TICAD

Tisa Catchment Area Development

NATIONAL STUDY
Serbia

1st Draft

October 2010, Novi Sad

Content

INTRODUCTION

In March 2001, after two significant waves of pollution that arrived from Romania and spread along the Tisza river and certain streams in its drainage system and caused ecological disaster, the decision of the Ministerial Committee of the European Council asked the concerned states (Hungary, Romania, Serbia and Montenegro, Slovakia and Ukraine) to cooperate in order to prevent cases similar to the disasters affecting the Tisza and Szamos rivers, including the potential elaboration of an agreement under the auspices of the European Council.

The five countries situated in the Tisza river basin agreed with the appeal and undertook cooperation in this issue. With the active participation of the European Council, the "Expert Group" of experts delegated by the above countries as well as other international organisations concerned prepared the basic document of cooperation entitled "Initiative on Sustainable Spatial Development of the Tisza River Basin", which the five countries concerned adopted unanimously.

With signing the "Initiative", joint work started, for the extension and synthesised continuation of which the responsible ministries and planning institutes of the partner states submitted a successful application to the **South-East Europe Trans-national Cooperation Programme**. In June 2009 the implementation of the project started with at the kick-off meeting, with the cooperation 14 organisations from the five affected countries and the Tisza Group of the International Commission for the Protection of the Danube River (ICPDR).

The **aim of the Tisza Catchment Area Development** – TICAD – **trans-national project** is to contribute to the harmonisation of the integrated territorial developments implemented in the river basin, to facilitate the creation of a sustainable economic structure, the optimal utilisation of natural and cultural resources, the development of areas of competitive growth and to promote the establishment of the internal and external functional interdependencies of the network of settlements.

Within the framework of the project the partners will elaborate a common methodology, on the basis of which they will prepare the analysis of territorial processes, develop trans-national complex development strategy and formulate common policy resolutions. In the course of this work they will create a forum for international cooperation for planners and decision-makers and ensure publicity.

The present document is the **territorial analysis of the Serbian national catchment area,** elaborated on the basis of a unified and accepted methodology which, together with the Slovakian, Hungarian, Ukrainian and Romanian national examinations forms the basis of a common territorial analysis on water-basin level.

1. International and national development trends influencing the development of the river basin

1.1. International development trends, the most important development documents of the EU

European spatial development directives

The 1990's represented a period of development, growth and prosperity in the life of the European Union. Economic development, strengthening integration and territorial enlargement resulted in the reassessment of development policy and foregrounding the need for *territorial cohesion*.

European Spatial Development Perspective (ESDP)

The ESDP is a common document of the ministers responsible for spatial development of the member states and the Directorate General for Regional Policy of the European Commission, which contains jointly formulated and approved recommendations. Its approach and orientation, which is of decisive importance for European spatial planning and the development policy of the EU, can be summarised as follows:

The *value system of the ESDP* is based on the principle of *sustainable development*. Its determining factors are *understanding and managing responsible foresight and territorial interdependencies.*

Characteristics:

- Integrated (harmonising the aspects of environment, society and economy)
- Strategic (defines interlinked actions)
- Indicative (its implementation is the responsibility of member states and regions)

The topics of the sixty development policy recommendations formulated in the course of consultations and the exchange of opinions are the following:

- Polycentric spatial development and a new urban-rural relationship (balanced urban network, urban-rural relations)
- Parity of access to infrastructure and knowledge (transport, IT development)
- Wise management of the natural and cultural heritage (protection and utilisation of natural and cultural values)

CEMAT Guiding Principles

Following the development of the ESDP, the material entitled **"Guiding Principles for Sustainable Spatial Development of the European Continent" (CEMAT Guiding Principles**) was prepared and adopted at the *European Council Conference of Ministers Responsible of Spatial Development (CEMAT)* held in Hanover in 2000, which brought together representatives of the 47 member states. It agrees with the

ESDP in its approach, orientation and the system of its objectives. It takes a step forward with the designation types of *geographical areas* "requiring special treatment".

It highlights the following types of regions:

- cultural landscapes,
- urban areas,
- rural areas,
- coastal and island regions,
- mountains,
- floodplains and alluvial valleys,
- Eurocorridors,
- redundant industrial sites, deteriorated industrial areas
- border regions.

