ANTONIO VALENTIN TACHE¹, OANA POPESCU², ALEXANDRU-IONUŢ PETRIŞOR³

ABSTRACT - The article includes concepts, information, methodologies of spatial planning focused on the Danube carried out within the European projects "Donauregionen" and "Donauregionen+", financed by the European Union through the South East Europe Transnational Cooperation Programme. The article proposes solutions for solving problems related to the opportunities offered by the Danube as an important corridor to support the economic growth and competitiveness of functional regions in the Danube area. The current situation in the Danube River riparian land-use planning policies involves (a) creating the spatial concept of the Danube area interregional level, b) developing integrated strategies to develop sectoral strategies embodied in the Danube area, the Transdanube strategy and development strategies for the Danube region as a whole. In this general scheme, indicators have been proposed, designed on four main areas (natural conditions, housing and human resources, technical infrastructure and transport, and economy). Based on the analyses conducted in the project, five Danube sub-regions and 19 Transdanube regions were established. Using the forecasting methodology proposed in the "Donauregionen+" project, three types of scenarios were developed for each sub-region: pessimistic, realistic and optimistic. All these scenarios have resulted in GIS cartograms, based on groups of territorial indicators that highlight the socio-economic development capacity of the Danube sub-regions.

Keywords: strategic planning, Danube, GIS scheme, socio-economic indicators, the Danube Strategy, Transdanube Strategy

INTRODUCTION

Europe 2020 is the EU's growth strategy for the next decade. In a rapidly changing world, the EU wants to become a smart, sustainable and inclusive economy. These three priorities are mutually reinforcing themselves and are considered able to help the EU and its Member States achieve a high level of labour employment, productivity and social cohesion. In practice, the European Union has set five key objectives - on employment, innovation, education, social inclusion and climate/energy - to be reached by 2020. Member States have adopted their own national targets in these areas. Various actions at European and national level supported the strategy (European Commission, 2010). In this respect, the European Parliament, which has been involved in designing the Danube Strategy, will remain a partner throughout its implementation. The European Parliament also created the "Danube Forum" as a platform for stakeholders who wish to increase cohesion in the Danube Region. "As the Baltic Sea Strategy, the EU Strategy for the Danube Region is a platform for testing the macro model

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and effective regional cooperation." The Danube Strategy is a project of the European Union and the neighbouring third countries are also invited to participate.

The four priority axes of the strategy are: (a) Connectivity (intermodal transport, culture and tourism, energy networks); (b) Environmental protection (water management, biodiversity protection and risk management); (c) Increasing prosperity in the Danube region (education, research, competitiveness); (d) Improvement of governance (institutional capacity and internal security).

The strategy also proposes a series of time-bound targets that are given attention, including the development of efficient multimodal terminals at Danube river ports to connect inland waterways with rail and road transport by 2020; the implementation of flood risk management plans on the whole course of the Danube - which will be completed in 2015 under the EU Floods Directive and significantly reduce flood risk by 2021; reduction of nutrients to restore the Black Sea ecosystems to the 1960 levels by 2020; guaranteeing access to broadband high speed internet for all EU citizens in the region by 2013; investing 3% of GDP in research and development by 2020 (Hasenbichler, 2011).

Out of the entire area covered by the Strategy (Figure 1), the Danube Region studied in Donauregionen+ project included 48 counties (NUTS 3) and 8 countries (NUTS 0) (Figure 2). The socio-economic development of this vast Danube Region was designed for a general scheme of indicators on 4 priority areas: natural conditions, housing and human resources, technical and transport infrastructure, and economy. Analyses in GIS aimed at defining the typology of regions (developed, stable, stagnant and underdeveloped) and at identifying Danube sub-regions (5) and Transdanube regions (19) (Donauregionen+, 2010).

