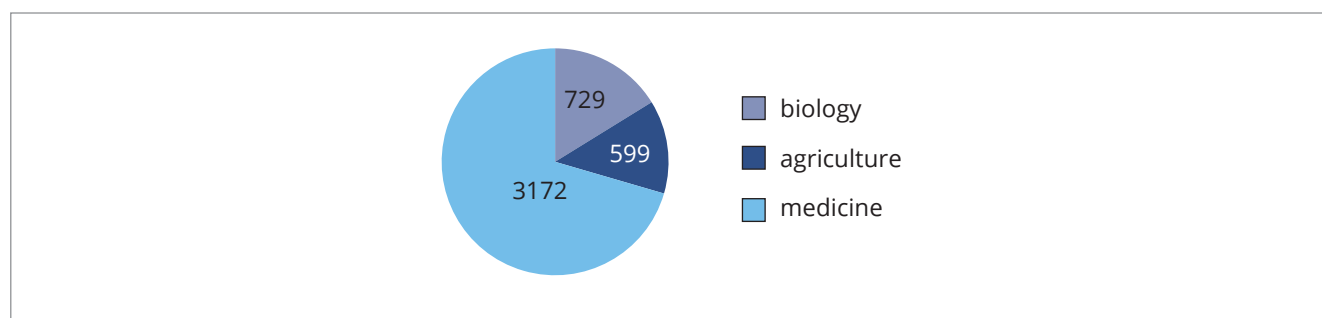


Source: Local Data Bank, Central Statistical Office of Poland



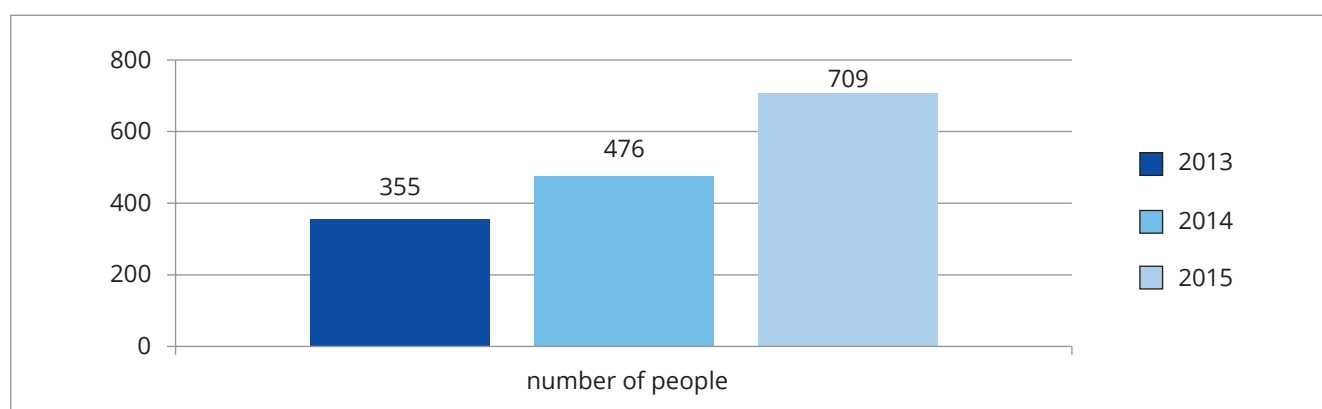
Source: Local Data Bank, Central Statistical Office of Poland; Data for 2016

Graph 10 Graduates of the Life sciences faculties



Source: Local Data Bank, Central Statistical Office of Poland; Data for 2016

Graph 11 Personnel in the Biotechnology R&D at academic units on the territory of Małopolska



Source: Local Data Bank, Central Statistical Office of Poland; Figures in people

1.2.3. Research programmes and supporting initiatives

- **Małopolska Centre for Biotechnology (MCB)** – Centre is composed of 6 sites with mutually complementary research subjects and 5 laboratories of independent research groups. MCB's areas of scientific operations, *i.e.* biotechnology, contagious diseases, food safety, structural biology, nutrigenomics, neurobiology and bio-information technology are a part of the Bio thematic group, which constitutes one of four "strategic subject areas of technology research and development" in Poland.

More information on the website: www.mcb.uj.edu.pl

- **Małopolska Centre of Medicine** – holds the status of a scientific facility conducting clinical research on new medication for the pharmaceutical industry or new dosage of medication already available at pharmacies. The centre specialises in conducting research not solely for leading pharmaceutical companies but also for raising biotechnological companies - as one of the few centres in Poland. MCM cooperates with partners from the European Union, the United States, Japan, South Korea and has its share in the global registration of about a dozen of innovative medications, in particular in the field of haematology and rheumatology.

More information on the website: www.mcm.med.pl

- **Cracow Medical Centre** - Centre of clinical research of SMO type, specialised in execution of the most difficult clinical research protocols of phase I – IV. Currently, there work 42 doctor specialists who practise diagnostics and disease therapy within: internal diseases, gynaecology, ophthalmology, laryngology, orthopaedics, osteoporosis and allergology, surgery, dermatology, diabetology and many others.

More information on the website: www.kcm.pl

- **Małopolska Clinical Centre** - specialist centre conducting clinical research in compliance with the Good Clinical Practice (GCP) principle within: neurology, rheumatology, pulmonology, immunology, cardiology, dermatology, oncology and diabetology. For this purpose the Centre cooperates with a group of 20 regularly trained specialists, who are involved in cooperation with respect to the sponsor's requirements and preferences.

More information on the website: www.mck-krakow.pl

- **Centre for Innovative Therapies Centre for Clinical Research Coordination of the University Hospital in Cracow** - specialised unit of the University Hospital in Cracow which organises, coordinates and supervises conducting clinical research, in accordance with the Good Clinical Practice (GCP) principles. Currently there are over 100 clinical research studies in progress, some within: oncology, rheumatology, geriatrics, cardiology, allergology, urology and others. The Centre has its own premises adapted to conduct clinical research, with a possibility to take and carry out preliminary processing of biological material samples.

More information on the website: www.su.krakow.pl

- **Jagiellonian Centre of Innovation** - centre set up by the Jagiellonian University in Cracow. It operates at the point of contact of science and business offering a broad range of Life Science services, which may be classed into 4 groups:

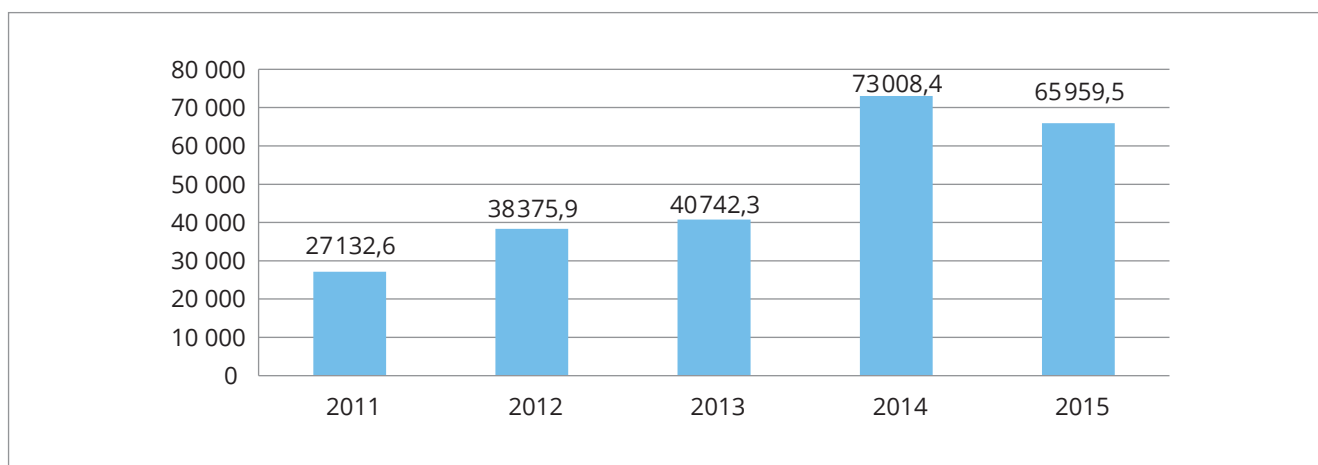
- Research offer (Laboratories and research services, JCI Quality Institute, JCI Centre for Clinical Research, Life Science Park),
- Financing (Seed funds, grants for science),
- Education (postgraduate studies, training and workshops, scientific kindergarten),
- Rental (laboratory premises, c rooms, rehabilitation robots, studies and treatment room).

More information on the website: www.omics.wl.cm.uj.edu.pl

1.2.4. Investments in research operations within a specialisation

As in the instance of a significant number of Life sciences RISM related aspects, also in the instance of investment in R&D operations within biotechnology, there appear tendencies of a positive nature, to say the least.

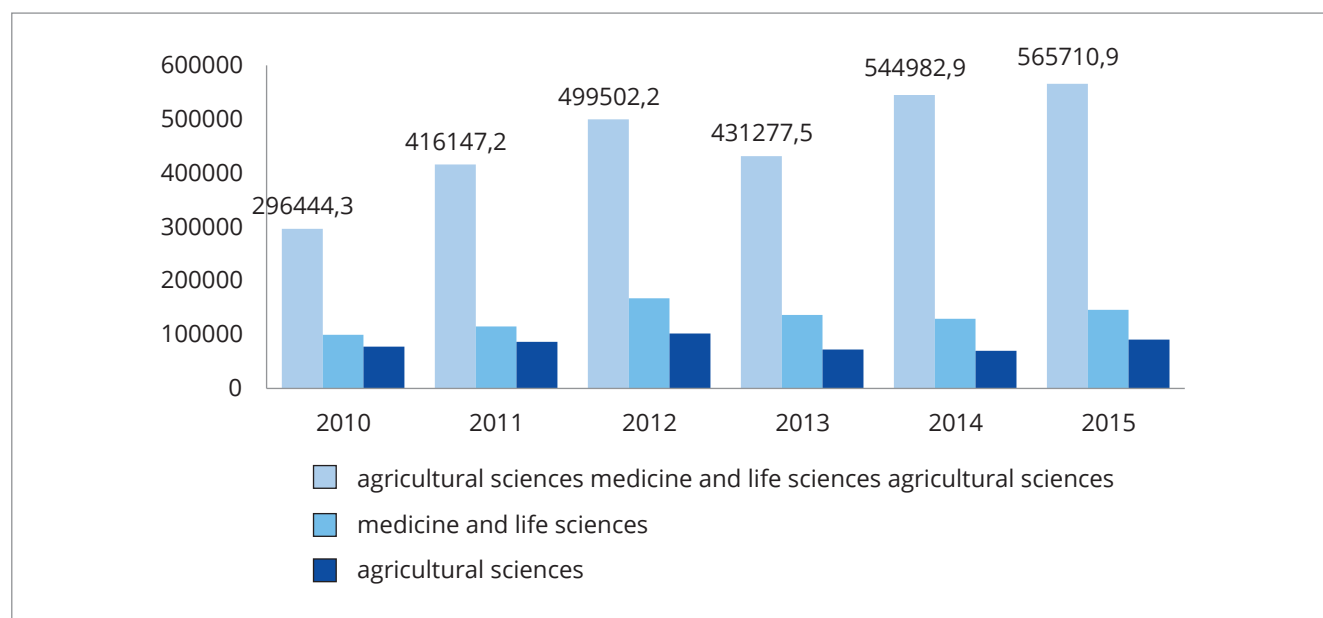
Graph 12 Investment in the biotechnology R&D operations in Małopolska



Source: Local Data Bank, Main Office for Statistics; Data in thousands of PLN

The Value of investment in biotechnology R&D at scientific units in 2015 was over PLN 65m - which means that with respect to year 2011 this value increased by 41%. It is a positive phenomenon which proves a strong development of research allowing successive emergence of more advanced solutions and inventions. They constitute a great value at a regional and national level, not only from the perspective of economics or science but, importantly, they also constitute a significant social value. The key aspect, however, is the fact that they determine and stimulate further development.

Graph 13 Internal investments in the R&D operations



Source: Local Data Bank, Central Office for Statistics; Figures in thousands of PLN

1.3. Technological offers of enterprises from Małopolska

Numerous international and national entities operate within the area of Małopolska's Life sciences specialisation. An abundant ecosystem of enterprises poses perfect conditions for cooperation at the meeting point of the world of science and business, especially that the sector displays a notable diversification with a broad representation of individual market segments. Enterprises from Małopolska feature innovativeness as well as high activity within execution of EU and international programmes.

Table 3 Analysis of services/products rendered by leaders in the *Life sciences RISM* sector

Entity	Scope of operations	Technological offer
TEVA	pharmaceutics	Inventing and developing medication indicated for diseases of dermatological, digestive system, haematopoietic system, cardiovascular system, urinary system, muscular-skeletal system, respiratory system, hearing and sight organs. Hormonal medication for internal use, anti-infective medication, anti-cancer and immunomodelling medication, dietary supplements. www.teva.pl
Selvita	biotechnology	Services within: computational chemistry, medical chemistry, industrial chemistry, process chemistry, protein chemistry, chemical analysis, pre-clinical research, comparative research on bio-similar medicines. Research and development company providing comprehensive biotechnological and bio-information technology solutions for R&D units, it constitutes a perfect example of creating the synergy effect. www.selvita.com/pl/

Entity	Scope of operations	Technological offer
Silvermedia	e-health	IT solutions and applications for the medical sector: cardiac telerehabilitation, cardiac telemonitoring, remote EKG consultation, Silvermedic Cardio Webviewer, Telecare SilverLife System, prevention research platform, HomeABR. www.silvermedia.pl
Bielenda	cosmetology	Natural beauty care products for body, face and hair. www.bielenda.pl
Prodromus	rehabilitation	<i>Prodrobot</i> - automated walk trainer intended for rehabilitation of lower limbs in patients with walking dysfunctions.
Tukan Rehabilitation Centre	rehabilitation	Centre for treatment of patients with musculoskeletal diseases and patients who have suffered neurological incidents, strokes, cerebrovascular accidents as well as post neurological operations and spinal diseases. www.tukan.info.pl
Farmina	zoology	Operates within dog and cat food production www.farina.pl
Aspel	medicine	Electrocardiographs, Holter monitor systems, pressure Holter, exercise systems, cardiac rehabilitation systems, spirometry, EEG systems, accessories and equipment. www.aspel.com.pl
BioTe21	genetics	Nucleic acid sequencing, genetic paternity tests, nucleic acid synthesis, DNA/RNA, genetic diagnostics - malignant melanoma, breast tumour, lung tumour, genetic diagnostics - tumours, metabolic, autoimmune, haematological, neuromuscular, cardiovascular diseases. www.biote21.com
Barwa	cosmetology	Anti-acne beauty products, soap bars, liquid soaps, skin care, face care products, shampoos, interior cosmetics. www.barwa.com.pl
BioCentrum	biotechnology	Pre-clinical research in vitro – ADME, toxicity, pharmacodynamics, comparative research on biosimilar medicines, biochemical analysis of proteins, production of recombinant proteins, crystallographic services; analytical services - LC/MS, development and validation of analytical methods, cleaning validation, proteomics and pharmacokinetics. www.biocentrum.com.pl
Prolab	microbiology	Microbiological studies on food products/dietary supplements, beauty products, probiotics, disinfectants; research on antimicrobial properties, research on water, inspection of sterilisation process effectiveness, monitoring of environment, research on packaging, bacterial endotoxins, molecular research; the Prolab collection includes bacteria strains with probiotic properties, which belong to two kinds: <i>Lactobacillus</i> spp. and <i>Bifidobacterium</i> spp. as well as conducts research on probiotic stands. www.prolabpolska.pl
Amara	pharmaceutics	Substances for pharmacist's equipment, medicinal products, dietary supplements. www.amara.pl

Source: Own elaboration

The innovation potential is particularly prominent among SME. The examples are entities which protect their products through patent protection as well as companies awarded in prestigious contests such as Innovator Małopolski. The body mentioned above also includes: Prodromus Sp. z o.o., Intelliseq Sp. z o.o., Silvermedia Sp. z o.o., Dodd-Inwest Sp. z o.o., Inotec Sp. z o.o., Tukan Rehabilitation Centre, Farmina Sp. z o.o., Aspel S.A., BioTe21 Adam Master, Barwa Sp. z o.o., Biocentrum Sp. z o.o., Prolab Sp. z o.o. Sp.k., Pharmaceuticals Plant AMAR Sp. z o.o..

2. Sustainable energy

1.2. Sector description

Sustainable energy was selected as *Regional Smart Specialisations of the Małopolskie Province* as a result of foresight research. The main objective of *Sustainable energy RISM* is to enhance the development trends of the industries it comprises and to improve the efficiency of energy use in a manner allowing meeting the current demand for energy without damage to the environment and the opportunities of¹⁷ future generations.¹⁸ Activities undertaken by national and EU level units, as per the selection above, result in the *Sustainable energy RISM* being an excellent area for business and innovation development. Moreover, a unique economic and social profile of the Małopolska province gives this area even more perspectives for science and business.

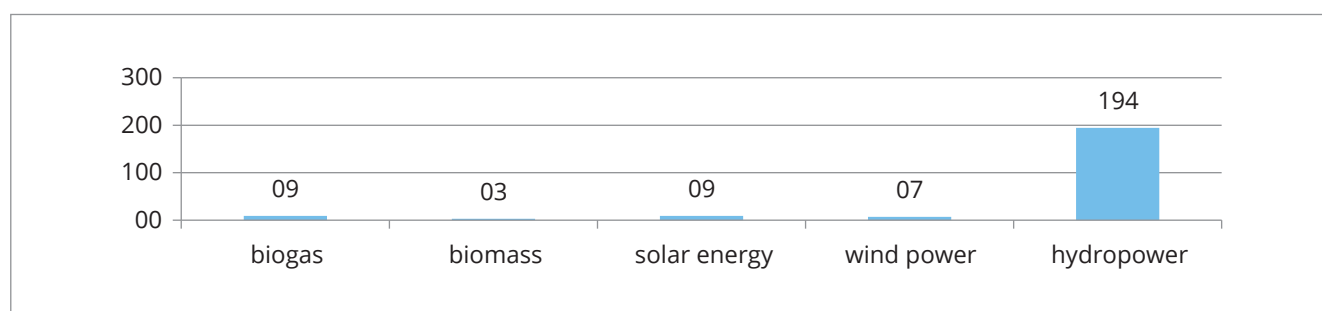
The composition of Regional Smart Specialisation of the Małopolskie Province includes the following detailed areas:

- Smart grids for energy storage;
- Clean technologies for processing and conversion of fossil fuels;
- Energy efficiency;
- Energy from waste and chemical energy carriers;
- Renewable energy sources;
- Energy efficient smart buildings and cities.¹⁹

2.1.1. Assessment of the present situation in Małopolska.

The province of Małopolska is 3rd in Poland with regards to production of electric power at hydroelectric power plants. Total value of RES produced energy in 2016 was 222.44 MW, where 5.54% comes from biofuels. Małopolska also deserves attention with respects to its position on the market of production of devices for solar energy industry.²⁰ In 2016 Małopolska's share in the total RES energy produced in Poland was 2.64%.

Graph 14 Energy production with the application of RES in Małopolska



Source: Own elaboration based on: Energy Regulation Office, Figures in [MW]; data as at 31.12.2016

¹⁷ As "future generations' opportunities" under the defined objective, RISM is understood as access to the energy resources and environment.

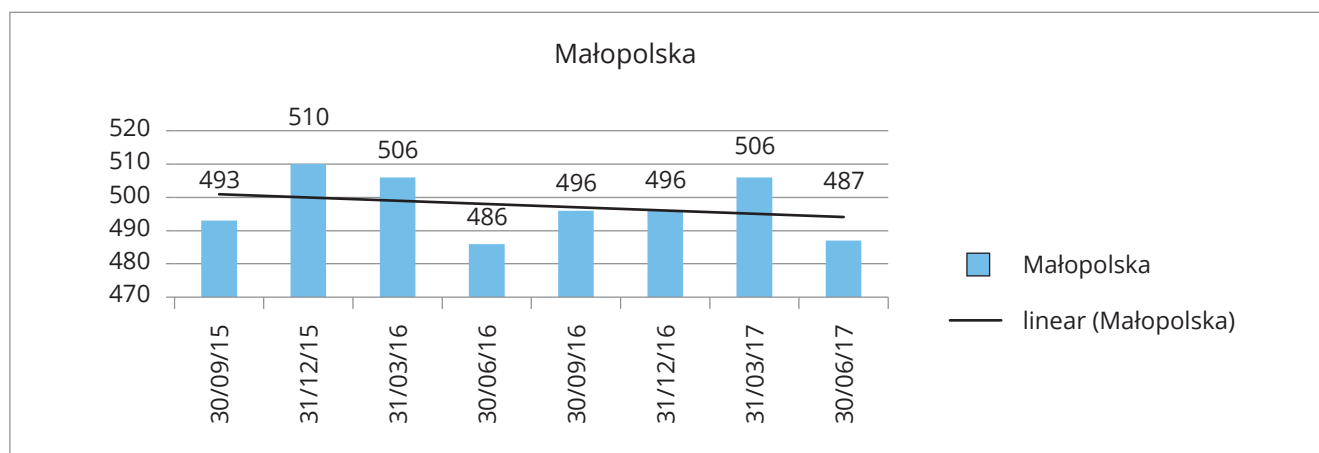
¹⁸ Strategy Programme for the Regional Strategy for Innovation of the Małopolska Province 2020 (Appendix no. 1 to the Resolution no. 995/16), Department for Economic Development UMWM, June 2016.

¹⁹ Smart Specialisations of the Małopolskie Province (Appendix no. 1 to the Resolution no. 1262/15), Małopolskie Province Management, Cracow, 2015

²⁰ Polish industry of production of devices for renewable energy industry, Renewable Energy Institute, Warsaw, 2016

Positive social changes and economic development of the region jointly translate to the growing aggregated demand for electric power not limited to the RES area. In Małopolska the total energy demand was over 12.3 thousand GWh in 2015, which constituted a 4.05% growth until 2007.

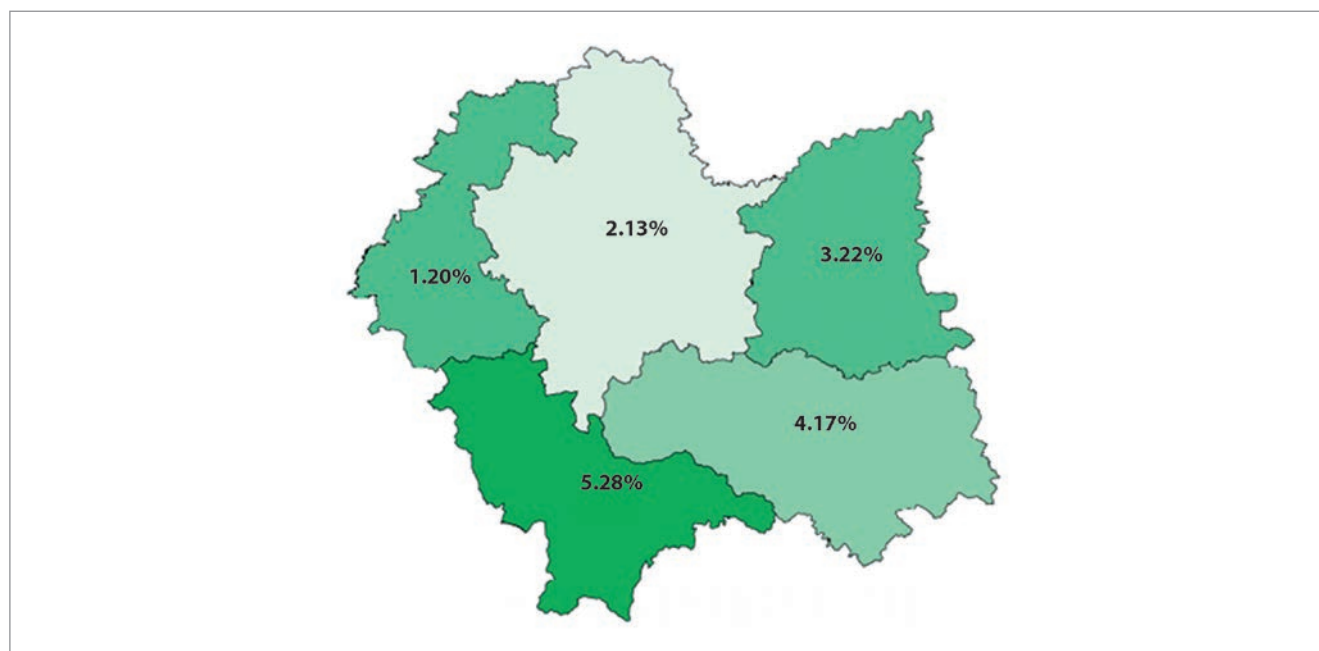
Graph 15 Number of Sustainable Energy RIS enterprises in Małopolska



Source: Own elaboration based on: National economy entities entered in the register at REGON, GUS, 2017

Currently there operate 500 entities within the *Life sciences RISM* area. This constitutes about 5.5% of the total of enterprises operating within this area on the Polish territory. Those statistics are maintained at a relatively stable level, which proves high stability of the renewable energy sector in Małopolska.

Graph 16 Percentage of enterprises using RES subdivided into regions of the province of Małopolska



Source: *Pro ecological behaviour and operations under social corporate responsibility among entrepreneurs in Małopolska, Regional Development Observatory in Małopolska, Cracow, 2016; status in 2016; 1. West Małopolska, 2. Kraków Metropolitan Area, 3. Tarnowskie, 4. Sądeckie, 5. Podhalańskie*

The most common RES in the Małopolska province are: solar energy (12% enterprises), heat pumps (6%), biomass (3%).

Analysis of the above data allows a statement that Małopolska is an excellent region to run a business and to invest in the Sustainable energy area. This is particularly affected by:

- positive dynamics of energy consumption resulting from social changes and generic economic development;
- notable involvement of national institutions in boosting development (more information in the chapters hereinbelow);
- still unused potential for development.

Direct foreign investments are an evidence that foreign entities are interested in the region and RISM. Foreign capital companies (such as Woodward in Niepołomice) invested USD 70.5m in the energy sector in the territory of the province of Małopolska in 2014. The Woodward investment included construction of a production complex on an area of about 6.5 thousand m² and employing over 100 people. Over USD 1m investments were made by French EDF at the Heat and Power Plant Kraków or the Czech CEZ owner of the Power Plant Skawina and the Heat and Power Plant Gorlice. The value of FDI's investment in 1989-2014 in the energy sector was USD 870.37m.²¹

2.1.2. Perspectives for specialisation development in Małopolska

The most important perspectives for the sector development:

- Małopolska's efforts to reduce the electric power deficit within the province which will have a direct impact on the increase of demand for electric installations;
- exchange of obsolete installations is an additional demand driver;
- further growth of demand for electric power (4% increase of general demand in the period 2007-2015²², 11% increase of demand in cities in the period 2000-2015²³);
- further growth of the sector investments, including environment protection and RES investments (production increase of RES energy in the period 2006-2015 was 81%);
- further intensification of operations directed at sustainable energy sector development and environment protection on the part of governmental and EU institutions;
- efforts of the European Council to introduce the so called Winter Package reducing the CO₂ emissions to the level of 550g per kWh as well as the efforts of the European Commission to meet the emission targets (green gas emission reduction in the period 1990-2050 by 80%, including by 90% for residential and office construction)²⁴;
- expected 2.2% annual drop in the number of CO₂ emission allowances CO₂²⁵;
- most legislative activities with an impact on the sector development perspectives stem from the worsening air pollution, deterioration of the condition of the environment and the level of exploitation of conventional energy sources. To a high extent, individual legislative activities stem from the national Energy Policy 2030 and the European Commission's guidelines.

2.1.3. Domestic and international competitiveness

The Małopolskie region features an above average pace of growth. Average annual pace of growth for the European Union countries was 1.34% in the period 2009-2015, while in the area of Małopolska it was 8.5%. Data regarding the period 2016-2018 was estimated.

²¹ *Foreign investors in Małopolska in 2014. Regional Development Observatory in Małopolska, Regional Policy Department, Warsaw 2016.*

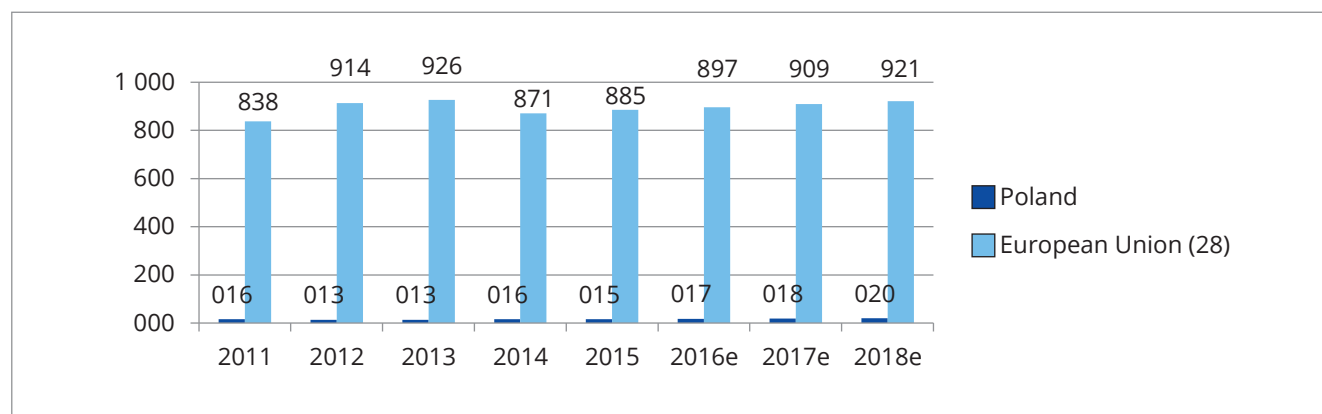
²² *Own elaboration based on: Energy use efficiency in the period 2005-2015, GUS, Warsaw, 2017*

²³ *Statistical yearbook for the Małopolska province, GUS, Cracow, 2016*

²⁴ https://ec.europa.eu/clima/policies/strategies/2050_pl, 07.08.2017

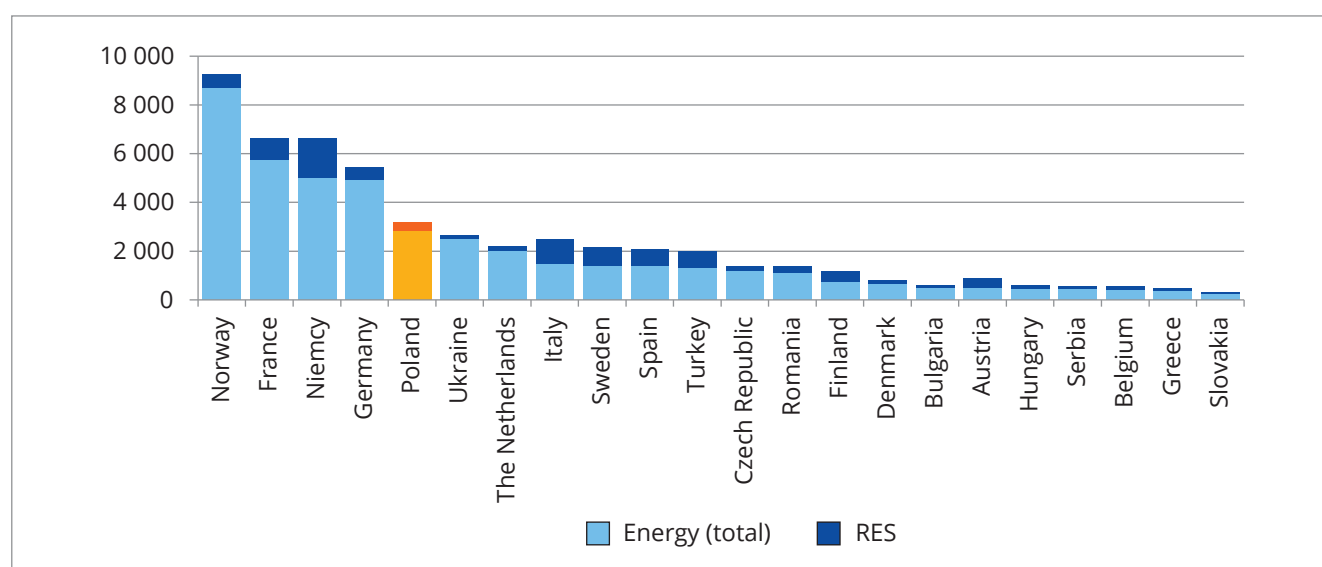
²⁵ <http://www.pap.pl/aktualnosci/news,823031,panstwa-ue-uzgodnily-stanowisko-ws-reformy-ets-polska-przeciw.html>, 07.08.2017

Graph 17 Value of the sold production in the area of Sustainable Energy in an international approach



Source: Own elaboration based on Eurostat; Figures in billions of EUR; comparison drawn on the basis of aggregated data for individual PKD codes included in the composition of RIS; Key: e-forecast

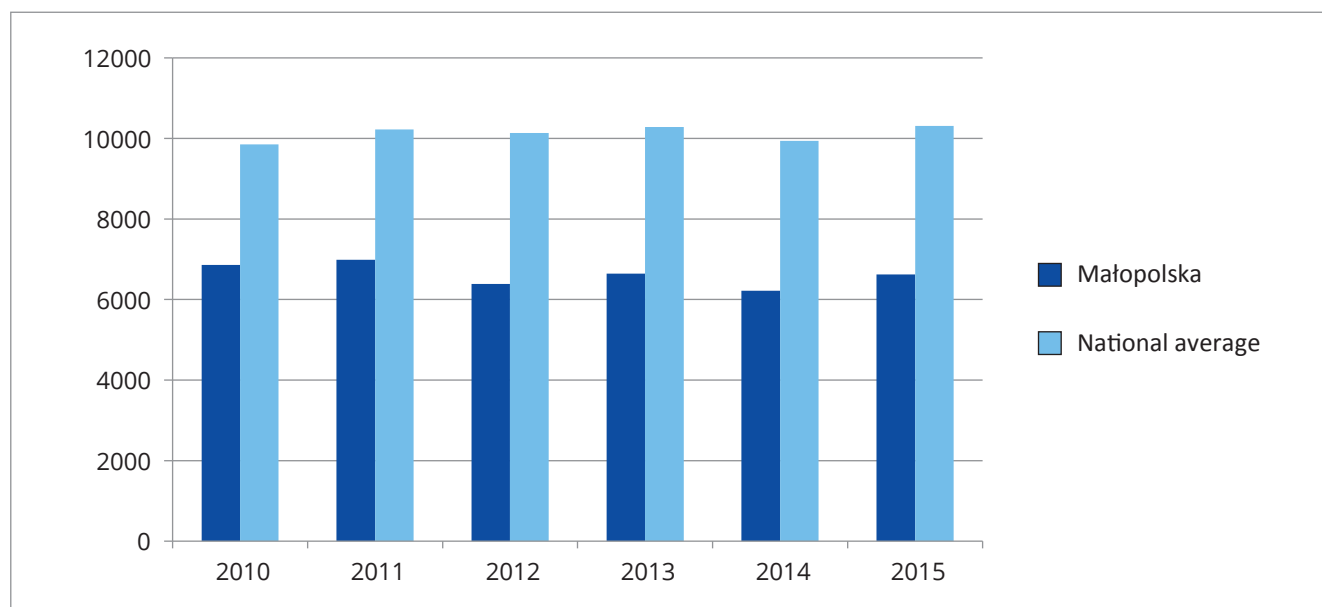
Graph 18 Size of energy and RES energy production



Source: Eurostat- Energy statistics; Figures in petajoules; Data for 2015

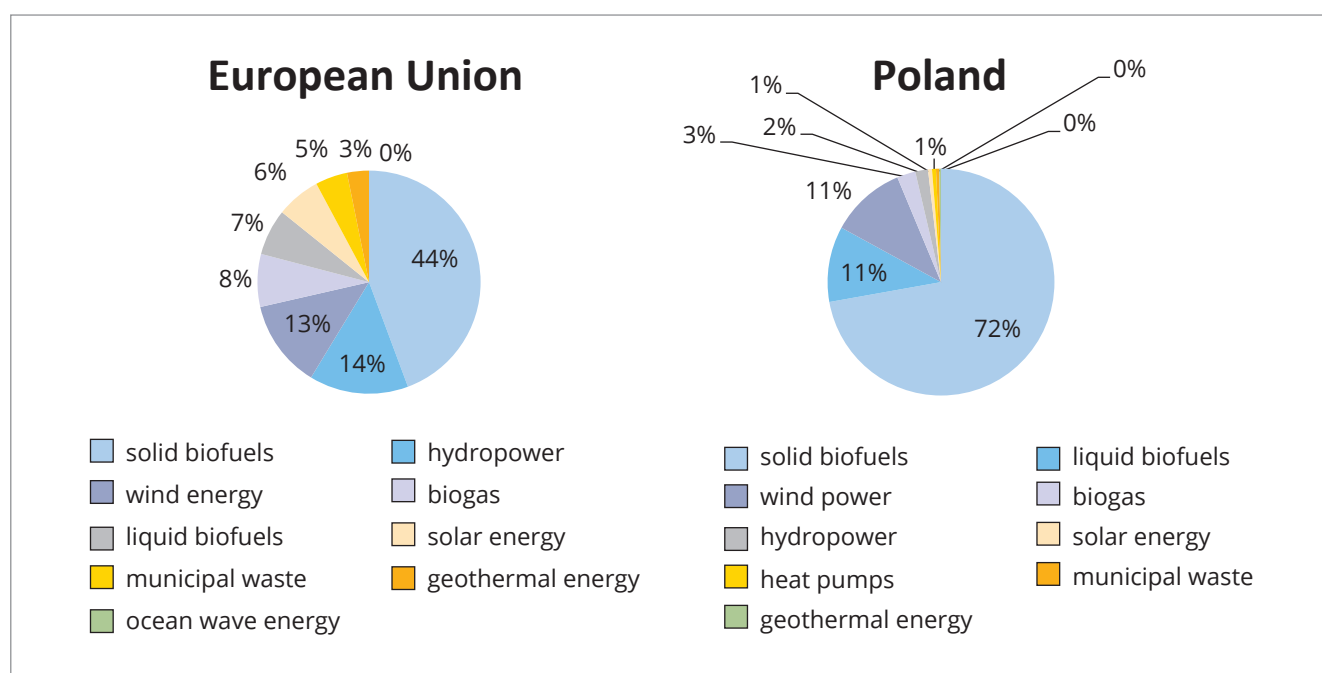
Poland is the 5th energy producer in the European Union, thus responsible for about 8.8% of the total EU production. Within the area of RES energy production Poland holds the 11th position and provides about 4.21% of the EU supply of RES energy. This data proves notable receptive nature of the internal market an further development potential for RES.