Both the ESDP and the CEMAT Guiding Principles outline the tasks which serve the practical enforcement of the formulated principles, and record the need for analyses which explore the territorial processes and the enforcement of the formulated spatial development principles.

A series of other work processes and materials affecting the future of the region were elaborated on the basis of the two main European documents containing spatial development principles.

Vision Planet

One of the series of works following the system of values of the ESDP – CEMAT principles is the Vision Planet project of 1998-2002, which belongs to the INTERREG II C CADSES (for Central Europe, Adriatic, Danubian and South Eastern Space, surrounded by Germany, Austria, Northern Italy and Greece) programme. The substantive aim of the project for elaborating the integrated spatial development strategy of the CADSES region was to initiate cooperation and joint work between the spatial planning and research experts of the former socialist countries and the EU member states, and to explore and analyse the fundamental territorial characteristics and qualities of the region.

The importance of the work is indicated by the fact that the CADSES region includes the entire territory of 13 European countries (Albania, Bosnia and Herzegovina, Bulgaria, the Czech Republic, Greece, Croatia, Yugoslavia, Hungary, Macedonia, Moldova, Romania, Slovakia and Slovenia), as well as part of the territory of five countries (Austria, Poland, Germany, Italy and Ukraine), including regions regarding which the European Union had only minimal knowledge. The situation report resulted in really useful information, and the joint work meant the start of actual professional cooperation.

Carpathian Euroregion VASICA

The *Carpathian Euroregion* was formed in 1993 with the participation of Poland, Hungary, Slovakian and Ukraine, and Romania joined the association in 1997. The status of Euroregion initially provided

a framework only for occasional bi- or trilateral cooperations along the border. Strategy development work on a regular basis evolved in the course of the INTERREG III B CADSES programme in 2000-2006. The aim of the Carpathians project was the sustainable development of the region based on the rich natural and cultural heritage, with the cooperation of 18 institutions from ten countries. Besides detailed and synthesised analyses and spatial development recommendations, a collection of maps and a four-language manual were prepared for local governments and investors. The summary document entitled *VASICA (Visions and Strategies for the Carpathian Area* was presented and discussed in 2008 at the Vienna conference on the strategy for the Carpathian region.

In May 2003 in Kiev the *Czech, Hungarian, Polish, Romanian, Serbian, Slovakian and Ukrainian ministers responsible for spatial development* signed a *Framework Agreement* on the protection and sustainable development of the values of the region.

Sustainable development of the Tisza Region

The creation of the CEMAT Initiative is discussed in the Introduction.

The agreement entitled Sustainable Spatial Development of the Tisza Region was presented at the 13th Session of the CEMAT.

The spatial development cooperation agreement set the following objectives:

- balanced social and economic development, improved competitiveness, promoting territorial cohesion;
- development generated by urban functions, the relationship between the town and the countryside
- promoting accessibility;
- reducing environmental damage;
- enhancing and protecting natural resources and the natural heritage;
- enhancing the cultural heritage as a factor for development;
- developing energy resources, maintaining safety;
- encouraging high quality, sustainable tourism;
- limitation of the impact of natural disasters by preventive measures.

The following were set as basic conditions within the framework of the strategy to be developed:

- the protection of the landscape and fragile ecosystems,
  - water systems management in the course of spatial planning, the conservation of streams and lakes, limitation of the areas which can be occupied by urban expansion and intensive agriculture, flood protection;
- promoting territorial cohesion
  - (balanced territorial management, urban functions, urban-rural relationship, accessibility and access to information and knowledge), conservation of the natural and cultural heritage,

encouraging high quality and sustainable tourism, the development of energy resources while maintaining safety;

- identifying the most efficient instruments of funding the programmes and projects for the sustainable development of the Tisza river basin, especially by involving international organisations and funds.

Bilateral cooperation started on the basis of the CEMAT initiative, and the present TICAD project is an expansion and synthesised continuation of these.

Interlude

The millennium brought a new perspective as well as new considerations and tasks for the European Union. These did not evolve as a result of a new turn, but manifested themselves following known antecedents, with a increased emphasis.

The message of the 1992 UN World Conference, the principle of sustainable development and the Agenda 21 predominated the development policy of the European Union in the 1990's in a perceptible manner. However, during the preparation for the new World Conference of 2002, it seemed advisable to publish an own sustainable development document for the EU. This is the so-called **Gothenburg Strategy of 2000** on the sustainable development of the EU.

