Sanja JELISAVAC TROŠIĆ, Ph.D.[1]

THE DEVELOPMENT OF A KNOWLEDGE SOCIETY IN SERBIA AND ITS PLACE IN THE DANUBE REGION

ABSTRACT

The Danube Strategy in the Priority Area 7 - To develop the Knowledge Society (research, education and ICT), where the Serbia is a coordinator, has a great potential for strengthening cooperation between the countries of the region. Countries of the Danube Region are each very different, but these disparities could be overcome in certain areas by working together on solving a large number of challenges that are in front of everyone. Serbia has the potential to increase its competitiveness through research and development, education, increased mobility of highly educated, technological innovation, and etc. The experience of developed countries shows that a much larger proportion of investment in the development and dispersion of knowledge has a positive effect on economic growth and national income. Investing in people is very much needed in Serbia and in the whole region also, because that way we can ensure long-term prosperity and sustainable development. Since the objective of the Strategy is a better connection, coordination and cooperation among the countries of the Danube Region, as a matter of Priority Area 7 we believe that Serbia has a lot to gain with this type of cooperation. Creation and constant improvements of skilled labor may, in the long run, lead to better positioning of Serbia in the World.

Key words: knowledge society, research, development, education, ICT, Serbia, Danube.

---

[1] Institute of International Politics and Economics, Belgrade, Serbia. This paper was created within the project "Serbia in contemporary international relations: Strategic directions of development and firming the position of Serbia in international integrative processes – foreign affairs, international economic, legal and security aspects", Ministry of Education and Science of the Republic of Serbia, number OI179029, for the period 2011–2015 and is implemented in Institute of International Politics and Economics.

1. THE DANUBE REGION STRATEGY

The Danube Region Strategy is the macro-regional approach promoted by the European Union. That is one of the European policies which goal is integrated and competitive Danube Region. This macro-regional strategy operates on the basis of the 'three No's' rule:

1. No new EU funds;
2. No additional EU structures;
3. No new EU legislation.

The idea is to better align existing funds and policies at EU, national and regional level and to rely on existing bodies for implementation.[2] There are total of eleven priority areas in the Danube Region Strategy (see table 1).

Table 1. Pillars and priority areas, with leading countries (or regions)

Connecting the region	Protecting the environment	Building prosperity	Strengthening the region
PA1 - Mobility and intermodality - of inland waterways (Austria, Romania) - rail, road and air (Slovenia, Serbia)	PA4 - Water quality (Hungary, Slovakia)	PA7 - Knowledge Society (research, education, ICT) (Slovakia, Serbia)	PA10 - Institutional capacity and cooperation (Austria, Slovenia)
PA2 - Sustainable energy (Czech Republic, Hungary)	PA5 - Environmental risks (Hungary, Romania)	PA8 - Competitiveness of enterprises (Baden-Württemberg, Croatia)	PA11 - Security (Bulgaria, Bavaria)
PA3 - Culture and tourism, people to people contacts (Bulgaria, Romania)	PA6 - Biodiversity, landscapes, quality of air and soils (Bavaria, Croatia)	PA9 - People and skills (Austria, Moldova)	

Source: EUSDR, 2015.

- Serbia is selected to be Priority Area Coordinator in 2 Priority Areas:
- Priority Area 1b „To improve mobility and intermodality of inland waterways" (with Slovenia).
- Priority Area 7 „To develop the Knowledge Society (research, education and ICT) (with Slovakia).

[2] Vivienne Halleux, Briefing, May 2015, European Parliamentary Research Service, PE 557.024, p. 2.