Graph 19 Electric power production



Source: Local Data Bank, Main Office for Statistics; Figures in [GWh]

Graph 20 RES energy mix (EU/Poland)



Source: Energy 2017, GUS, Warsaw 2017; Structure of power generation from RES in 2015 [%]

2.1.4. Forms of support within a specialisation

Due to the key nature of the Sustainable Energy RISM area, enterprises and investors of this sector may depend on advantageous support conditions. Examples of direct support are:

Table 4 Selected subsidies directed to RISM

National level		
Competition	Amount of allocation	Contact
Operational Program Infrastructure and Environment 2014-2020: Measure 1.1 Supporting production and distribution of energy from renewable energy sources Submeasure 1.1.1 Supporting investments related to production of energy from renewable energy sources with connecting those sources to the distribution /transfer grid - where the subsidies are for construction, installation rebuilding resulting in an increased power of the installed units using the renewable energy sources;	PLN 300,000,000	www.pois.nfosigw.gov.pl
Strategic programmes of the National Centre for Research and Development: TECHMATSTRATEG	PLN 500,000,000	www.ncbr.gov.pl
Sectoral programmes of the National Centre for Research and Development , POIR 1.2.: PBSE	PLN 120,000,000	www.ncbr.gov.pl
Regional level		
Competition	Amount of allocation	Contact
ROP for the Małopolska Province: Priority axis IV Regional energy policy Measure 4.1 Increased use of renewable energy sources Submeasure 4.1.1 Development of the infrastructure for the production of energy from renewable energy sources - where the subsidies are for infrastructure for production and distribution of electricity or heat from RES	PLN 86,614,000	www.rpo.malopolska.pl
ROP for the Małopolska Province, Submeasure 3.4.4 Subsidies for SME, B. investments of SME producing equipment necessary for production of energy and bio-components and biofuels of II and/or III generation	PLN 21,653,500	www.rpo.malopolska.pl
ROP for the Małopolska Province: Priority axis IV Regional energy policy Measure 4.1 Increased use of renewable energy sources Submeasure 4.2 Eco-Enterprises, A. fundamental energy modernisation of buildings, B. investments within installation of production of energy form sources C. comprehensive project involving: (a) energy modernisation of buildings, (b) investments within installation of production of energy form renewable sources, D. development of energy efficient and passive construction.	PLN 82,283,300	www.rpo.malopolska.pl
ROP for the Małopolska Province: Priority axis IV Regional energy policy Measure 4.1 Increased use of renewable energy sources Submeasure 4.3.3 Fundamental modernisation of public buildings - regional investments	PLN 84,448,650.00	www.rpo.malopolska.pl

ROP for the Małopolska Province: Submeasure 5.2.2 Waste management - SDP, A. construction, development, rebuilding of points of selective collection of municipal waste and points of repair, B. construction, development, rebuilding of installation for recovery, recycling and further use, C. asbestos removal related measures	PLN 86,614,000	www.rpo.malopolska.pl
ROP for the Małopolska Province: Submeasure 5.3.2 Water and sewerage management - SPR, A. construction, development, rebuilding of sanitary sewerage system, B. construction, development, rebuilding of waste water treatment plant, including renovation of sewage sludge, C. construction, development, rebuilding of supply systems	PLN 15,359,957.86	www.rpo.malopolska.pl

Source: Own elaboration

2.1.5. Key entities

- **Małopolska and Podkarpacie Clean Energy Cluster** under the cluster there operate enterprises, local governments, universities and business related institutions. Entities forming MPCEC focus their operation on intensified acquisition and use of clean energy in the region, focusing scientific research within this field and integration of operation within the field of energy and successive implementation of innovations within a relevant scope.²⁶

More information on the website: www.klaster.agh.edu.pl

- **South Poland Cleantech Cluster** are concentrated around technologically advanced fields; Smart city, smart and low emission buildings as well as management systems, energy efficiency, Big Data, bio-economy, renewable energy sources, smart grid. Initiatives undertaken under the SPCleantech cluster contribute to the renewable energy growth of production and efficiency and environment friendly materials, with simultaneous reduction of damage caused by the use of fossil fuels.

More information on the website: www.spcleantech.com

- **The Sustainable Infrastructure Cluster** - is an initiative of the business and science world created in 2011. The cluster focuses on development of solutions within construction, interior automation and ecology. The cluster is composed of over 90 entities from diverse sectors and specialisations of science. Cluster as a co-operational network creates for its members an organizational base, provides funds and infrastructure for the development, implementation and commercialization of innovative products and technologies.

More information on the website: www.klasterzi.pl

- **The Intelligent Building Cluster** - was created in 2010. Its objective is to support innovations and entrepreneurship within construction. The cluster constitutes a platform for execution of cooperation, investments or research and development works among its members. The Cluster provides a platform for the implementation of joint investment projects, research and development work, and other activities related to the development of smart buildings in the broad sense. Partners work together on various stages of projects: preparing a joint bid, raising funds, and promoting their business together.

More information on the website: www.klaster.intelligentnebudownictwo.com

²⁶ <https://www.malopolska.pl/biznes/bizneswmalopolsce/instytucje-wspierajace-biznes/klastry-w-malopolsce>, 08.08.2017

- **Science and Technology Park in Tarnów** is a distinctive entity among other science and technology parks which exist on the territory of the province of Małopolska, through its emphasis on support for projects related to ecology and natural environment protection. At the same time it supports operations contributing to creation of new job positions, consolidation of local business circles and acquisition of means to implement business and ecological enterprises.²⁷

2.1.6. Institutions responsible for legal regulations

At the national level establishing and implementation of policy and legal regulations within sustainable energy is the responsibility of:

- President of the Energy Regulation Office is responsible for granting and cancelling concessions, granting certificates of independence, granting and cancelling exemption from the obligation of provision of services of transfer or distribution of gas fuels and power, issuance of certificates of origin from cogeneration and their redemption and many others.²⁸ More information on the website: www.ure.gov.pl
- Regional Directorate for Environmental Protection in Cracow: www.krakow.rdos.gov.pl
- National Fund for Environmental Protection and Water Management; www.nfosigw.gov.pl
- Polish Chamber of Commerce for Renewable Energy; www.pigeor.pl
- Polish chamber for Biomass; www.biomasa.org.pl
- Polish Chamber for Biofuels; www.kib.pl
- Renewable Energy Association; www.seo.org.pl
- Council of the Commune, where investment in planned (location decision)
- Local network operator/distributor (decision on connecting)- Polish Electric Power Grid: www.pse.pl, Tauron Distribution: www.tauron-dystrybucja.pl
- County office, proper department for architecture and construction (construction permit).

2.2. The B&R&I Market

Research and development works are a driving wheel for development of sectors related to energy industry. Relatively high dynamics of changes taking place on the market and a notable pressure on the part of regulations and laws create a demand for innovations. RISM feature a broad potential within research and development works. Staff resources in the region are composed of 3,300 academics specialised in RISM related fields. In 2016, over 7,300 students graduated from field studies at the faculties of engineering and technology as well as natural sciences in the province. Moreover, the demand for innovations is significantly driven by enterprises and state and local government administration. In 2015, investments in fixed assets for protection of air and climate amounted to almost PLN 460.5m, while investments in new incineration techniques and technologies amounted over PLN 132m.

2.2.1. Catalogue of universities

The Małopolskie region has developed research and science facilities. Teaching within the Sustainable Energy RISM area is implemented by the following universities:

- AHG University of Science and Technology in Cracow;
 - o Faculty of Energy and Fuels
 - Department for Carbon Chemistry and Natural Sciences
 - Department for Nuclear Energy
 - Department for Hydrogen Energy

²⁷ <http://parki-technologiczne.pl/city/polska/listing/tarnowski-park-naukowo-technologiczny/>

²⁸ <https://www.ure.gov.pl/pl/urząd/informacje-ogólne/kompetencje-prezesa-ur/6533,Zadania-Prezesa-URE.html>

- Department for Heating and Flow Fluid Machines
- Department for Fundamental Energy Problems
- Department for Fuel Technology
- Department for Sustainable Energy Development
- Jagiellonian University in Cracow;
 - o Institute for Economy, Finances and Management
- Cracow University of Technology
 - o Faculty of Mechanical Engineering
 - Institute for Heat and Process Engineering
 - Institute for Energy Devices and Machines
- University of Agriculture in Cracow;
 - o Faculty for Production and Energy Engineering
 - Department for Agricultural Processes Energy and Automation

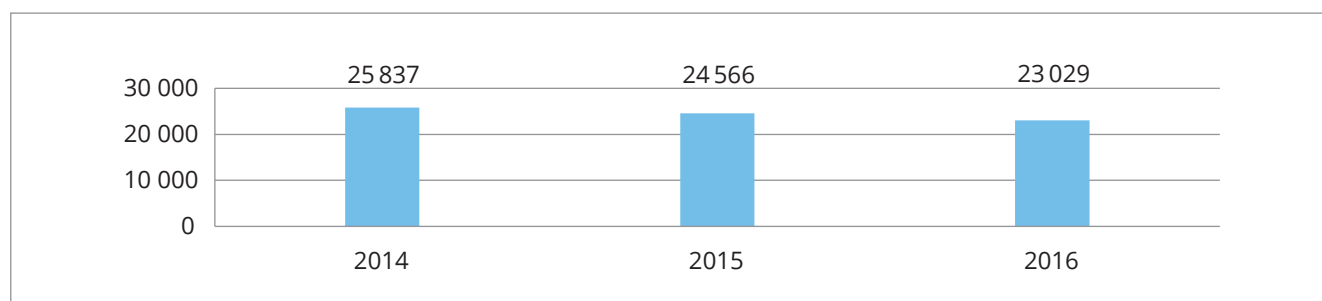
The following operate within science and research works and cooperation with business:

- Małopolska Laboratory for Energy Efficient Construction;
- Institute for Chemistry and Gas;
- Institute of Environment Protection Polish Academy of Sciences;
- Jerzy Haber Institute of Catalysis and Surface Chemistry Polish Academy of Sciences;
- Institute of Mineral and Energy Economy Research Institute Polish Academy of Sciences;
- Institute of Environmental Economics;
- The Henryk Niewodniczański Institute of Nuclear Physics Polish Academy of Sciences;

2.2.2. The academics' potential

Małopolska also features abundance of human resources. Great academic resources translate to a high standard of education of young people.

Graph 21 Students of faculties of engineering and technology and natural sciences



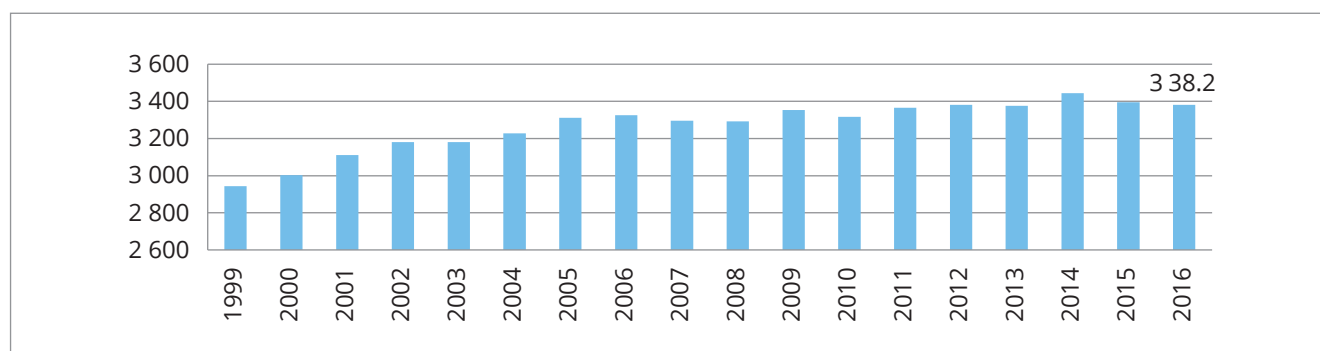
Source: Local Data Bank, Central Statistical Office of Poland

Graph 22 Graduates of faculties of engineering and technology and natural sciences



Source: Local Data Bank, Central Statistical Office of Poland

Graph 23 Academics at universities of technology



Source: Local Data Bank, Central Statistical Office of Poland

The GUS data refers to the number of students and graduates in the faculties of engineering and technology as well as natural sciences. Those faculties are closely related to *Sustainable Energy RISM*. The number of students shows a slight downwards trend - from 25,837 in 2014 down to 23,029 in 2016. However, this phenomena should not be defined as negative because this trend has been common throughout the country since 2006 and is also conditional upon demographic factors. The Province of Małopolska has been the second educational centre in Poland for many years. Moreover, the increasing number of graduates of the analysed faculties shows that the market records an increasing number of specialists contributing to the development of sustainable energy related research and solutions.

The province of Małopolska also demonstrates an increase of the number of academics at universities of technology. In the period 1999-2016 this increase reached nearly 15%. This proves a continuous increase of the academics' potential, who apart from their own contribution in the form of science and research operations, enhance the facilities within the sustainable energy specialisation, through successive improvement of higher education quality and competence of the graduates of universities in Małopolska.

2.2.3. Research programmes and supporting initiatives

Under Sustainable energy RISM numerous initiatives supporting R&D and cooperation of science and business are formed in Małopolska. Those include:

■ **Małopolska Centre for Energy Efficient Construction**

Centre with an impressive research and development facility at its disposal. The centre offers entrepreneurs, scientific institutions, architects, constructors, developers and even individuals a plethora of services within low-energy construction and systems of renewable sources energy production. Within its operations MCBE conducts scientific reports, low-energy building projects with profitability analysis, creates energy efficient material and construction solutions as well as building energy audits. Moreover, MCBE is the author of Małopolska Energy Efficient Construction Certificate, the first one in Poland confirming

fulfilment of conditions required while designing and constructing energy efficient buildings compliant with the criteria of nearly zero demand for energy (European Union directives).

More information on the website: www.mcbe.pl

■ ***Centre for Sustainable Development and Energy Efficiency WGGiOŚ at AGH University of Science and Technology in Miękinia***

Science and research unit at the AGH University of Science and Technology offering support to entrepreneurs during the process of energy efficiency optimisation. To serve this purpose they use instruments such as changes to the technology and production processes as well as adapting premises to new energy standards with the application of renewable energy sources and energy efficient construction. Moreover, this offer also includes diverse advisory services, training within renewable energy sources and technological audits.

More information on the website: www.spin.miekinia.agh.edu.pl

■ ***AGH Energy Centre***

The main objective of the project is increase of competitiveness and use of the potential of the Kraków Metropolitan Area not only in Poland but also among European metropolitan areas. The Centre's activity concentrates around consolidation of scientific circles and entities conducting research and development within the sustainable energy filed in a broad scope, including clean coal technologies, renewable energy, nuclear energy, material technologies, transport and environmental protection. Execution of the assumed objectives is possible through very well equipped research and commercial as well as research and educational laboratories such as:

- Laboratory of Energy Changes in Renewable Energy Sector ;
- Laboratory for Environmental Protection and Radiochemistry;
- Laboratory for Oil Fuels and Second Generation Biofuels;
- Laboratory for Alternative Fuels and Waste;
- Laboratory for Advances Energy Systems.

More information on the website: www.ce.agh.edu.pl

■ ***Małopolska Laboratory for Energy Efficient Construction***

The Laboratory is the first place in Poland to do such large-scale research on energy efficient technologies and the comfort of the occupants of low-energy buildings. This interesting project gives the University the leading position in the sector of energy efficient building.

The Laboratory building with a surface of 1039 m² has 14 climate and energy zones located at 5 levels which enables studying properties of materials and technologies depending on climate conditions. The laboratory has:

- a chamber for climate testing of building partitions and installations,
- a chamber for studying thermal comfort while using
- different HVAC installations,
- thermal imaging cameras,
- a 3D scanner,
- thermal manikin,
- a PIV system to examine air flow in relations to the ventilation system used

More information on the website: www.mlbe.pk.edu.pl

■ KIC InnoEnergy

The project run by an international consortium - coordinated by Karlsruhe Institute of Technology (KIT) - one of the top 8 flagship German universities. It is an international consortium composed of 6 so-called Hubs responsible for individual subject areas. The entire consortium forms a so-called Knowledge and Innovation Community – KIC. The Polish hub coordinator (CC PolandPlus) is AGH University of Science and Technology, whereas the main partners are: Silesian University of Technology, Central Mining Institute [p.l. GIG], Institute for Chemical Processing of Coal [p.l. IChPW], Tauron, ZAK Kędzierzyn, LOTOS, PGNiG and a number of universities (including the Jagiellonian University) as the so-called associated partners. Those entities explore the issue of Clean Coal Technologies and New Paradigm of Coal Resources Management.

More information on the website:

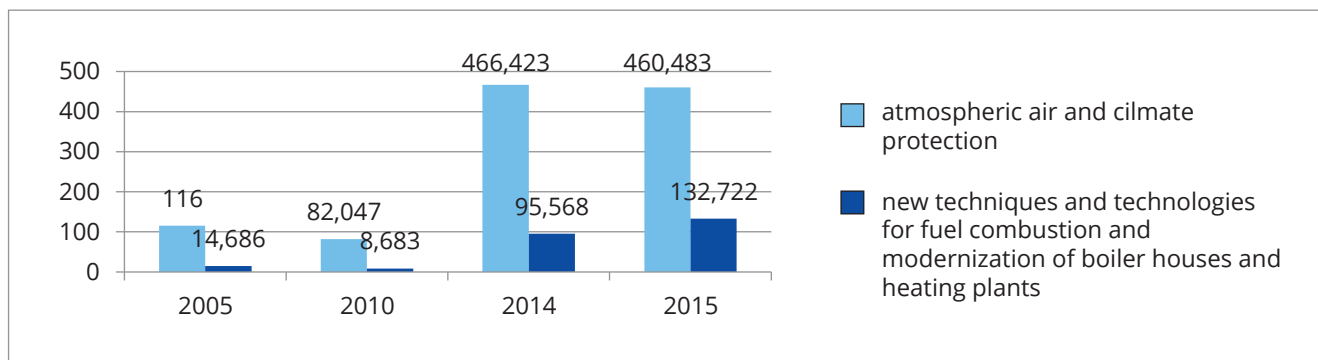
www.smartgrid.agh.edu.pl

www.innoenergy.com

2.2.4. Investments in research operations within a specialisation

Enterprises from Małopolska display a high level of innovation. In 2015, in the territory of the province of Małopolska there were in total 530 patents and 101 utility models application in total.²⁹ This is an effect of investments in R&D activities. Within the Sustainable Energy RISM, R&D activity is declared by 11.9% enterprises. At the same time as many as 22.6% enterprises declare product introduction or improvement.³⁰ While there are no statistics regarding and dedicated to Sustainable Energy RISM, the qualitative trend of the sector to increase investments in R&D is well portrayed in the statistics related to investments in fixed assets for environment protection. In the instance of investments in air and climate protection over the researched years, they increased 4 times, in the instance of investments in new incineration techniques as much as 9 times. A positive trend is also displayed in investments by enterprises in a total view featuring a twofold growth in the period 2010-2015.³¹

Graph 24 Investments for fixed assets for environment protection



Source: Statistical yearbook for the Małopolska province, GUS, Cracow, 2016; Figures in millions of PLN, current prices

²⁹ Polish Patent Office, Annual report 2015

³⁰ Innovation and research and development activities among enterprises in Małopolska, Małopolska Centre for Regional Development, Cracow, 2016

³¹ Statistical yearbook for the Małopolska province, GUS, Cracow, 2016;

2.3. Technological offers of enterprises from Małopolska

Sustainable Energy RISM is composed of a complex ecosystem of enterprises. In the region there operate large enterprises as well as a network composed of SMEs. The biggest enterprises in the region and specialisations include:

- **Tauron Group Polska Energia** - second largest energy enterprise in Poland and one of the biggest energy holdings in Eastern Europe. The company has a comprehensive product and services offer practically including all stages of the value chain.
- **EDF Fuels (EDF Group)**- part of an international concern delivering electric power. Enterprise provides coal and biomass delivery as well as the process logistics. The company provides services within delivery of production fuels, in particular coal and biomass;
- **CEZ**- international enterprise stemming from the Czech market. This entity operates within production and sale of electric and heat power. The company has made significant investments in the region of Małopolska.

The ecosystem of the entrepreneurs in Małopolska is completed with SMEs, which in many instances feature a high level of innovation. An example may be laureates of Innovator Małopolski competitions and companies which submitted their innovative solutions for patent protection. This group includes many companies connected with Sustainable Energy RISM, including many finalists of the Innovator Małopolski contests, such as: M3 System Sp. z o.o., K&K Recycling System Paweł Kuta, Protech Sp. z o.o., Jacek Habryło Firma NPF, Vis Inventis Sp. z o.o., Elfran Sp. z o.o., Anew Institute Sp. z o.o., Chochołowskie Termy Sp. z o.o., Kielar-Eco Sp. z o.o., Zdania Sp. z o.o., S-labs Sp. z o.o., Newindenergy Sp. z o.o., Formes Sp. z o.o., Skorut Systemy Solarne Sp. z o.o..

Table 5 Analysis of services/products rendered by leaders in the *Sustainable Energy RISM* sector

Entity	Scope of operations	Technological offer
Tauron Group Poland Energy	energy	Hard coal mining, electric power and heat production, electric power distribution, electric power sale, heat distribution and sale. www.en.tauron.pl
EDF Fuels	energy	Coal and delivery logistics (thermal dusts), natural gas and biomass sale and delivery. www.edfenergy.com
CEZ	energy	Electric power sale with the use of standard and non standard products which are used in Europe; OH, OHT, POB services. www.cezpolska.pl
Design studio F - 11	architecture	Full (conceptual, building and execution) multi-discipline design including eg. Energy-saving & Passive buildings, landscape architecture, environmental protection buildings, photovoltaic and windmill farms, urban design including usage of renewable energy sources www.f-11.pl
M3 System	energy efficient construction	House, residential and buildings for trade construction with the application of energy efficient solutions/technologies www.m3system.pl
K&K Recycling System	recycling	The recycling lines for plastics, regrind, plastic bags, made from a high quality regrind, processing of resources such as turf plastic packaging, dirt soiled plastic used in agriculture, heylage stretch plastic, packaging plastic LLDPE, LDPE, HDPE, PP, PCV, PS, PET,PA, non-woven farming material, big bags, sports ground artificial grass, disintegrated waste of farming chemicals. www.kkr.biz.pl
ELFRAN	RES	Producer of innovative accumulating Sun tracing solar collectors. www.elfran.com.pl

Entity	Scope of operations	Technological offer
Chchołowska Baths	RES	Pool complex with entertainment functions, with thermal water supply from the intake in w Chchołów (PIG-1). www.chocholowskietermy.pl
Newindenergy	RES	Providing all materials and thorough completion of a wind power plant ready for operation and organising all formalities related to design, arrangements, obtaining necessary permits and agreements in accordance with regulations. www.newindenergy.pl
Skorut Solar Systems	RES	Solar systems, photovoltaics, photovoltaic systems, photovoltaic trailer, solar collectors, production of photovoltaic and hybrid panels. www.skorut-solar.pl
ANew Institute	wind energy	Design and production of wind turbines of Vertical Axis Wind Turbine type. www.anew-institute.com
Bruck-Bet Solar	photovoltaics	Bruck-Bet Solar offers a wide scope of multicrystalline, monocrystalline modules as well as BIPV (Building Integrated Photovoltaics), which we produce with standard type PERC cells. www.solar.bruck-bet.pl
DR Ząber	wind energy	The business scope covers engineering and construction of special machines and equipment, process automation and small wind farm production. www.zaber.com.pl
Ekoprogram	solar systems	The offer of the enterprise includes: heat pumps, solar collectors, photovoltaics and other assembly services and servicing. www.ekoprogram.pl
ELTECO POLAND	RES	The company specialises in producing cogenerating systems - equipment for production of cogenerated electric and heat power as well as wireless power equipment (generator units and spare UPSs). www.elteco.pl
Protech	energy	The enterprise specialises in producing heating boilers. Among traditional boilers and modern boilers with feeders and fuel tanks there are boilers from 10 up to 1200 kW. www.protech-wkg.pl
GS Energia	energy	The offer includes: energy monitoring, enterprise energy audit, cogeneration, photovoltaics, thermal vision tests, air-conditioning efficiency assessment, boiler efficiency assessment, energy certificates, building energy audit. www.gsenergia.pl
HYMON ENERGY	solar systems	Products offered by the company: inverters, photovoltaic panels, assembly systems, photovoltaic sets, DC boxes and accessories. www.hymon.pl
IKOS-TERM	energy	The operations cover production of: central heating, gas, oil, solid fuel boilers; solar (water) collectors for DHW heating and to support central heating (with a 45% subsidy); air source heat pumps and with ground source heat exchanger; photovoltaic solar collectors; DWH heaters: gas, electric; installation materials and installation fitting. www.ikos-term.pl
Krio – Therm	energy	Conducting audits and analyses of economic rationalisations and optimisation of heating and ventilation systems, solar systems for single houses and apartment houses www.kriotherm.pl

Entity	Scope of operations	Technological offer
MAKROTERM	heating/cooling systems	Heating and cooling for single houses, industrial and facility buildings. Recovery and managing waste heat from fumes, vapours, technological processes and cooling. Renewable energy use. www.makroterm.pl
PEC Geotermia Podhalańska	Geothermal power	Production and distribution of heat power. www.geotermia.pl
RM-Instal	RES	Mini solar power plants, water heating sets, ventilation, air-conditioning, cooling, thermal insulation, heat pumps, thermal vision, energy efficient construction. www.rm-instal.pl
Seedia	RES	Smart ecological furniture powered by renewable energy. www.seedia.city
SiGa-Tech	biomass	Design and conceptual works, equipping biogas network, biogas treatment, fermentation chambers and process reservoirs, domes, odour filters and covering, heat exchangers and recuperators, assembly works, start-ups, servicing. www.sigatech.pl
Solgro	solar systems	The offer of the enterprise includes solar collectors, photovoltaic systems, photovoltaic sets, household sewage treatment systems, central vacuum cleaners. www.solgro.pl
Thermex	proecological installations	Thermal waste processing, flue treatment system, flue and ventilation ducts, pneumatic dispenser and transport systems, analyses and research reports, 3D modelling, industrial process optimisation and MES analyses. www.thermex.com.pl
Topset	solar systems	The enterprise makes photovoltaic power plants connected to the grid (on-grid) and autonomous (off-grid) with an accumulator bank. Its offer also includes stationary mount and sun tracing systems - installed on a tracking structure (tracker). www.topset-trackers.com
VAT R A	energy	Complete heating and air-conditioning systems with renewable energy sources applied. www.vatra.pl
Bt electronics	smart construction	The company portfolio includes the following products: building smart management system HOMATIC, automatic reception, receptionist support system, System of Automatic Identification of Keys SAIK formed of key depositories and corresponding control software. www.bte.pl
DLJM System	smart installations	Designing traditional electric installations, low voltage, house automation and BMS systems. www.inteligentnebudownictwo.com.pl
Elmodis	proecological solutions	They offer integrated hardware and software solutions which allow optimising energy consumption and preventing misuse. www.elmodis.com
ES-System	LED lighting	They produce and sell a broad spectrum of professional LED lighting solutions of high efficiency intended for architect circles, industry, trade and urban circles. www.essystem.pl

Entity	Scope of operations	Technological offer
Intelektronik	smart construction	Smart buildings EIB/KNX, devices KNX. The enterprise renders service services additionally. www.intelektronik.pl
KontaktIO	energy efficient solutions	It combines the real world with the Internet of Things providing solutions based on the Bluetooth Smart technology. The solution offered is cloud based, thus opening the possibility to manage beacon fleet from any location on Earth. www.hemms.pl
Hemms	building automation	The Hemms automatic control system provides integration of all installations in a smart house of flat with a guarantee of intuitive and problem free handling. www.hemms.pl
Thessla Green	proecological solutions	Producer of compact air handling units with heat recovery. www.thesslagreen.com
Airly	sensors	Airly builds networks of air quality sensors that can be deployed across entire cities or counties. The technology enables real-time monitoring of air quality via an online map. www.airly.eu

Source: Own elaboration

3. Information and Communication Technologies (ICT)

3.1. Sector description

Information and Communication Technologies (ICT) in the present world are one of the most dynamically developing and at the same time widely popular sectors. This situation is reflected in selection of the sector as the Regional Smart Specialisation of the Małopolska province. Notably, the sector is a driving force for other sectors' development and thus for the entire economy, with an offer of new solutions to support effectiveness.