The other emphatic topic, which also influenced the preparation of the UN World Conference, was *globalisation,* and the need for the *international – global – competitiveness* of the EU. The European Union's answer to this is elaborated in the **Lisbon Strategy**, also adopted in 2000**.** The document sets the daring and categorical objective of that the European Union *should become the leading knowledge-based economy in the world, outstanding in the field of productivity, research – development – innovation and full employment*.

The Territorial Agenda of the EU

With the accession of ten, then another two member states (and thus with increasing disparities in territorial development) and as a result of the change in circumstances and research due to other factors (climate change, an ageing population, globalisation, etc.), improved and better-founded knowledge of the situation of the European Union offered reasons and opportunities for the rethinking and complementation of the spatial development principles set in the ESDP, and the elaboration of new European spatial development directives based on the principles of the ESDP.

Two significant spatial development documents were discussed and adopted at the consultation of the ministers responsible for spatial development of the European Union and the representatives of the European Commission, held in Leipzig in May 2007. One background material which offers an extended analysis of the present situation and an

exploration of the expected future is entitled **"Territorial State and Perspectives of the European Union"**. The other is the **Territorial Agenda of the European Union.**

The document records the *main challenges* facing the European Union. Due to the change in the situation the scope of these is larger and the tension is more acute then at the time of development of the ESDP in the 1990's.

The challenges recorded by the material are the following:

- the geographical concentration of the population and the economy, the falling behind of internal and external peripheral areas,
- ageing and migration
- climate change
- loss of biodiversity
- increasing environmental and technological risks
- the scarcity of energy resources, rising energy prices
- increasing global competition.

As an answer to the challenges for the implementation of the principles of sustainable development, competitiveness and territorial cohesion, the material defines strategic objectives grouped in the following categories:

- Polycentric development of urban areas and urban networks
- Strengthening the urban – rural partnership
- Development of trans-national competitive and innovative regional clusters (international territorial cooperation in the creation and operation of interconnected, competitive, innovative research – education – production – commercial units)
- Strengthening of trans-European technological (transport, communication, information technology, energy) networks
- Trans-European risk management (prevention of technological and natural disasters within the framework of international cooperation)
- The protection and utilisation of ecological structures and cultural resources.

The directives lay an even greater emphasis than before on the following:

- The aspects of globalisation (advantages, disadvantages, requirements)
- The disparities of the expanded territory of the European Union
- The priority of developing a knowledge-based economy.

During the formulation of the priorities of the Territorial Agenda the designation of types of geographical regions was also carried out (*integrated development of coastal zones, maritime and river basins and mountainous areas). In this way, the Territorial Agenda of the European Union also provides a framework for the integrated territorial strategy of the Tisza region*. The TICAD project and its continuation can be joined with the current development process of the Strategy for the Danube Region.

Directives for the protection of natural resources

The so-called principle of sustainable development, which ensures the preservation of natural resources for the future generations, requires the integration of environmental protection in the field of water management as well. The principle of sustainable water management means that it is important to create a balance between satisfying social needs and demands and preserving the quality and quantity of water as an environmental value.

Water management

Water Framework Directive

European legislation regarding water has been continuous since 1975. More than a dozen different directives had been developed by 1995 in order to prevent water pollution. In spite of the fact that in some cases the quality of water has improved, a lot of problems and tasks to be solved have arisen, which prompted the rethinking of the regulations. In 1997 agreement was born regarding the need to create a new regulation providing a framework for the earlier legal norms, in order to ensure the consistency and appropriateness of the water policy of the Community. This led to the creation of the new water policy of the European Union and the ***Water Framework Directive*** 2000/60/EC *"establishing a framework for Community action in the field of water policy"*, which serves its implementation. The exact date of its adoption is 23 October 2000, and it came into force on 22 December 2000. The Water Framework Directive (WFD) is the most important instrument for enforcing the new water policy of the EC. According to its provisions, the condition of all surface and underground waters has to be improved in the member states of the European Union by 2015, and the sustainability of this improved condition has to be ensured.

The Framework Directive covers all water bodies of the Community (inland surface waters, transitional waters, coastal waters and groundwater), its aim is the improvement of water quality and achieving the good condition of all waters by 2015.