The main event of the year for the EU Strategy for the Danube Region is the Annual Forum. This event assembles its stakeholders from the whole Danube area to give strategic direction, exchange and showcase opinions and experiences, and discuss vital questions of the Strategy's prospects and challenges.[3] The first Annual Forum of the EU Strategy for the Danube Region, organized in cooperation between the Government of Bavaria and the European Commission, took place from 27-28 November in Regensburg (Bavaria), Germany. The Second Annual Forum of the EU Strategy for the Danube Region (EUSDR), jointly organized between the Government of Romania and the European Commission, took place at the International Conference Centre/Palace of the Parliament in Bucharest, Romania, on 28-29 October 2013.[4] The 3rd EUSDR Annual Forum on June, 26th-27th 2014, was organized by the European Commission together with the Republic of Austria and the City of Vienna. The 4th Annual Forum of the EU Strategy for the Danube Region, jointly organized by the European Commission, the State of Baden-Württemberg and the City of Ulm took place on 29 and 30 October 2015 at the Trade Fair Ulm. On the annual forums there were topics such as innovation, professional training and dual education, entrepreneurship and civil society as key factors for a sustainable and integrative growth in the Danube Region. The talks were about inclusive, sustainable growth as a focus and prerequisite of prosperity. "We grow together" represents the EU goals of economic, territorial and social cohesion. This is particularly relevant for the sustainable development of the Danube area. The Danube macro-region is very diverse in membership. It covers 14 countries whose development levels and status in relation to the European Union (including their access to EU funding as a result of the latter) are not the same. That fact represents a biggest challenge for the Danube strategy.

2. THE KNOWLEDGE SOCIETY

Knowledge Society is identified as society based on the creation, dissemination and utilization of information and knowledge. It is a society with an economy in which knowledge is acquired, created, disseminated and applied to enhance economic and social development.[5] A knowledge-based society refers to the type of society that is needed to compete and succeed in the changing economic and

[3] Danube Region Strategy, Internet, http://www.danube-region.eu/communication/past-events/600085-save-the-date-3rd-annual-forum-of-the-eusdr/event_details, 20/11/2015.

[4] European Commission, 2nd Annual Forum, EU Strategy for the Danube Region, Internet, http://ec.europa.eu/regional_policy/archive/conferences/danube_forum2013/index_en.cfm, 16/11/2015.

[5] What is the Knowledge Society?, Internet, www.gesci.org/.../2.%20Knowledge%20Society, 19/11/2015.

political dynamics of the modern world. It refers to societies that are well educated, and who therefore rely on the knowledge of their citizens to drive the innovation, entrepreneurship and dynamism of that society's economy.[6] What does it mean for an entire society to know something? The only sensible way of defining knowledge at a social level is as the union of all the sets of individual knowledge of the members of this society. Knowledge is shared and distributed, and its transmission through learning is essential for knowledge society to make effective use of it.[7] Every society has its own knowledge assets. It is therefore necessary to work towards connecting the forms of knowledge that societies already possess and the new forms of development, acquisition and spread of knowledge valued by the knowledge economy model.[8] The European Innovation Progress Report classifies some countries in the Region as "innovation leaders", but others only as "catching up innovators". In terms of tertiary education quality and competitive standing within the globalize educational environment, a similar divide can be observed. Studies on researchers' mobility (students, graduates and higher education staff) show south-east European countries at a disadvantage compared to other EU countries, especially in international research mobility, as well as in the ability to attract bilateral R&D cooperation. However, even though diverse, the Region is also linked through long standing and intensive trade links and shared historical and political developments, which provide a good basis for cooperation.[9] In order to achieve defined objectives of 11 pillars of the Danube Strategy it is necessary to carry out activities aimed at strengthening the capacity of all countries of the Danube Region to create and use knowledge. Knowledge is a key factor for progress and development. Danube Region is characterized by an uneven picture when it comes to innovation and research and development in the region because there are leaders in technological fields, but there are also lagging regions. We may conclude that knowledge sharing is crucial for balanced development. Competitiveness within the whole country depends on the ability of Universities, research Institutes and enterprises to generate new ideas, knowledge and technology and to turn them into commercial products. Targeted support for research infrastructure, stronger networks between Universities and Institutes, on one hand, and enterprises and decision makers, as well as better use of information and communication technologies is

[6] Knowledge-based Society, Internet, http://www.oas.org/en/topics/knowledge_society.asp, 18/11/2015.