The composition of Regional Smart Specialisation of the Małopolskie Province includes the following detailed areas:

- Medical engineering technologies, including medical biotechnologies;
- Diagnostics and therapy of modern age civilisation diseases and in personalised medicine;
- Innovative technologies, processes and products within the farming and food sector and forestry and wood sector;
- IT technologies supporting high quality food production;
- Highly efficient, low emission and integrated systems of production, storage, transfer and distribution of energy;
- Systems of building structure smart design and management;
- Environment friendly transport solutions;
- Advanced technologies of natural resources and raw material management and production of their substitutes;
- Multifunctional materials and composites with advanced properties, including nano-processes and nano-products;
- Sensors (including biosensors) and smart sensor networks;
- Smart networks, system integration and geoinformation technologies;
- Electronics based on conductive polymers;
- Automation and robotisation of technological processes;
- Smart creating technologies.³²

As an ICT sector it must define all operations related to production and use of telecommunication and IT equipment and related services (*i.e.* data collecting, processing or making available).

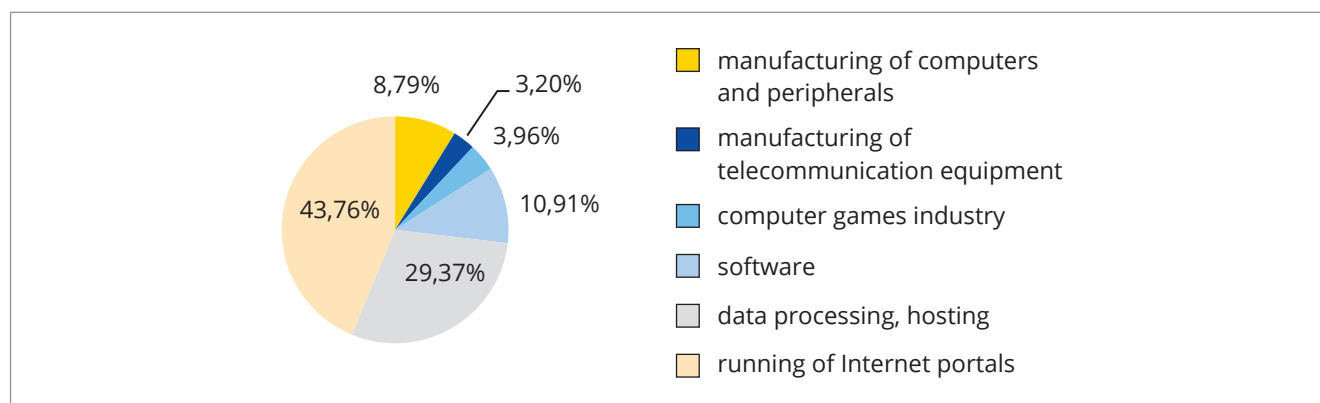
3.1.1. Assessment of the present situation in Małopolska.

Currently there are 1,842 entities in operation in this sector in³³ Małopolska. In comparison to 2014 it constitutes an increase of over 56%. In a quantitative view most entities (44%) are companies running Internet businesses.

³² *Smart Specialisations of the Małopolskie Province (Attachment no. 1 to the Resolution no. 1262/15), Małopolskie Province Management, Cracow, 2015*

³³ *Own elaboration based on: National economy entities entered in the register at REGON, GUS, 2017*

Graph 25 ICT sector type structure in Małopolska



Source: Own elaboration based on: National economy entities entered in the register at REGON, GUS, 2017

Małopolska is a region with a significantly higher concentration of ICT companies. Data presented in the TOP 200 Computerworld – ICT Market in Poland shows that the ICT sector employs 4,158 people therefore the province is second among provinces with the highest indicator of employment in the ICT sector.³⁴ Currently the Polish ICT sector generates about 8% GDP and 7.5% share of Polish export with a 3% participation in total employment.³⁵

In a structural view the ICT sector in Poland consists of three subsectors:³⁶

- Hardware 57%;
- Software 14%;
- Services 29%;

In Poland ICT provides services practically to all sectors with the most significant being:³⁷

- Administration (24.5%);
- Banking sector (17%);
- Telecommunications sector (16.7%);
- Industry (10.5%);
- Trade (7.9%);
- Financial sector (6.1%);
- Other (17.3%).

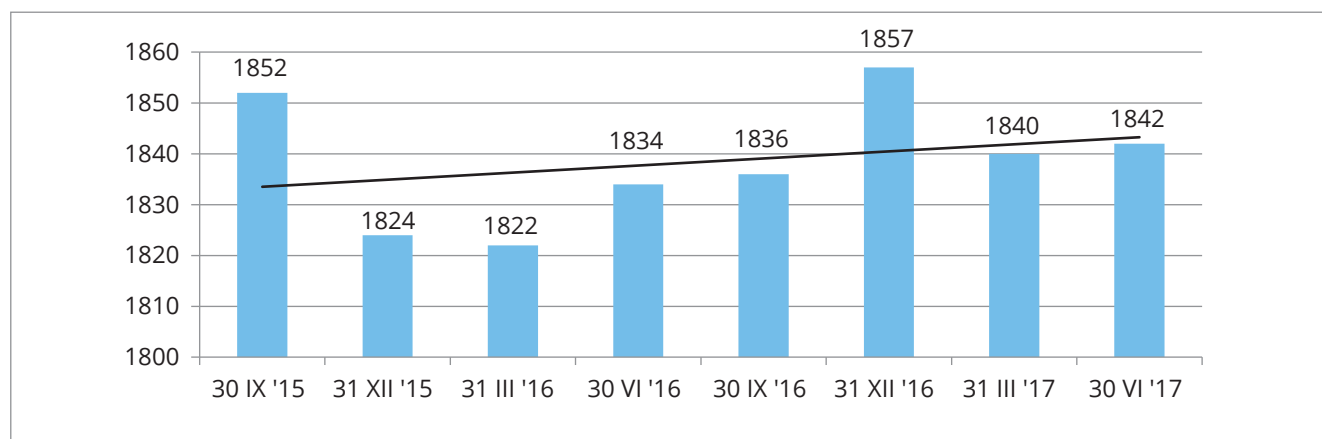
In Małopolska there operate 9.6% enterprises of the Polish ICT sector.

³⁴ *Ibidem*.

³⁵ <https://www.mr.gov.pl/strony/aktualnosci/spotkanie-z-branza-ict/>, 22.08.2017

³⁶ <https://analizybranzowe.wordpress.com/2015/12/09/ict-w-polsce/22.08.2017>

³⁷ *Ibidem*.

Graph 26 Number of enterprises in the ICT sector in Małopolska

Source: Own elaboration based on: National economy entities entered in the register at REGON, GUS, 2017

The enterprises from Małopolska operating within the ICT sector are very popular among investors with foreign capital. Total value of investments in the period 1989-2014 was over USD 473 m. Main share in the investment value belonged to the companies from the sector of modern services for business such as UBS Service Center, Cisco Global Support Center, RWE, Lufthansa Global Business Services or Luxoft.³⁸

A very strong trend related to setting up BPO, SSC or ITO centres also deserves attention. Such investments were made by the likes of Capgemini, SSC Corp, IBM, Hitachi Data Systems, Motorola, Google, Akamai, Volantis Software, Dassault Systemes and many others. The percentage of those employed in the ICT sector at foreign companies is 15.79% in relation to total employment in foreign companies in Małopolska, which is an evidence of an excellent condition of the sector.³⁹

Table 6 Foreign investments as per PKD in 2014 and in the period 1989-2014

Type	Investment value in USD m in 2014 year	Investment value in 1989-2014
Production of computers, electronic and optics products	39.52	81.72
Publishing operations	2	50.5
Information services operations	16.82	341.62

Source: Foreign investors in Małopolska in 2014. Regional Development Observatory in Małopolska, Regional Policy Department, Warsaw 2016

In 2015 the share of the Polish ICT sector in total export value was 7.6%. Absolute value of exported products was PLN 56.7bn. In comparison to 2012 it constituted an increase by PLN 4.9bn. Since 2012 export increased by 52%, while import by 37.4%.

³⁸ Foreign investors in Małopolska in 2014. Regional Development Observatory in Małopolska, Regional Policy Department, Warsaw, 2016, p. 9.

³⁹ Foreign investors in Małopolska in 2014, Regional Development Observatory in Małopolska, 2016

Table 7 Net revenue from export sales

Specification	2013	2014	2015
ICT sector	33,766.1	35,747.9	44,025.1
ICT production	18,911.4	20,477.0	23,902.6
ICT services, including:	14,854.8	15,270.9	20,122.4
a. ICT wholesale	5,718.4	3,991.8	5,057.4
b. Telecommunications	1,419.8	1,579.0	1,588.1
c. IT services	7,716.5	9,700.1	13,477.0

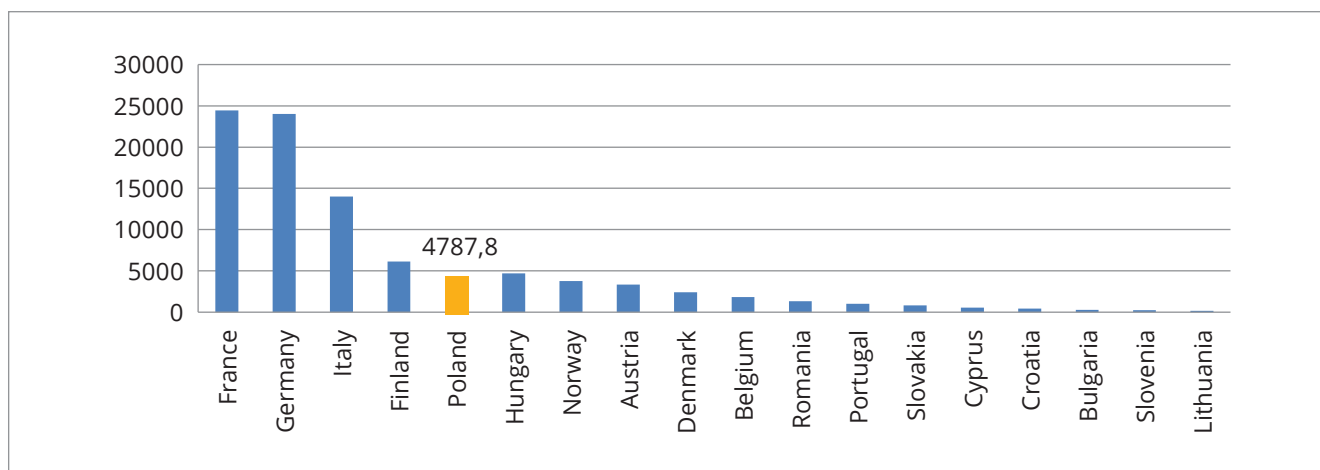
Source: Information society in Poland, Results of statistics analysis for the period 2012-2016, GUS, 2016; Figures in millions of PLN

Perspectives for specialisation development in Małopolska Economic and social data are evident of optimistic perspectives for the sector. Global, national or regional trends give rise to further dynamic development of the ICT sector and last but not least, it will be relatively resistant to economic fluctuations. The Krakow Technology Park conducted a project Technological Perspective Cracow-Małopolska 2020, which shows that ICT technology has the biggest development potential in the province. Among 10 technological fields selected, 3 are directly related to the IT sector - universal access to information, touchless computer interface, smart systems, whereas 1 indirectly - streamlining the therapeutic process on the basis of data analysis. The key trends in the sector are cloud technologies, Big Data, Internet of things and cybersafety.

3.1.2. Domestic and international competitiveness

Since 2008, Poland has been successively enhancing its position as one of the European leaders and thus becoming an increasingly more competitive economy within the ICT sector. Not only within cost but also quality advantage. Currently Poland is 6th among European countries.⁴⁰

Graph 27 Production value of the ICT sector

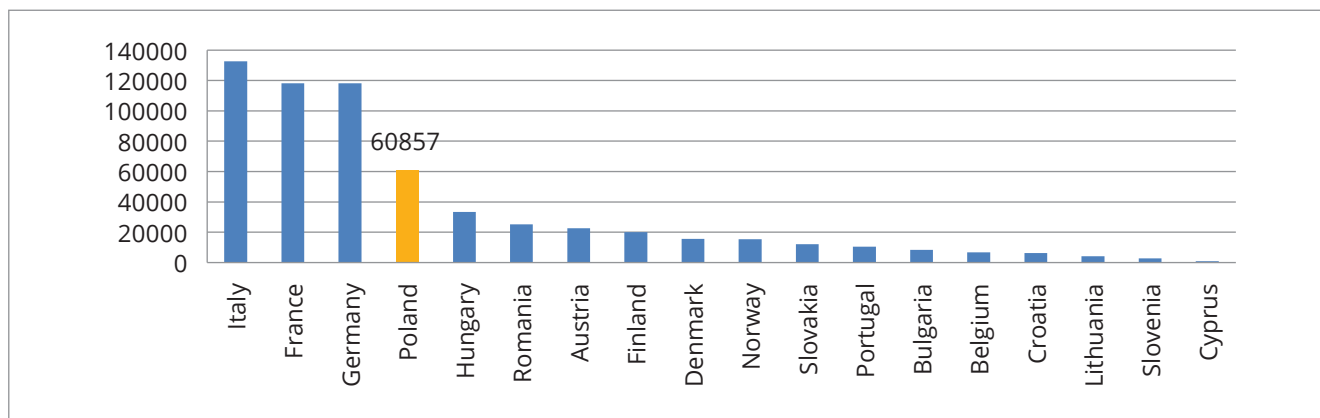


Source: Own elaboration based on Eurostat; Figures in millions of EUR for 2015; comparison drawn on the basis of aggregated data for individual PKD codes included in the composition of RISM ICT

In 2015 the production value in the ICT industry was EUR 4787.8bn. Since 2008 this value increased by 45%, while in France it remained unchanged, Germany recorded 2%, Italy 25%, whereas Finland 71% drop in the value of production in the relevant business sector.

⁴⁰ Data for Great Britain has not been presented due to statistical incompleteness. The country is number 1 in the comparison.

Graph 28 Number of people employed in the ICT sector



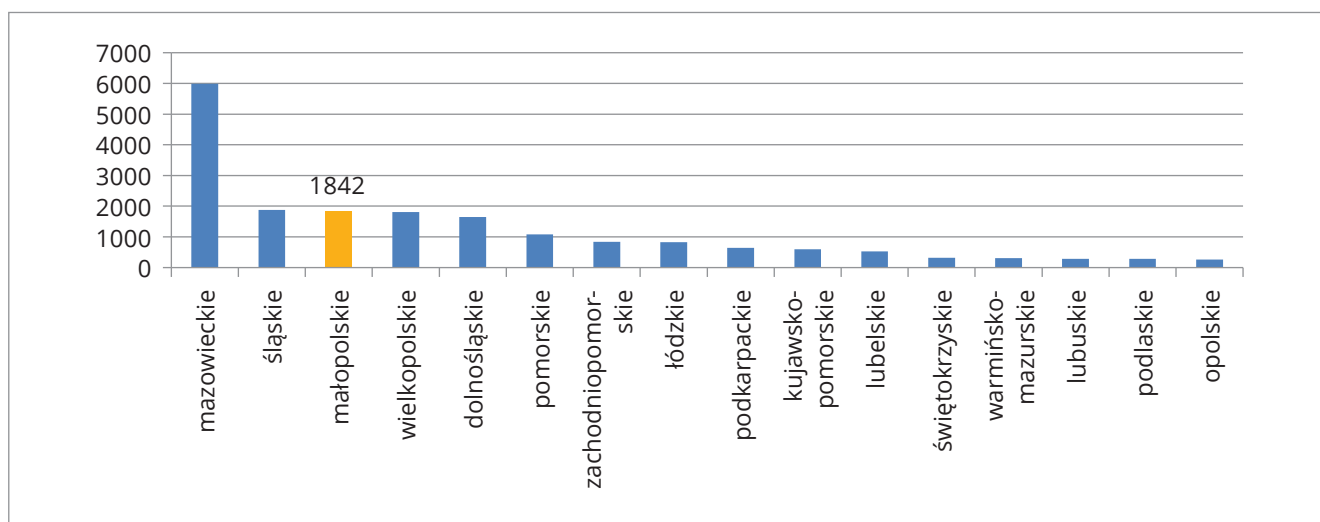
Source: Own elaboration based on Eurostat; comparison drawn on the basis of aggregated data for individual PKD codes included in the composition of RISM ICT; Figures in for 2015 expressed in FTE

In 2015, Poland came up 5th in comparison to the above countries⁴¹ and since 2008 it has recorded a 37% increase of the number of people employed in the ICT sector. In a situation when in Italy and France the dynamics was negative: -24% and -18% respectively, Germany recorded only a 4% increase.

A notable increase in the values of production and the number of employees in the Polish ICT sector in the period 2008-2015 is evident of an improving competitiveness of this area and of an effective use of the available potential, which translates to an increase of the meaning of Poland on the European ICT market.

An above average potential of the Małopolska ICT sector on the international arena stems from an eminent position of Poland in Europe as well as of Małopolska on the domestic market. An analysis of competitiveness of the ICT sector in the Małopolska province with other Polish regions determines that Małopolska is in the lead of regions with the highest number of entities in the ICT sector.

Graph 29 Number of entities in the ICT sector according to regions (Polish voivodships)



Source: Own elaboration based on REGON register ; comparison drawn on the basis of aggregated data for individual PKD codes included in the composition of ICT RISM

In Małopolska there currently operate 1842 companies from the ICT sector, which locates the analysed region in the 3rd position, right behind the province of Śląsk (1877) and Mazowieckie (5986). The number of ICT RISM related enterprises in Małopolska is clearly above the average (1197). This data proves a stable and competitive position held by the Małopolska ICT sector in Poland.

⁴¹ Data for Great Britain has not been presented due to statistical incompleteness. The country is number 1 in the comparison.

3.1.3. Forms of support within a specialisation

Apart from very good economic results, competitiveness of the Małopolska ICT sector is also based on a range of incentives and public assistance tools. Entities within the discussed RISM sector can acquire subsidies through programmes such as the ones listed below:

Table 8 Selected subsidies directed at RISM 3 ⁴²

National level		
Competition	Amount of allocation	Contact
Operational Programme Digital Poland All operations under the programme are directed at the ICT sector directly or indirectly.	PLN 2,596,000,000 ⁴²	www.polskacyfrowa.gov.pl
Strategic programmes of the National Centre for Research and Development: INFOSTRATEG	unknown	www.ncbr.gov.pl
Strategic programmes of the National Centre for Research and Development: CyberSecIdent	PLN 31,730,000	www.ncbr.gov.pl
Regional level		
Competition	Amount of allocation	Contact
Operational Programme Digital Poland Submeasure 2.1.3 Digital regional resources	PLN 14,926,524.08	www.rpo.malopolska.pl

Source: Own elaboration

An additional factor encouraging the ICT sector investors to place their businesses in Małopolska is the public assistance for making an investment in the territory of the Cracow Special Economic Zone [*pl. SSE*] as well as Special Economic Zone EURO-PARK Mielec. Such assistance adopts the form of income tax exemption and its level varies depending on the company size.⁴³ Detailed information on the principles of granting public assistance under investment projects on the territory of SSE is available on the website www.paih.gov.pl

3.1.4. Key entities

- **Małopolska Cluster of Information Technologies** – creates the information technology environment providing transfer of knowledge, means and technology. An agreement under the cluster was concluded by the biggest IT companies from Małopolska such as Comarch, Ericpol Telecom, Motorola Polska and IBM Polska, universities such as the Cracow University of Technology, Jagiellonian University, AGH University of Science and Technology.⁴⁴
- **TRIDENT Information Cluster** – the main objective of the cluster is an increase of competitiveness, efficiency of resources use and information diffusion, and effectively the potential to introduce innovative products to the IT market through companies belonging to the cluster. Trident has also launched their operations on the international arena by establishing cooperation with IT clusters from Czech Republic and Lithuania.⁴⁵
- **BIMklaster Cluster of Information Technologies in Construction** – the objective of the cluster is to connect the potential and competence of companies and other entities, thus facilitating construction project implementation through cutting edge ICT technologies.⁴⁶

More information on the website: www.bimklaster.org.pl

⁴² In accordance with the selection schedule for 2017 Data for 2017

⁴³ <http://www.kpt.krakow.pl/specjalna-strefa-ekonomiczna/>, 23.08.2017

⁴⁴ <http://naukawpolsce.pap.pl/aktualnosci/news,24414,malopolski-klaster-technologie-informacyjnych.html>, 23.08.2017

⁴⁵ <http://www.klustry.org/wydarzenia-mainmenu-4/30-inicjatywy/88-trident>

⁴⁶ http://www.bimklaster.org.pl/?page_id=365, 23.08.2017

- **Cluster of Multimedia and Information Systems** – the main objective of the cluster is to support and integrate the SME sector in Poland, multimedia and information systems in operation on the Polish market and the research and development sector.

More information on the website: www.multiklaster.pl

■ **Małopolska Information Technology Park**

Innovation Centre at the Krakow Technology Park - it is an already completed project which concerned construction of the Małopolski Technological Park in Pychowice. So far it has been the biggest and the most important investment of the Krakow Technology Park directed at information technologies.

Małopolska Information Technology and Multimedia Park, which covers the operations of the Technological Incubator supporting young companies within the ICT sector within a broad scope. The Park composition is as follows:

- Technological incubator;
- Multimedia laboratory;
- Data center;
- L@b gallery – showroom;
- Living lab.

More information on the website: www.mpti.krakow.pl

- **Technological Park – MMC Brainville**; thanks to the specialist IT facilities it supports development of companies in the ICT, multimedia or film sector. The focus of the Park is to implement projects such as:

- Implementation of the advertising spot for the IKER brand;
- Animations created for the needs of the “Life without Boundaries” Event;
- Misericordes Choir Recordings;
- Making figure of Józef Piłsudski – 3D scan and 3D print.

More information on the website: www.brainville.pl

- **The Kościuszko Institute** - non-governmental science and research centre, initiatives are significant for the ICT sector. One of the key projects is CyberSecHub (www.cybersechub.eu) aimed at promotion and development of the cybersecurity sector, which is one of the most dynamically developing trends in the ICT sector. The platform covers cooperation, acceleration as well as investments in the best projects. The next initiative on a global scale is Hub:raum, an incubator established by Deutsche Telekom and invest in start-ups at an early stage of their development. The initiative started in 2012 and it functions in three locations: Berlin, Cracow and Tel-Aviv (www.hubraum.com).

More information on the website: www.ik.org.pl

3.1.5. Institutions responsible for legal regulations

- **Delegation of the Office of Electronic Communications in Cracow** - entity holding supervision functions within products emitting or susceptible to electromagnetic field emission, including telecommunication equipment and devices placed for trading on the Polish market.⁴⁷

More information on the website: www.uke.gov.pl

⁴⁷ <https://www.uke.gov.pl/kompetencje-972>, 23.08.2017

- **Polish Chamber of Information Technology and Telecommunications** - issues opinions and assesses implementations as well as functioning of regulations concerning business operations within the ICT sector.

More information on the website: www.piit.org.pl

- **Chamber of Digital Economy** - undertakes legislation activities and effectively also a dialogue with the Polish state and European Union administration institutions and with domestic and global non-governmental institutions.

More information on the website: www.ecommercepolska.pl

- **The Committee of the Council of Ministers for Digitalization** - handles implementation of IT solutions and application of information technologies in building knowledge-based economy.

More information on the website: www.krmc.mc.gov.pl

3.2. The R&D&I Market

The R&D&I Market constitutes a key background for the development of innovations in the region and beyond it. Availability of relevant infrastructure and foremost adequately qualified staff and the know-how constitute grounds to gain competitive advantage through advanced solutions and inventions. The region of Małopolska has very good facilities for business and science, which is described in the chapters herein-below. In comparison to 1999 the number of academics at technical universities increased by about 15% to the level of 3,382 people. At the same time there was recorded a triple increase of the number of technical school graduates in the analysed period with a total of 13,247 in 2016. Investment on R&D operations under RISM and related fields (engineering and technical sciences) amounted to 1,195,849 in 2015, which shows an over 188% increase in comparison to 2008.

3.2.1. Catalogue of universities

The ICT sector in Małopolska has very solid R&D&I background. Within the region there are the following universities with relevant specialisations:

- Cracow University of Technology
 - Faculty for Production and Energy Engineering;
 - Institute of Information Technology;
 - Institute of Teleinformation Technology;
- AGH University of Science and Technology in Cracow:
 - Faculty of Physics and Applied Information Technology;
 - Faculty of Information Technology, Electronics and Telecommunications;
 - Faculty of Electronics, Automation, Information Technology and Biomedical Engineering;
 - In the possession of the university is the biggest computer in Poland (www.cyfronet.krakow.pl).
- Jagiellonian University in Cracow:
 - Faculty of Mathematics and Information Technology

3.2.2. The academics' potential

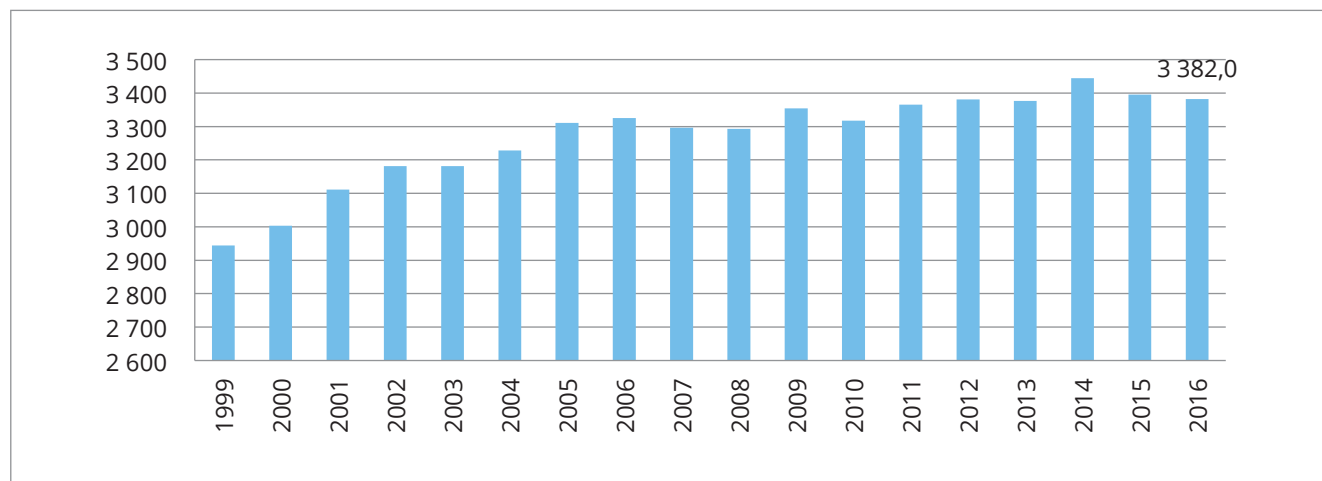
Małopolska holds 1st position in Poland with regards to the number of students at ICT sector dedicated faculties – 12% of all graduates of faculties strictly related to ICT, in Poland.⁴⁸ Notably, 9.7 thousand students in the province of Małopolska studies IT faculties.⁴⁹

⁴⁸ *Centrum Biznes in Małopolska, 2016*

⁴⁹ <https://www.malopolska.pl/aktualnosci/biznes-i-gospodarka/rci-malopolska-umacnia-swoja-pozycje-wsrod-regionow-eu>

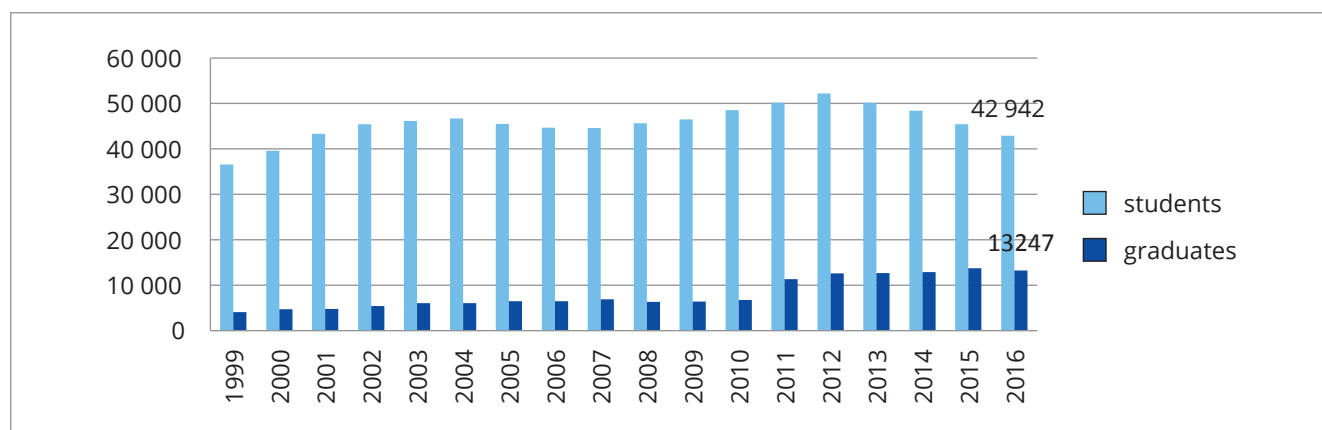
Despite the changing number of students in technical faculties, the number of graduates has been increasing year by year - the ICT market sees a growing number of specialists.

Graph 30 Academics at universities of technology in Małopolska



Source: Local Data Bank, Central Statistical Office of Poland

Graph 31 Academics and graduates at universities of technology in Małopolska



Source: Local Data Bank, Central Statistical Office of Poland

3.2.3. Research programmes and supporting initiatives

- **Programme “Małopolska – here technology becomes business”** is a programme with an objective to enhance the potential and to intensify technological meetings resulting in the promotion of the region which supports development of entrepreneurship based on advanced technologies. So far, the support was granted to 65 undertakings which involved the participation of over 60 thousand people.⁵⁰

More information on the website: www.malopolska.pl

⁵⁰ <https://www.malopolska.pl/aktualnosci/biznes-i-gospodarka/malopolska-tu-technologie-staje-sie-biznesem-znamy-zwycieczkow-konkursu>

- **IT solutions, E-commerce and Mobile Devices Fairs** - they are unique in Poland and they gather experts from 3 sectors: mobile, IT and e-commerce. The province local government supports innovative solutions at companies from Małopolska and in particular operations directly related to RISM. This undertaking enables companies from Małopolska to participate in international fairs along individual sector leaders. The subsidy for the exhibitors' participation in each fair event is at the level of 90% of the cost.⁵¹

More information on the website: www.mobile-it.com.pl

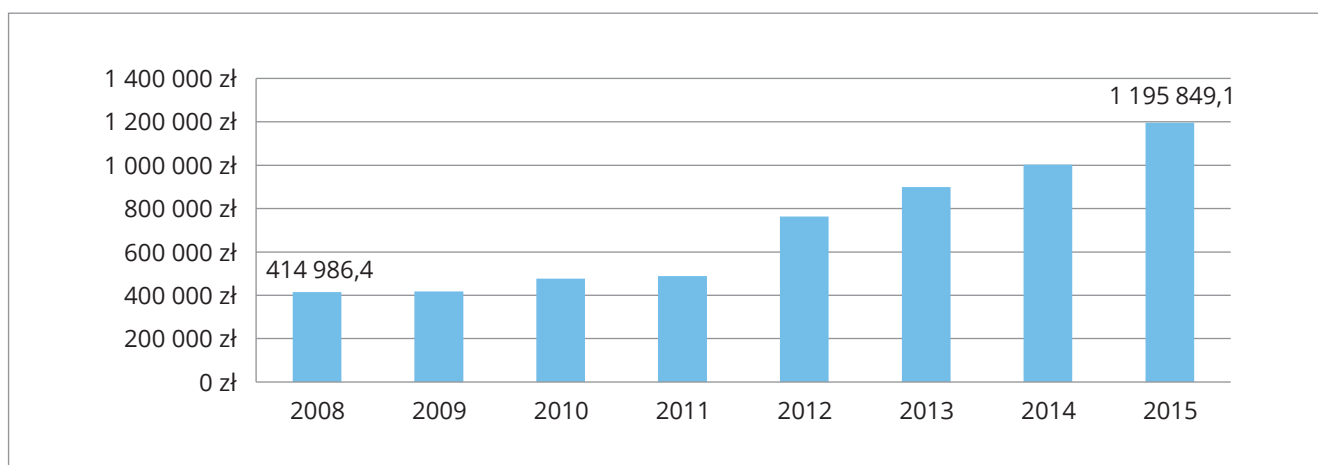
- **Centre of Smart IT Systems** provides smart system services - related to large amounts of data processing, services related to technology transfer, product and marketing innovations, implementing new solutions at companies. Moreover, the centre conducts market and marketing research.

More information on the website: www.isi.agh.edu.pl

3.2.4. Investments in research operations within a specialisation

Investments in R&D within engineering and technical sciences show a clear upwards trend. In 2015 the investments were higher by 65% than investments in R&D in 2008 - it is a definitely positive phenomena from the perspective of sector development and growth of the regional competitiveness.