In the case of surface waters (e.g. rivers, lakes, etc.) good condition means both the ecological and chemical status of the water. Ecological status depends on the condition of the ecosystem of the water, while chemical water quality is determined by the concentration of certain pollutants. A surface water body can be considered of good condition if the above parameters show only slight divergence compared to the natural condition. In the case of groundwater the monitoring of certain parameters (oxygen, pH, conductivity, nitrates) is compulsory. The quantity of groundwater is also very important: it has to be known how much water can be extracted from a given source, and how long it takes for the water base to recharge in natural conditions. Thus the good

condition of groundwater means that neither the extent of water extraction nor the level of pollution causes a problem.

If the concentration of a pollutant resulting from human activity significantly and continuously rises, the member state concerned is obliged to take steps in order to arrest and reverse the process. As a result of the above and the strict monitoring regulations, the directive will presumably have a beneficial effect on wetlands and other types of habitats in the case of both surface waters and groundwater.

Floods Directive

Directive 2007/60/EC of the European Parliament and of the Council *on the assessment and management of flood risks* aims to reduce and manage the risks floods pose to human health, the environment, infrastructure and property. The directive requires that the management of flood risks be discussed across national borders, and promotes commitment to improving transparency and involving the citizens. The directive prescribes the execution of four tasks for the member states (as well as those countries which adopt and wish to implement the considerations of the directive):

- preliminary flood risk assessment by 2011,
- the preparation of flood hazard maps and
- flood risk maps by 2013, as well as
- flood risk management plans by 2015.

The directive obliges member states to harmonise their activities with those member states and countries outside the Union with which they share a river basin, and requires them not to implement any measures which could increase flood risk outside their territory, except if agreements with the countries concerned are in place regarding these measures.

ICPDR International Commission for the Protection of the Danube River

The **International Commission for the Protection of the Danube River** was established by 13 countries (Germany; Austria; the Czech Republic; Slovakia; Hungary; Slovenia; Croatia; Serbia-Montenegro; Bosnia and Herzegovina, Bulgaria; Romania; Moldova and Ukraine) and the European Union as contracting parties, with its headquarters in Vienna, in order to coordinate the implementation of the **Danube River Protection Convention**. The **Danube River Protection Convention**, signed in 1994 by representatives of the eleven countries along the Danube, came into force in 1998. Its aim is the protection of the Danube River and its entire river basin against pollution and damaging effects, and its sustainable utilisation. The task of the Commission is to support the creation of a river basin management plan covering the entire

basin and meeting the requirements of the EU Water Framework Directive.

Besides the examination, assessment and planning tasks related to the Danube river basin, the ICPDR also assumes an active role in the sub-territories (Tisza, Dráva, Száva basins, Danube Delta).

At the meeting of the ministers of the ICPDR countries in December 2004, the ministers and the high-ranking representatives of the Tisza countries signed a memorandum on preparing the Tisza river basin management plan ensuring the sustainable development of the region. The ICPDR established the **Tisza Group** to coordinate the task, whose main responsibility connected to the international, national and regional activities affecting the Tisza river basin is the strengthening of coordination and the exchange of information, in order to ensure the harmonisation and efficiency of these activities. The countries of the Tisza Group agreed to prepare by 2009 the Tisza river basin management plan, which integrates the issues related to water quality, water quantity, landscape and water management, flood protection and droughts. By 2007 the situation report of the Tisza river basin was prepared, which analyses the main environmental and water management problems in the context of water quality and quantity.

Environmental protection

Natura 2000

The network of **Natura 2000** sites was created by the European Union for the protection of the biological diversity, the remaining natural habitats and the wild species of animals and plants of the member states. The Natura 2000 network of the European Union is formed by two types of interconnected protected areas:

Special Protection Areas – SPA

These are designated by the member states on the basis of the provisions of the Birds Directive (79/409/EEC), adopted in the countries of the European Union in 1979. This group of protected areas was created for the protection of rare and endangered species of wild birds and their habitats. The member states designate the areas on the basis of the incidence of species listed in Annex I of the Birds Directive, requiring the implementation of special measures, as well as of migratory species.