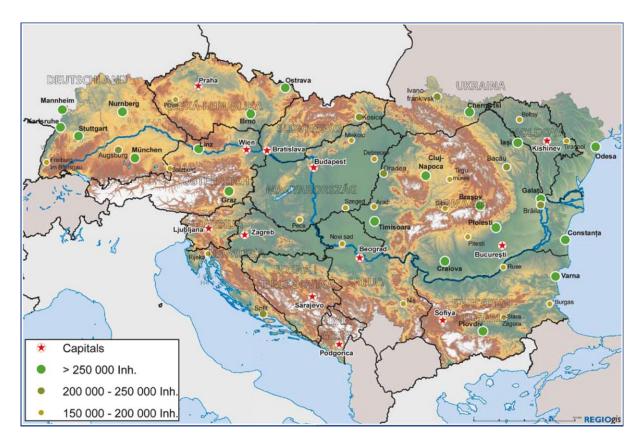


Figure 1. Territorial coverage of the EU Strategy for the Danube Region

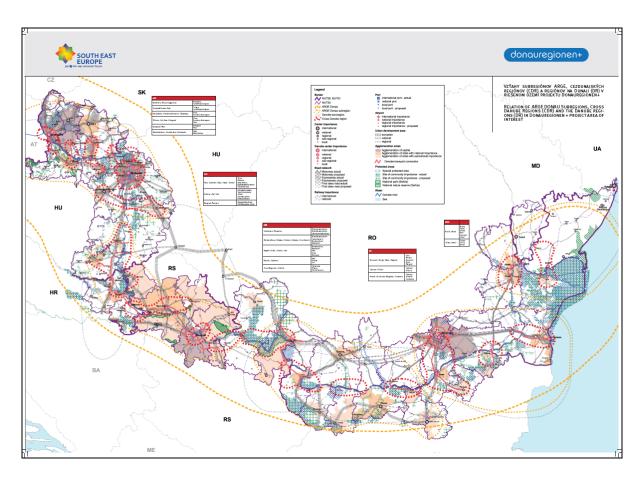


Figure 2. Danube area studied in the project Donauregionen+

The purpose of the research projects developed, Donauregionen and Donauregionen+, was to strengthen the NUTS 3 level functional regions located on the Danube River corridor in supporting the European growth and competitiveness (Bubulete et al., 2010; Popescu, 2011). For this purpose, a general scheme of spatial indicators was developed, generally valid for all regions studied, to assess the potential socio-economic development of the Danube Region in a broader context. Modern methods were used to assess the potential socio-economic development of the region and define the typology of regions according to Vision Planet. In addition, five Danube regions and 19 areas of Transdanube cooperation were identified based on GIS (Geographic Information Systems) and on tools and techniques specific for spatial planning. Finally, development scenarios were made for the five Danube sub-regions based on documents, measures and projects at local, regional, national and international levels based on external and internal factors that can influence the socio-economic development of the studied region (INCD URBANPROIECT et al., 2004; Popescu, Tache, 2012).

METHODS

The objectives and criteria mentioned in the introduction were selected for 27 socio-economic indicators grouped into four main chapters and quantified for all the participating Danube regions whose evolution was studied for the following years: 1996, 2001, 2005, and 2008. The chapters and indicators are listed below.

GS Natural Conditions

- 1. Water pollution index
- 2. Atmospheric pollution SO2
- 3. Atmospheric pollution NOx

ANTONIO VALENTIN TACHE, OANA POPESCU and ALEXANDRU-IONUŢ PETRIŞOR

- 4. Atmospheric pollution ash
- 5. Atmospheric pollution CO
- 6. Capacity of landfills

GS Settlements Structure and Human Resources

- 1. Number of dwellings per 1,000 inhabitants
- 2. Number of university students per 1,000 inhabitants
- 3. Regional Vitality Index