Graph 32 Investment in R&D within engineering and technical sciences



Source: Local Data Bank, Central Statistical Office of Poland

⁵¹ <https://www.malopolska.pl/aktualnosci/biznes-i-gospodarka/4-targi-rozwiazan-it-ecommerce-i-urzadzen-mobilnych>, 23.08.2017

3.3. Technological offers of enterprises from Małopolska

The panel of leaders in the ICT sector in the province of Małopolska includes:

Table 9 Analysis of services/products rendered by leaders in the *Information and Communication Technologies (ICT) RISM* sector

Entity	Scope of operations	Technological offer
Google	Internet sector	The company offers services such as on-line Google search engine and advertising services AdWords and AdSense, Gmail, Google Maps and Google Earth as well as Google Chrome, Google Desktop and Picasa software
Cisco	network sector	Products and services the company offers can be classified, as per technology, into 9 groups: Networks (switchers, routers, wireless, etc.), Wireless network and mobility (access points, access points for external use and in industrial environments, controllers), Security (new generation firewalls, Advanced Malware Protection solution, security of the WWW network, etc.), Cooperation (terminals for cooperation, conferences, customer service, single communication), Data centre (Unified Computing products, data centre automation and management, network attached storage, etc.), Analyses (data and analyses, data analyses at data centres), Video (video end points, video entertainment, video analysis, digital information screens), Internet of Things (connectivity, in-built networks, IOx and Fog applications, etc.), Software (IOS and NX-OS, Cisco ONE for access, Cisco ONE for network WAN, Cisco ONE for network at data centre, etc.) www.cisco.com
Luxoft	software	Offers nonstandard software development related services to enterprises included in the IT organisations and software vendors www.luxoft.com
ComArch	IT	The composition of the company offer is as follows: ERP class software for every company, solutions to run Internet sales, advanced business intelligence, automatic data backup and file synchronisation in the cloud, electronic documents exchange, e-invoicing, managing the IT infrastructure, Data Center, documents and workflow processes management www.comarch.pl
Motorola	telecommunications	The scope of operations includes production of a wide range of equipment such as mobile phones, transmitter/receiver equipment and network infrastructure www.motorolapolska.pl
IBM	software	They offer solutions on the basis of advisory and IT services as well as software and Equipment. Flagship IBM products: IBM SPSS Statistics, IBM Bluemix, IBM Watson Analytics, IBM Marketing Cloud www.ibm.com
Delphi	system technologies	Leading supplier of a state-of-the-art electronic solutions and system technologies with a broad scope of application in the automotive, aviation and telecommunications sector. www.delphikrakow.pl
CD Projekt	video games sector	Creates and produces video games for personal computers with the Windows and OS X systems and for the latest generation consoles. www.cdprojekt.com
3D FLY	3D print	The company offer includes: 3D print, modelling, training, workshops, 3D printer rental, 3D printers and filaments, machining www.3dfly.pl

Silvermedia		Individually tailored IT services on the offer: Algorithms analysing bio-medical signals; Integration of IT systems; Software for mobile devices. Silvermedic software is composed of two basic components: <u>Internet applications</u> : systems for medical data collection, processing and making available, <u>customer applications</u> : applications for mobile computer and devices (smartphones, tablets or mobile medical equipment) www.silvermedia.pl
Aplixcom	software	The Aplixcom's offer includes own SCADA-MES solution; ERP systems: Infor ERP LN, Infor ERP XPPS / XPERT Automotive, Infor ERP System21 (iBusiness), Infor BI (Business Intelligence), InterForm400; own Aplixcom solution: Standard Audit File for Tax www.aplixcom.com
Edrone	eCRM system	Customer intelligence, cookie marketing, CRM and automatic segmentation, Social CRM, restoring abandoned carts, loyalty programmes, specialised newsletter, wishlist, A/B tests, personalised recommendations, cross-selling and up-selling, Exit PopUp and on-site marketing, notifications push/ browser notifications, product analysis and on-line merchandising, machine learning & deep learning. www.edrone.me
Softhis	IT systems	Products: Softhis BPM Workflow, Software for Accounting, SaaS Software; Services: Internet application design, CRM, ERP and document circulation, e-commerce platforms, Systems B2B and B2C, Cloud Computing (SaaS), Softhis testing centre www.softhis.com
Axence	software	Axence nVision® - professional software for comprehensive IT infrastructure management at any organisation; Axence netTools - world-wide famous set of 10 tools for network scanning and monitoring. www.axence.net
Nokia	IT	Nokia is a global leader, bringing technological innovations to the foundations of today's interconnected world. Backed by the research and innovation of Nokia Bell Labs, company provides telecommunications service providers, administrators, large enterprises and consumers with a comprehensive portfolio of products, services and licenses. From the infrastructure that creates 5G and IoT to the latest applications for virtual reality and digital health www.nokia.com/pl

Source: Own elaboration

4. Chemistry

4.1. Sector description

Chemistry is another Regional Smart Specialisations of the Małopolska Province. The focus of this specialisation is most of all the areas related to implementation of new chemical technologies, materials and compounds as well as a search for new applications of known solutions. The main subjects addressed under the specialisations are chemical product applications in health care, sustainable agriculture, food, timber and paper industry, biology, energy sector, construction or transport.

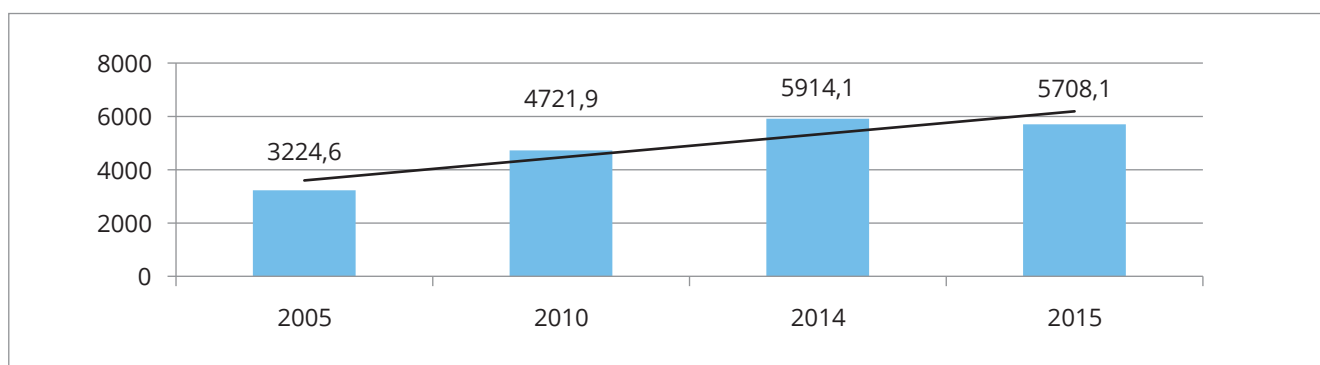
The composition of Regional Smart Specialisation of the Małopolskie Province includes the following detailed areas:

- Chemistry for health care;
- Chemistry in agriculture and agricultural and food, timber and cellulose and paper industry;
- Biological and environmental chemistry;
- Natural resources;
- Waste management;
- Materials for construction and transport purposes;
- Advanced materials and nanotechnologies;
- Sensors.⁵²

4.1.1. Assessment of the present situation in Małopolska.

Małopolska chemistry industry was developing very dynamically in the past decade. In the period 2005-2015 sold production value increased by over 77%, thus noting an average annual growth at the level of 22.7%. In 2015 the production value in industry sector was PLN 5,708.1m.

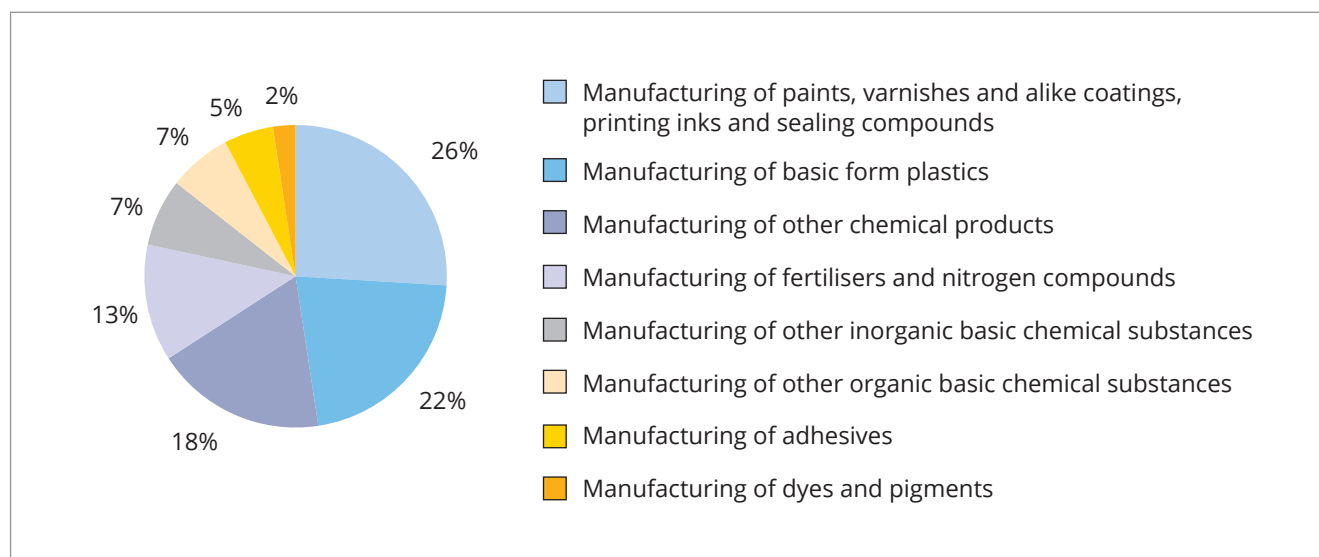
Graph 33 Specialisation sold production value in Małopolska



Source: Statistical yearbook for the Małopolska province, GUS, 2016; Figures in millions of PLN.

⁵² Smart Specialisations of the Małopolskie Province (Attachment no. 1 to the Resolution no. 1262/15), Małopolskie Province Management, Cracow, 2015

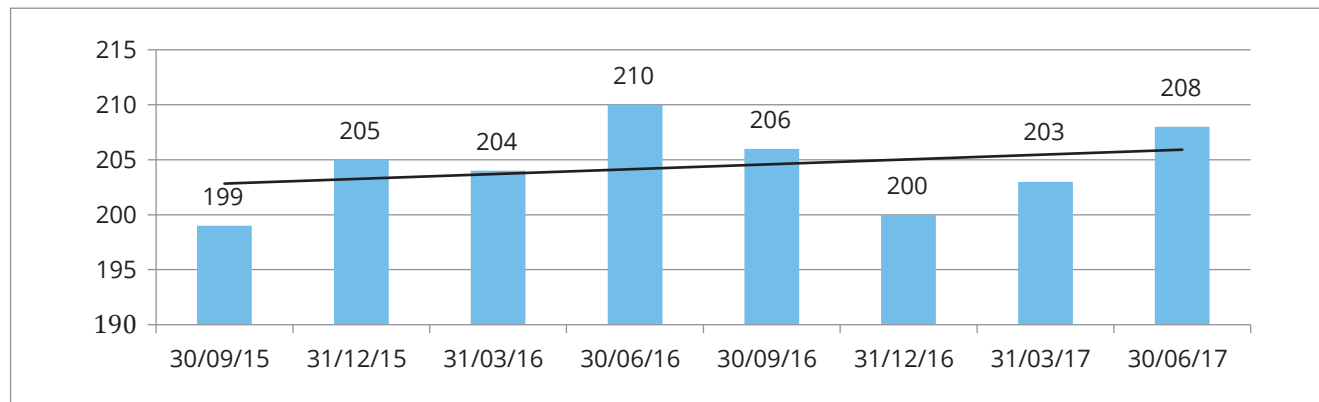
Graph 34 Generic division and the structure of the industry *Chemistry RISM*



Source: Own elaboration based on: National economy entities entered in the register at REGON, GUS, 2017

The enterprises producing paint, varnish and similar coatings, printing ink and sealing masses dominate in the *Chemistry RISM* sector. In the period 2015-2017 the total number of companies in the analysed sector in Małopolska increased by 5%. The highest increase was noted in the instance of enterprises producing fertilisers and nitrogen compounds (+86%) as well as enterprises producing glues (+38%).

Graph 35 Number of enterprises in the *Chemistry RISM* sector in Małopolska



Source: Own elaboration based on: National economy entities entered in the register at REGON, GUS, 2017

In the *Chemistry RISM* sector there currently operate about 208 enterprises, which is 6.8% of all entities of that field in Poland. In the period 2015-2017 the number of enterprises in the region has seen faster growth (+4.5%) than it has been the case on the national scale (+3%).

The Chemistry specialisation in Małopolska attracts many investors due to its specification. The top foreign investment value in the production sector covers production of chemicals and chemistry products, mainly due to the Grupa Azoty in Tarnów. The investment total in 2014-2018 in Tarnów alone is to amount in total about USD 287m. Apart from the Grupa Azoty investments in the chemistry sector were also made by Zakłady Chemiczne Alwernia with their estimated value in the amount of USD 10m.

The "Top investors in Małopolska since 1989" ranking, the enterprise Acorn (Russia) investing in nitrogen fertilisers and plastics production operations, was in 17th position with investments of USD 100-500m in 2014.

Table 10 The volume of FDI investments in the field of Chemistry RISM

Subject of the investment	Investment value in USD m in 2014	Investment value in USD m in 1989 -2014
Production of chemicals and chemistry products	61.37	769.49

Source: *Foreign investors in Małopolska in 2014. Regional Development Observatory in Małopolska, Regional Policy Department, Warsaw 2016*

The percentage of investments in the field of chemicals and chemistry products production in the C section of GDP, i.e. industrial processing reached 15.71%, whereas in the production sector a total of 11.40%. Therefore the analysed sector was in 2nd position, right behind food product production.⁵³

Good condition of the sector is emphasised by the analysis of export operations of the enterprises from Małopolska.

Table 11 Export of Chemistry RISM in Małopolska

Group of products	2010	2014	2015
Chemistry industry products	294.2	345.9	362.3
Fertilisers	30.3	65.8	77.6
Various chemical products	N/A	52.9	65.4
Non organic chemicals	N/A	67.1	62.3
Organic chemicals	80.8	70.2	53.3

Source: *Export potential of enterprises in Małopolska, Regional Development Observatory in Małopolska, Regional Policy Department, 2017; Figures in millions of EUR*

Export of chemistry sector in a broad sense over the period of the presented years indicated an upward trend. Slight drops in the group of organic and non organic chemicals were balanced by increases within other groups - finally reaching 3% growth in 2015.

Table 12 Foreign trade in chemicals in Poland in 2016 (EUR m)

Group of products	Export	Import	Balance
Total national turnover	183,633.9	178,873.9	4,760.0
Total Chemicals	25,698.1	32,307.0	-6,608.9
Participation of "Chemistry" in national turnover in %	14.0	18.1	N/A
Household detergents	1,573.8	961.2	612.6
Non organic chemicals	698.9	998.5	-299.6
Organic chemicals	1,195.7	3,244.6	-2,048.9
Miscellaneous chemicals	2,020.1	2,765.9	-745.8
Paints, dyes, tannins	859.7	1,500.3	-640.6
Pharmaceuticals	2,673.3	5,064.6	-2,391.3
Photo-chemicals	32.1	123.6	-91.5
Rubbers and products	4,165.3	3,097.2	1,068.1
Glues, enzymes, proteins	200.2	566.0	-365.8
Cosmetics, semi-finished products	2,711.5	2,080.5	631.0
Pyrotechnic materials	46.0	47.2	-1.2

⁵³ *Foreign investors in Małopolska in 2014, Regional Development Observatory in Małopolska, Departament for Regional Policy, Warsaw 2016*

Group of products	Export	Import	Balance
Fertilisers	551.9	736.0	-184.1
Plastics and products	8,793.1	11,065.3	-2,272.2

Source: Statistics webpage 2017/1

Enterprises from Małopolska focus not only on creating innovations but also on legal protection of their inventions. A definite majority is protected by trade secret, however, some through patent protection. In the period 2007-2016 the Polish Patent Office granted patents to 19 business entities from the province of Małopolska which operate within the field of *Chemistry RISM*. For example: Joint stock company Alwernia was granted a patent for "Method of production of granulated fertiliser magnesium sulphate", Fluorochemika Poland Sp. z o.o. achieved a patent for "Surface cleaning and grease removal agent", enterprise ARKOP Sp. z o.o. was granted a patent for "Method of production of sodium selenate and a system of equipment for sodium selenate production", whereas an experimental and production enterprises NAFTOCHEM Sp. z o.o. Was granted a patent for a "Greasing agent for plastic processing of metals".⁵⁴

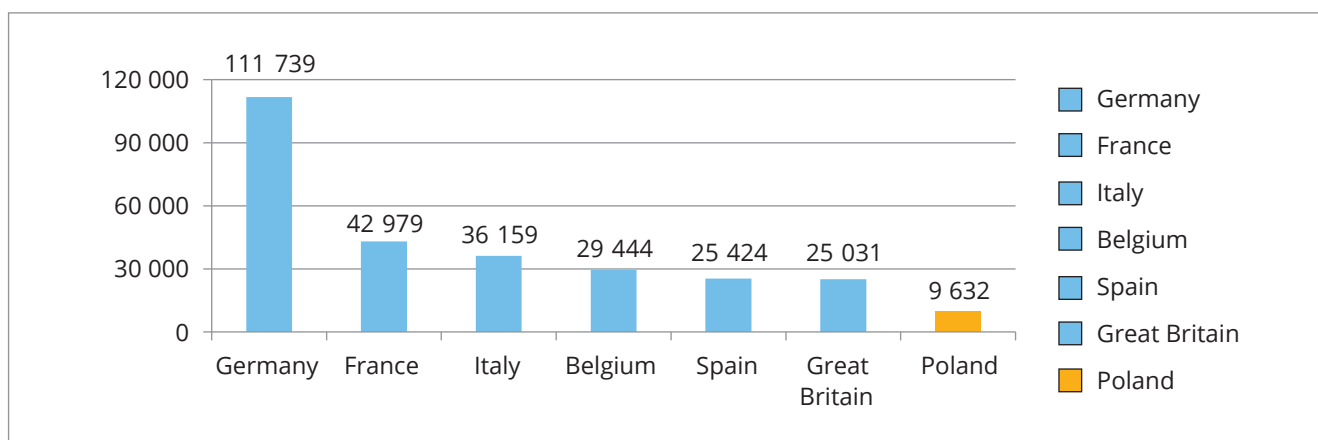
4.1.1. Perspectives for specialisation development in Małopolska

The Chemistry industry is undoubtedly an important part of economy of Małopolska. In the area of the analysed region, *i.e.* Tarnów, Alwernia and Oświęcim there are chemical plants, which are among the biggest domestic producers of chemistry products. They make the sector more and more competitive through their great potential, successive development and investments. The operations of the entities from Małopolska within the Chemistry RISM area are of strategic significance to the Polish economy and are a national flagship example on an international arena.

4.1.2. Domestic and international competitiveness

An analysis of Poland's competitiveness with regards to the volume of production and employment at Chemistry RISM shows that it is at a level very similar to that of European leaders. The dynamics of growth of both of the presented categories constitutes a particularly positive aspect. In the period 2008-2015 an average growth of production value was 4% y/y (in comparison: Germany 2% y/y, Italy 0% y/y, Great Britain -2% y/y), whereas the number of people employed 2% y/y - only Spain showed a higher dynamics of growth in this area, *i.e.* 3%. At the same time, in comparison to European countries considered unquestionable leaders, Poland develops remarkably dynamically in the *Chemistry RISM* area.

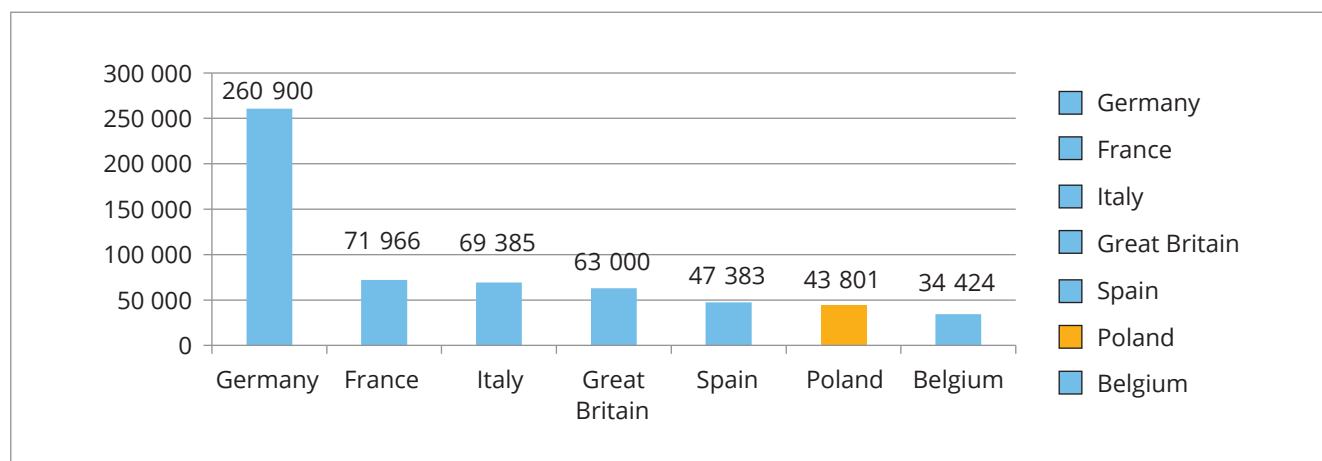
Graph 36 Production volume of Chemistry RISM



Source: Eurostat; Figures in millions of EUR; Data for 2015

⁵⁴ Małopolska market analysis, Polish-American Innovation Bridge PULS, Cracow, 2017

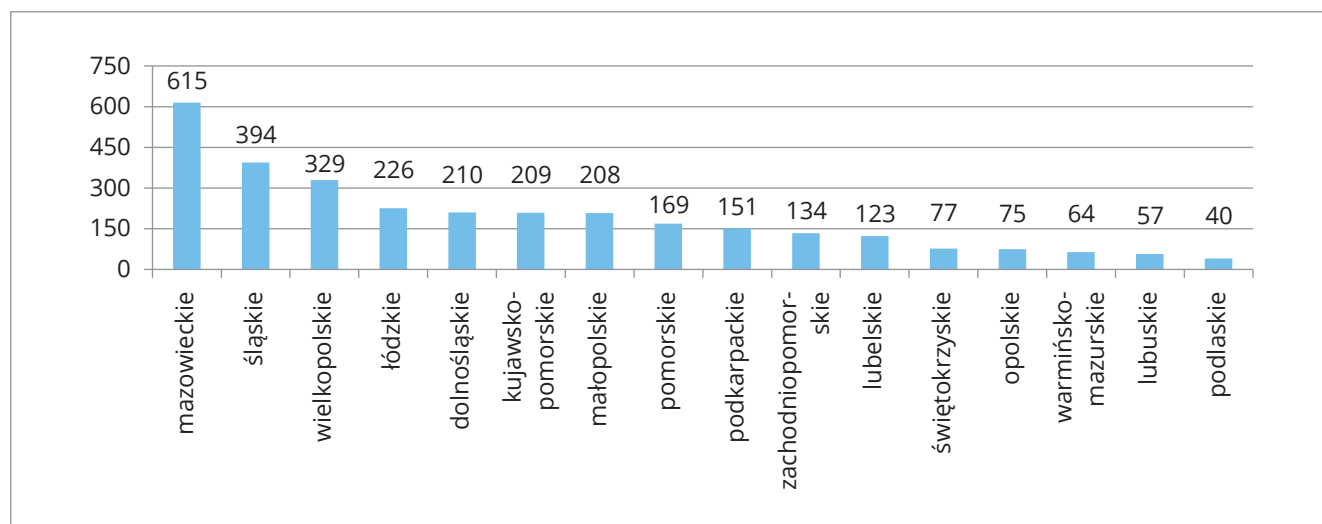
Graph 37 Employment volume at *Chemistry RISM*



Source: Eurostat; Figures in FTE; Data for 2015

Chemistry sector in the view of Poland on an international arena as well as Małopolska in the national view records good results. The province of Małopolska holds 7th position in the country with respect to the number of enterprises in the *Chemistry RISM* sector, with a slight deviation from provinces with a higher location in the ranking. At the same time, this number constitutes 7% of all companies in a relevant area in Poland and its growth continues - in the period 2015-2017 the number of companies in the chemistry sector increased by about 5%.

Graph 38 Listing of regions as per enterprises in the *Chemistry RISM* sector according to regions (Polish voivodships)



Source: Own elaboration based on: National economy entities entered in the register at REGON, GUS, 2017

Apart from good economic condition Małopolska offers to the investors and sector entities numerous investment incentives and support programmes.

4.1.3. Forms of support within a specialisation

For instance, within the chemistry sector, the Operational Programme Smart Development in the period 2014-2020 support is assumed to implement R&D projects under the INNOCHEM programme. The volume of assistance under the Programme is from 25% to 80%, depending on the project type and type of a beneficiary. Meanwhile, the value of qualified expenses depends on the programme and the volume of

an enterprise leader and oscillates between PLN 10,000,000 – PLN 50,000,000 (leader: large, medium, small or micro enterprise) or PLN 1,000,000 – PLN 7,500,000 (leader: large, medium, small or micro enterprise).⁵⁵ A more detailed comparison of available forms of support within a specialisation is presented below.

Table 13 Selected subsidies directed at RISM 4

National level		
Competition	Amount of allocation	Contact
Strategic programmes of the National Centre for Research and Development: TECHMATSTRATEG	PLN 500,000,000	www.ncbr.gov.pl

Source: Own elaboration

Moreover, a significant non-financial support is provided by Business Related Institutions operating on the territory of the province of Małopolska such as Association of Chemistry Sector Engineers and Technicians, Division in Tarnów, Cracow, Oświęcim.⁵⁶

4.1.4. Key entities

■ **Bureau for Chemical Substances** – competent authority for REACH - Regulation (EC) no. 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) and establishing a European Chemicals Agency and CLP - Regulation of the European Parliament and of the Council (EC) no. 1272/2008 of 16 December 2008 on classification, labelling and packaging of substances and mixtures in Poland;

- Inspector for Chemical Substances – manufacturing and marketing on the the territory of Poland, a mixture posing a hazard or dangerous or bringing such a mixture onto the territory of Poland requires a notification of the Inspector and submission of a safety data sheet for a mixture or a legally required datasheet for a mixture. m. The inspector is responsible for keeping a register of entities who market category 2 drug precursors.
- Inspectors of Good Laboratory Practice are responsible for issuing or cancelling a certificate confirming conformity with the Good Laboratory Practice principles;

More information on the website: www.chemikalia.gov.pl

■ **PIPC** is a member of a range of domestic and foreign associations, and – as the only Polish organisation – is a regular member of the European Chemical Industry Council CEFIC – has a right to represent Polish chemical industry on an international arena;

More information on the website: www.pipc.org.pl

■ **Polish Chemical Society** is a scientific society and at the same time a public benefit organisation with the primary objective to support chemical sciences and to expand chemical knowledge in the society.

More information on the website: www.ptchem.pl

⁵⁵ <http://nytko.eu/index.php/fundusze-europejskie/dotacje-dla-firm-z-województwa-malopolskiego>

⁵⁶ *Investment Attractiveness of Regions 2016, Warsaw School of Economics, 2016*

4.2. The B&R&I Market

4.2.1. Catalogue of universities

Małopolska has a strong academic background in the field of *Chemistry RISM*. This is related to regional industrial traditions. The main scientific and academic centres are:

- AHG University of Science and Technology in Cracow
 - Faculty for Production and Energy Engineering
 - Faculty of Energy and Fuels
- Cracow University of Technology
 - Faculty of Chemical Technology and Engineering
- Jagiellonian University in Cracow
 - Faculty of Chemistry
- State Higher Vocational School in Tarnów
 - Institute of Mathematical and Natural Science (Chemistry Department)
- University of Agriculture in Cracow

4.2.2. The academics' potential

AGH University of Science and Technology, Cracow University of Technology and Jagiellonian University have a vast educational offer as regards chemistry sciences. At the same time those universities are proud to have the highest numbers of students and graduates in Małopolska. Out of 6,810 PhD students in the academic year 2015/2016 over 3% are chemistry sciences PhD students.

According to the report drawn up by the Committee for the Evaluation of Scientific Units 6 university faculties in Małopolska were awarded the top academic rate A+.

The initiative to establish a Chemical Centre of Technology and Development in Tarnów as well as new investments in the Chemistry RISM area are indicative of an increasing pace of the sector development with its positive impact on the economy on a micro and macroeconomic scale.

4.2.3. Research programmes and supporting initiatives

- **The Institute of Catalysis and Surface Chemistry Polish Academy of Sciences** – The activity of the Institute concerns catalysis and physical chemistry of phenomena taking place in surface systems such as solid/ gas, liquid/gas and solid/gas with an emphasis on significance of those phenomena for catalysis and processes and colloidal dispersions.

More information on the website: www.ik-pan.krakow.pl

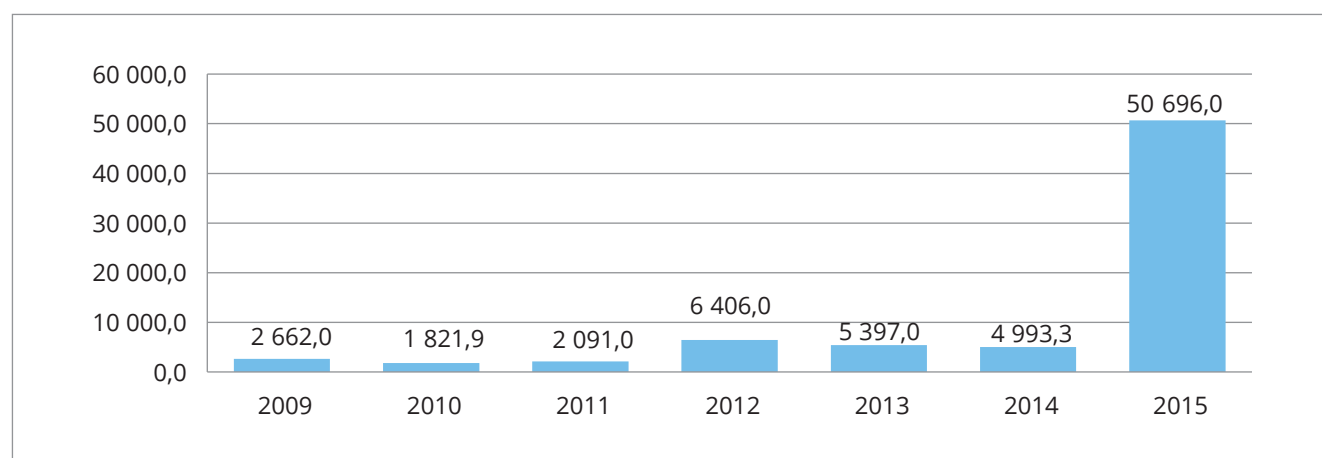
- **The PRO CHEMIA Foundation at the Faculty of Chemistry at the Jagiellonian University** – the objective of the Foundation is to support the Faculty of Chemistry at the Jagiellonian University in all fields and particularly in operations aimed at a thorough renewal of the material base with respect to modern laboratory appliances and equipment for research and educational purposes.

More information on the website: www.prochemia.org

4.2.4. Investments in research operations within a specialisation

A vast scientific and research background as well as the entrepreneurs' attitudes affects the volume of investments in the R&D operations in sector in Małopolska.

Graph 39 R&D investments in chemicals and chemical products production operations



Source: Local Data Bank, Central Statistical Office of Poland; Figures in thousands of PLN

R&D investments in chemicals and chemical products production operations in 2015 were over 10 times higher than in the preceding year.

4.3. Technological offers of enterprises from Małopolska

Many international concerns and biggest Polish companies decided to invest in Małopolska. Among the chemistry sector leaders there are:

Table 14 Analysis of services/products rendered by leaders in the *Chemistry RISM* sector

Entity	Scope of operations	Technological offer
St. Gobain	glue, sealing compound, plastics production.	The producer of decorative plaster and facade paints, adhesive mortar and grout mortar for tiles, subfloor and flooring, facade and wall renovation and repair systems, technological mortar for hydroinsulation. Global leader in highly efficient plastics processing www.saint-gobain.pl
Air Liquide	basic and high quality chemical products	Inerting – blanketing – drying – flushing – mixing; cooling; process gases; cleaning process equipment; regulations compliance – quality and process control; solvent recovery; renovations and maintenance; water treatment and sewage treatment. www.przemysl.air-liquide.pl
Grupa Azoty	fertiliser and chemicals sector	Production of polyamids, acetal copolymers and caprolactam. Furthermore, the offer of the enterprise includes: plastics, semi-finished products and raw materials for plastics production, mineral fertilisers and chemicals, OXO, pigments. www.grupaazoty.com

Entity	Scope of operations	Technological offer
Synthos	chemical resources	Synthetic rubber, polystyrene, extruded polystyrene, microbeads, dispersions produced on the basis of vinyl acetate, acrylic and styrene-acrylic copolymers, glue for wood and paper, plant protecting and products and biocides, liposomes with active substances are used in cosmetic industry, concentrates for phosphorescing. www.synthosgroup.com
Rafineria Trzebinia – Orlen Południe	chemical substances	Solvents, base oils, glycerines, potassium sulphates, liquid sulphur, residue vacuum reg. from used oils distillation. www.orklenpoludnie.pl
Alwernia	chemical agents	Phosphoric acid, technical phosphates, fodder phosphates, Ecoret, chromium compounds, sodium nitrate, potassium nitrate, magnesium sulphate, fodder minerals and fertilisers for agriculture and horticulture. www.alwernia.com.pl
Tegeos	thermal electrics	The operations of the TEGEOS company covers two areas: 1) Design and construction of solutions for waste heat recovery. Solutions allowing to capture waste heat effectively and transform it into electricity and usable heat. 2) Construction of test sites and measuring equipment. Producing test sites and measuring equipment to measure thermal and electrical properties of materials upon customer's request. www.tegeos.eu
InnovaLab	laboratory and research services	Chemical labelling of materials; introduction of additives to thermoplastics, plasticisation, mixing plastics; design and development of organic compound syntheses, etc. www.innovallab.com.pl
HussarTech Sp. z o. o.	hybrid materials	HussarTech is providing a cost-effective and long-lasting antimicrobial solution for a wide variety of products in order to make a safer and cleaner environment. Their hybrid material's mineral structure is preventing the growth of unwanted microbes in consumer and industrial products. The application of the material is versatile and proven effective on plastics, paints, powder coatings, sealants, latex and nitrile films www.hussartech.com

Source: Own elaboration

5. Production of metals, metal products and mineral non-metallic raw material products

5.1. Sector description

Production of metals, metal products and mineral non-metallic raw material products specialisation addresses the need to consider material oriented sectors which are developing dynamically and are fundamental for the development of numerous economy areas. A well-developed base of companies operating in this area forms a basis for the business of sectors like: construction industry, machine industry, processing industry or transport. The specialisation mainly covers the area of material production and formation, waste management and raw material acquisition.