Special Areas of Conservation – SAC

These are constituted by areas designated on the basis of the Habitats Directive (92/43/ECC) of the European Union, adopted in 1992, which the Union considers worthy of protection. The Habitats Directive serves the protection of all species of animals and plants occurring in natural conditions on the territory of the member states, with the exception of bird species, as well as the protection of their natural habitats. Special Areas of Conservation are designated on the basis of Annexes I (Natural habitat types of Community interest) and II (Animal

and plant species of Community interest) of the Habitats Directive. The Habitats Directive clearly states that the designation of Natura 2000 areas does not aim to arrest economic development or to create closed reservations. The designation of an area as part of the Natura 2000 network does not mean the restriction of human activities if they are sustainable from an environmental point of view and do not endanger the area, the unity of the habitats found in the area, or the species protection objectives regarding the area.

Member states are obliged to create management plans for the protection of the Natura 2000 areas, and to implement the measures contained therein.

Tasks in the Natura 2000 network areas:

- Preparation of a management plan for the purposes of environmental protection
- To ensure the continuous supervision (monitoring) of the condition of Natura 2000 areas and the natural values of the areas
- The basic data of Natura 2000 areas have to be stored in a computer database, and information services based on this have to be provided to interested professionals and the general public
- The authorities and population of the designated areas have to be widely informed about the opportunities, benefits and obligations resulting from the designation
- The objectives of the Natura 2000 network have to be included in education
- Special attention has to be accorded to the presentation of Natura 2000 sites
- Regional development plans and programmes have to be subjected to strategic impact assessment (SIA) in order to ensure the opportunity to prevent negative impacts and include environmental aspects in the early stages of planning.
- Environmental impact assessment (EIA) has to be prepared in order to reveal the possible impacts on the environment of all future activities planned in the Natura 2000 areas or their immediate surroundings.

European Landscape Convention

The document, which was created in 2000 after long preparation, was/is individually ratified by the parliaments of the countries of the European Council (Hungary signed, then ratified it in 2005.) The European Landscape Convention laid the foundations of the unified examination, assessment, qualification and protection system of European landscapes.

The Landscape Convention represents a paradigm shift compared to the traditional reservation approach to protection. The scope of the adopted convention covers "landscapes that might be considered outstanding as well as everyday or degraded landscapes". It "applies to the entire territory of the parties, and covers natural, rural, urban and

peri-urban areas". It does not treat and interpret landscape separately by sectors, but in its complex unity.

One of its most important observations is that landscapes are "an essential component of people's surroundings, an expression of the diversity of their shared cultural and natural heritage, and a foundation of their identity". The entire document focuses on the determining effect on landscape of the cultural and natural heritage, and on the trinity of protection, management and planning.

The designated tasks of the signatory member states include increasing the awareness of society of the issue, the training of professionals specialised in assessing and operating the landscapes, the identification of landscapes, taking notes of the changes in landscapes, analysing the characteristics of landscapes, the preparation of landscape character assessments, the integration of the concept of landscape in regional and town planning policies, as well as in cultural, environmental, agricultural, social and other economic programmes and plans.

1.2. The most important Serbian development measures affecting the Tisza Catchment Area

During the recent couple of years, a large number of laws, by-laws and strategies were passed, dealing with the subject of territory in a direct or indirect manner. An entire series of acts regulates environmental protection, tourism, sustainable and regional development of the area, water management and protection, traffic development and similar. We shall name some of the acts:

- The RS Spatial Development Strategy until 2020 – Programme (The RS Official Gazette no. 119/2008)
- Republic of Serbia Integrated Border Management Strategy (The RS Official Gazette no. 11/06)
- Development Strategy for Railway, Road, Water, Air and Intermodal Transport in the Republic of Serbia from 2008 to 2015(The RS Official Gazette no. 4/08)
- Republic of Serbia Regional Development Strategy for the 2007-2012 period (The RS Official Gazette no. 21/07)
- Republic of Serbia Tourism Development Strategy (The RS Official Gazette no. 91/06)
- Tourism Development Strategy of Vojvodina - Tourism Marketing Strategy of Vojvodina (The APV Official Gazette no. 6/10)
- Water Supply and Water Protection Strategy in AP Vojvodina (The APV Official Gazette no. 1/10)

There is a large number of municipal spatial plans in the subject territory, some of which have been adopted and some are still in the development stage. Moreover, a large number of urban planning has also been adopted in the subject territory. An overview of the actual urban planning for the local self-government's units on the territory of AP