[7] Joel Mokyr, The Knowledge Society: Theoretical and Historical Underpinnings, Paper presented to the Ad Hoc Expert Group on Knowledge Systems, United Nations, New York, Sept. 4-5. p. 1.

[8] UNESCO, Towards Knowledge Societies, UNESCO 2005, p. 17.

[9] European Commission, Action Plan, Brussels, European Union Strategy for the Danube Region, SEC(2010) 1489/3, p. 58.

essential for the promotion and development in the Danube region. Given the polarization within the Danube Region concerning innovation and ICT indicators, it is necessary to promote the diffusion mechanisms, as well as targeted support for the development of infrastructure necessary for research and development.[10]

Picture 1 – Territorial coverage of the Danube region strategy

Source: European Commission, 2015.

Organizations such as International Commission for the Protection of the Danube River, and The Danube Cooperation Process, are needed but insufficient because they are focused only on particular and specific areas of cooperation. Those organizations could not respond to the increasing tendency to connect people, their ideas and needs. Because of that it was necessary to create an instrument that could ensure sustainable development based on knowledge, territorial, economic and social cohesion within the European Union.[11] The Danube Region Strategy is a

[10] Jelena Stojović i grupa autora, Vodič kroz Dunavsku strategiju, Evropski pokret u Srbiji, Beograd, 2012, p. 25.

[11] Ibid, p. 19.

comprehensive strategy that gives the opportunities for building stronger connections and cooperation between countries involved. All countries involved could benefit from this kind of cooperation.

3. KNOWLEDGE SOCIETY IN SERBIA

Key factor for progress and growth is a society's ability to create and exploit knowledge. A society based on knowledge needs competitive research and education infrastructure, innovation supporting and facilitating institutions, and high performing information and communication technologies. These framework conditions differ remarkably throughout the Danube Region but remain, overall, below the level of EU27.[12] In addition less developed regions downstream can benefit from the leading innovative regions that are upstream. According to OECD research, increasing investments in electronic communications by 8% - is causing an increase in GDP by 1%. In the period 2001-2009 in Serbia growth of gross value added (GVA) transport, storage and communications grew at a high annual average rate of 14.9%. This was mainly contributed by telecommunications (and postal activities), whose GVA makes up about 44% of the total GVA of the sector of transport, storage and communications. World Bank research has shown that the world's increasing broadband penetration of 10%, is causing an increase in GDP of 1.3%. The development of a national broadband communication network will provide introduction services for public administration, health, education, legislation and the business sector.[13] The proclaimed goal of Serbia is to create a knowledge-based economy through cooperation in the Danube region. In achieving objectives of the Strategy important segment is the active role of science. The Strategy of scientific and technological development of the Republic of Serbia in the period from 2010 to 2015 is the strategic basis for development of science in our country over this five years period. But this is not enough. The lack of financial support and better allocation of financial resources are just some of the shortcomings of science sector in Serbia. The vision of the Republic of Serbia as an innovative country where scientists reach European standards, contribute to the overall level of knowledge society and advance technological development of the economy. But this is still just a vision. This document defines the national science priorities and defines measures to stimulate technology transfer, fostering innovation, linking national innovation system, with the aim of development of society and economy based on knowledge.

---

[12] European Commission, Action Plan, Brussels, European Union Strategy for the Danube Region, SEC(2010) 1489/3, p. 58.

[13] Jurij Bajec, grupa autora, Postkrizni model privrednog rasta i razvoja Srbije 2011-2020, USAID, Ekonomski fakultet, Ekonomski institut, Beograd, 2010, p. 35.