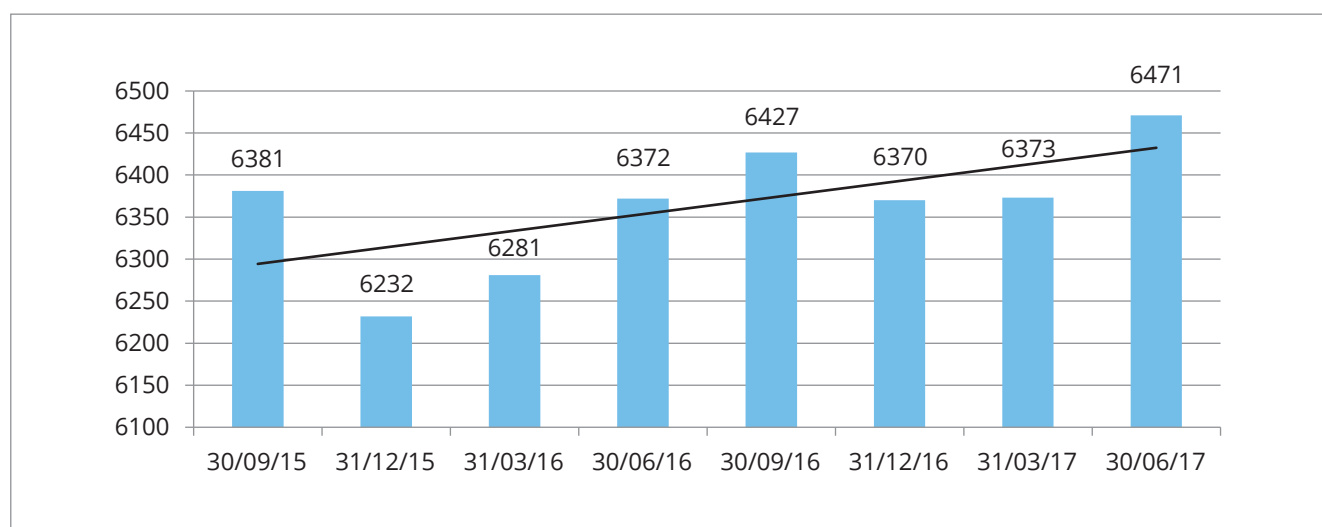
The composition of Regional Smart Specialisation of the Małopolskie Province includes the following detailed areas:

- Environmentally friendly innovative structural solutions and components in machinery, devices and means of transport;
- Innovative environmentally friendly technologies of waste reduction and management;
- Innovative technologies and industrial processes;
- Materials of increased performance;
- Raw materials acquisition and processing.⁵⁷

5.1.1. Assessment of the present situation in Małopolska.

Regional Smart Specialisation Production of metal, metal products and mineral products notes an increase in the number of active entities. Business enterprises from Małopolska account for as much as 8.36% of the entire sector in Poland.

Graph 40 Number of enterprises within RISM

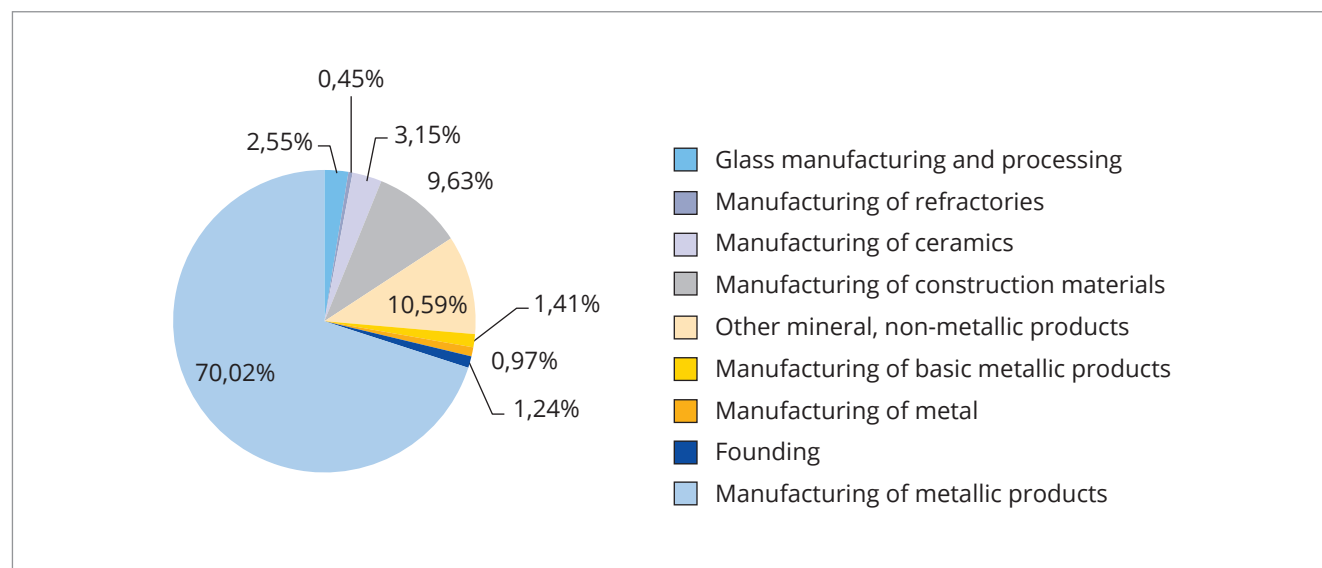


Source: Own elaboration based on: National economy entities entered in the register at REGON, GUS, 2017

⁵⁷ Smart Specialisations of the Małopolskie Province (Appendix no. 1 to the Resolution no. 1262/15), Małopolskie Province Management, Cracow, 2015

The majority of companies operate in the sector of steel products manufacturing (4,531 enterprises). The following sectors rank respectively: production of other non-metallic raw material based products (685), construction products production (623), ceramics production (204), glass production and processing (165).

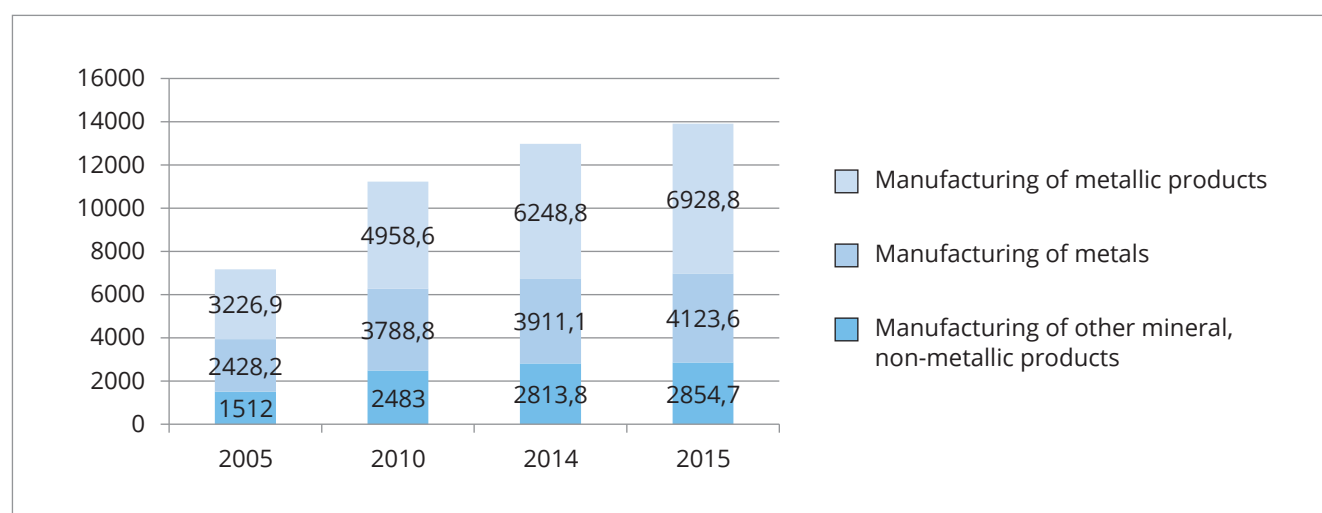
Graph 41 RISM structure by type



Source: Own elaboration based on: National economy entities entered in the register at REGON, GUS, 2017

Małopolska represents 7.3% of Specialisation production in Poland. In the case of non-metallic raw material products it is 5.68%, of metals - 9.21% and of metal products - 7.22%. Since 2005 these sectors have recorded an increase, respectively, of 89%, 70% and 115%, which demonstrates the excellent condition of Specialisation in Poland.

Graph 42 RIS sold production in Małopolska



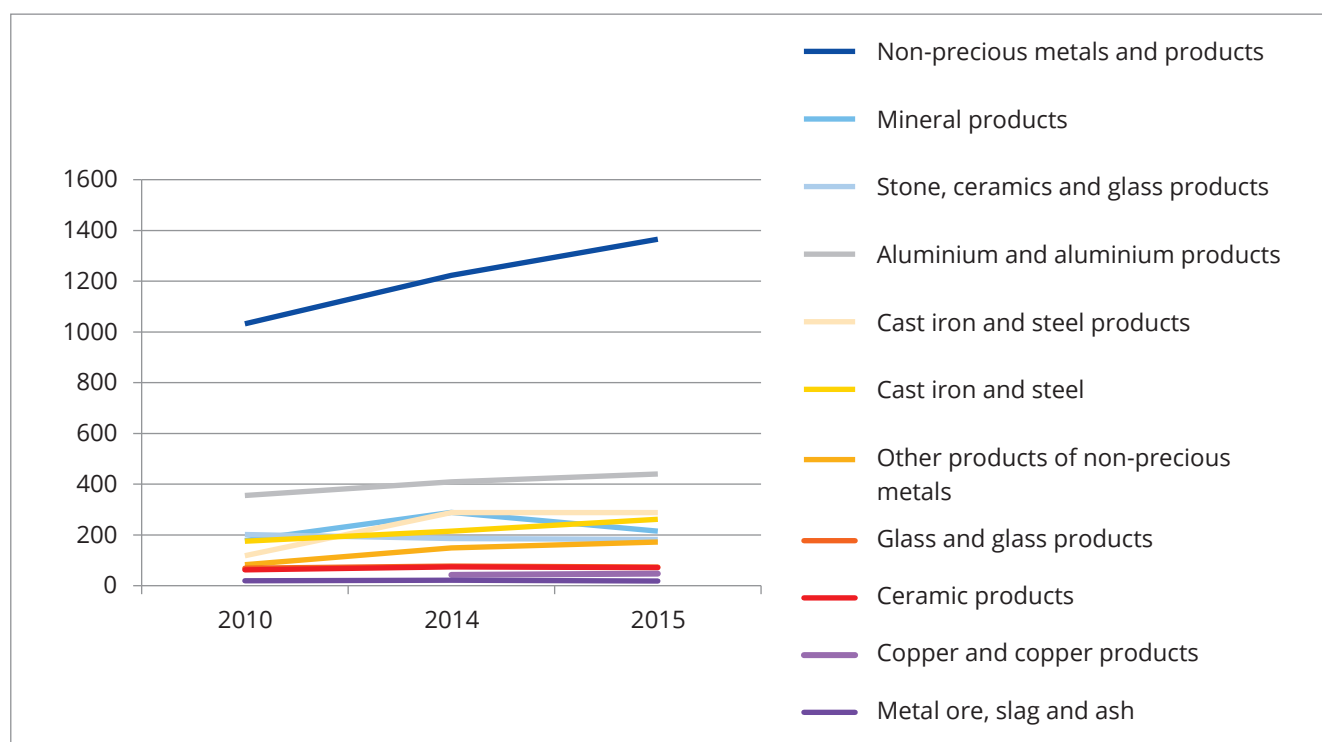
Source: Statistical yearbook for the Małopolska province, GUS, 2016; Figures in PLN m.

Considering their location on the map of Europe, both Poland and Małopolska are powerful areas of international trade. Poland exports products mainly to European countries. Regionally, Małopolska is a significantly powerful export centre of aluminium, cast iron and steel. Notably, export of the goods classes presented below increased by 36% in the period of 2010-2015.

Table 15 Import and export of steel products

Export		Import	
Germany	1,404	Germany	2,504
Czech Republic	1,063	Ukraine	1,048
Slovakia	386	Czech Republic	853
Italy	278	Slovakia	801
Hungary	229	Russia	646
Austria	217	Italy	555
France	212	Belgium	370
Lithuania	142	Austria	333
Spain	131	France	312
Ukraine	114	China	227

Reference: *The Polish Steel Industry 2017, HIPH, 2017*

Graph 43 RIS Export in Małopolska

Source: *Export potential of enterprises in Małopolska, Regional Development Observatory in Małopolska, 2017*

The region, due to its very good macroeconomic conditions, attracts significant foreign investments. For example, in 2017 Arcerol Mittal Corporation launched an investment estimated at PLN 850 million. The first phase of the investment in the amount of PLN 500 million aims at the modernisation and performance increase of the steel mill in Cracow, including the environmental standards of the plant. The second phase, in the amount of PLN 350 million, will cover the modernisation of a heat and power plant with a modern dust extraction and CO₂ emissions reduction system.⁵⁸ The metal production segment also received investment from Sapa, Benda-Lutz Alpoco, Single White Cap in Niepołomice, Can-Pack (F&P Holding) in Brzesko, Standard Cooper, whereas Industrimeccanica di Precisione Brandizzo invested in a metal press in Oświęcim.⁵⁹

⁵⁸ <http://krakow.wyborcza.pl/krakow/7,44425,21790323,inwestycje-za-850-mln-zl-w-krakowskiej-hucie-arcelormittal.html?disableRedirects=true>, 24.08.2017

⁵⁹ *Foreign investors in Małopolska in 2014, Regional Development Observatory in Małopolska, 2016*

Overall, the metal production segment represents 6.4% of the foreign investments in the region, whereas the finished metal product manufacturing segment represents 9.5%, which amounts in total to 15.9% of investments in Małopolska in 2014. Between 1989 and 2014 the shares amount respectively to 16.3%, 9.8%, 26.1%.⁶⁰

The sector responsible for production of metals, metal products and mineral non-metallic raw material products in Małopolska attracts investors also due to its innovative character. Between 2007 and 2017 the Polish Patent Office granted over 80 patents for innovative solutions to entities within this sector.⁶¹

5.1.1. Perspectives for specialisation development in Małopolska

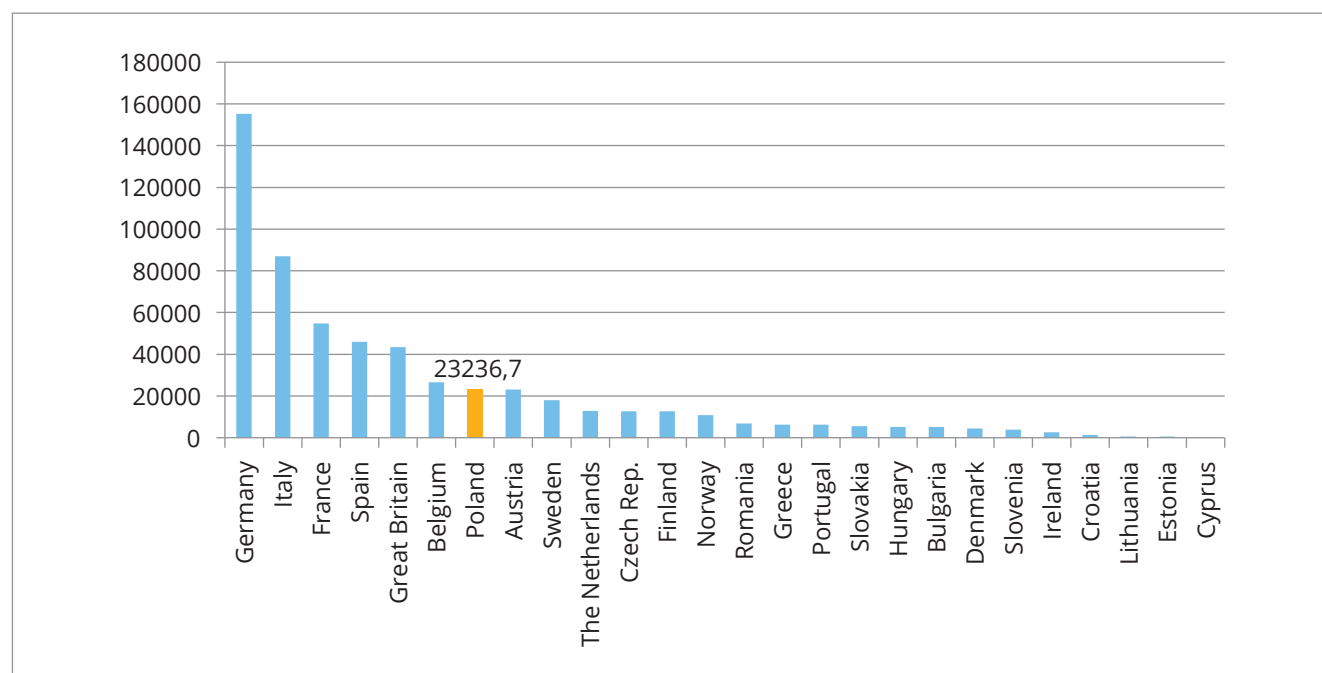
The presented data demonstrates highly optimistic perspectives for RISM. It is, in fact, one of the component elements of economy, and it also has an indirect impact on many other sectors. The great economic importance has a positive impact on the sector's position. Following the above factors, by 2020 the sector will most probably have noted:

- Increase in the number of foreign investments, particularly in metallurgy and steelworks;
- Average annual growth in sold production at the level of 5-10%, depending on the segment;
- Average annual growth in export of about 5-7%;
- Moderate increase or a stabilisation in the number of entities in the sector;
- Significant investments in renovation and modernisation of the existing production capacities (mainly in metallurgy).

5.1.2. Domestic and international competitiveness

Poland is one of the major producers of goods within RIS in the European Union. Regarding the production value, Poland holds the 7th position among 28 countries with the sale of products at the level of EUR 23,236.7m.⁶²

Graph 44 RIS sold production in Europe



Source: Annual detailed enterprise statistics for industry, Eurostat, 2017; Figures in EUR m.

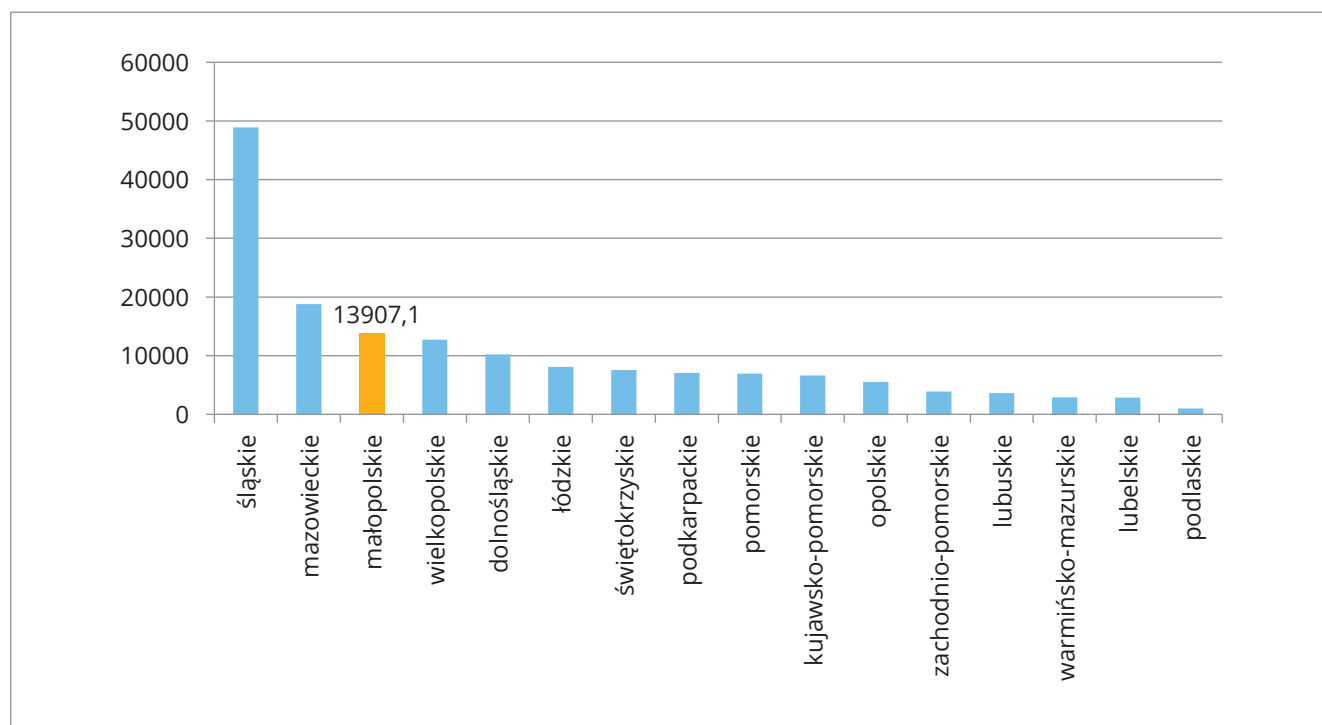
⁶⁰ Foreign investors in Małopolska in 2014, Regional Development Observatory in Małopolska, 2016

⁶¹ Polish Patent Office

⁶² Annual detailed enterprise statistics for industry, Eurostat, 2017

Małopolska Province is one of the centres for manufacturing mineral non-metallic raw material products, metal products and metals. In these categories, in comparison to other Polish provinces, it holds respectively the 6th, 3rd and 4th position in terms of sold production volume.

Graph 45 RIS sold production volume according to regions (Polish voivodships)



Source: Own elaboration based on Statistical yearbooks of individual provinces; Figures for 2015 in PLN m.

5.1.3. Forms of support within a specialisation

Apart from the above average macroeconomic parameters, the entities investing in Małopolska may take advantage of numerous support programmes and investment incentives within the Specialisation.

Table 16 Selection of subsidy addressed to RISM 5.

National level		
Competition	Amount of allocation	Contact
Strategic programmes of the National Centre for Research and Development: TECHMATSTRATEG	PLN 500,000,000	www.ncbr.gov.pl
Sectoral programmes of the National Centre for Research and Development, POIR 1.2 "Sectoral R&D programmes" INNOSTAL	PLN 95,000,000	www.ncbr.gov.pl

Reference: Own elaboration

5.1.4. Key entities

- **Innovative Foundry Cluster** - the cluster was established in 2011 and since then it has been focusing its operations on supporting heavy industry and foundry enterprises through innovation and entrepreneurship development in the region. The cluster consists of 13 enterprises, 2 scientific units and 1 Business Environment Institution. The cluster's major foreign partners are Germany, Sweden, Italy, Afghanistan, Austria, the Czech Republic, France, Spain, the Netherlands, Iceland, Norway and the United States.⁶³ The

⁶³ <https://mapaklastrow.pi.gov.pl/Klastry2/index.html#cont=159&nokla=5&nowoj=15>, 28.08.2017

implementation of a project entitled “The Development Phase of the Cooperative Connections within the Innovative Foundry Cluster” was completed in 2015. The project was subsidised with the European Union funds under the Operational Programme of Innovative Economy.

More information on the website: www.moderncast.pl

- **Krakow Technology Park** - connected to the Special Economic Zone. The Technology Park concentrates on any industry-related activity (apart from licensed goods production), and also on selected service activity (e.g. ICT). The Technology Park is connected to the dynamic Special Economic Zone. Twenty-eight new investment permits were granted in 2016 alone. In 2017 a new investment within this RISM was made by RBS Stal in the amount of PLN 12m when they commenced the construction of a new production hall. At the same time a Japanese company, Mabuchi, is planning to invest PLN 360m in their first factory in Europe.⁶⁴

More information on the website: www.kpt.krakow.pl

- **Green Industrial Park in Tarnów** – a technology park covering 350 ha, combining 40 entities within sectors like construction components production, steel components production, electrical engineering, food production, glass production, logistics, storage.⁶⁵ The following companies are among those which made investments within the park: Domex - plumbing fixtures producer, Cegbud - brickworks, Bruk-Bet - paving stones and blocks producer, Eva Glassworks, Stalprodukt - steel products producer.⁶⁶

More information on the website: www.tkp.com.pl

- **“Czysta” Industrial Park** - composed of greenfield investment plots with the possibility of using SEZ privileges. The Park hosts companies which operate in the analysed sector, for example: Zakład Elementów Konstrukcyjnych Sp. z o.o. KON-INS-BUD Montaż Sp. z o.o.

More information on the website: www.tkp.com.pl

5.1.5. Institutions responsible for legal regulations

Considering the broad definition of the specialisation, there are many institutions responsible for legal regulations and sector operations organisation and therefore they are to be found mainly at central levels. The sector's activity is additionally supported by Chambers and Associations. The main offices are:

- Ministry of the Environment (integrated permits)
More information at: www.mos.gov.pl
- Ministry of Economic Development (trade in certain steel products)
More information at: www.mr.gov.pl
- Bureau for Chemical Substances - competent office for REACH and CLP in Poland
More information at: www.chemikalia.gov.pl
- Polish Chamber of Steelwork
More information at: www.piks.com.pl
- Polish Chamber of Commerce for High Technology
More information at: www.iztech.pl
- Economic Chamber of Non-Ferrous Metals and Recycling
More information at: www.igmnir.pl

⁶⁴ <http://www.radiokrakow.pl/gospodarka/pierwsze-zezwozenie-w-tym-roku-na-inwestycje-w-krakowskiej-sse/>, 21.09.2017

⁶⁵ http://www.paih.gov.pl/strefa_inwestora/parki_przemyslowe_i_tehnologiczne/tarnow, 28.08.2017

⁶⁶ https://www.paih.gov.pl/strefa_inwestora/parki_przemyslowe_i_tehnologiczne/tarnow, 21.09.2017

5.2. The R&D&I Market

Małopolska is one of the main academic centres in the country. This translates also into a wide range of research facilities for the RISM in question. A particularly firm position is held by two universities in this province, *i.e.* AGH University of Science and Technology and Cracow University of Technology. Collectively, the universities of Małopolska introduce over 14.5 thousand graduates of derived specialisations onto the job market every year.

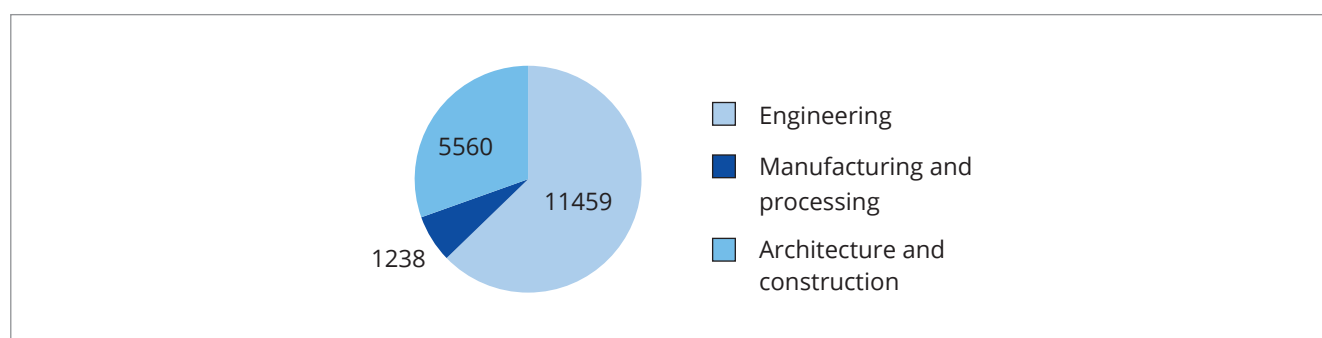
5.2.1. Catalogue of universities

- AGH University of Science and Technology in Krakow - a RISM oriented university:
 - Faculty of Materials Science and Ceramics;
 - Faculty of Mining and Geoengineering;
 - Faculty of Metals Engineering and Industrial Computer Science;
 - Faculty of Foundry Engineering;
 - Faculty of Non-Ferrous Metals.
- Cracow University of Technology
 - Faculty of Civil Engineering;
 - Faculty of Chemical Engineering and Technology;
 - Faculty of Mechanical Engineering.
- Foundry Research Institute in Cracow;
- Institute of Metal Cutting in Cracow;
- Institute of Metallurgy and Materials Science Polish Academy of Sciences in Cracow;
- Institute of Advanced Manufacturing Technology in Cracow.

5.2.2. The academics' potential

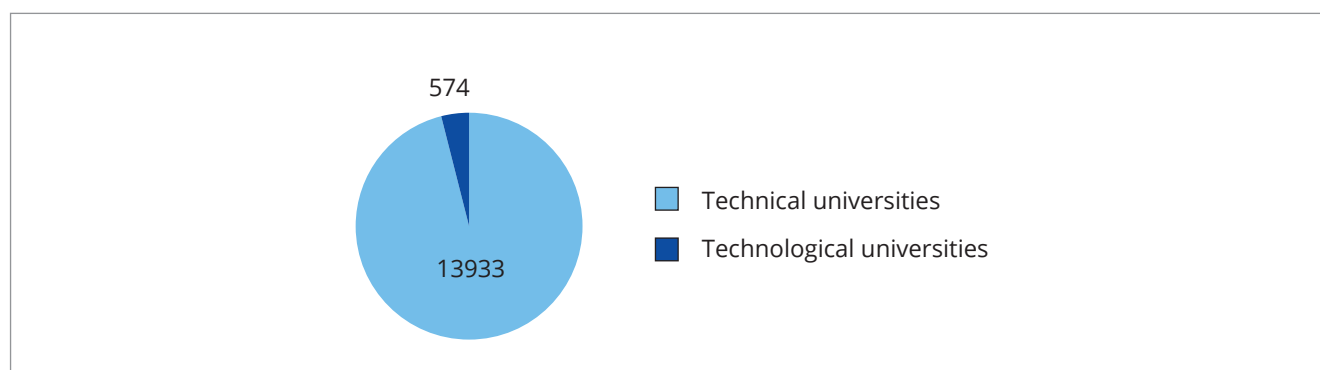
First-class facilities of universities and lower-level schools successively build up the above average staff resources in the province within the discussed specialisation. The distribution and the size of the main job and education market parameters in the province in the area of faculties related to RISM are presented below.

Graph 46 Technical school graduates of faculties related to RISM



Source: Local Data Bank, GUS, Cracow, 2017; Data for 2016

Graph 47 University graduates of faculties related to RISM



Source: Local Data Bank, GUS, Cracow, 2017; Data for 2016

5.2.3. Research programmes and supporting initiatives

- **BioMOre Project** - the project, conducted under SME Instruments programme, aims at development of technology for extracting metals from deep-seated metal ores with the use of biotechnology. The project involves AGH University of Science and Technology and 19 other foreign entities.

More information on the website: www.biomore.info

- **MiNatura 2020 Project** - the project, conducted under SME Instruments programme, aims at development of methodology and good practices within the informed use of mineral deposits. The project includes Mineral and Energy Economy Research Institute and 23 foreign entities.

More information on the website: www.minatura2020.eu

- **MinFuture Project** - the project is aimed at exchange and development of international competence within the material flow and modelling of future proceedings scenarios in the sector. The project includes Mineral and Energy Economy Research Institute and 14 foreign entities.

More information on the website: www.minfuture.eu

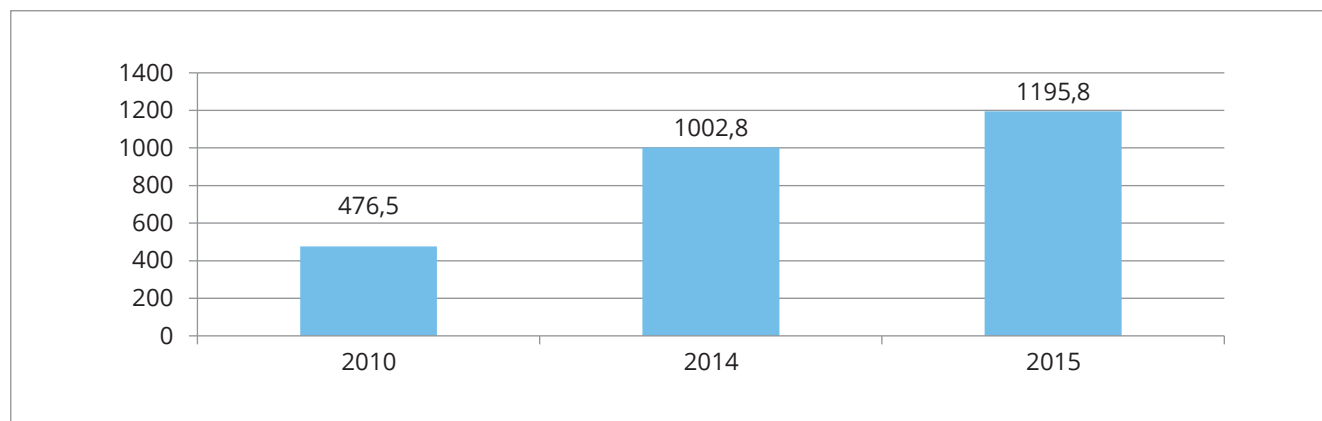
Foundry Research Institute - founded in 1946, in Krakow is the leading unit of state-led research activities for the foundry industry in Poland under the supervision of the Ministry of Development. The Institute is most modern software for computer simulation of casting processes (MAGMA, ABAQUS, FluidFlow, PANDAT) and advanced equipment for rapid prototyping, melting alloy and small lot production of casting alloy of Al, Mg, Zn, Sn, Cu, Ni, Fe, Co, Ti, composite metal-ceramic, functionally graded materials, as well as metals and alloys using technologies such as traditional casting of the weight of the sand and metal molds, investment casting and advanced technologies in which the pressure is the element supporting the casting process (compression in the liquid state, under high pressure casting, low pressure casting, centrifugal casting, hot isostatic pressing).