Vojvodina, within the scope of the Serbian Tisza Catchment Area, has been given by Counties:

Srednje banatska oblast:

- Municipality of Zitiste Spatial Plan
- Municipality of Zrenjanin Spatial Plan
- Municipality of Nova Crnja Spatial Plan
- Municipality of Secanj Spatial Plan

Severno banatska oblast:

- Municipality of Ada Spatial Plan
- Municipality of Kanjiza Spatial Plan (under development)
- Municipality of Kikinda Spatial Plan
- Municipality of Nova Knezevac Spatial Plan
- Municipality of Senta Spatial Plan
- Municipality of Coka Spatial Plan (under development)

Juzno backa oblast

- Municipality of Bac Spatial Plan
- Municipality of Backa Palanka Spatial Plan
- Municipality of Backi Petrovac Spatial Plan
- Municipality of Beocin Spatial Plan
- Municipality of Becej Spatial Plan
- Municipality of Vrbas Spatial Plan
- Municipality of Zabalj Spatial Plan until 2005
- Regional Spatial Plan of Novi Sad – Municipality of Sremski Karlovci Spatial Plan, the new Spatial Plan of Novi Sad is under development
- Municipality of Srbobran Spatial Plan (under development)
- Municipality of Sremski Karlovci Spatial Plan
- Municipality of Temerin Spatial Plan
- Municipality of Titel Spatial Plan.

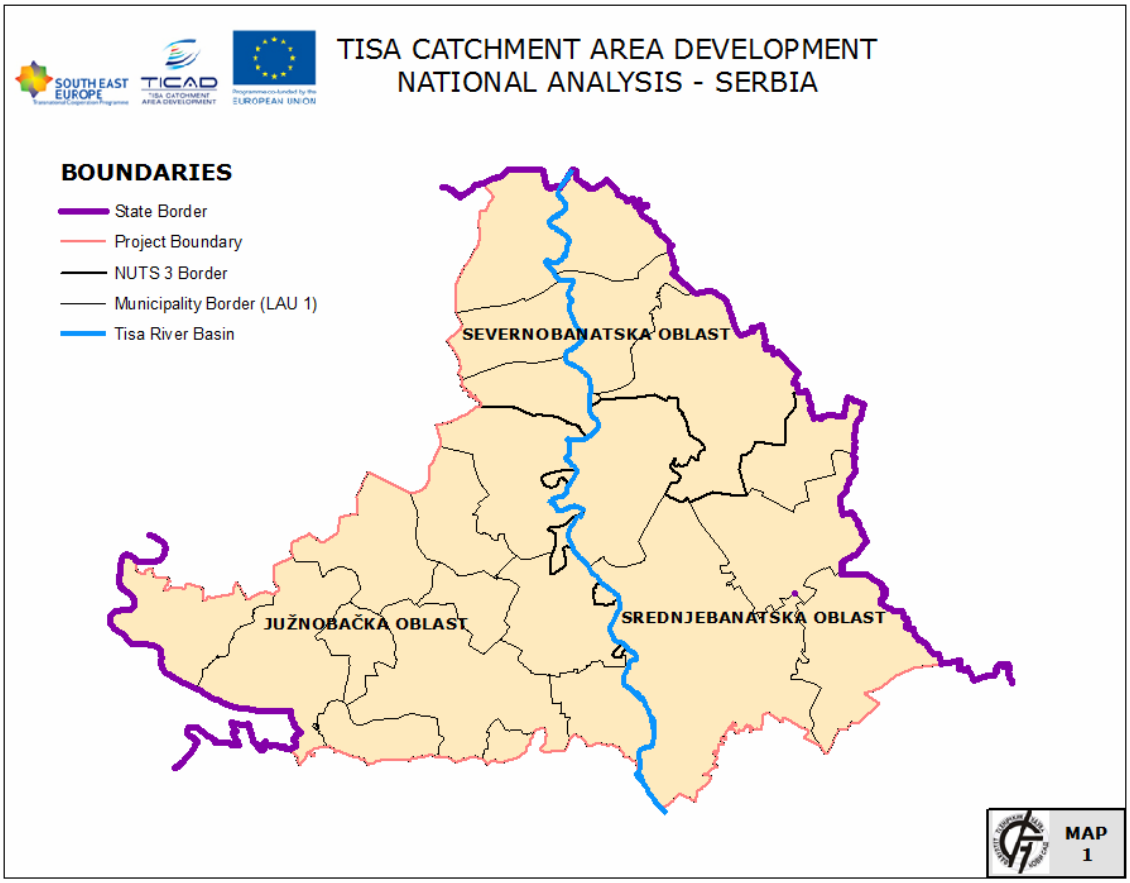
Municipal spatial plans, in addition to planning and construction policies, contain also measures and conditions of protection, planning, utilisation and development of natural systems and resources, and also principles, objectives and the development concept for the units of the local self-government, spatial development of traffic and infrastructure systems, protection of the environment, landscapes, natural and cultural heritage, as well as regional cooperation and functional connections with the surroundings.