New 2016-2020 Strategy of scientific and technological development "Research for innovation" is focused on encouraging excellence and relevance of scientific research in Serbia. Yet there is a strong suspicion that the right measures are designed to achieve these objectives. A plan that emphasizes innovation as the most important goal must be supported financially and well designed strategically to bring real results. Knowledge society and knowledge-based economy implies a set of skills, abilities and interest (competencies) that create innovation, solve problems, cooperate with others and act for the common good.[14] For building prosperity in the Danube region and to achieve an overall growth based on knowledge, first and far most important is to invest in people. The way to invest in people is by investing in skills, fighting poverty and modernizing labor markets, training and social protection systems. The importance of Knowledge Society priority, aimed at improving human capital, reflects in the fact that in the Danube region lives approximately one third of the EU population at risk of poverty. This endangered population is younger than the average of the EU 27, many of whom belong to marginalized groups, including 80% of Roma in Europe. Relying on the existing quality of the Danube region it is necessary to promote better access to further education and to modernize training and improve social support. Education policy, labor market, integration, research and innovation should be mutually reinforcing. Also, the problems are migration flows motivated with significant differences in income, between countries in the Danube region. The result is a brain drain in some parts and excess supply of educated labor force in other parts of the region. In order to fully exploit the potential of labor force and to fight poverty, the Danube Region's labor market also needs to be more inclusive. In the Danube region, there is plenty of scope for joint activities between countries in the fight against social and economic exclusion of marginalized communities, which could be significantly changed by adequate implementation of activities under this priority Danube Strategy.[15]

In the Table 1 we compare research and development (R&D), science, technology and intellectual property through Danube Region. Regarding research and development we have separate data for researchers and technicians. Researchers in R&D are professionals engaged in the conception or creation of new knowledge, products, processes, methods, or systems and in the management of the projects concerned and the leading countries by the number of engaged researchers per million people in the Danube Region are Austria, Germany and Slovenia. The one that is closing to the leading three is Czech Republic, but the rest countries are lacking far

[14] Nada Dragović, „Stvaranje ekonomije znanja kroz saradnju u regionu Podunavlja i aktivna uloga nauke u postizanju ciljeva Strategije", sa konferencije *Dunavska strategija i ekonomija znanja,* 6. april 2001, Beograd.

[15] Jelena Stojović i grupa autora, Vodič kroz Dunavsku strategiju, Evropski pokret u Srbiji, Beograd, 2012, p. 26.

Table 1: R&D, science, technology and intellectual property – Danube Region

Country	Research and development (R&D)		Scientific and technical journal articles	Expenditures for R&D	High technology exports		Charges for the use of intellectual property		Patent applications filed		Trademark applications filed
	Researchers[16] 2005-14	Technicians[17] 2005-14	2011	% of GDP 2005-14	$ millions 2013	% of manufactured exports 2013	Receipts $ millions 2014	Payments $ millions 2014	Residents 2013	Nonresidents 2013	Total 2013
Austria	4,704	2,177	5,103	2.83	18,412	13.7	1,073	1,880	2,162	244	9,153
Bulgaria	1,693	444	650	0.65	1,128	8.0	34	229	282	15	6,177
Czech Republic	3,250	1,795	4,127	1.91	20,921	14.7	482	1,202	984	97	11,237
Croatia	1,529	660	1,289	0.81	633	8.0	24*	246*	230	23	16,239
Germany	4,472	1,744	46,259	2.85	193,088	16.1	13,797	8,122	47,353	15,814	64,826
Hungary	2,523	781	2,289	1.41	14,471	16.3	2,091	1,728	642	66	5,905
Romania	945	252	1,626	0.39	2,858	5.7	139	880	993	53	11,790
Slovak Republic	2,718	330	1,099	0.83	7,574	10.3	27	526	184	26	5,032
Slovenia	4,217	2,521	1,239	2.59	1,467	6.2	71	243	470*	11*	1,700
Bosnia and Herzegovina	217	38	54	0,33	80	2,3	13	7	7	22	4.342
Montenegro	647	102	28	0.38	5	..	1	5	23	41*	3,736
Serbia	1,381	260	1,269	0.73	335	..	44*	221*	201	20	6,869
Moldova	644	64	76	0.35	14	2.4	7	22	67	29	5,506
Ukraine	1,165	217	1,727	0.76	2,189	5.9	118	552	2,856	2,556	34,082

* Most Recent Value (MRV) if data for the specified year or full period are not available; or growth rate is calculated for less than the full period. Source: World Development Indicators 2015, 5.13 World Development Indicators: Science and technology, World Bank.