More information on the website: www.iod.krakow.pl

5.2.4. Investments in research operations within a specialisation

The RISM is an area heavily dependent on innovation supply. This phenomenon is particularly visible in the size of outlays on the R+D activity of the enterprises in the sector. In the analysed years the outlay on research was over 2.5 times higher. Moreover, in the metal products production sector as many as 6.7% of the net revenue in 2015 came from the sale of new or significantly improved products, in the mineral non-metallic raw material products manufacturing the figure amounted to 13.3%.⁶⁷

Graph 48 Investments in the R&D operations of enterprises



Source: Yearbook of the Małopolska Province for 2016, GUS; Data presented for scientific disciplines: engineering and technical sciences; figures in millions of PLN.

5.3. Technological offers of enterprises from Małopolska

The biggest enterprises within the given specialisation in Małopolska are, for example:

Table 17 Analysis of services/goods provided by RISM sector leaders within *Production of metals, metal products and mineral non-metallic raw material products*

Entity	Scope of operations	Technological offer
Arcelor Mittal	steel production	Sheet metal, tapes, semi-finished products and heavy steel castings, hot-rolled sections, round plain wire rod, profiled wire rod, bars for general purpose, various sorts of rails, railway accessories, sections for mining. www.poland.arcelormittal.com
CAN-PACK	metal products	Aluminium cans, round tins and shaped steel cans, crown stoppers (caps), steel easy-open lids, a wide selection of steel containers for storing chemical products: spray containers, cylindrical metal boxes. www.canpack.eu
Silgan	metal and non-metallic raw material products	Plastic and metal packaging; metal, plastic and composite vacuum closures. www.silgan.com
St. Gobain	glass production and processing	Glass producer for construction works (decorative, facade and sheet glass), automotive industry (glass panes and glass components for cars and transport vehicles). www.saint-gobain.pl

⁶⁷ Yearbook of Małopolska Province for 2016, GUS

Entity	Scope of operations	Technological offer
ALPHA Technologies	Foundry	Non-ferrous metal pressure casting, centrifugal casting of zinc alloys, moulds and tools production, laser processing of sheets, numerically controlled sheet and profile bending, plastic forming of metals, galvanisation, metal welding. www.alpha.krakow.pl
Automationstechnik	industrial automation	It specialises in providing technologically advanced equipment for the automation of production processes and complete production lines, e.g. Bosch Rexroth assembly system, Orgatex visualization systems of production, Bosch industrial tools, FMW Friedrich radial riveting machines, Mader Pressen industrial presses, Fimotec vibrating feeders, Bloksma stationary lifters, workshop equipment, BS-Rollen wheel sets, electric screwdrivers. www.automationstechnik.pl
KZN Biezanów	metal structures	The offer is primarily related to rail surfaces and it is complemented by supply distribution and logistics, investment implementation, railway sidings operation, service, maintenance and also technical support. www.kzn.pl
Boryszew Group	metal processing	The company produces: lead and derivatives, wires and aluminium wire rods, copper, pipes, flat bars, aluminium stripes and sheets, bearings and zinc products. www.boryszew.com.pl
Stalprodukt	steel products production	It specialises in the production of: road and bridge safety barriers, transformer cores, cold rolled sections and profiles, as well as electrical steel stripes and sheets. www.stalprodukt.com.pl
Kęty Group	aluminium products production	A producer of aluminium profiles as well as elements and components prefabricated on CNC machines of aluminium systems for construction industry. They offer window and door systems, facade systems, roller shutters, roll-up gate systems and steel systems. www.grupakety.com
Polska Stal Group	steelwork products production	It is a partner of 12 companies which own 55 warehouses for steel products and service centres throughout Poland, providing a wide choice of high-quality steel products. www.gps.net.pl
Alumetal Group	Foundry	It specialises in the production of aluminium alloys, master alloys, aluminium for steel deoxidation, fluxes and salts. www.alumetal.pl
ATT Inox Drain	steel products production	The company's offer includes: drainage systems, manhole covers, pump station equipment, food processing equipment, shower drains, floor boxes. www.att.eu
AutoBast	machinery parts production	The main operations of the company include construction of industrial machines, production of stations dedicated to electric harness installation and testing, lines for production of automotive and house appliance wire harnesses, control tests and tools. www,auto-bast.com

Entity	Scope of operations	Technological offer
FASING	metal products	The enterprise specialises in production of round and flat link mining chains, chain assemblies, locks, connecting links, wear resistant round link chains, chains for hoists, fishing chains etc. www.fasing.pl
HARDKOP	Foundry	Steel castings, iron castings and bronze castings, precision castings, industrial fans, steel structures, mechanical processing, machinery parts, electric engines, aluminium stripes. www.hardkop.pl
KUŹNIA Sułkowice	metal products	The company specialises in production of high-quality hot forged drop forgings of unit weight from 0.10 to 10 kg, made of carbon steel, alloy steel, structural steel and stainless steel. www.kuznia-sulkowice.pl
Legbud Gargula	metal structures	The enterprise offers: tilt-up garage doors, sectional garage doors, sectional industrial doors, perimeter fencing, industrial fencing, garages and doors. www.legbudgargula.com
Lenze Tarnów	machinery parts production	The enterprise specialises in production of, e.g.: frequency converters, engines, gears, accessories and additional equipment. www.lenze.com
ŚRUBONIT A.K.	metal products	Production of screws, bolts, rivets, screw and connecting items. www.srubonit.pl
Wostal	steel products and structures	Production: steel structures, drop forgings and products for coal mining (slings, stays, components of suspended monorails). Services: machining, heat treatment, grinding, welding and cutting. www.wostal.pl
WIŚNIEWSKI	metal structures	Production of a variety of gates and systems, windows, doors as well as perimeter and industrial fencing. www.wisniowski.pl
Drabest	aluminium structures	The enterprise offers steel, aluminium, warehouse, garden and household ladders of various profiles and sizes, bicycle racks, metal furniture for workshops, workshop shelves, emergency fire escape stairs, saw horses, car racks and other products. www.drabest.pl

Source: Own elaboration

6. Electrical engineering and machinery industry

6.1. Sector description

Electrical engineering and machinery industry are the basis for modern production. Maintaining the innovation level of this branch is crucial from the perspective of the production growth rate in economy, therefore, these fields have been identified as a separate Regional Smart Specialisation of the Małopolska Province. The specialisation includes production of electrical engineering products, optical products, electric and mechanic appliances, as well as production of vehicles and their components.

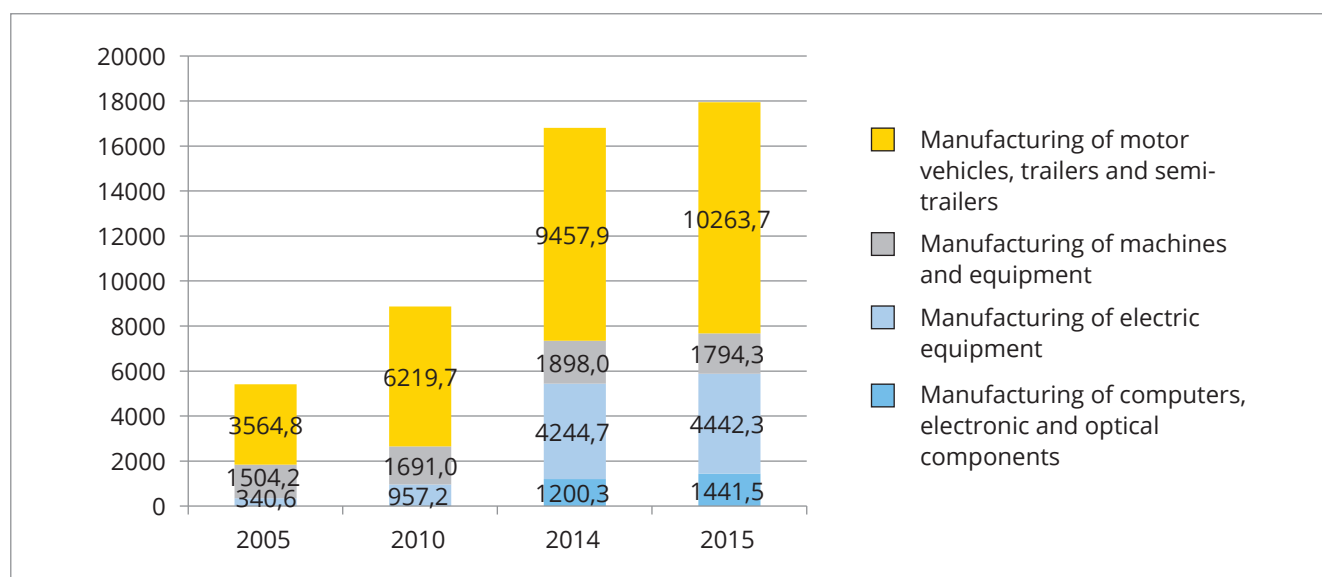
The composition of Regional Smart Specialisation of the Małopolska Province includes the following detailed areas:

- Medical engineering technologies;
- Innovative technologies, processes and products of the agriculture and food sector and the forestry and timber sector;
- Sustainable power engineering, smart and energy-efficient construction industry;
- Innovative technologies and industrial processes;
- Automation and robotics of technological processes;
- Optoelectronic systems and materials;
- Creative smart technologies, design.⁶⁸

6.1.1. Assessment of the present situation in Małopolska.

Małopolska represents 6.75% of the Specialisation production in Poland. The total specialisation sold production in 2015 amounted to PLN 17,941.8m. Dynamic analyses bring positive conclusions. Production of computers, electronic and optical products increased in 2014/2015 by over 20%, whereas the production of electric appliances, production of machinery and devices and production of vehicles, trailers and semi-trailers rose in 2005-2015 by, respectively, over 13 times, about 20% and 188%.⁶⁹

Graph 49 RIS sold production in Małopolska



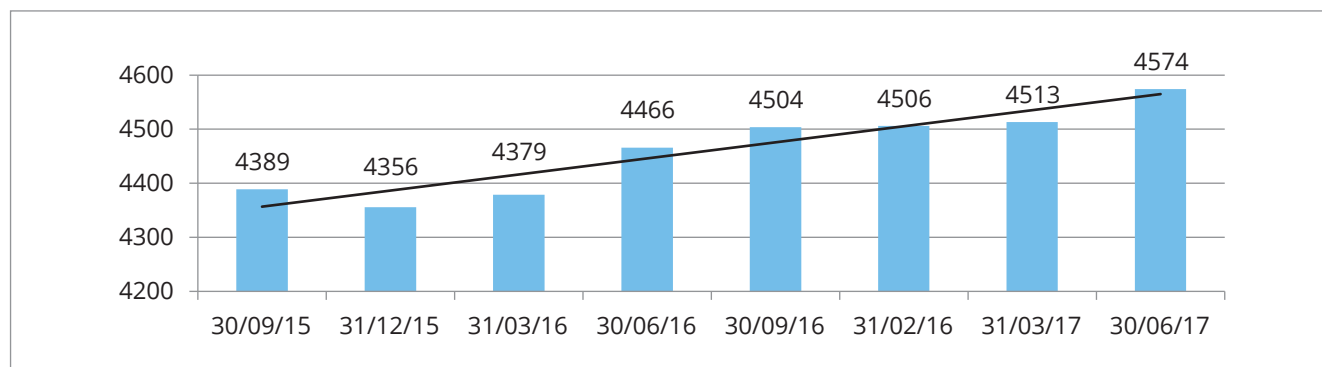
Source: Statistical yearbook for the Małopolska province, GUS, 2016; Figures in millions of PLN.

⁶⁸ Smart Specialisations of the Małopolska Province (Appendix no. 1 to the Resolution no. 1262/15), Małopolska Province Management, Cracow, 2015

⁶⁹ Statistical yearbook for the Małopolska Province, GUS, 2016; Figures in millions of PLN.

Electrical engineering and machine industry in Małopolska are developing dynamically. This is demonstrated by the number of newly-established enterprises. Between 2015 and 2017 the number of companies set up within the discussed RISM increased by 4.2%. Enterprises from Małopolska represent almost 7% of all enterprises operating within the specialisation throughout the country.

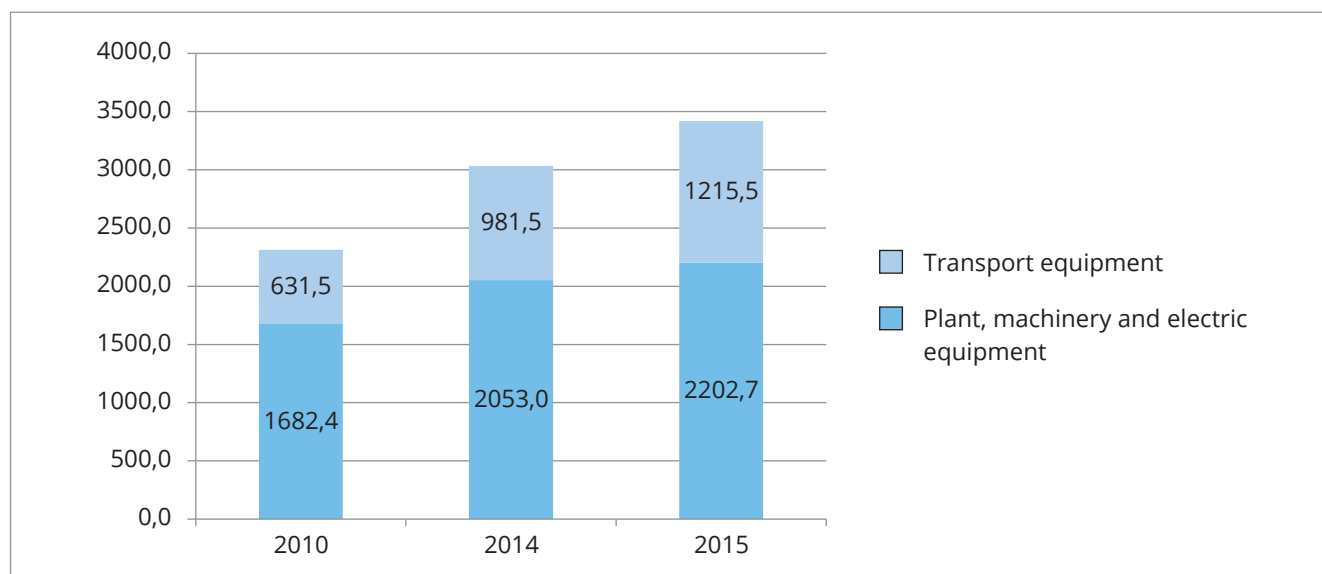
Graph 50 Number of enterprises within RISM



Source: Own elaboration based on: National economy entities entered in the register at REGON, GUS, 2017

When analysing trade statistics in those years, a significant increase in export, reaching almost 50%, should also be noted. In the same period of time export within the specialisation in the domestic perspective grew by 39.5%. Małopolska's export share within the specialisation amounts to 4.9%.

Graph 51 Export of selected specialisation goods in Małopolska



Source: Export potential of enterprises in Małopolska, Regional Development Observatory in Małopolska, 2017; Figures in millions of EUR, according to CN classification

The outstanding condition of the sector is demonstrated by direct foreign investments. They are particularly visible in the automotive sector. In 2014 they reached almost PLN 20m, mainly due to such investors as BWI Poland Technologies, Brembo, Delphi, Nidec Motors and Actuators. The sector dealing with the production of motor vehicles, trailers and semi-trailers recorded 8% share in general FDI/BIZ in Małopolska in 2014. In the period 1989-2014 it gathered 9.6% of investments. Another strong segment of the specialisation is production of electrical devices, which in 2014 collected 9.4% of investments. The main investors in the area include Somfy, which in June 2014 completed the construction of a factory in Niepołomice, ATB Tamel, Elet-

trostandard, Norlys, Samsung and ABB.⁷⁰ Another example of a foreign investment is the purchase of modern machinery and equipment for a plant in Niepołomice by Pratt & Whitney Tubes, a producer of engines.

Table 18 Foreign investments in selected segments of RISM

Sector	Investment
Production of computers, electronic and optical products	39.52
Production of electrical equipment	36.8
Production of machinery and equipment	7.49
Production of motor vehicles, trailers and semi-trailers	31.37
Repair, maintenance and installation of machinery and equipment	2.02

Source: *Foreign investors in Małopolska in 2014, Regional Development Observatory in Małopolska, 2016; Figures for 2014 given in millions of USD.*

The sector's entities in Małopolska represent a significant level of innovation. It is evident in the number of patents granted by the Polish Patent Office. In the period 2007-2016 up to 78 innovative solutions within electric engineering and machine industry obtained patent protection.⁷¹

6.1.2. Perspectives for specialisation development in Małopolska

In the perspective until 2020 the sector is expected to grow at the rate of 10% per annum. Segments of the highest development potential shall include:

- Medical devices;
- Metal processing devices;
- Wood processing devices (including production of furniture);
- Optical devices;
- Machines and devices addressed to automotive industry (both semi-finished products and devices used in the production process).

Notably, the sector is highly dependent on the general economic situation. In Polish reality, the sector has a significant export potential both eastwards and westwards.

6.1.3. Domestic and international competitiveness

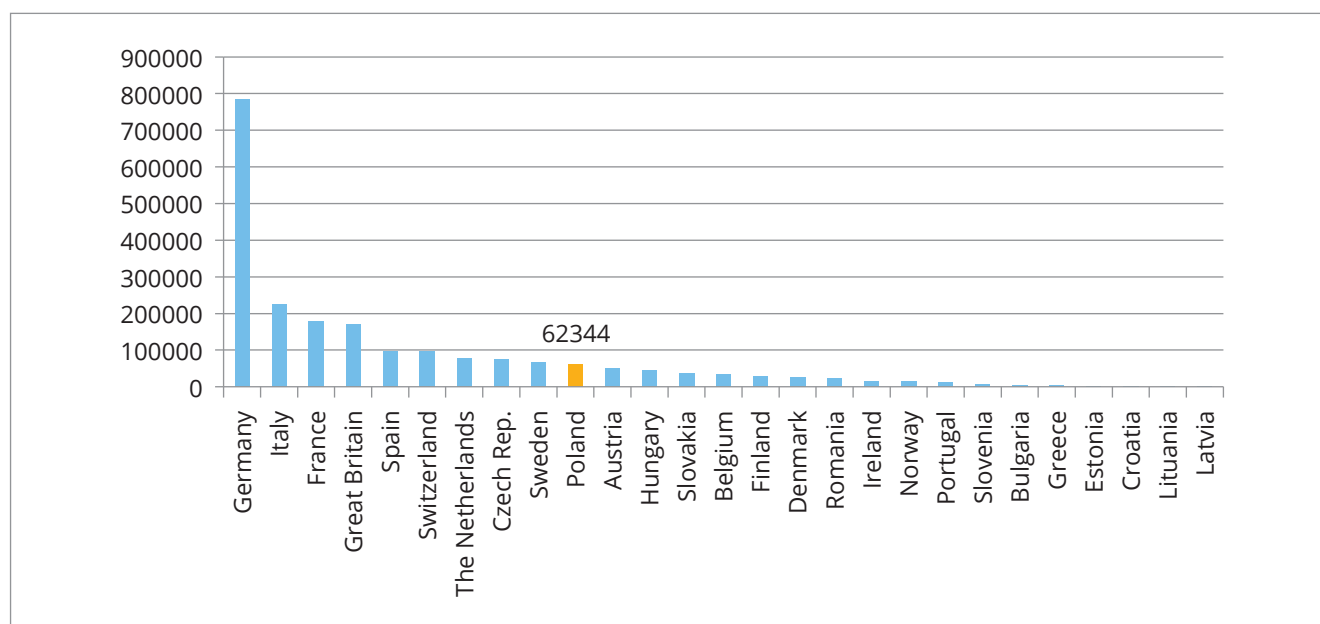
Poland is an important area in the European Union for the production of machinery and equipment. Regarding the production value, Poland holds the 10th position among 28 countries with the sold production at the level of EUR 62,344m.⁷² In the period 2006-2015 Poland saw a significant production growth of almost 55%. And in the period 2012-2015 of 17.5%, whereas in the same time the production value in all EU member states increased by 12%.

⁷⁰ *Foreign investors in Małopolska in 2014, Regional Development Observatory in Małopolska, 2016*

⁷¹ *Polish Patent Office*

⁷² *Annual detailed enterprise statistics for industry, Eurostat, 2017*

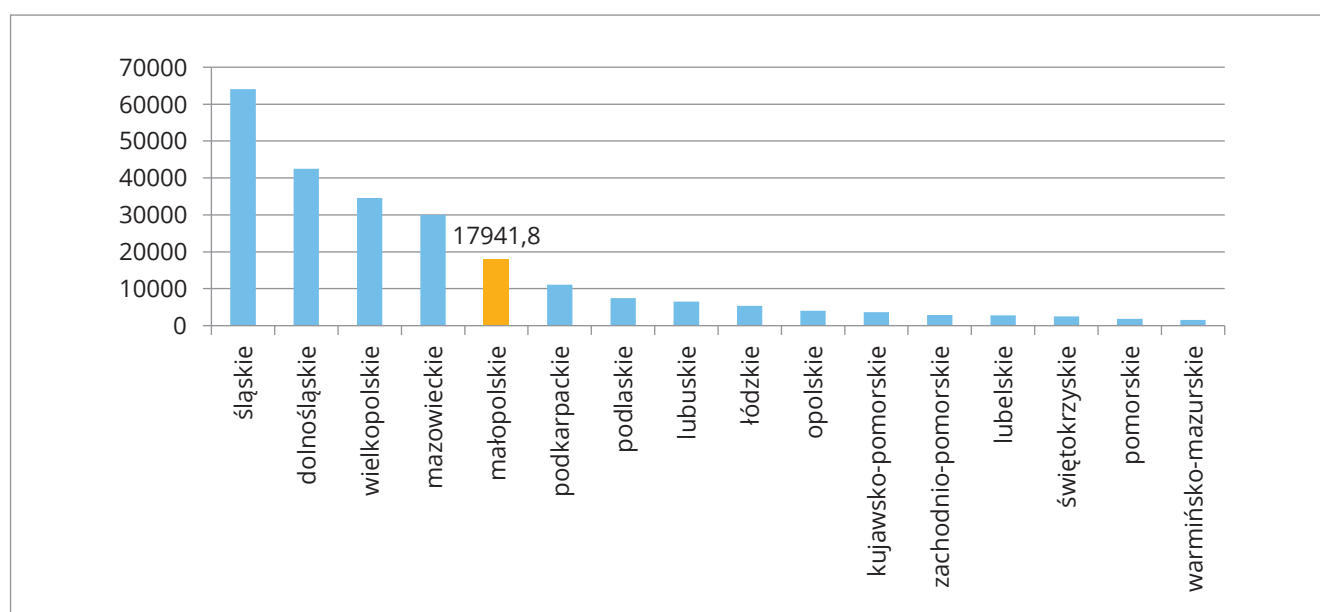
Graph 52 RIS sold production in Małopolska



Source: Annual detailed enterprise statistics for industry, Eurostat, 2017; Figures in millions of EUR

The Małopolska province holds a firm position on the domestic arena of *Electric engineering and machine industry RISM*. In the following segments: production of computers, electronic and optical devices (1), production of electric appliances (2), production of machines and devices (3) and production of motor vehicles, trailers and semi-trailers, holds respectively the 5th, 5th, 6th and 4th position in terms of sold production volume.

Graph 53 RIS sold production volume according to regions (Polish voivodships)



Source: Own elaboration based on Statistical yearbooks of individual provinces; Figures for 2015 in millions of PLN.

6.1.4. Forms of support within a specialisation

Apart from favourable results of domestic and international comparisons, RIS of Małopolska offers a variety of incentives and reliefs for investors and enterprises operating in the sector. The following could serve as an example:

Table 19 Selected subsidy addressed to RISM 6.

Domestic level		
Competition	Amount of allocation	Contact
Sectoral programmes of the National Centre for Research and Development, POIR 1.2 "Sectoral R&D programmes": INNOBZ	PLN 50,000,000	www.ncbr.gov.pl

Source: Own elaboration

It should be emphasised that the Małopolska province implemented the second highest, right behind the Mazovia province, number of projects related to support for scientific research, technological development and innovations. Beside the programmes, the investors may take advantage of such incentives as CIT tax relief (up to 55%) and property tax relief.

6.1.5. Key entities

- **The Tarnow Industrial Cluster** - business related institution established in 1999, operating in the region of Tarnow. The shareholders include 37 business and science entities. The Cluster carries out its mission through the Economic Activity Zone and three industrial parks: "Mechaniczne" Industrial Park, "Czysta" Industrial Park and "Kryształowy" Green Industrial Park.⁷³ The Cluster covers 140 ha where 60 entrepreneurs run their businesses, employing 1,500 people. Among the companies which made investments on the area of the Cluster there are: P.W. Intech - production of devices, containers and installations made of acid-resistant steel, Qube Production - CNC processing and production of parts, Bobcat Company - producer of construction, road and loading machines, R-TechniQ - mechanic components for industry, el PLC - mechatronic solutions.⁷⁴

More information on the website: www.tkp.com.pl

6.1.6. Institutions responsible for legal regulations

RISM including Electric engineering and machine industry is a wide set of scientific fields and economy sectors. In practice it is regulated by many entities, depending on its particular segments. The main institutions at the national level include:

- Ministry of Energy
More information on the website: www.me.gov.pl
- Ministry of Infrastructure and Construction
More information on the website: mib.gov.pl
- Ministry of Economic Development
More information on the website: www.mr.gov.pl
- Ministry of Environment (e.g. General Inspectorate of Environmental Protection for marketing batteries and accumulators throughout the country).
More information on the website: www.mos.gov.pl and www.gios.gov.pl/pl
- Polish Economic Chamber of Electrotechnics

⁷³ <http://www.tkp.com.pl/o-nas> 30.08.2017

⁷⁴ <http://www.tkp.com.pl/>, 21.09.2017

More information on the website: pige.com.pl

- Polish Committee for Standardization

More information on the website: www.pkn.pl

6.2. The R&D&I Market

6.2.1. Catalogue of universities

A wide range of qualified scientific staff and university graduates is to a large extent the result of an extensive selection of academic facilities. The main universities providing education within the *Electric engineering and machine industry RISM* are:

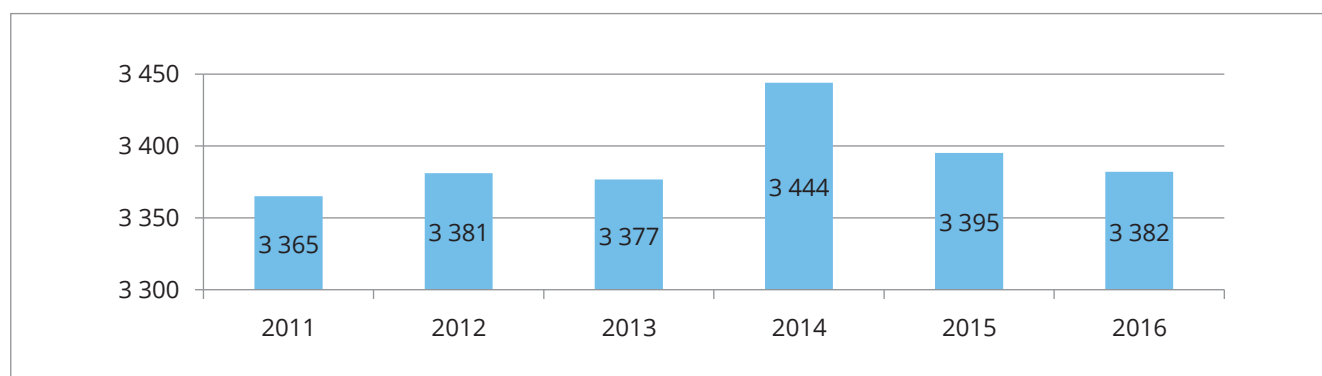
- AGH University of Science and Technology in Krakow - a university largely focused on the discussed RISM. It offers many faculties, like:
 - Mining and Geology;
 - Environmental Engineering;
 - Management and Production Engineering;
 - Automatics and Robotics;
 - Electrical Engineering;
 - Electronics;
 - Mechanical Engineering and Materials Engineering;
 - Mechatronic Engineering;
- Cracow University of Technology
 - Faculty of Physics, Mathematics and Computer Science;
 - Faculty of Electrical and Computer Engineering;
 - Faculty of Civil Engineering;
 - Faculty of Environmental Engineering;
 - Faculty of Chemical Engineering and Technology;
 - Faculty of Mechanical Engineering.

6.2.2. The academics' potential

The electric engineering and machine industry sector in Małopolska as well as its experience in business developed a vast circle of academic staff in the province. The staff is brought together in the main academic centres as well as in the leading enterprises of the region. The example are the likes of AGH University of Science and Technology and Cracow University of Technology, or leaders of the sector, like: Abb, Valeo, MAN, etc. due to the interdisciplinary character of the science field, highly-qualified experts come from various scientific areas.

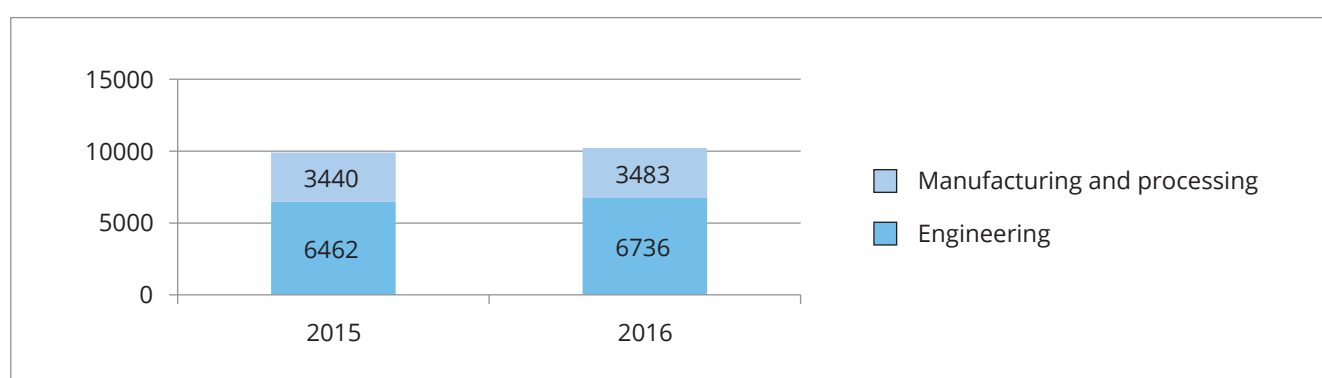
The extensive academic and research background of Małopolska is demonstrated by, e.g. qualified scientific staff and the number of graduates. In 2016 in Małopolska there were 3,382 academics employed by universities of technology. And the figure remains relatively stable. However, it is worth mentioning that the proportion of the academics in the Małopolska region to the general number of academics in Poland is constantly growing. In the analysed period of time from 16.5% to 17.2%. A similar situation refers to the potential of university graduates. The number of graduates increased by 3.2% in the last year.

Graph 54 Number of academics at universities of technology



Source: Local data bank; Number of academics at universities of technology given in persons

Graph 55 Number of graduates within Specialisation



Source: Local data bank; Number of graduates given in persons

6.2.3. Research programmes and supporting initiatives

- **Association of Polish Electrical Engineers** (branch in Cracow) - national organisation associating persons and entities from the electric sector and related ones. The organisation's objective is to support the scientific and business development in the field of electricity.

More information on the website: www.sep.com.pl

- **Advanced European Infrastructures for Detectors at Accelerators** - a project directed at development of detector technology and infrastructure used for the purpose. AGH University of Science and Technology participates in the project.

More information on the website: www.aida2020.web.cern.ch

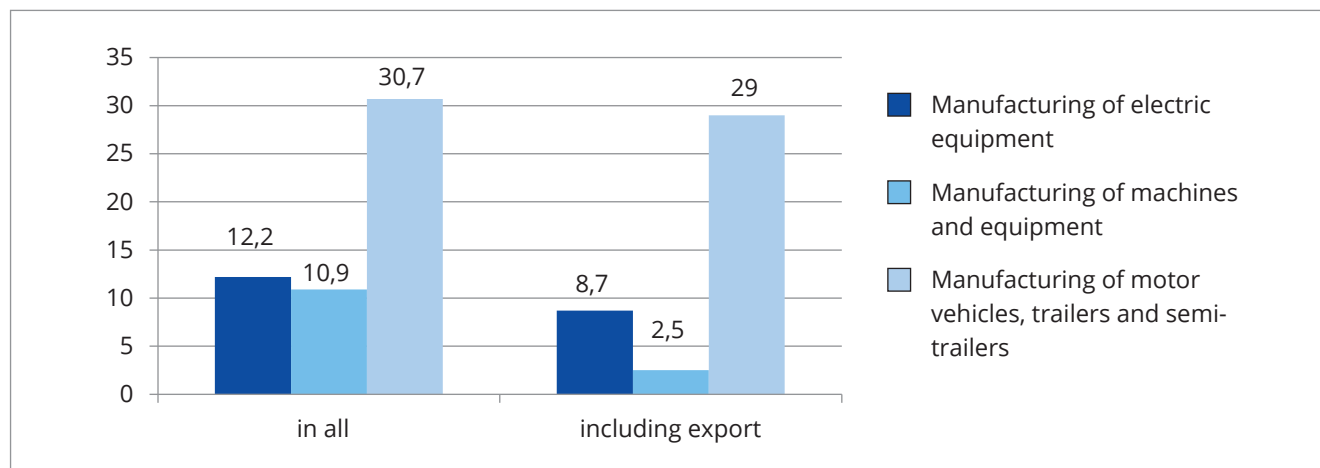
- **The Institute of Advanced Manufacturing Technology** established in Krakow in 1949, is a research institute specializing in problems of technology and techniques of metal cutting, abrasive machining, non-conventional methods of machining, technical metrology, automation of manufacturing and assembly processes.