2. Analyzed geographical area

The designation of the territory was made taking into account the following aspects:

- coverage of the entire natural Serbian Tisza Catchment Area;
- the boundaries of territory are consistent with the administrative boundaries so that all necessary statistical data are available;
- standardisation of the reference territorial level for all the countries involved in the elaboration and implementation of the TICAD project.

Picture 1. Serbian Tisza Catchment Area



In the case of Serbia, NUTS 3 was designated to be the reference territorial level, this level meeting the above mentioned principles. By including all territorial-administrative units located along the Tisa, 3 NUTS 3 regions (counties) were designated (Južnobačka oblast, Severnobanatska oblast i Srednjebanatska oblast), the administrative scalar level undergoing deviations for certain indicators at the level of local administrative-territorial units in order to highlight, in the most concise manner, certain indicators that are punctually rendered in space.

3. Territorial analysis of the region

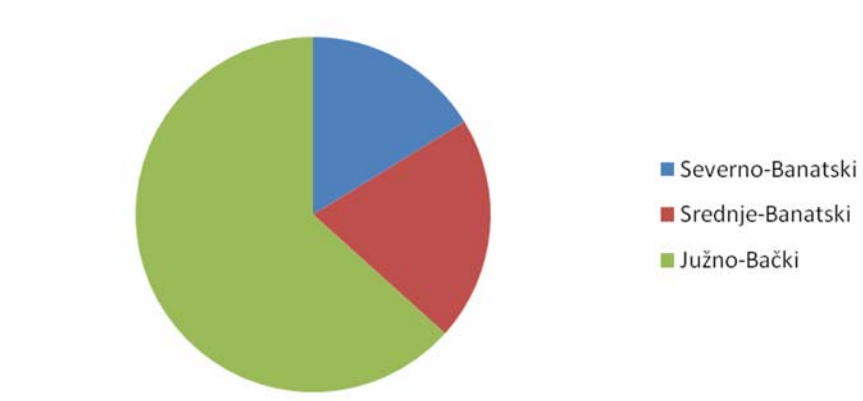
3.1. Survey of the region's social situation

