

Report on the national potential of SLOVENIA

EMERGING INDUSTRIES

- Active Aging
- Sustainable Development / Green Economy
- Sustainable / Intelligent Mobility

CROSS-CUTTING ISSUES

- Internationalization
- Technology & Knowledge Transfer
- Gender in Innovation, including diversity aspects

Date:	4.8.2013
Partner organisation:	<i>SPIRIT Slovenia, public agency of the Republic of Slovenia</i>
Contact Person:	<i>Alenka Mubi Zalaznik; alenka.zalaznik@spiritslovenia.si</i>

INTRODUCTION

In 2013, 2.058.821 people inhabited Slovenia. Labour force by the Labour Force Survey in the first quarter of 2013 amount 999.000 workers. The unemployment rate in the same period is 11%.

Europe Union is a clear business priority, accounting for 70% of all exports and 78% of all imports. Exports of goods are strong on these markets, mainly thanks to continuing sales to Germany, Austria, France, UK, and Italy, as well as to Poland, Slovakia, Hungary, Czech Republic. Among non-EU markets, exports to the CIS (Commonwealth of independent states) region are at the top, with Russia and Ukraine leading the list. Slovenian firms also record strong export figures to more remote markets, such as US, China, India, Egypt, and Brazil. Traditional exports to Balkan markets (Serbia, Bosnia and Herzegovina, Montenegro, and Croatia) are also substantial.

Following relatively high growth in 2011, exports remained at the 2011 level, while a significant decline in domestic consumption led to a decline in imports by 4.3%. Accordingly, the current account recorded a surplus of 2.5% of GDP. On the basis of anticipated trends in the most important export markets, a slight recovery in exports is anticipated in 2013. Due to a minor decline in domestic consumption, a decline in imports in 2012 will be smaller compared to the previous year. The current account of the balance of payments surplus will further increase.

Leading sectors in the country are: chemicals, pharmaceuticals and biotechnology; automotive, construction and civil engineering, energy and financial services.

Slovenia is economy as innovation driven society, in the group of innovation followers according to European Innovation Scoreboard (2013).

Slovenia has entered a double tip recession and faces growing unemployment and heightened financial market stress. Public debt has surged from 22% of GDP in 2008 to 47% of GDP in 2011 and is expected to rise significantly in the short term, partly driven by the rising costs of rescuing banks (Source: OECD).

Economic activity in Slovenia declined by 2.3% in 2012, and will continue to fall in 2013. In its spring forecast the Institute of Macroeconomic Analysis and Development (IMAD) forecasts a 1.9% decline in GDP in 2013. The downward revision of the forecast is the result of the anticipated deterioration of the situation in the international environment and a further decline in final consumption. (Source: National reform program 2013-2014).

However, the level of RD expenditure has been growing in the last years. The statistical data on investment in R&D for 2011 show that total funds for research and development were 2.47% of GDP. The majority of funds for R&D came from the business sector (73.9%), the government sector (14.3%) and the higher education sector (11.8%). Most funds for all gross domestic expenditure for research were contributed by companies (61.2%), government funds (31.5%) and funds from abroad (7%).

Slovenia has invested heavily into the development of several innovation centers (clusters). The investment amounted close to 300 MEUR since 2010. In Slovenia, there are 7 competence centres, 8 centres of excellence and 17 development centres.

Number of patents (Source: SIPO) for 2010: 455 applications of Slovenian applicants. Compared to the 2010, the number of national applications filed by domestic applicants increased by 3% in 2011 (470). In 2011, Slovenian residents filed 80 pct applications, a 5 % increase over the preceding year and the largest increase until now.

There are 101 registered research institutes in Slovenia and total 953 registered RD research groups, both private and public. They employ 12.514 researchers. In number of citations among EU states (number of citations per million inhabitants), Slovenia ranked 12 in 2011 (Source: ARRS).

EMERGING INDUSTRIES

2013 is the year when the process of smart specialisation in EU countries is intensified. The Clustrat consortium in Slovenia has entered into the process in late 2012 and all the data and analysis considering emerging industries stems from this process.