More information on the website: www.ios.krakow.pl

6.2.4. Investment in research operations within the specialisation

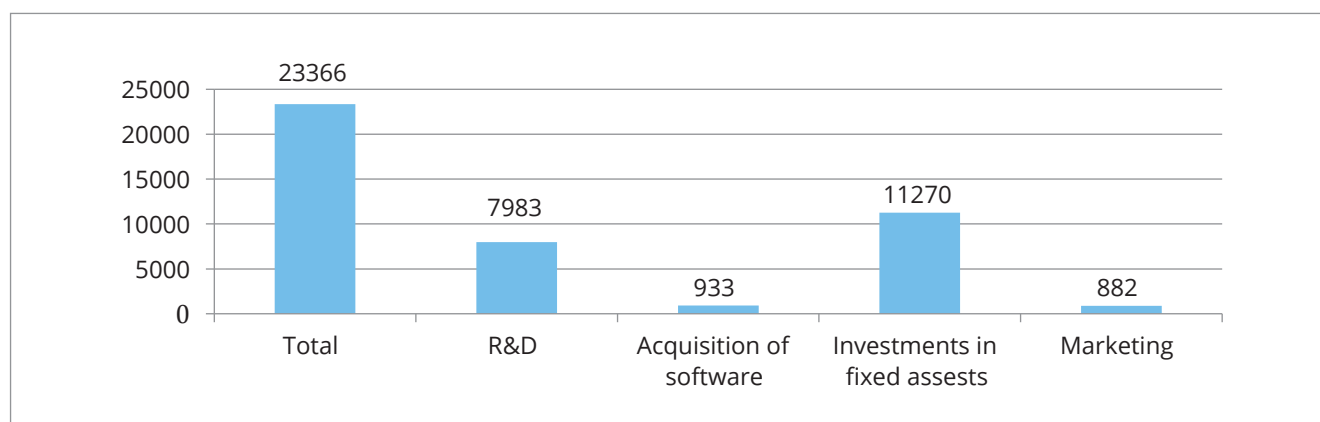
Considerable research and development potential of *Electric engineering and machine industry RISM* is also confirmed by the number of innovations introduced by enterprises in the region. In 2016 over 14% net revenue on average of the enterprises within RISM came from the sale of new or significantly improved products. Investments directly dedicated to research and development activity in 2016 amounted to PLN 7,983k.

Graph 56 Share of new or significantly improved products



Source: Statistical yearbook for the Małopolska Province, GUS, 2016; Share of net revenues from sales of new or significantly improved products in net revenues total (total/export); Figures for 2015 given in percentage.

Graph 57 Investment in innovative activity



Source: Statistical yearbook for the Małopolska Province, GUS, 2016; Figures in thousands of PLN. These categories refer solely to investments in new or significantly improved products.

6.3. Technological offers of enterprises from Małopolska

The biggest enterprises within the Specialisation operating and investing on the territory of Małopolska include:

Table 20 Analysis of services/products provided by leaders of *Electric engineering and machine industry RISM* sector.

Entity	Scope of operations	Technological offer
ABB	solutions for power engineering and automatics	Production of power stations and systems, electrical equipment, high, medium and low voltage switchgears www.new.abb.com/pl
MAN Trucks	vehicle production	TGS and TGX heavy goods vehicles of GVWR over 16 tonnes - assembled in various configurations as 2-, 3- and 4-axle vehicles, e.g. semi-tractors, vehicles for customisation and all-wheel-drive vehicles www.mantruckandbus.com
Valeo	production of parts and accessories for motor vehicles	Engine coolers, oil coolers, turbocharger air coolers, air-conditioner cooler and complete engine cooling systems - cooling modules which, apart from their original function allow for the reduction of fuel consumption and decrease of harmful compounds emission, including carbon dioxide www.valeo.pl
SumiRiko	production of car parts	Components of engine suspension, bodywork and exhaust system, and also polyurethane engine shields and covers www.sumiriko.tri.pl
Nidec Motors & Actuators	production of car parts	Engines, control and switching units for automotive and trade markets www.nidec-ma.de
Sinterit	3D print	Producer of SLS 3D printers - creating three-dimensional objects by laser sintering of powdered plastics, www.sinterit.com
3DKreator	3D print	The offer includes: Kreator Motion 3D printer, David 3D scanners, Simplify 3D software, filaments, accessories, Wi-Fi extension www.3dkreator.com
K&K Recycling	production of devices	Producer of plastics recycling lines. www.kkr.recykling.biz
elPLC	engineering industry	3D and 2D design (SolidWorks, AutoCAD), machine and work station building, design visualisation, CNC (AVIA) and conventional processing, turning, milling, drilling, threading, material selection, mechanical parts manufacturing. www.elplc.pl
Wamech	machinery industry	Intralogistic products for internal logistics of production plants (trolleys, platforms, turntables), pipe-joint system for fast mounting and modification of rack structures, and industrial wheels for versatile application. www.wamech.com
Delphi	automotive industry	Provider of modern electronic solutions and system technologies widely used in automotive, aviation and telecommunication sectors. www.delphi.com

Entity	Scope of operations	Technological offer
TF KABLE	production of wires	The offer includes: low-voltage cables, halogen-free cables, installation ducts, overhead ducts, overhead contact cables and railway traction cables, telecommunication cables, fibre optic cables, signal and control cables, vehicle cables, high-voltage systems. www.tfkable.com
SUPERSNOW	production of devices	Production of snow machines, snow-making systems and storage reservoirs. www.supersnow.pl
MANEX	transport	The company provides transport services - they offer vehicles with semi-trailers and with self-unloading semi-trailers, cars without tarpaulins, vehicles with trailers, vehicles with cranes, vehicles intended for steel carriage, vehicles intended for construction material carriage and light commercial cars. www.manex.com.pl
ZUE Group	urban infrastructure	Construction of railway catenary, traction substations, tramway tracks, construction and maintenance of street lighting, construction of cable lines and fault location, construction of traffic lights and telecommunications engineering. www.grupazue.pl
FlyTech UAV	unmanned aircraft systems	Retail sale of unmanned systems (drones), operation and service trainings. www.flytechuav.com
EC Engineering	machinery industry	Serial production of 160EC railway pantographs and 70EC tramway pantographs. www.ec-engineering.pl
CADM Automotive	automotive industry	The company specialises in development of individual components as well as whole modules or systems, mainly for automotive, railway and aviation sectors. www.cadm-a.com
Meiller Polska	vehicle production	Construction logistics (three-way tippers, rear tippers, tipping semi-trailers, centre-axle trailers, rock tippers), waste management (hook lifts, skip handlers, trailers for container carriage). www.meiller.com
Newag	railway industry	The offer includes: Electric Multiple Units, diesel multiple units, electric locomotives, diesel locomotives, passenger cars, trams and underground vehicles. www.newag.pl
Steinhof International Holdings N.V.	automotive industry	STEINHOF company offers high quality brake pads, disks, shoes as well as tow bars for cars. www.steinhof.pl
Zasław TSS	vehicle production	The company offers: curtain vehicles and semi-trailers, tippers, semi-trailers for timber, construction materials and container transport, agro-vehicles, cargo trailers, chassis for refrigerators, tanks and BDF trailers, DOLLY carts and Walter Jet Ski www.zaslaw.pl

Entity	Scope of operations	Technological offer
WESEM	lighting for automotive industry	Producer of lighting for agricultural vehicles, low-speed machines, heavy goods vehicles, off-road and racing vehicles, as well as passenger cars. www.wesem.pl
ATB Tamel	production of electric motors	Producer of general purpose electric motors, of IE2, IE3, IE4 efficiency, explosion-proof, fire-tight, one-phase, multi-speed and of special purpose motors, which are technical modifications, tailored for customers (Shell, Aramco). www.tamel.pl
EC Systems	solutions for electronic engineering and mechatronics	EC Systems designs specialised electronic devices, prototype solutions within electronics and mechatronics, sensors and systems for signal collecting and processing, creates specialised software for monitoring systems, product testing systems, as well as systems for control and diagnostics of structures and processes. The company also produces multichannel systems of machinery and structure monitoring. www.ec-systems.pl
ES-System	LED lighting	They produce and sell a broad spectrum of professional highly efficient LED lighting solutions intended for architect circles, industry, trade and urban circles. www.essystem.pl
FCA	telecommunications	The company offer includes a whole range of specialized systems for telecommunications and optic teletransmission – from central nodes of operators, energetic stations and the industry through to areas of access network. www.fca.com.pl
Fideltronik	electronics	Specialises in designing and production of electronics and Industry 4.0 solutions as well as in software development www.fideltronik.com
Omega	electrics	Wire harness producer and a subcontractor for electric and electronic equipment installation. Low-pressure injection moulding machine adds to the production of wire harness. The company owns two production lines specialising in pre-assembly of finished products www.zeomega.cc.pl
PONAR Wadowice	hydraulics	The company offer includes: distributors, mobile hydraulics, valves, hydraulic pumps, safety and functional blocks, hydraulic motors, accumulators, filtration units, heat exchangers, as well as standard and non-standard hydraulic systems www.ponar-wadowice.pl
Sabaj System	electrical engineering	The company offers: low-voltage switchgears made of stainless steel sheet and plastics, control and transmission systems, data telecommunication cabinets, housing development, advanced technologies of laser cutting, complex services for sheet metal processing www.sabaj.pl
BOLARUS	cooling equipment	The company offers cooling solutions, e.g. refrigerating counters, pastry display cabinets, wall cooling cabinets, tables, display cases and cabinets, freezers. www.bolarus.com.pl

Entity	Scope of operations	Technological offer
CEBEA	cooling equipment	Range of products: pastry display cabinets, display cabinets and refrigerating counters, cooling cabinets and racks, INOX cabinets, freezing devices and accessories for cooling cabinets. www.cebeabochnia.pl
ES SYSTEM K	cooling equipment	The company offers refrigerated counters and displays, cooling racks/cabinets, freezing islands, confectionery counters and display cabinets www.essystemk.pl
Igloo	cooling equipment	Plug-in devices: cooling racks, freezing racks and display cabinets, cooling and freezing cabinets, refrigerating counters, pastry display cabinets, ice cream dispensers, salad display units, heating units. Remote devices: cooling racks, freezing racks and display cabinets, refrigerated counters, confectionery display cabinets, freezers and combifreezers www.igloo.pl
Juka	cooling equipment and gastronomy equipment	The company offers: pastry display cabinets, ice cream displays, refrigerating counters, cooling racks and other devices for the catering industry: tables, salad counters, self-service tables, pizza tables, waste chambers, heating devices etc. www.juka.com.pl
Mawi	cooling equipment and gastronomy equipment	Cooling display cabinets, pastry display cabinets, cooling racks and cabinets, freezing cabinets, islands and freezers, gastronomy units, stainless furniture, specialised devices, cooling and freezing chambers, cooling equipment for impulse sale, gastronomy devices. www.mawi-poland.pl
Machines Pióro	agricultural machinery	The offer includes devices for creating a fully equipped vegetable line: from washers, roller calibration, polishers, brushers, through box tipplers, receiving hoppers, weight-packing machines, conveyors, selection tables, to haulm shredders, ridge forming machine and other machines for vegetable processing www.machinespioro.com
Gaska	parts for agricultural machinery	Main product groups: grain and corn harvesting technology, forage and root crop harvesting technology, plant cultivation, fertilisation and preservation technology, tractor and commercial vehicle technology, machine accessories and equipment, drive transmission technology, farm and workshop equipment. www.gaska.com.pl
AnbiTech	metal and plastics products	Production of elements made of metals and plastics as well as production of flange gaskets. www.anbi-tech.pl
Metchem	plastics products	Main directions of production: injection moulding of thermoplastics, mechanical and manual installation, foam cutting, injection moulds manufacturing, ultrasonic welding, electrical discharge machining, laser welding. www.metchem.pl

Entity	Scope of operations	Technological offer
Control Process	environmental solutions/ power engineering	Control Process offers the construction of: heat and power plants, power stations, exhaust treatment installations, biomass and biogas installations, substations, transmission lines, electroenergetic installations. Moreover, for the environment sector Control Process offers turnkey construction of: sewage treatment plants, water treatment plants, pump stations, sludge drying plants, waste management plants, quarters of waste dumps, sedimentation and waste treatment plants, installations for methanation and biogas production. www.controlprocess.pl
Elektromontaż Kraków	electric installations	Specialises in electrical installations in all types of facilities, ranging from industrial, institutional, commercial-service and general construction, through environmental facilities to energy and road infrastructure. www.elektromontaz.krakow.pl
Elektrotermia	electric installations	The enterprise offers design services and production of low and medium voltage electrical installations, such as wire installation for medium and low voltage, transformer stations, switchgears and control cabinets, internal and external installations of all kinds, heating installations. www.elektrotermia.com.pl
ELTECO POLAND	RES	The company specialises in producing combined heat and power systems - equipment for production of cogenerated electric and heat power as well as wireless power equipment (generator units and spare UPSs). www.elteco.pl
EPS System	power generators	The offer includes constant and emergency work gen-sets, UPS generators, combined heat and power gen-sets, as well as installation and technical support services. www.epssystem.pl

Source: Own elaboration

7. Creative and leisure industries

Creative and leisure industries smart specialisation covers the activity that takes advantage of individual creation in its broad sense, which is marked by economic potential. Thus, it looks for new business solutions within innovative areas of creative work (intellectual property).

The composition of Regional Smart Specialisation of the Małopolska Province includes the following detailed areas:

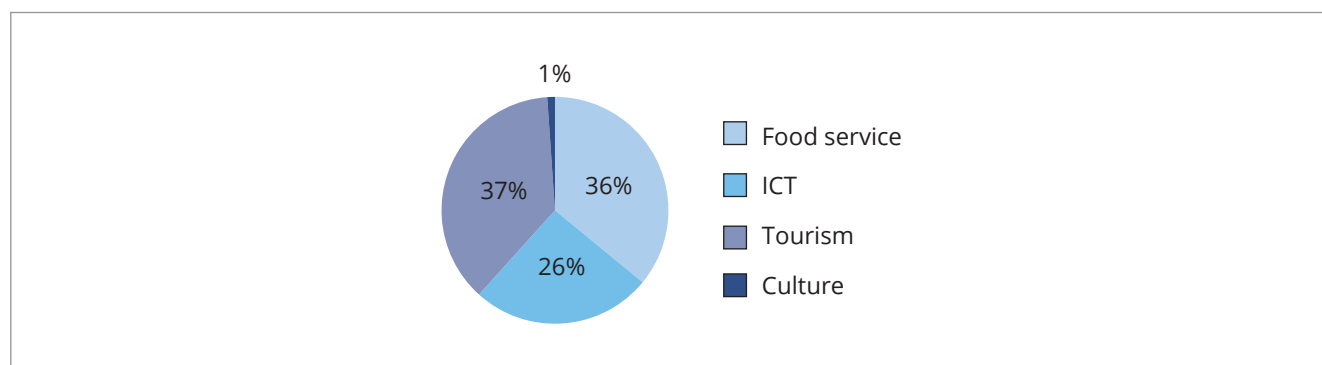
- Creative industries;
- Graphic design and industrial design;
- Computer games and software (Interactive Leisure Software);
- Leisure industries.⁷⁵

7.1. Sector description

7.1.1. Assessment of the present situation in Małopolska.

Activity within *Creative and leisure industries RISM* is clearly dominated by activity within tourism, gastronomy and information and computer technology. Activity within culture accounts for only 1% of the entire sector.

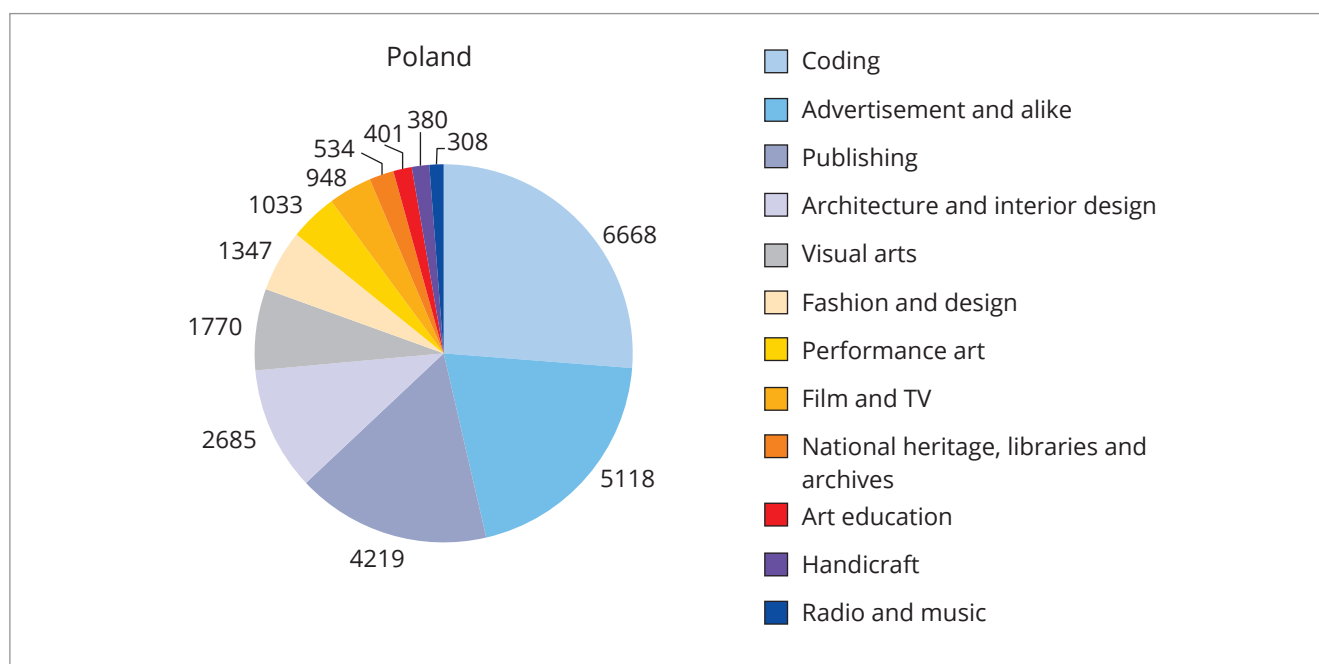
Graph 58 Generic division and the structure of *Creative and leisure industries RISM* (approach I)



Source: Own elaboration based on: National economy entities entered in the register at REGON, GUS, 2017

⁷⁵ Smart Specialisations of the Małopolska Province (Attachment no. 1 to the Resolution no. 1262/15), Małopolska Province Management, Cracow, 2015

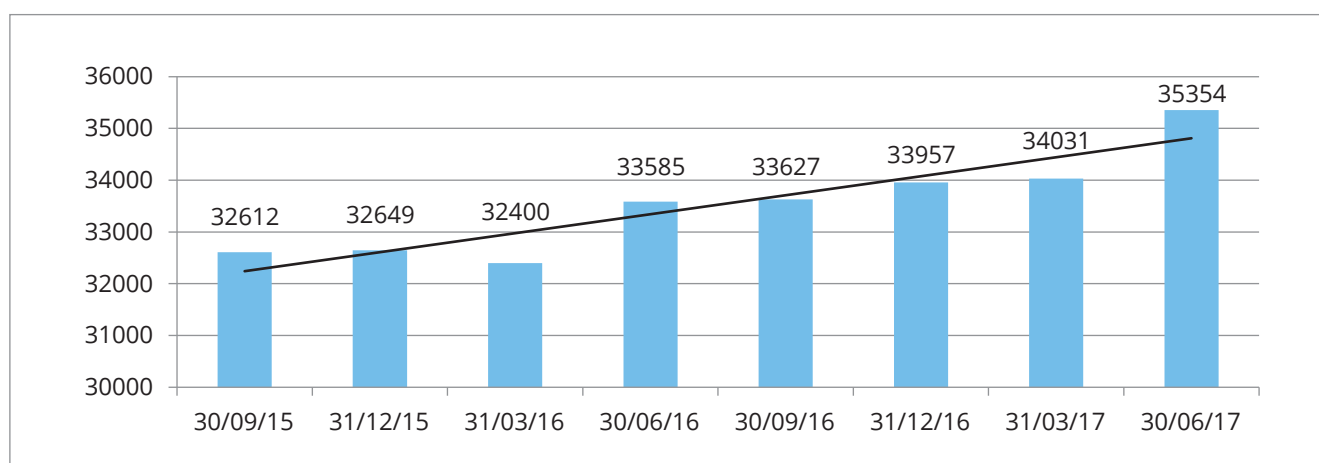
Graph 59 Generic division and the structure of Creative and leisure industries RISM (approach II)



Source: Own elaboration based on: National economy entities entered in the register at REGON, GUS, 2017

The number of enterprises within *Creative and leisure RISM*, over the analysed years, showed an upward trend and in 2017 it accounted for 10% of the entire number of Polish companies within an individual area, which is indicative of a good condition of the specialisation.

Graph 60 Number of *Creative and leisure industries RISM* enterprises



Source: Own elaboration based on: National economy entities entered in the register at REGON, GUS, 2017

Good parameters of the specialisation are also indicated by the level of foreign direct investments. The precise distribution of funds is presented in a table below.

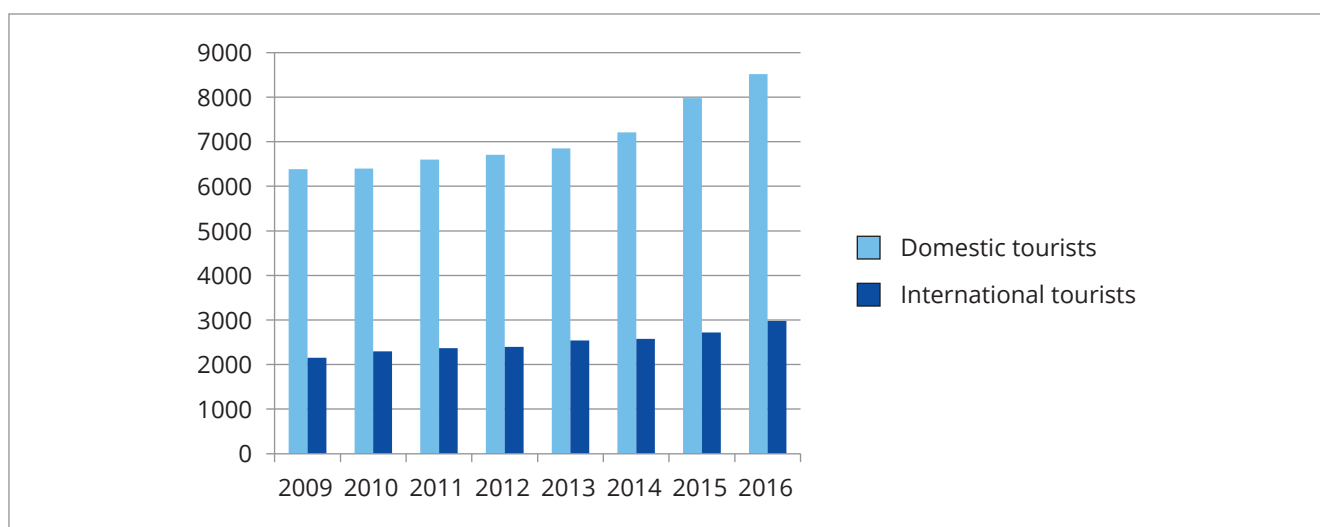
Table 21 Volume of FDI investments in the *Creative and leisure industries RISM* area

Subject of investment	Investment value in USD m. in 2014	Investment value in USD m. in the period 1989-2014
Software and IT consultancy activities	3.4	413.5
IT services operations	16.82	341.62
Travel agency, tour operator reservation service and related activities	0.76	3.36
Food and beverage service activities	0	70.9
Architectural and engineering activities; technical testing and analysis	0	107.5
Library, archive and museum activities and related activities	0	1

Source: *Foreign investors in Małopolska in 2014. Regional Development Observatory in Małopolska, Regional Policy Department, Warsaw 2016*

Globally, the substantial part of the specialisation is taken by tourism industry. In this area Małopolska holds a very strong position in Poland, due to its historical heritage and natural resources. The number of visitors to Małopolska is gradually increasing year by year. According to estimations, the change relating to the period 2015/2016 will amount to +7.5% (foreign visitors +9.6%, domestic visitors 6.8%).⁷⁶ Actual growth of the total number of tourists in 2015 came to +9.3% YoY. Year average growth dynamics of the number of tourists in the Małopolska province amounted to 4.4% in the analysed period of time.

Graph 61 Number of tourists in the Małopolska Province in 2009-2015 and estimations for 2016

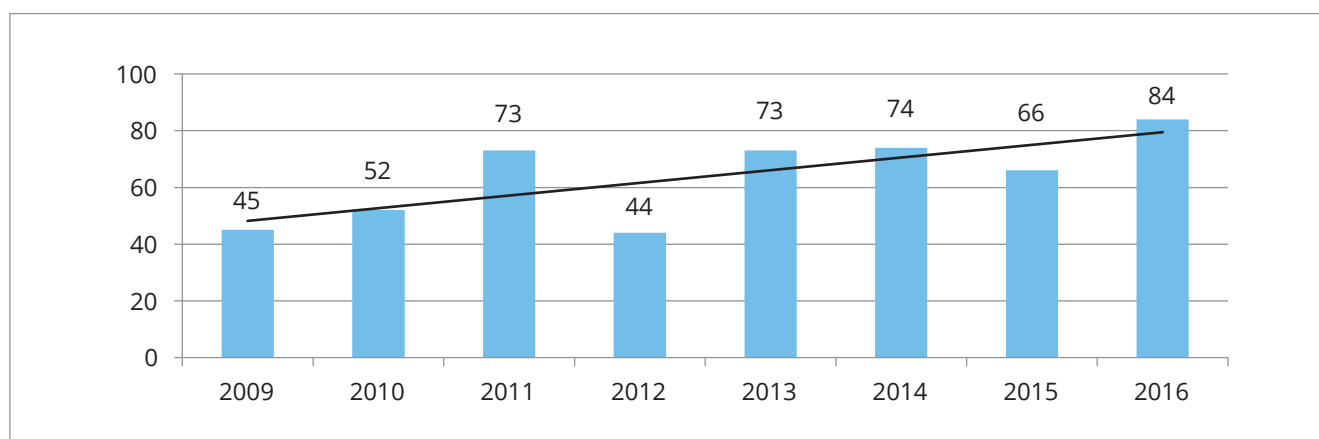


Source: Own elaboration on the basis of "Research on Tourism Flow in the Małopolska Province in 2016" report, IPSYLON Social Analyses Centre, BOSQO Research Centre

Creative industries rely heavily on creative activity. And in Poland this type of activity may be protected. The method for identifying the potential of this area of creative industries is to analyse the number of utility models. In 2016 the Polish Patent Office granted 84 protection rights for utility models in the Małopolska Province (+27% y/y). The year average growth in the period 2009-2016 amounted to 14%. The phenomenon proves the invention development within *Creative and leisure Industries RISM*. These figures present a significant trend in the number of submitted utility models and also a relevant activity in the area of design.

⁷⁶ "Research on Tourism Flow in the Małopolska Province in 2016" report, IPSYLON Social Analyses Centre, BOSQO Research Centre

Graph 62 Number of protection rights granted to utility models in Małopolska



Source: Central Statistical Office of Poland, Local Data Bank

7.1.2. Perspectives for specialisation development in Małopolska

Małopolska, and Cracow in particular, is one of the most important tourist centres in the country, and at the same time one of the most recognisable Polish cities in the world. Every year it attracts millions of tourists, thanks to the rich cultural and historical heritage of the Region, as well as its natural environment. The popularity of Cracow may be shown in specific figures: in 2014 an estimated number of visitors to Cracow amounted almost to 10 million. The tourists are estimated to have spent PLN 4 billion 500 million during their stay in Cracow. In 2016 Małopolska had 14.9 million visitors, which means that the number increased by 6.9% per annum. The upward trends concerning the number of tourists show the increasing demand not only for tourism services, but also for food and beverage and other related services.⁷⁷

On the basis of the data provided by the Central Statistical Office of Poland, in 2017 there were 25,411 enterprises operating in Małopolska within the creative sector. The most numerous group is created by programming IT enterprises (26.2%). Note that the sector's characteristics is determined by the way it is defined. Generally, the largest sectors are food and beverage, tourism and programming (IT) businesses. In comparison to 2016, the creative and leisure industries sector increased by 6.7%. In the last year the segments with the most dynamic growth were visual arts (+76%), programming (+17%), fashion and industrial design (+1.12%).⁷⁸

What is also significant is the fact that culture in the Małopolska province is one of the best subsidised sectors in Poland. As regards expenditures financed by the Province Governor budget, Małopolska holds the second position in the country (12.6% of expenditures). A particularly high share of expenditures goes to museums (13.6% of total expenses on culture – 2nd highest indicator in the country). This may be due to a great demand for financing of the sector development. is a leader in obtaining foreign funding for culture-related objectives (PLN 416.4m, 15.2% of the global budget of provinces).⁷⁹

7.1.3. Domestic and international competitiveness

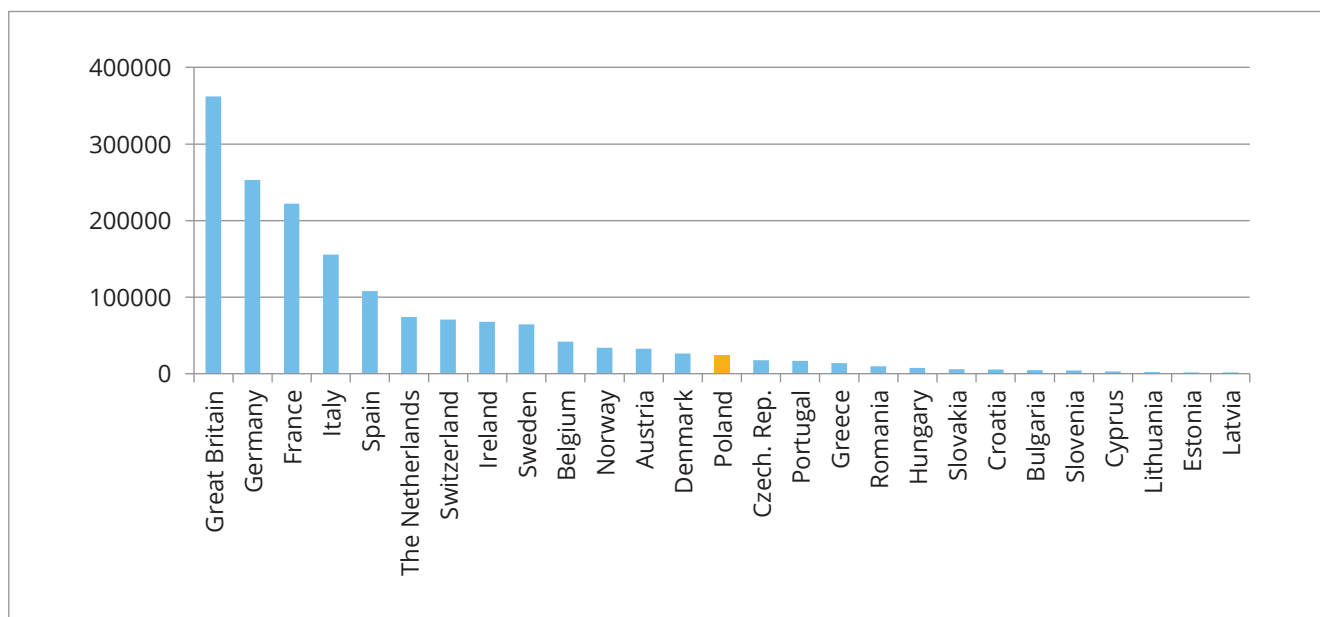
In international ratings Poland ranks above the European average in terms of production and employment volume within the given specialisation. On the one hand, it proves the sector's good condition, on the other, it shows that there is still an untapped potential for further growths.