GS Transport and Technical Infrastructure

- 1. Density of highways length of highways per km^2
- 2. Density of railways length of total railway network per km^2
- 3. Water transport freight transferred through ports in the region per 1,000 inhabitants
- 4. Accessibility of water ports (share of region area accessible from ports within a 60-km radius, %)
- 5. TEN T airports accessibility (share of inhabitants living in area within an 80-km radius, %)
- 6. Electric energy supply
- 7. Natural gas supply
- 8. Drinking water supply
- 9. Wastewater treatment
- 10. Broadband internet
- 11. Renewable energy production

GS Economy

- 1. Regional GDP per capita in PPS as a share of EU 27 average (%)
- 2. Labour force participation rate (%)
- 3. Unemployment rate in region (%)
- 4. Number of employed in tertiary branch (%)
- 5. Share of college and secondary school educated inhabitants
- 6. Tourism average guest nights
- 7. Tourism foreign visitors

The spatial databases were designed according to Europe 2020 (European Council, Brussels, 2010), Eurostat indicators and the indicator system proposed by *ESPON project 4.1.3. - Feasibility study on monitoring territorial development* based on ESPON key indicators (ESPON Monitoring Committee, 2007; Tache et al., 2010).

Out of the range of methods that can be used to forecast the potential socio-economic development, we favoured the method based on identifying documents, relevant measures and projects in the Danube Region with impact on the indicators used, estimating the impact of these measures on indicators selected by experts and calculation of indicators for 2020. This forecasting method for the Danube Region was chosen at the expense of statistical and mathematical forecasting methods because of fluctuations in the world economy in the coming years that can influence the mathematical calculations and can lead to erroneous conclusions.

The application of the socio-economic forecasting for the Danube area under study, both at the NUTS 3 level (counties) and the identified sub-regions, involved the following steps:

- (1) identification of relevant indicators to assess the development potential of the studied Danube Region;
- (2) identification of measures, documents, strategies and specific projects in the Danube Region impacting on the selected indicators;
- (3) estimation of the minimum and maximum impact of these measures on indicators selected by experts;

- (4) calculation of indicators (minimum and maximum) selected for 2020, following the algorithm. Each indicator has a set of impact measures for 2020. For each measure, experts give a value of maximum and minimum influence on the indicator studied, depending on the actual implementation. For each measure, there is a probability of 25% (when there is the idea of an objective), 50% (when the measure is caught in a strategy, but there are no feasibility studies), 75% (when the measure is caught in a strategy, there is documentation of achievement, but no funding sources), 100% (when the measure is caught in the documentation, there is documentation and financing measures may have both positive, with positive sign, and negative impact on the indicator. The final calculation for each indicator in 2020 is done by adding to the value of the indicator in 2008 the values given by experts for each measure multiplied by the probability of the specific measures set indicator. For example, if we denote by x the value of the indicator in 2008 and we have a set of 8 measures impact on the 2020 indicator, denoted m1, m2 m8, with associated probabilities, then, the estimated indicator y for 2020 will have the following value: y = x + m1 * m2 * 0.5 + 0.75 + m3 * 1 + m2 * 0.5 + 0.75 + m3 * 1 + m2 * 0.5 + 0.75 + m3 * 1 + m3 * 1 + m2 * 0.5 + 0.75 + m3 * 1 + m3 * 1 + m3 * 0.5 + 0.75 + m3 * 1 + m3 * 0.5 + 0.75 + m3 * 1 + m3 * 0.5 + 0.75 + m3 * 1 + m3 * 0.5 + 0.75 + m3 * 1 + m3 * 0.5 + 0.75 + m3 * 1 + m3 * 0.5 + 0.75 + m3 * 0.5 + 0.75 + m3 * 1 + m3 * 0.5 + 0.75 + 0.75 + m3 * 0.5 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 + 0.75 $\dots + m8 * 0.25$. In the end, we will have a maximum and a minimum value estimated for each indicator proposed scheme.
- (5) making cartograms in GIS for each indicator of the general scheme at county level (NUTS 3) for the Danube region studied;
- (6) development of scenarios pessimistic, realistic, and optimistic on the basis of estimated indicators for 2020 and the internal and external factors that can influence the socio-economic development of the area studied.