Spirit Slovenia (before 2013 Public agency for technology of the Republic of Slovenia – TIA) and partners (Faculty of economics of university of Ljubljana and Chamber of commerce and Industry of Slovenia) conducted a study and a series of consultation on the topic of emerging industry and smart specialisation in Slovenia.

In defining the emerging industries in the country, the following indicators have been taken into account – growth in export, average value added per employee, size of the industry (number of employees), and increase in number of companies in the sector.

The data was recovered for the period of 2008-2011. The following **industries** were identified as most important, with highest growth in recent years (SCA: standard classification of activities):

- manufacturing of parts and accessories for motor vehicles
- manufacturing of plastic products
- manufacturing of domestic appliances
- manufacturing of pharmaceutical preparations
- electr.power generation, transm.,distrib.
- manufacturing of el.motors, gener., trans.,distrib.
- manufacturing of structural metal products
- manufacturing of cutlery, tools, general hardware
- manufacturing of products of wood, cork, straw
- manufacturing of other fabricated metal products
- manufacturing of general purpose machinery
- casting of metals
- manufacturing of rubber products
- manufacturing of basic iron and steel and of ferro-alloys
- manufacturing of motor vehicles
- manufacturing of chemicals, plastics, synth rubber
- manufacturing of pulp, paper and paperboard
- manufacturing of paints, varnish.,print ink, mastics

The traditional industries, most related to the EI are: manufacturing, pharmaceuticals, automotive, chemical and construction. All Clustrat-focused emerging industries are important.

Growing industries in Slovenia, according to the analysis of data 2002-2011 (export, added value, size, employment, growth in number of new companies), focused at growing sectors/product areas are:

1. Automotive and other vehicle manufacturing
 manufacture of ships and boats; air, space and related machinery; manufacture of parts and accessories for motor vehicles, of electrical and electronics equipment for motor vehicles
2. Processing of materials
 Manufacturing of ceramic insulators and insulating fittings, products of first processing of steel, manufacture of fabricated metal products, treatment of metals, manufacture of products of wood and cork
3. Manufacture of electrical equipment
 Manufacture of medical and dental instruments, manufacture of optical products, manufacture of machinery and equipment, manuf. of electrical equipment; electric motors, generators, transformers and electricity distribution
4. Production of materials
 Manufacture of pulp, paper and paperboard, manufacture of paints, varnishes and coatings
5. Related service activities
 Research and development in the field of natural sciences and engineering

When observing the investments in RD in the period 2008-2010, they are most significant in the following sectors: manufacture of communication equipment, manufacture of transport equipment, manufacturing of instruments and appliances for measuring; and of electrical equipment, pharmaceutical products and preparations, manufacturing of chemicals and chemical products, computer programming, manufacture of motor vehicles.

The correlation is observed with growing sectors, mentioned above.

Similar pattern can be observed in private RD investments, where according to data of Public agency for technology (2007-2011), companies invested most in biotechnology, process technologies and ICT.

Public investment into priority technology fields has been focused at development of innovation centres/clusters. They specialised on the following areas: advanced materials and nanotechnology (7 centres), biotechnology (7 centres), advanced production and process technologies (8 centres), ICT (4 centres) and sustainable development technologies (6 centres).

The analysis of **knowledge and competences** in priority areas resulted in definition of three priority areas and topics within:

1. Technologies for life and health: medical technology, instruments and supplies, biotech manufacturing, bioprocess technologies, diagnostics, analysis techniques and procedures
2. Advanced materials and technologies: advanced magnetic materials, soft complex materials, ceramic materials, metal materials, polymers, multifunctional materials; manufacture and process technologies
3. Sustainable development technologies: advanced process control, systems and devices, optical and sensor elements, technologies for gathering, processing and integration of big data, use and management of resources in buildings, technologies for sustainable transport and internet of things

With these identified topics, Slovenia has ended the process of verifying emerging industries as offered by Clustrat project. All of them: green economy, active ageing and sustainable mobility find relevant elements of technologies, competences and partners for active participation/continuation of the project (pilot, strategy).