[16] fulltime equivalent per million people.

[17] fulltime equivalent per million people.

behind. Technicians in R&D and equivalent staff are people whose main tasks require technical knowledge and experience in engineering, physical and life sciences (technicians), or social sciences and humanities (equivalent staff). They participate in R&D by performing scientific and technical tasks involving the application of concepts and operational methods, normally under the supervision of researchers. In the field of involving technicians in R&D, in terms of fulltime equivalent per million people Slovenia is taking the leading position, and is followed by Austria and Germany. In this field also we can see the difference between the members and nonmembers EU countries. Looking at scientific and technical journal articles which refer to the number of scientific and engineering articles published in the leading fields like physics, biology, and chemistry, we can conclude that Germany has left all the others countries from the Danube Region far behind. Austria and Slovenia are among the top of the rest which is leading us to a conclusion that these tree countries are archiving mach more than the rest of the Danube Region countries. Expenditures for research and development are current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge, including knowledge of humanity, culture, and society, and the use of knowledge for new applications. R&D covers basic research, applied research, and experimental development. Expenditures shows how much is invested and it should be proportional to number of journal articles, high-technology exports and use of intellectual property work in the way that the more is invested in R&D the more should be innovations and export. The country that is investing the most in R&D, as a percent of GDP, is Germany with 2.85% of GDP. Followed by Austria 2.83% and Slovenia 2.59% these countries are the only one in the Danube Region that are approaching the EU goal of 3% GDP. From the rest of total 14 countries the only two that stands up are Czech Republic and Hungary, which are the only ones with expenditures for research and development above the 1% of GDP. The largest number of countries still finances less than 1 percent for R&D. High-technology exports are products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery. The leader in high-technology export is Germany, around ten times better than the following Czech Republic. Austria and Hungary are taking third and forth place, and the rest of the countries of the Danube region are ten time worst than Hungary. The most obvious that this indicator is showing us is the existence of a huge gap between developed and developing countries in the Danube Region. Differences between leading and the worst positioning countries in high-technology exports are shoving us the direction for development. The goal for Serbia and the similar ranking countries is increase in high-technology exports. According to the percent from manufactured exports Hungary is taking the lead, closely followed by Germany, Czech Republic, Austria, and Slovak Republic. Charges for the use of intellectual property are payments and receipts between residents and nonresidents for the authorized use of proprietary rights (such as patents, trademarks, copyrights,

industrial processes and designs including trade secrets, and franchises) and for the use, through licensing agreements, of produced originals or prototypes (such as copyrights on books and manuscripts, computer software, cinematographic works, and sound recordings) and related rights (such as for live performances and television, cable, or satellite broadcast). Germany, Austria and Hungary have the largest amounts of intellectual property payments and receipts, which makes them leaders in trade of intellectual property rights. Worldwide patent applications filed through the Patent Cooperation Treaty procedure or with a national patent office for exclusive rights for an invention are showed in the next column of the table 1. Patent applications are highest in no surprise Germany, but surprise in Ukraine as second. Of course Germany as a leader is far in front of the followers from Danube Region. Trademark applications filed are applications to register a trademark with a national or regional Intellectual Property office. Germany is again leader. Once again Ukraine is second country in numbers of trademark applications, which together with second in numbers of patent applications shoves that the market of Ukraine shows great potential for the development of trade in high-tech products. Among all these indicators Serbia is among the least successful countries of the Danube Region. Serbia needs to first look up at the experience of Germany, and maybe even closer to Austria and Hungary, which have managed to achieve good results in achieving knowledge society and also sale of products that have been created as a result of R&D. Reports from the European Commission, while highlighting the strategies' impact in terms of projects, coordination and integration, promotion of multi-level governance and territorial cohesion, underline the need for stronger political backing, commitment and leadership from the participating countries and regions. Stakeholders have called for a more streamlined governance structure, criticized the limited involvement of civil society organizations, local and regional actors in planning and decision-making processes, and pointed to capacity shortcomings impeding their participation. The wide disparities between the partners have a significant impact on the operation of the strategy.[18] So Germany as a leader in the Region could have the strongest impact on development of least developed countries in the Danube Region. Serbia should take more decisive steps to build stronger R&D departments and position better in the high technology export, making knowledge (IP and patents) and creating knowledge society.