RESULTS AND DISCUSSION

The implementation methodology by the Romanian side project was done for two Donauregionen+ Danube subsets as follows: sub-region Romania-Ukraine-Republic of Moldova (Sub-

region RMU - Figure 3), which includes Brăila, Galați, Tulcea in Cahul. Romania. Cantemir. Taraclia, UTA Găgăuzia in the Republic of Moldova and the districts of Chilia, Izmail and Reni Ukraine and sub-region in Romania-Bulgaria (Figure 4), which Constanța, includes Ialomita, Călărași, Giurgiu, Ilfov and Bucharest in Romania and the counties of Ruse, Razgrad and Silistra in Bulgaria. In this context, measures affecting each indicator in the general scheme of proposed indicators for each county were analyzed, stating the measures that have cross-border effects.

The different indicators do not show a consistent pattern. Only the communication routes (major highways, connecting roads, and railroads) seem to be well developed on a gradient exhibiting high values from the south to the northeast of the region.

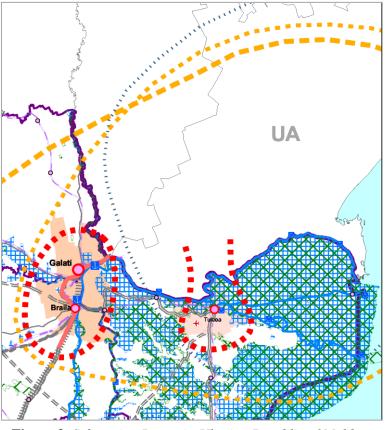


Figure 3. Sub-region Romania-Ukraine-Republic of Moldova

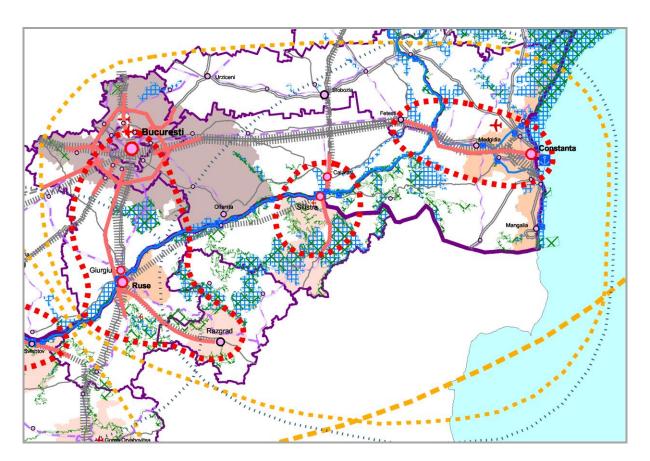


Figure 4. Sub-region Romania-Bulgaria

The first column in Table 1 contains the measures taken in strategy projects at local, regional, national and international level that impact on GDP per capita in PPS indicator (% of GDP EU 27), the second column contains the probabilities of achieving these measures until 2020, columns 3 and 4 contain the minimum and maximum values set by economic experts for the indicator studied, and the last column indicates the cross-border effect measures (the selected).

Measure	Probability (%)	v-min	v-max	СВ
Internal factors	100	-3	2.5	
Increasing the productivity in agriculture sector and accessing EU funds in this sector	50	0.8	1.2	
Development of the services sector	100	2.5	3.2	
Exploiting the economic potential of the county by using its important stone resources in constructions	75	2.2	2.6	
Development of cross-border cooperation with countries from the Black Sea area	75	0.1	0.2	x
Using the tourism potential of the county (the Danube Delta Reserve, the Black Sea, the Macin Mountains) by the attraction of international tourism operators	75	1.5	2	х
Accessing EU funds to support the SMEs	100	2.1	2.6	Х
Changing the structure of agricultural cultivations, especially for technical crops, to obtain bio-fuels	100	1.4	1.8	х