Hereinafter we present **the priority areas where Slovenia is best at and can provide important development in the future/emerging fields**. This selection has been done according to the strengths for the identified priority areas. This means that the areas are justified taken into account the following criteria:

- Existence of competence in the entire value chain (from (basic) research to marketed products and services)
- Existence of capacities (leaders in the industry that form partnerships to invest in further RD, to participate in networks with research community for (new) market penetration in (new) value chains
- Having the impact both in social and market challenges

The priority areas most relevant/promising for future development and growth in the country (potentials for emerging industries), **are:**

1. Advanced process control, systems and devices with majority of competences in:
 - a. Manufacturing and process technologies - systems and services
 - b. ICT - systems and services
2. Electrical and electronic components and devices with majority of competences in:
 - a. Electrical drives and actuators
 - b. Optical, photon and sensor elements

- c. Electronic systems and devices
3. Materials and related technologies - with majority of competences in:
 - a. Materials
 - b. Services related to materials

Gaps and recommendations

The gaps in the country have been identified not so much in the technology areas, but in innovation support that would effectively facilitate technology transfer process (commercialisation) and networking for inter-disciplinary (inter-technology) collaboration.

In referring again to the identified priority areas that have the ability to give rise to emerging industries in the country, some **key recommendations** can be given. They relate mostly to innovation landscape and support in Slovenia that would foster the development of emerging industries:

- Holistic approach in defining and executing related policies (innovation, research, education; employment, fiscal, etc) and their measures
- Additional support to development of identified priority areas (from research to commercialisation; both horizontal as well as vertical – interdisciplinary)
- Development of effective evaluation system that would enable further identification of opportunities and their support

To foster interdisciplinary collaboration is in our opinion crucial for **future strategy** on regional level (Central Europe). This difficult task lays before all individual countries, although some are more advanced in **vertical integration**. It should be explored in practice within Clustrat (pilot projects), where concrete partners are to formulate main point of collaboration (according to the needs) in pre-defined priority areas/topics/challenges.

Clustrat partners could in this case:

- a. act as integrators (facilitators) of potential pilot consortiums and
- b. in the process of pilot implementation find the way (together with counterparts on decision-making level) to support these international development partnerships (consortiums) in their joint ventures

Future **Clustrat strategy** should support the creation of model for identifying and supporting vertical integration in the region. Priorities based on societal challenges and market trends should take into account state of the art competitors and partners. One single country (especially small one) rarely has necessary resources to have a complete overview.

Also, the aim of the strategy should be identifying sector (emerging industry) bottlenecks/barriers (ex. legal barriers, standardisation) and proposing common indicators for evaluation of results and trends in the growth of emerging sector.

Examples of two groups of competence centres/centres of excellence from Slovenia that each in their own field stepped together aiming to:

- a. discover common points for achieving benefits of vertical integration (in this case new emerging industry because all necessary competences and capacities were identified) – suggested pilot case: smart ambient (see final chapter of this paper)
- b. join in order to collaborate on horizontal issues, common to them all: internationalisation, spin off support (technology transfer), market analysis, promotion

CROSS CUTTING ISSUES

Gender is not an obvious issue in Slovenia. In technical innovation men are predominant but with other types of innovation the ratio between men and women is almost equal. Of the Clustrat-focused cross cutting issues (CCI) that are of greatest importance and need in Slovenia, most attention of policy and stakeholders in the future lays in internationalisation (INT) and knowledge/technology transfer (KTT).

Knowledge/technology transfer

In Slovenia, according to the KTT experts and stakeholders, KTT process should be more developed and it could/should play a more important role in regional development policies. Lack of experts in particular fields of KTT process (human resources) is to be addressed (for assistance in the search for integration and cooperation both at home and abroad; skills in ex: market analysis, protection of IPR, IP valuation, negotiation, contract drafting).

The active tools for supporting KTT process in the country is related to the existence of TTO offices, incubators and EEN (EU platform). Clusters in Slovenia address mostly the needs of their member organizations. Active promotion of KTT within the cluster and in collaboration with external partners would result in broader network and more efficient transfer of knowledge and technologies.