⁷⁷ Culture in 2016, GUS, Warsaw, 2017

⁷⁸ Own elaboration based on: National economy entities entered in the register at REGON, GUS, 2017

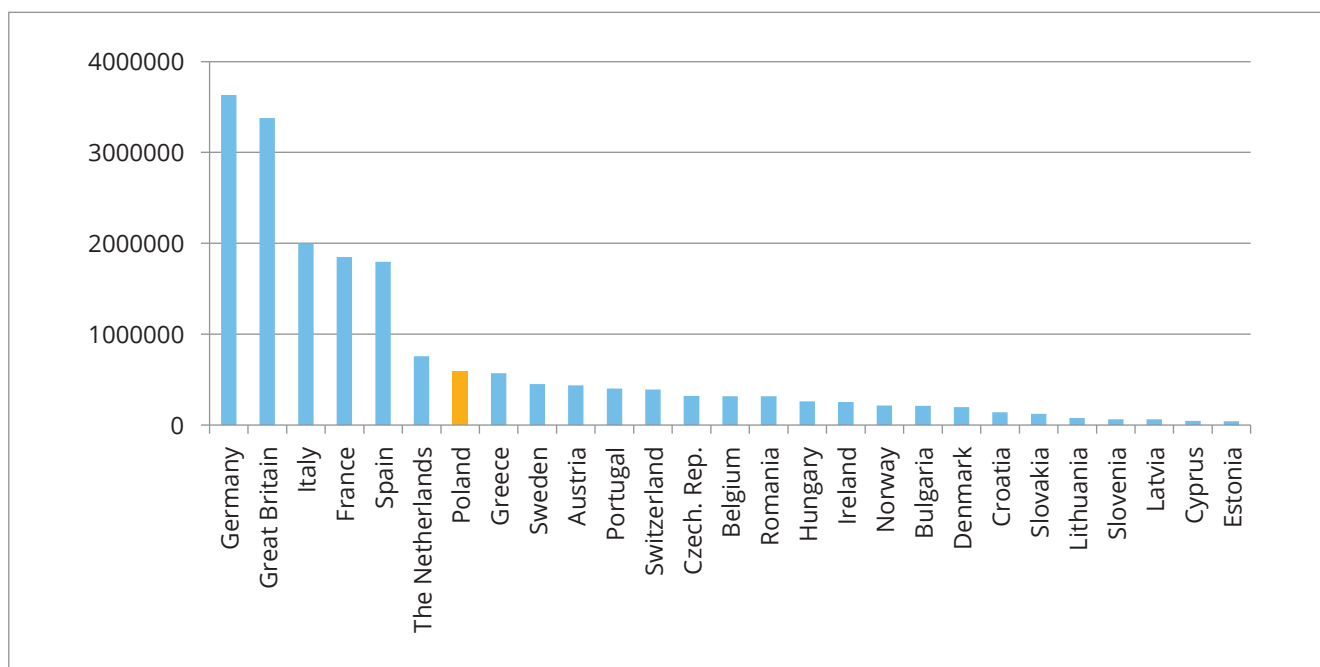
⁷⁹ Culture funding in 2007-2015, GUS, Statistical Office in Cracow, Cracow, 2016

Graph 63 Production volume of *Creative and leisure industries RISM*



Source: Eurostat; Figures in millions of EUR.; Figures for 2015; the list does not include codes: 91.01.B, 91.02.Z, 91.04.Z, 91.90.A

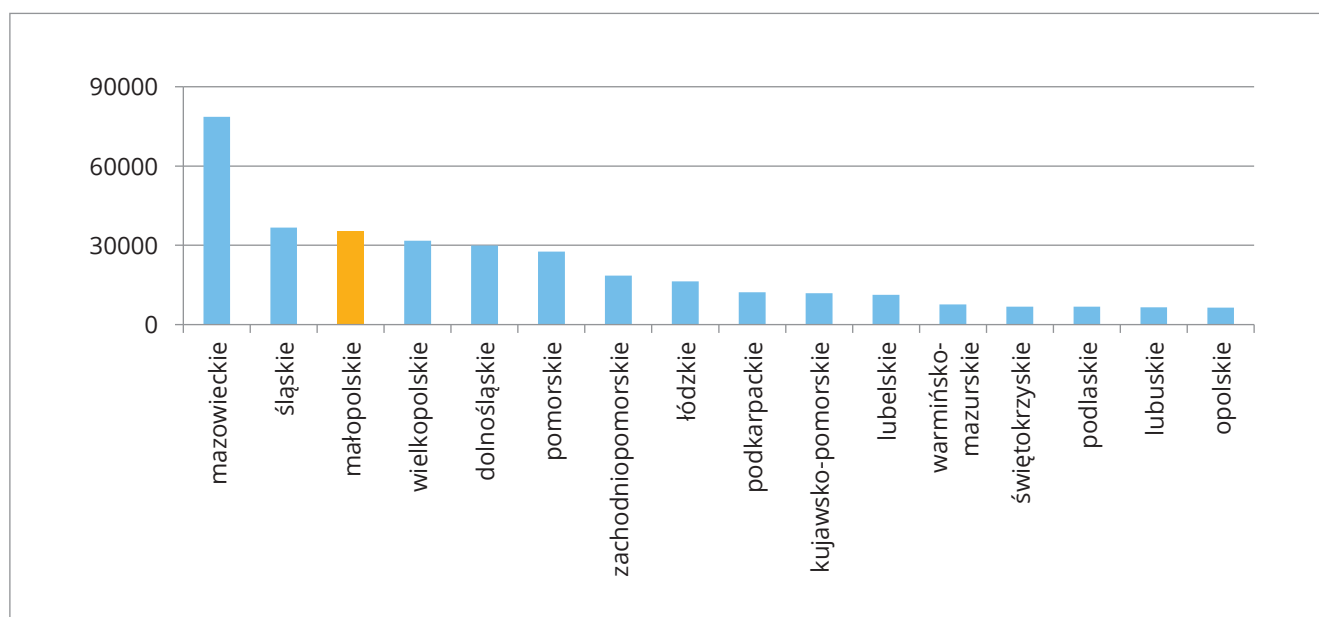
Graph 64 Employment volume of *Creative and leisure industries RISM*



Source: Eurostat; Figures in millions of EUR.; Figures for 2015; the list does not include codes: 91.01.B, 91.02.Z, 91.03.Z, 91.04.Z

Currently, Małopolska holds the 3rd position in the country regarding the number of enterprises within *Creative and leisure industries RISM*. This indicates high competitiveness of Małopolska's economy within the analysed sector.

Graph 65 Number of *Creative and leisure industries RISM* enterprises according to regions (Polish voivodships)



Source: Own elaboration based on: National economy entities entered in the register at REGON, GUS, 2017

7.1.4. Forms of support within the specialisation

There are many incentives and support programmes awaiting foreign investors and entities operating within the sector. Under the R&D sector programmes the entities entitled to receive public aid are, for instance, entities operating within video games production (GAMEINN), furniture sector (WoodINN), as well as electronics, data communications and information technology sector (JUSER). The volume of aid may vary from 25% to 80%, depending on the type of project and the kind of beneficiary.

Table 22 Selectidies addressed to RISM 7.

Regional level		
Competition	Amount of allocation	Contact
Operational Programme Digital Poland Submeasure 2.1.3 Digital regional resources	PLN 14,926,524.08	www.rpo.malopolska.pl
Regional Operational Programme for the Małopolska Province, Submeasure 6.2 Protection of biological variety, D. development of environmental education centres	PLN 11,967,478.03	www.rpo.malopolska.pl
Regional Operational Programme for the Małopolska Province, Submeasure 6.3.1 Development of subregions' local resources - SPR, A. development of tourism and leisure infrastructure in subregions	PLN 8,232,244.05	www.rpo.malopolska.pl

Regional level		
Competition	Amount of allocation	Contact
Regional Operational Programme for the Małopolska Province, Submeasure 11.1.1 Revitalisation of main city centres in the region, A. redevelopment, development, modernisation and adaptation of infrastructural buildings for social purposes, B. construction, redevelopment, development, modernisation and adaptation of culture infrastructure facilities, C. activities leading to economic recovery of revitalised areas, D. public space planning for social purposes, E. modernisations, renovations of public buildings improving their exterior aesthetics, F. modernisations, renovations of communal areas of residential buildings	PLN 217,808,732.49	www.rpo.malopolska.pl
Regional Operational Programme for the Małopolska Province, Submeasure 11.2 Renewal of rural areas, A. redevelopment, development, modernisation and adaptation of infrastructural buildings for social purposes, B. construction, redevelopment, development, modernisation and adaptation of culture infrastructure facilities, C. activities leading to economic recovery of revitalised areas, D. public space planning for social purposes, E. modernisations, renovations of public buildings improving their exterior aesthetics, F. modernisations, renovations of communal areas of residential buildings	PLN 118,584,755.40	www.rpo.malopolska.pl
Regional Operational Programme for the Małopolska Province, Submeasure 11.4 Revitalisation of industrial areas A. redevelopment, development, modernisation and adaptation of infrastructural buildings for social purposes, B. construction, redevelopment, development, modernisation and adaptation of culture infrastructure facilities, C. activities leading to economic recovery of revitalised areas, D. public space planning for social purposes, E. modernisations, renovations of public buildings improving their exterior aesthetics, F. modernisations, renovations of communal areas of residential buildings	PLN 72,602,917.04	www.rpo.malopolska.pl

Source: Own elaboration

Cracow is one of the most significant education centres for industrial designers in the country, which is demonstrated by the considerable percentage of students at artistic faculties - of all students undergoing artistic courses in Poland 13.3% studied in the Małopolska province. The future Creativity and Design Centre is to support the development of already existing potential and to exploit it fully. The primary objective of a given entity is to support enterprises in implementation of high-quality industrial design and to advertise the Region as an important design and creative industry centre. The Centre will be established by the following universities: Academy of Fine Arts in Cracow, AGH University of Science and Technology, Cracow University of Technology and Cracow University of Economics.⁸⁰

⁸⁰ <https://www.malopolska.pl/aktualnosci/biznes-i-gospodarka/powstanie-centrum-kreatywnosci-i-dizajnu>

7.1.5. Key entities

- **Małopolska Printing Cluster** - brings together around 30 entities engaged in the printing sector development. Members of Małopolska Printing Centre initiated creation of the Digital Print Centre which runs R&D works on digital print development.⁸¹ There are numerous trainings and workshops conducted within the Cluster, like digital print training or digital print workshops for students of Cracow University of Technology.

More information on the website: www.klastermalopolski.pl

- **“Wytwórnia”** - a dynamic society of creative people engaged in workshop production of furniture, sewing, design of green installations, architecture, graphics and creation of e-services on the Internet. There are many workshops closely related to *Creative and leisure industries RISM* run in the Manufacture, like: carpentry workshops, renovation and upholstery workshops, furniture renovation workshops, holidays workshops (decorations, gifts).

More information on the website: www.wytworniakrakow.pl

- **Cracow Film Cluster** - association of over 300 representatives of professional companies, organisations and experienced individual creators within the film sector operating on the territory of the Małopolska province. The cluster is a platform for cooperation, information exchange, publicity and educational actions and support for innovation of entities operating within the cluster. Recently, Cracow Film Cluster has been a partner of the 57th Cracow Film Festival, NETIA ODD CAMERA festival, and also *US in Progress* - sector's event accompanying the 7th American Film Festival in Wrocław.

More information on the website: www.film-krakow.pl

- **Digital Entertainment Cluster** - The operation of the Digital Entertainment Cluster (DEC) was initiated in 2013, and its main mission is to support the games market. The basic tasks of the cluster include organisation of cooperation between Polish businesses, enhancement of the potential of the Polish sector at foreign fairs, and support in obtaining financing for participation therein. Following the principle that “size does matter”, it significantly leverages promotion of Polish businesses at international events. Additionally, the DEC supports the process of acquiring foreign business partners for Polish companies from the sector.

More information on the website: www.dec-cluster.com

- **MAKE-IT MAŁOPOLSKA CLUSTER** - Małopolska MakeIT Cluster is an alliance of businesses operating in the realm of new technologies. It is primarily a group of people who believe that it is quality that provides the greatest competitive edge of the Polish IT sector. An ecosystem favouring cooperation has been developed inside the KTP building. The presence of many businesses at a single location helps to start business contacts, run projects, exchange experience, and jointly represent the interests of IT sector businesses.

More information on the website: www.kpt.krakow.pl

- **MMC Brainville Technology Park**, is a prestigious, and a very modern office and laboratory building for companies that operate in multimedia and IT sectors. It is also a perfect place for companies from different industries, which want to grow in the atmosphere of openness to new solutions, and utilize the possibilities offered by the Park. MMC Brainville has high quality IT infrastructure, which helps to render services in the multimedia and the movie sector..⁸²

More information on the website: www.brainville.pl

⁸¹ <https://www.malopolska.pl/biznes/bizneswmalopolsce/instytucje-wspierajace-biznes/klastry-w-malopolsce>

⁸² <https://brainville.pl/o-projekcie/>

- **Institute of Tourism in Cracow** is an advisory and training institution implementing projects aiming at e.g. increasing the competitiveness of specific groups of people and entities on the job market, encouraging activity and providing support in starting up one's own business. For instance, "Towards Development" project designed for tourism industry entrepreneurs and its main objective it is to provide support in making rational choices related to subjective systems of financing.⁸³

More information on the website: www.itk.krakow.pl

7.1.6. Institutions responsible for legal regulations

Creative and leisure Industries RISM is subject to many regulations, depending on the analysed segment. The main entities responsible for regulations are:

- Ministry of Culture and National Heritage; Department of Cultural heritage, Department of Monuments Preservation

More information on the website: www.mkidn.gov.pl

Ministry of Digitalisation; Department of Digital Services and Data Openness

More information on the website: www.gov.pl

Ministry of Infrastructure and Construction; Department of Architecture, Construction and Land Surveying

More information on the website: www.mib.gov.pl

Ministry of Sport and Tourism; Department of Tourism

More information on the website: www.msit.gov.pl

- Polish Tourist Organisation

More information on the website: www.pot.gov.pl

- Polish Hotel Chamber of Commerce

More information on the website: www.ighp.pl

- Małopolska Tourist Organisation

More information on the website: www.mot.krakow.pl

- Cracow Chamber of Tourism

More information on the website: www.kit.krakow.pl

- Province Sanitary and Epidemiology Station in Cracow

More information on the website: www.wsse.krakow.pl

- Province Construction Works Inspectorate in Cracow

- Regional Chamber of Polish Architects in Małopolska

More information on the website: www.mpoia.pl

7.2. The R&D&I Market

In terms of Creative and Leisure Industries RISM the market of innovations and research and development works is of a multidimensional nature. Considering the vast technological offer, innovative specialisations of enterprises and multitude of areas which create a given RISM, research works are carried out in a large variety of fields. The most distinctive ones are: computer programming, including games production, and also industrial design and design. Note that the other category can be used in many sectors, such as furniture industry, industrial production and processing, or final goods. The variety of fields provides for great opportunities within R&D&I works offered by Małopolska.

⁸³ <http://www.itk.krakow.pl/w-kierunku-rozwoju/>

7.2.1. Catalogue of universities

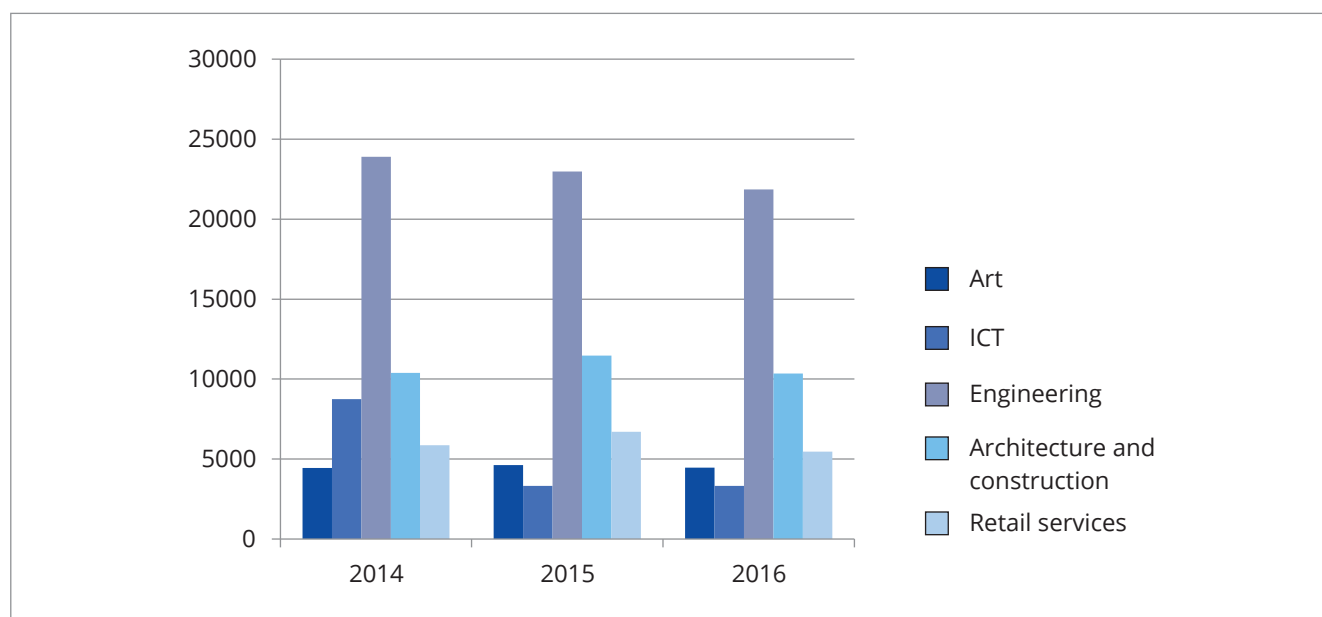
The scientific potential of the region is demonstrated by institutions such as the following:

- AGH University of Science and Technology in Cracow
 - Faculty of Computer Science, Electronics and Telecommunications
 - Faculty of Materials Science and Ceramics
- Academy of Fine Arts in Cracow
 - Faculty of Conservation and Restoration of Works of Art
 - Faculty of Internal Design
- Academy of Physical Education in Cracow
 - Faculty of Tourism and Leisure
- Andrzej Frycz Modrzewski Cracow University
 - Faculty of Architecture and Fine Arts
- Małopolska School of Economics in Tarnów
 - Faculty of Management and Tourism
- Cracow University of Technology
 - Faculty of Architecture
 - Faculty of Environmental Engineering;
 - Faculty of Civil Engineering;
 - Faculty of Mechanical Engineering.
- Jagiellonian University in Cracow
 - Faculty of History
- John Paul II Pontifical University in Cracow
 - Faculty of History and Cultural Heritage
- University of Agriculture in Cracow
 - Faculty of Horticulture
 - Faculty of Environmental Engineering and Land Surveying

7.2.2. The academics' potential

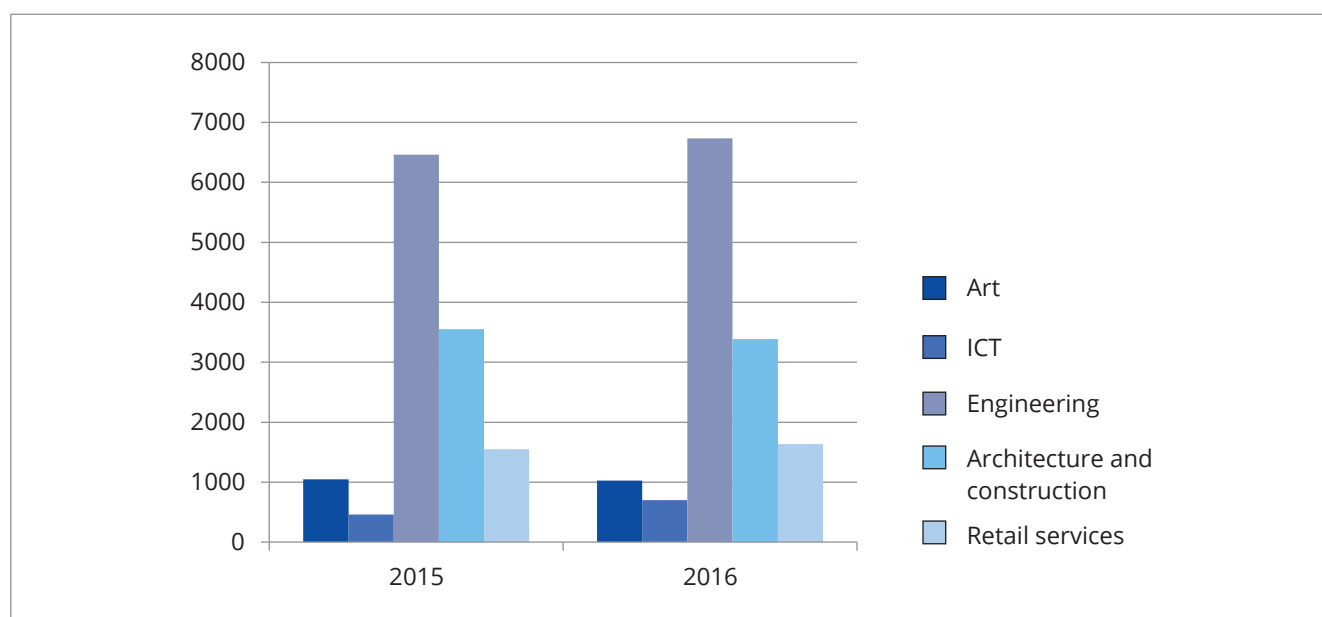
The Małopolska province has a rich R&D&I potential. It is demonstrated by the number of graduates, academic staff or infrastructure. The total number of students of faculties mentioned below shows a slight downward trend - from 48,087 in 2015 to 45,453 in 2016. Despite this phenomenon, the number of graduates increased by 3% y/y and this is the key information, as the number of graduates is more important for the job market - the growth of their number is synonymous with the growth in the number of experts in given fields.

Graph 66 Number of *Creative and leisure industries RISM* students



Source: Local Data Bank, Central Statistical Office of Poland

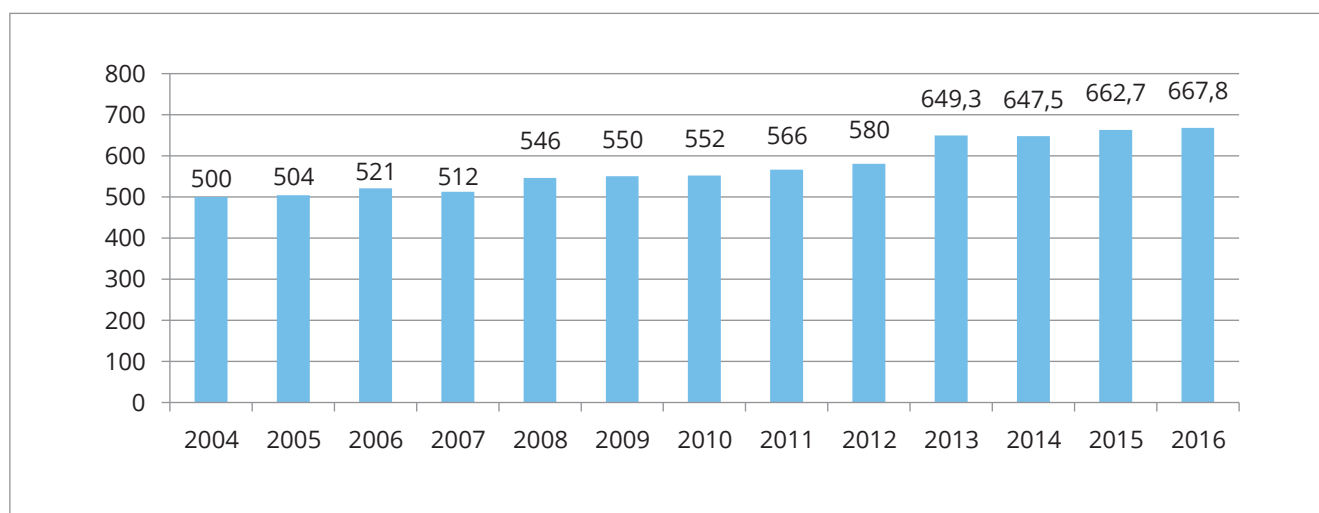
Graph 67 Number of *Creative and leisure industries RISM* graduates



Source: Local Data Bank, Central Statistical Office of Poland

The number of academics at universities of arts in 2016 increased by almost 26% in comparison to the base year 2004. From the perspective of *Creative and Leisure Industries RISM*, the growing potential of academic staff increases the perspectives for development of a sector which has a significant importance in the region with such impressive cultural qualities.

Graph 68 Academics at universities of arts



Source: Local Data Bank, Central Statistical Office of Poland

7.2.3. Research programmes and supporting initiatives

Faculty of Mechanical Engineering at Cracow University of Technology, in cooperation with Academy of Fine Arts in Cracow, launched a new department, Industrial Design Engineering. The department is a perfect example of inter-university cooperation aimed at adapting the offer to the needs of the market and entrepreneurs. Industrial Design Engineering prepares a student for a profession of an engineer who will participate in creation of innovative products. An industrial design engineer will play the key role of a designer's direct partner by co-creating the utility concept of a product and designing a technologically reasonable form of the product.

More information on the website: www.mech.pk.edu.pl

Watify - under a project by the European Commission, partners within individual countries were selected to handle its promotion and popularisation in their countries. One of the partners is Cracow Technology Park which promotes the project through organisation of inspiring events related to digital entrepreneurship.

More information on the website: www.watify.communication.pl

Digital Dragons - is one of the biggest sector conferences in Central and Eastern Europe, directed at the representatives of the digital entertainment sector. Cracow Technology Park has been the main organiser of the event for several years. Digital Dragons is an undertaking which promotes Polish games sector - one of the most intensely developing segments of the digital entertainment sector.

More information on the website: www.digitaldragons.pl

Researchers' Night in Małopolska - science and culture event gathering together over 70,000 participants every year. Its objective is to promote and develop science. All major research centres are involved in organising the event.

More information on the website: nocnaukowcow.malopolska.pl

7.3. Technological offers of enterprises from Małopolska

The biggest enterprises within the Specialisation operating and investing on the territory of Małopolska include:

Table 23 Analysis of services/products provided by leaders of the *Creative and leisure industries RISM* sector.

Entity	Scope of operations	Technological offer
55 Architekci	architecture	Building designs of various usability programs; architectural services from the concept to turnkey www.55architekci.pl
Karpiel i Steindel	architecture	Designs of houses, apartments, hotels, offices and commercial buildings. www.karpielsteindel.eu
Antrax	production of office furniture	Producer of office furniture, conference tables, office racks, reception desks, executive furniture and partitions. www.antrax.com.pl
BENEDYK	production of furniture	Producer of beds, wardrobes, tables, chairs, benches and external doors. It also offers equipment for kitchens, bathrooms, halls, walk-in closets, bedrooms, rooms etc. www.benedyk.com
EURONOVA	production of office and hotel furniture	Producer of office furniture, executive furniture, conference furniture, walls, reception desks, chairs and armchairs, seats, sofas and accessories. www.euronova.pl
Filex	design and production of upholstered furniture	Producer of corner sofas and convertible corner sofas, sofas and beds. www.filex.pl
FABRYKA MEBLI RYŚ	production of house and commercial furniture	The company produces kitchen and flat fitted furniture and also runs interior design projects for hotels and large retail chains. www.rys.com.pl
HOUSEFORM	production of furniture	The company's assortment includes: living room suites, tables, chairs, bedrooms, kitchen furniture, home furniture, benches, coffee tables and console tables. www.houseform.pl
IKER	production of furniture	A company producing sofas, armchairs, chairs and tables. www.iker.com.pl
KOMSERWIS	production of small architecture components	An enterprise specialising in the production of benches and tables, plant pots, bollards and chains, barriers, cabinets, fence posts, bicycle racks, tree grilles and tree guards. www.komserwis.pl
KONDAK	production of furniture	The company's offer includes: dining sets, tables and benches, chairs, classic furniture, modern furniture, sofa beds, couches, living room suites, sofas and corner sofas. www.kondak.pl
KOZBI	production of kitchen furniture	A company specialising in the production of kitchen furniture with over 2000 colours of lacquered fronts and around 960 types of natural veneers. www.kozbi.com.pl

Entity	Scope of operations	Technological offer
LUXMEBEL	production of furniture	A company producing kitchen furniture, bathroom furniture, bedroom furniture, wardrobes and racks. www.luxmebel.com.pl
Made of Wood Group	production of solid wood furniture	A company producing e.g. desks and PC tables, closets, chests of drawers and linen cupboards, sideboards, chairs, stools, trunks and chests, mirrors, beds, cots and cradles, racks, cabinets. www.madeofwood.pl
MEBLE KUDELA	production of furniture	A company producing cocktail cabinets, bookcases, doors, chests of drawers, sideboards, tables, benches, bathroom and kitchen furniture, wall units, reception units, racks, chests, cabinets, wardrobes, dressing tables. www.meblekudela.com
MEBLE PYREK	production of wooden furniture to order	Production of wooden furniture, made of natural veneers and matt and gloss lacquered MDF. Production of kitchen furniture - both modern (Polish veneer, exotic veneer, glass, lacquered MDF) and classic (English, Provençal and rustic style furniture) www.meblepyrek.pl
MEBLOFORM	production of furniture to order	Provides furniture primarily for international high-class hotel chains, but also for low-budget hotels, clinics, retirement homes, halls of residence and other institutions throughout Europe. www.mebloform.pl
MEBLOMET	production of furniture and small architecture components	Produces equipment for outdoor gyms (aerobic, strength, stretching, warm-up), garden furniture, school furniture and office furniture. www.meblomet.com.pl
MEBLOMEX	production of furniture for public buildings	Produces furniture designed for public facilities, such as offices, hotels, shopping malls and for individual customers. Undertakes the comprehensive implementation of technical support, logistics, transport and furniture assembly. www.meblo mex.com.pl
PACYGA	production of furniture	It manufactures furniture for children and teenagers, e.g. cots, beds, desks, chairs and small tables, chests of drawers, wardrobes, shelves and racks. www.pacyga.com.pl
PAJMEBLE	production of furniture	The company's offer includes: corner sofas, sofas, living room suites, bedroom furniture, armchairs, poufs and dining sets. www.pajmeble.pl
DOMINEX PLUS	production of living room suites	Producer of beds, sofa beds, corner sofas, armchairs. www.dominexplus.pl

Source: Own elaboration

The innovative character of the sector is also demonstrated by the significant innovation supply on the part of SMEs. Examples include the contestants and finalists of Innovator Małopolski contest, such as: Trakt-Boats (sail boats), Modern Dimension of Education (workshops for children in robotics), Miquido (application design and advancement). It is important to remark that Miquido took the 6th place in the ranking of the fastest developing technology companies in Central Europe according to Deloitte.

List of drawings, tables and graphs

Graph 1 Number of Life sciences RISM enterprises in Małopolska (units).....	9
Graph 2 Export of primary pharmaceutical substances and medicines and other pharmaceutical products.....	11
Graph 3 Import of primary pharmaceutical substances and medicines and other pharmaceutical products.....	11
Graph 4 Number of clinical research studies.....	13
Graph 5 Number of clinical research studies divided into individual phases.....	13
Graph 6 Production value of Life sciences RISM.....	14
Graph 7 Employment rate in Life sciences RISM	14
Graph 8 Number of entities conducting biotechnology R&D operations.....	17
Graph 9 Students in the Life sciences faculties.....	18
Graph 10 Graduates of the Life sciences faculties	19
Graph 11 Personnel in the Biotechnology R&D at academic units on the territory of Małopolska.....	19
Graph 12 Investment in the biotechnology R&D operations in Małopolska	20
Graph 13 Internal investments in the R&D operations.....	21
Graph 14 Energy production with the application of RES in Małopolska	23
Graph 15 Number of Sustainable Energy RIS enterprises in Małopolska	24
Graph 16 Percentage of enterprises using RES subdivided into regions of the province of Małopolska	24
Graph 17 Value of the sold production in the area of Sustainable Energy in an international approach.....	26
Graph 18 Size of energy and RES energy production	26
Graph 19 Electric power production	27
Graph 20 RES energy mix (EU/Poland).....	27
Graph 21 Students of faculties of engineering and technology and natural sciences.....	31
Graph 22 Graduates of faculties of engineering and technology and natural sciences.....	32
Graph 23 Academics at universities of technology	32
Graph 24 Investments for fixed assets for environment protection.....	34
Graph 25 ICT sector type structure in Małopolska	40
Graph 26 Number of enterprises in the ICT sector in Małopolska.....	41
Graph 27 Production value of the ICT sector	42
Graph 28 Number of people employed in the ICT sector.....	43
Graph 29 Number of entities in the ICT sector according to regions (Polish voivodships)	43
Graph 30 Academics at universities of technology in Małopolska	47
Graph 31 Academics and graduates at universities of technology in Małopolska	47
Graph 32 Investment in R&D within engineering and technical sciences	48
Graph 33 Specialisation sold production value in Małopolska	51
Graph 34 Generic division and the structure of the industry Chemistry RISM.....	52
Graph 35 Number of enterprises in the Chemistry RISM sector in Małopolska.....	52

Graph 36 Production volume of Chemistry RISM.....	54
Graph 37 Employment volume at Chemistry RISM	55
Graph 38 Listing of regions as per enterprises in the Chemistry RISM sector according to regions (Polish voivodships)	55
Graph 39 R&D investments in chemicals and chemical products production operations.....	58
Graph 40 Number of enterprises within RISM	61
Graph 41 RISM structure by type.....	62
Graph 42 RIS sold production in Małopolska	62
Graph 43 RIS Export in Małopolska	63
Graph 44 RIS sold production in Europe	64
Graph 45 RIS sold production volume according to regions (Polish voivodships)	65
Graph 46 Technical school graduates of faculties related to RISM	67
Graph 47 University graduates of faculties related to RISM	68
Graph 48 Investments in the R&D operations of enterprises.....	69
Graph 49 RIS sold production in Małopolska	73
Graph 50 Number of enterprises within RISM	74
Graph 51 Export of selected specialisation goods in Małopolska	74
Graph 52 RIS sold production in Małopolska	76
Graph 53 RIS sold production volume according to regions (Polish voivodships)	76
Graph 54 Number of academics at universities of technology.....	79
Graph 55 Number of graduates within Specialisation	79
Graph 56 Share of new or significantly improved products.....	80
Graph 57 Investment in innovative activity	80
Graph 58 Generic division and the structure of Creative and leisure industries RISM (approach I).....	87
Graph 59 Generic division and the structure of Creative and leisure industries RISM (approach II).....	88
Graph 60 Number of Creative and leisure industries RISM enterprises	88
Graph 61 Number of tourists in the Małopolska Province in 2009-2015 and estimations for 2016.....	89
Graph 62 Number of protection rights granted to utility models in Małopolska	90
Graph 63 Production volume of Creative and leisure industries RISM.....	91
Graph 64 Employment volume of Creative and leisure industries RISM.....	91
Graph 65 Number of Creative and leisure industries RISM enterprises according to regions (Polish voivodships)	92
Graph 66 Number of Creative and leisure industries RISM students	97
Graph 67 Number of Creative and leisure industries RISM graduates.....	97
Graph 68 Academics at universities of arts	98

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