Table 1. Indicator measures affecting GDP per capita in PPS as a percentage of average EU - EU27 - Tulcea County

Attracting foreign investments in the renewable energy production – wind farms (wind park in Valea Teilor commune)	100	5.2	8.5	x
Banks protection works against floods in several localities (Ostrov, Babadag, Beștepe, Nufăru)	100	0.15	0.2	х
External crises	100	-1.5	3	

The same values were filled for the whole general scheme of indicators (27 indicators) and by using the forecasting methodology implemented, we obtained the values presented in Table 2 for the indicators forecasting for 2020 at county level. In this way, all the tables were filled for the Danube counties in Romania and the borders of the neighbouring countries. Based on the SWOT analysis in each Danube county and the border effect measures, SWOT analyses and socio-economic scenarios (pessimistic, realistic, and optimistic) were designed for the two Danube sub-regions under study until 2020.

SWOT Analysis – Sub-region Romania-Ukraine-Republic of Moldova STRENGTHS

- Diverse and rich biodiversity
- Professional and labour skills in the field of maritime economy, steel industry, fishery, agriculture, wineries, rice production, and light industry
- Strategic transport location, access to the Black Sea, ports of international importance
- Classic and un-conventional sources of electric energy production (especially wind)
- Flexible, qualified, specialized, available and cheap labour force
- Free trade areas

WEAKNESSES

- Extreme climatic phenomena (floods, landslides, etc.)
- High rate of settlements with less than 2,000 inhabitants (a vast rural territory)
- Low accessibility in some areas, including the settlements in the Danube Delta
- Localities without water supply, sewerage and water treatment stations
- Low population income, the sub-region has the lowest GDP in the whole DR+ area
- Underground economy

	2008	2020		2020		
Indicator	Value	Value based on chosen measures		Value based on chosen measures and internal and external factors		
		Min	Max	Min	Max	
Natural Conditions:						
Water pollution Index	3.67	2.59	2.03	2.59	2.03	
Atmospheric pollution SO ₂	1.22	0.85	0.93	0.85	0.93	
Atmospheric pollution NO _X	4.57	2.67	3.17	2.67	3.17	
Atmospheric pollution ash	1.02	0.73	0.82	0.73	0.82	
Atmospheric pollution CO	9.24	6.06	7	6.06	7	
Capacity of landfills	271.3	151.1	179.8	151.1	179.8	
Housing and living conditions:						
Number of dwellings per 1,000 inhabitants	378	384.4	392.9	383.9	396.9	
Number of university students per 1,000 inhabitants	0	1.25	3.6	0.85	5.4	
Regional Vitality Index	112.3	111	121.3	109.5	123.8	

Table 2. Studied indicators forecasting for 2020 at county level

Transport infrastructure:				I	
Density of highways – length of highways per $\frac{2}{3}$	0	0.02	0.022	0.02	0.022
km ²					
Density of railways – length of total railway	0.013	0.017	0.017	0.017	0.017
network per km ²					
Water transport – freight transferred through ports	5011.6	8624	17162	7624	19662
in the region per 1,000 inhabitants	5011.0	0021	17102	7024	17002
Accessibility of water ports (share of region area	100	100	100	100	100
accessible from ports within a 60-km radius, %)	100	100	100	100	100
TEN T airports accessibility (%)	78.7	79.1	79.3	79.1	79.3
Technical Infrastructure:					
Electric energy supply	99.2	99.9	100.1	99.98	100.1
Natural gas supply	4.91	21.2	25.7	21.2	25.7
Drinking sater Supply	70	80.9	82.96	80.9	82.96
Wastewater treatment	10.3	33.83	53.68	31.83	59.68
Broadband internet	39.9	72.1	82.8	72.1	82.8
Renewable energy production	0.054	2.68	3.7	3.98	9.2
Economy:					
Regional GDP per capita in PPS as a share of EU	22.0	455	56.0	4.4	50.0
27(25) average (%)	33.9	45.5	56.9	44	59.9
Labour force participation rate (%)	54.5	58.1	62.3	57.7	64.8
Unemployment rate in region (%)	4.4	3.39	6.48	3	7.48
Number of employed in tertiary branch (%)	37.7	43.96	50.25	43.6	52.8
Share of college and secondary school educated	50	5 1 0		51.0	57.2
inhabitants	52 51.8		55.5	51.6	57.3
Tourism - average guest nights	1.82	5.72	7.71	4.22	9.21
Tourism - foreign visitors	69.8	73.57	75.71	73.07	84.7