Recommended policy response is to build national innovation system with more attention to capacity building (human resources in KTT; promote knowledge in non-technology innovation etc).

Internationalisation

The role of clusters is to connect SMEs, large enterprises, research and development organizations, support institutions. These links should help clusters to internationalize.

Internationalization encourages faster and more efficient transfer of knowledge and technologies. It promotes the development and enables direct comparison with the better players in the global environment. It allows access to the global market and active involvement in it. It brings new business models and principles and allows integration into international networks.

Some support measures are available on the national level - to help companies find international partners and reach foreign markets. Clusters however contribute to the width. They integrate and provide access to large amounts of knowledge, contacts and links in priority areas which represent biggest potential for emerging industries.

Smaller partners have greater weight if they outwardly appear with a more recognised partner/cluster. Main benefits are wider market area, possibility for global recognition with a product/service.

In the opinion of some (interviewed companies) it would be ideal if development of internationalization was based on phases. In the first phase export and distribution channels in international trade should be established. In the second phase investment in support facilities and aftermarket activities should be done. In the final phase establishment of independent affiliate should follow.

Current shortcomings are in failing to detect the strategic direction in internationalisation of the more specialized fields – regionally/globally. The Clustrat strategy might support the Central Europe customers here.

Support for clusters in the EU is well established. In Slovenia lack of systematic support clusters is detected. Therefore internationalization of clusters is also not supported in a proper way; there is a lack of systematic support, vision, development strategy, which would include more clusters and their internationalization. It would be necessary to ensure the sustainability of the various measures.

Possible potentials of great importance to the clusters in Slovenia is building strategic alliances for knowledge integration (in a product/service) to develop global complex solutions.

CONCLUSIONS FOR PILOT DEVELOPMENT

To briefly summarise some ideas we already provided in previous sections and concern Clustrat pilot phase:

- pilots will be proposed from Slovenia from some (not all) identified priority areas as identified to have biggest potential for emerging industries
- Vertical integration as formation of development partnerships (interdisciplinary) in value chains that react to social challenges; it should be explored in practice within Clustrat (pilot projects), where concrete partners are to formulate main points of collaboration (according to the needs) in pre-defined priority areas/topics/challenges.

Clustrat partners could in this case:

- act as integrators (facilitators) of potential pilot consortiums and
- in the process of pilot implementation find the way (together with counterparts on decision-making level) to support these international development partnerships (consortiums) in their joint ventures

General aim (result) of pilot project should therefore be:

- internationalisation (expanding their memberships, increasing the number of strategic/development partnerships)
- increase in market share (consortium of partners)
- development of technology solutions and shared users
- joint approach to investors

Example and possible pilot from Slovenia - »smart ambient«

Justification/background

This is the next step in the vertical integration of three existing competence centers in Slovenia (competence centers for internet of things and open communication platform for integrated services, sustainable construction technologies and advanced systems of efficient use of electrical energy). This consortium has high capacities (number of firms, above average exports and above-average value added per employee) but still not enough to access the global market without strategic partners that would assist in building a strong brand. This is due to missing access to some industries/technologies (inter-sector, cross-technology integration) that would make their products globally competitive.

By connecting existing networks and clusters with this group of competence centers, a higher level of specialization/knowledge concentration would be achieved – for exploring of new markets. Being a

small country, Slovenia cannot compete in mass production, but should concentrate on specialized markets that yet need to be developed into new business value chains, Smart ambient in this case.

In Slovenia, companies are quite dispersed and fragmented. Due to limited and scarce resources and not concentrated industry Slovenia realistically can't afford to create more than just a few world class competitive clusters in emerging industries.

The country is ranked as Innovation follower occupying place 26 among 141 countries in 2012. It has not been able to efficiently transform knowledge to a successful globally competitive own brands and products. Major disadvantages are in low productivity and low hi-tech density which don't help transferring knowledge, technologies and intellectual properties into products and sufficient sales in the global markets.