5. CONCLUSION

Germany is a leader of the Danube Region, and far ahead of the rest of countries. As a rule, EU Member States shows better results in R&D, science, technology and intellectual property than countries that are not EU members. The EU Member States

[18] Vivienne Halleux, Briefing, May 2015, European Parliamentary Research Service, PE 557.024, p. 1.

have developed research and development, as well as scientific work, and as a whole they achieve better results on the market (revenues from intellectual property high-technology export, etc.). Better results are achieved as a result of higher investments, but also as a result of better strategic development of the analyzed industries. Given the fact that most of the investments depend on the results, we have noticed a direct link between the facts that countries that have the most invested are achieving the best results in science and technology. Thus, for the other countries to have more success in the analyzed areas, it is necessary to increase their investment on research and development. Also, increasing spending on research and development in aggregate in the Danube Region would be good news for all countries. Since Danube Region is very diverse in membership, and has very wide disparities among countries Strategy can make a major contribution in closer cooperation. Serbia can increase competitiveness through research, education and technology. Serbia should devise targeted research aimed at economic progress, and developing basic research that can be used for better positioning of Serbia in the world. Investment in people is needed in today's world so the region can achieve sustainable progress and grow by giving priority to knowledge and inclusion.

LITERATURE

Danube Region Strategy, Internet, http://www.danube-region.eu/communication/past-events/600085-save-the-date-3rd-annual-forum-of-the-eusdr/event_details, 20/11/2015.

European Commission, 2015.

European Commission, 2nd Annual Forum, EU Strategy for the Danube Region, Internet, http://ec.europa.eu/regional_policy/archive/conferences/danube_forum 2013/index_en.cfm, 25/10/2015.

European Commission, Action Plan, Brussels, European Union Strategy for the Danube Region, SEC(2010) 1489/3.

EUSDR, 2015.

Grupa autora, Postkrizni model privrednog rasta i razvoja Srbije 2011-2020, USAID, Ekonomski fakultet, Ekonomski institut, 2010.

Jelena Stojović i grupa autora, Vodič kroz Dunavsku strategiju, Evropski pokret u Srbiji, Beograd, 2012.

Joel Mokyr, The Knowledge Society: Theoretical and Historical Underpinnings, Paper presented to the Ad Hoc Expert Group on Knowledge Systems, United Nations, New York, Sept. 4-5.

Jurij Bajec, grupa autora, Postkrizni model privrednog rasta i razvoja Srbije 2011-2020, USAID, Ekonomski fakultet, Ekonomski institut, Beograd, 2010.

Knowledge-based Society, Internet, http://www.oas.org/en/topics/knowledge_society.asp, 18/11/2015.

Nada Dragović, „Stvaranje ekonomije znanja kroz saradnju u regionu Podunavlja i aktivna uloga nauke u postizanju ciljeva Strategije", sa konferencije *Dunavska strategija i ekonomija znanja,* 6. april 2001, Beograd.

UNESCO, Towards Knowledge Societies, UNESCO 2005, p. 17.

Vivienne Halleux, Briefing, May 2015, European Parliamentary Research Service, PE 557.024.

What is the Knowledge Society?, Internet, www.gesci.org/.../2.%20Knowledge%20Society, 19/11/2015.

WalterW. Powell and Kaisa Snellman, The Knowledge Economy, Annu. Rev. Sociol. 2004.