ANTONIO VALENTIN TACHE, OANA POPESCU and ALEXANDRU-IONUŢ PETRIŞOR

OPPORTUNITIES

- Valorising the natural richness, high potential for tourism development, using the natural, cultural, historical and archaeological heritage
- High potential for the sea and river transport development
- Projects for the construction of new airports and Danube bridges
- Possibilities to extend the inexpensive electric and thermal energy from unconventional sources (wind, solar, biomass) and to attract massive investments in renewable energy
- Supporting and promoting the fishy potential and the wine farms

THREATS

- Un-controlled tourism and poaching
- Migration of young specialists towards more developed regions and abroad
- Risk of isolation towards the major transport terrestrial arteries (lack of highways, express roads, Danube bridges)
- High water pollution risk (the wastewater is flowing directly into the Danube)
- Economic crises which increases the poverty and emphasizes the development of black and grey economy

Socio-economic scenarios based on the SWOT analysis and the forecasting methodology for the Sub-region Romania-Ukraine-Republic of Moldova

Optimistic

The major urban agglomerations will develop, using their favourable positioning on the Danube River and their link with the Black Sea. The cities of Galați and Brăila, two major urban development poles, will create the Cantemir metropolitan area in the next years. In addition, smaller

settlement agglomerations will be developed in the Moldavian part. There will be an improvement of the living conditions by applying for funds under the programs regarding the rehabilitation of heating systems in public dwellings or the incentive programs to increase the housing stock, especially for young persons, with private and national funds.

One of the region's potential is represented by its high education institutes. The human resource potential of the sub-region will be used, especially its (relatively) high workforce qualification. The specific professional skills of the population and the (relatively) cheap workforce will be used in the development of marine economy, fishing, wineries, rice, and vegetable production.

The main advantage of the region is represented by its high potential for river transport development and by its ports (Tulcea, Sulina, Reni, and Giurgiuleşti) that may allow the traffic of goods to be switched from road to fluvial transport. The development of the Danube ports (e.g. development of ship construction in the Kiliya dockyard, or development of the Izmail shipyard) and the implementation of the EU's Danube Strategy will increase the economic development of this sub-region. The presence of free zones (e.g. the Free International Port of Giurgiuleşti) will increase the number of foreign investments.

The Danube-Black Sea Deep-Water Navigation Canal (via Bystroye canal) will be available and because of the increased interest and funding for programs related to the Danube tourism development, new tourist mini-ports and cruises will be developed. Logistic centres or combined transport terminals will be created, as well as new ferry connections. The infrastructure for a new border crossing point Isaccea (Romania)-Orlovca (Ukraine) will be achieved.

The transport infrastructure of the sub-region will be improved by materializing projects such as the construction of a bridge on the Danube linking Brăila and Galați counties with Tulcea county or the creation of the marine port in Kiliya district. The airports in the region (Tulcea and Cahul) will be modernized and a new airport in Brăila-Galați metropolitan area, that will include also a highway, will be constructed. Local roads and railroads will be modernized (including the railway connection Odessa-Izmail) or built (Izmail-Reni railway). The railways of national and regional importance located in the Moldavian Danube Area will give an impulse in its economic development.