Description of a specific emerging sector

Solution to these issues is to focus on a specific emerging industry in order to concentrate the dispersed hi-tech companies, SMEs and to restructure the existing industries and actively involve them with new and innovative products and solutions in the emerging industry. This new industry is called **»smart ambient«** which refers to **smart buildings, including smart home, smart industry and commercial buildings and subsystems**. This emerging industry consists of many particular sub-industries – systems, which need to be concentrated with a clear vision and common goal to produce a single new globally competitive product – **a smart house**. Today many single parts, products and even subsystems are produced by different companies with no or very little external cooperation and not enough concentration to create high(er) value product(s). These companies' products are also found on the global market mostly as OEM (original equipment manufacturer) products and rarely as stand-alone own branded products.

Potential of the emerging industry

This emerging industry – smart ambient, is focused to provide the complete value chain for smart buildings and living in terms of our homes on one side and in terms of industrial and commercial buildings on the other side. This value chain consists of companies (stakeholders) who provide particular subsystems for energy efficient, low carbon footprint and intelligent living and working environment (buildings) – smart spaces. In addition it is going to extend the reach to other sectors which are today indirectly involved in the emerging smart ambient industry like automotive (eMobility), design and wood. Some of the companies are already cooperating in the existing clusters which are the beneficiaries of the project, but there is a plan and intention to invite other particular companies from these additional sectors and industries.

Besides the existing capacity in the sectors which are involved in the project, the rationale to focus to ambient industry and the smart house(s) is also the global potential on the world market which is going to radically transform in terms of living. Main challenges and drivers for radical innovation in the ambient industry are already present today. They are found in many separated subsystems, they are persistent and they are demanding lower energy consumption, alternative energy sources, efficient HVAC systems, intelligent home and building management, total family care, safety systems, ubiquitous communication and information systems (always on), total building/home waste management, water management and many similar.

LIST OD SOURCES USED

Clustrat (internal) analysis:

- desk research and interviews from mapping process (WP4) and
- conclusions from all three national policy dialogues (WP3)

Official sources:

- TIA, GZS, Mešl M., dr.Kolar J. (22.7.2013): Prispevek k osnutku Strategije pametne specializacije (gradiva za javno razpravo) (<http://www.gzs.si/slo/62049>)
- Dr. Kotnik P. (Januar 2013): Analiza sektorjev in RR dejavnosti za namen identifikacije področij pametne specializacije (http://www.podjetniski-portal.si/resources/files/doc/Analiza_Clustrat_Kotnik.pdf)
- Slovenska industrijska politika (December 2012) (http://www.mgrt.gov.si/nc/si/medijsko_sredisce/novica/article//8924/)
- ARRS (2012): Poročilo o delu za leto 2011 (<http://www.arrs.gov.si/sl/finan/letpor/11/inc/ARRSporocilo2011.pdf>)
- OECD (April 2013): OECD Economic surveys – Slovenia (http://www.oecd.org/eco/surveys/Overview_Slovenia.pdf)
- National reform programme 2013-2014 (May 2013) (http://www.mf.gov.si/fileadmin/mf.gov.si/pageuploads/docs/Razvojni_dokumenti/20130510_NRP_2013_ENG.pdf)
- MGRT (July 2013): Osnutek strategije pametne specializacije – izhodišča za javno razpravo (http://www.mgrt.gov.si/fileadmin/mgrt.gov.si/pageuploads/EKP/Nactrtovanje/Osutek_strategije_pametne_specializacije_daljsa_razlicica.pdf)
- SURS (Julij 2013): website information (<http://www.stat.si/eng/index.asp>)
- European Commission (2013): European Innovation Scoreboard
- IMAD (2013): Spring forecast of economic trends (http://www.umar.gov.si/fileadmin/user_upload/publikacije/aanaliza/aspomladanska2013/a_PNGG_13.pdf)
- Slovenian intellectual property office (SIPO) (2012): Annual report 2011 (http://www.uil-sipo.si/fileadmin/upload_folder/URSIL-SIPO_LP-AR_2011.pdf)

Input on pilot development: Tomaž Vidonja, KC OPCOMM