Wastewater treatment stations will be modernized and new water treatment stations will be built. Not only the gas network will be extended, but also the inexpensive electric and thermal energy coming from unconventional renewable sources (wind, solar, biomass), especially in Dobrogea Region and in the Southern region of Moldova, attracting massive investments in valorising renewable energy to support wine-growing farms by new technologies and brands promoting.

Since the natural offer of the region is stimulating the development of agriculture as basic economic function, the concentration of agricultural lands, the implementation of modern technologies and the use of irrigation systems will increase the agricultural productivity. Organic farming will be enlarged and vegetable processing and wine industries will be expanded in some parts of the region (e.g. in Kiliya and Izmail districts). The high fish potential will lead to the development of aquaculture. In some areas (Reni district), sheep breeding and further wool and leather processing industry will be enlarged. Local, traditional food products will be promoted by the development of small-scale business in the field of animal processing and new processing industry centres for the production of final agricultural products will be created.

The extension of protected areas, together with a sustainable valorisation of the valuable natural ecosystems and unexploited natural areas will represent the premises for a green tourism in the area and for establishing a tri-lateral (RO-UA-MD) Biosphere Reserve. By exploiting the very important tourist potential of the region and by attracting important international tourism operators, the tourism on the Danube will develop. By using the European funds from the Romania-Moldova-Ukraine Program, the economic development of the RMU sub-region will increase.

Pessimistic

In this scenario, soil and coastal area erosion will aggravate. The natural risks (acid rains affecting forests, floods, seismic risk, landslides, the "deserted land" phenomena, siltation, and degradation of the Danube branches) will increase unless the necessary prevention measures are taken.

ANTONIO VALENTIN TACHE, OANA POPESCU and ALEXANDRU-IONUŢ PETRIŞOR

Men-made accidents will occur: accidents at ports, oil terminals and water transport, accidental pollutions. The uncontrolled development of economic environment will have negative impact upon the natural environment, like the extension of the naval traffic in the Danube Delta, poaching and excessive fishing, overexploitation of the living natural resources, habitat reduction and fragmentation due to urbanization processes together with dropping of green spaces in urban areas. Because of the economic activities and industrial fishing, the Black Sea ecosystems will be damaged progressively, endangering maritime flora and fauna species.

The lack of funds for the improvement of social conditions will lead to the deterioration of social and public infrastructure. There will be a decrease in population number, depopulation of settlements, population ageing and a high rate of settlements having less than 2,000 inhabitants.

The low labour motivation, decline in specific labour skills and long-time unemployment will increase the migration of young people and the qualified labour force towards developed countries. Poverty will increase.

In case of insufficient financial sources for transport and technical infrastructure development and of insufficient absorption of the EU funds, the risk of isolation from the major transport terrestrial arteries will grow (Dobrin M., Niţu M., 2009) because of the lack of bridges, highways, express roads.

The peripheral location of the sub-region, its transport and communication isolation due to poor development of the regional and national transport network (as in Reni or Kiliya districts), the lack of Pan-European corridors and TEN-T roads passing through the territory of the Moldavian Danube Area will decelerate the economic development of RMU sub-region.

The deterioration of the traffic on the Sulina channel will continue because of the alluvium deposits and bank degradation, as well as the decline in transit cargo flows through the Ukrainian Danube Region, emphasizing the unstable operation of the Danube-Black Sea Deep-Water Navigation Canal (via Bystroye canal).

Financial funds for the improvement of the electric energy and gas networks will be insufficient, affecting especially the Moldavian Danube Area, since here, the energy sector is highly dependent on external factors.

The long economic crises will affect the living standards (GDP/inhabitant), increasing poverty in the region and the development of black and gray economy.

The region will continue to face a low agricultural productivity and an ineffective agriculture. Soil contamination and degradation in the Ukrainian part of the region will increase. The low motivation for building up the effectiveness of land use for private landowners in Kilia and Reni districts will continue.

Globalization, together with the deindustrialization process, will lead to the disappearing of some traditional sectors (textile and light industries, manufacturing). Some parts of the sub-region will know the same dependence on external markets since a poor development of their internal markets will occur.

The region will have a descendant trend of foreign investments and a decreasing number in foreign companies due to low investments and new technologies achievement, due to an increase of disloyal concurrence and to a high level of corruption. The poor quality of tourism services and the degradation of social infrastructure will be constraints for an effective tourism development. Thus, tourism attractions will not attract significant external investments.

Realistic

In the realistic scenario, the natural or men-made risks will be diminished by applying several preventing measures, but most of them will still occur. The quality of water bodies will not be significantly improved and due to climate change, there will be some changes in water management. The Danube Delta and the Black Sea will be still affected by economic activities and industrial fishing, by the naval traffic, poaching and excessive fishing. However, tourism will continue to develop here, valorising the new unexploited areas. New protected areas will be declared in some parts of the sub-region, especially where they are not yet officially recognized (e.g. in the Ukrainian part)

and the management of the existing protected areas will be improved. Tourism will continue to endanger these areas.

In the realistic scenario, the expansion of the built-up areas and the loss of agricultural land will be balanced. Due to the natural offer, agriculture will continue to be the basic economic function of the region, with a better productivity based on new technologies and using the irrigation systems. Fishing and aquaculture will have an ascendant trend, as well as the ecological agriculture. Organic products will be obtained and the existent renewable energy resources will be more and more valorised (natural biomass and agricultural waste, solar and wind energy).

There will be a gradual decrease in emissions due to legislative measures and the obsolete industrial technologies will be upgraded. Waste production will be kept at its present level, waste management will be improved, the non-conforming landfills will be closed and replaced with new ecological waste dumps. Selective waste disposal and waste recovery will take place in few localities.

The urban system Galați-Brăila will represent a development pole, but the Cantemir metropolitan area might not be created. In Moldova, development will occur around the three major agglomerations in the Danube area, but the number of settlements with less than 2000 inhabitants will not decrease. The number of population will continue to decrease. Poverty will persist for a certain range of disadvantaged groups.

The realistic scenario operates with the assumption that all transport networks will be constructed in line with the proposed planning; however, not all transport-related constructions will be fully accomplished, as originally conceived within the 2030 time horizon. The high potential for the river transport development will be used and projects aiming at the improvement of transport accessibility will be in course. Railway network is assumed to undergo only a reconstruction of its currently present lines.

The gas network will be improved, but it will not have a very large extension, especially in rural areas. Since the region has an important potential of renewable sources, the energy coming from these sources will have a larger extent, especially in Dobrogea Region and in the Southern region of Moldova.

The economic potential of RMU sub-region will continue to be concentrated in its centres. The economic crises will affect the living standards (GDP/inhabitant), which will increase with only about 25% in the region. The black and gray economy will not disappear.

The presence of ports and free zones will enhance the economic development of the region in all its components and the number of foreign investments will increase.

The unemployment rate will be stagnant or even will have an ascendant trend (up to 25%), but the migration of the qualified labour force to developed countries will continue, as well as the illegal cross-border flows of goods.

The tourist potential of the region will be exploited and biodiversity valorised, but important tourist operators will be still not very involved in developing the tourism on the Danube and the tourism attractions will not attract significant external investments. The poor quality of services and the low social infrastructure will remain a constraint for an effective tourism development.

CONCLUSIONS

Border strategies should focus on results. Closer countries adjacent to the Danube will allow more efficient exploitation of the existing policies and funding. Although the Danube countries have different priorities, the cross-border cooperation areas will play an important role in strengthening the territorial cohesion and the Danube region strategy should be seen as a working method to increase efficiency and results.

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