3.1.1. Demographic situation

3.1.1.1. Population number

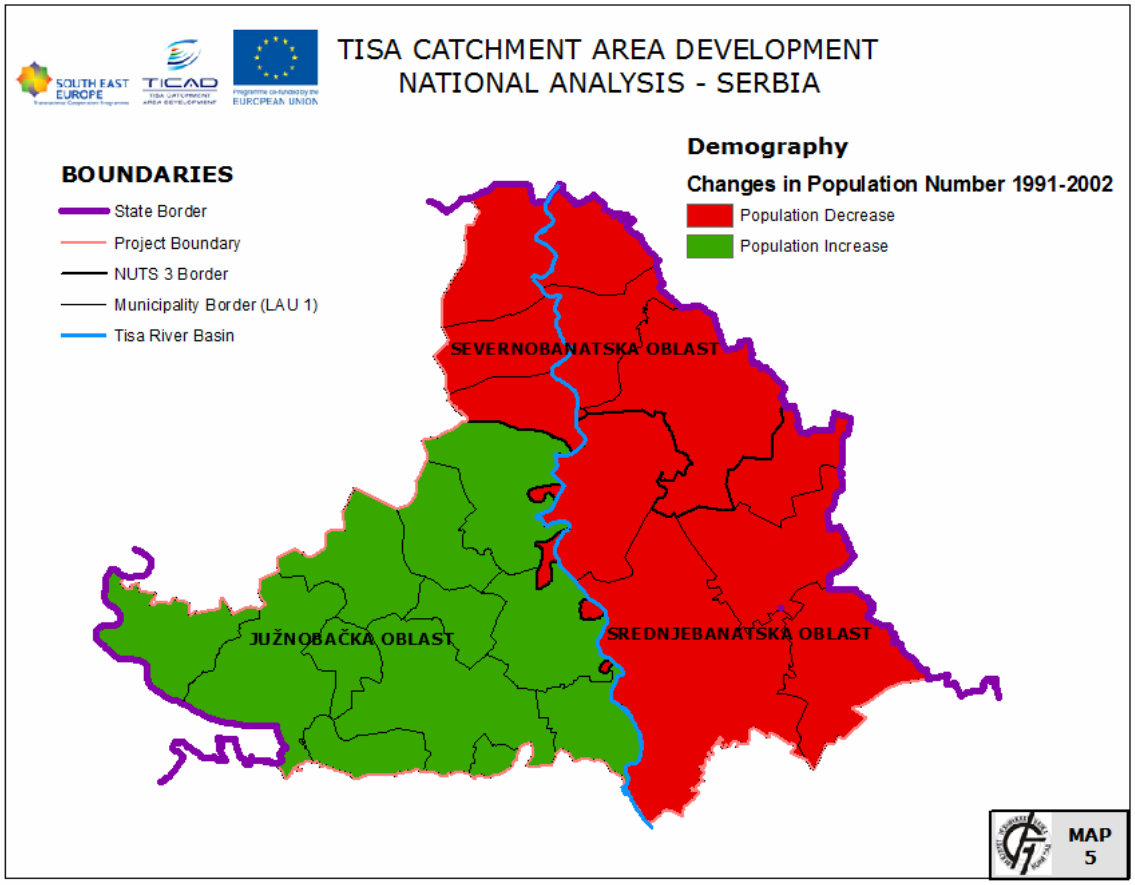
Serbian Tisza Catchment Area includes 3 counties in AP Vojvodina Juzna Backa, Severni Banat and Srednji Banat county. According to 2008 data, the population number in these three counties was 956297. Juzna Backa county has significantly higher concentration of population. It accounts 63.3% of total area population (Srednji Banat 20.4% and Severni Banat 16.3%).

Picture 2. Share of NUTS3 population number in total number od inhabitants (2008) in the Serbian Tisza Catchment Area



Population movement in 1991-2002 period had positive trend and the population increased for 3.2%. The increase of population was the consequence of population increase in Juzna Backa county while other two counties registered depopulation trend.

Picture 3. Changes in Population number 1991-2002 in the Serbian Tisza Catchment Area

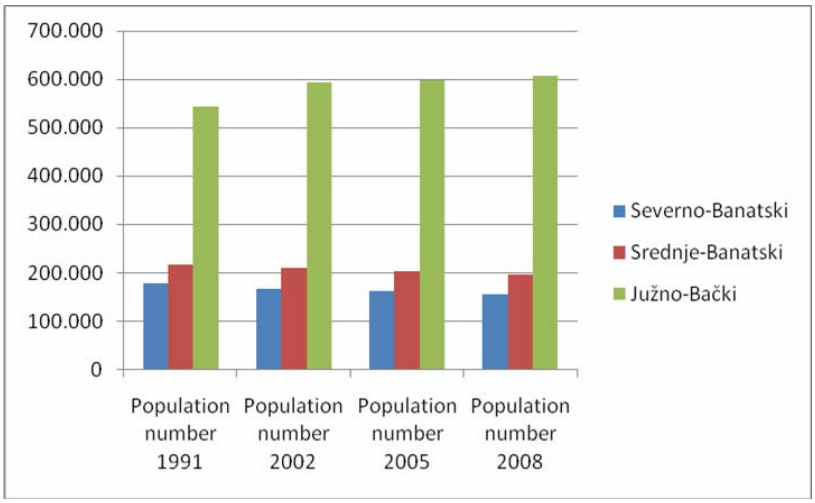


Total household number had the same changing pattern registering the increase of 5.2%. The increase of household number have increased in Juzna Backa county and dropped in other two counties.

These population tendencies and shrinking of average house hold size are direct consequence of family structure changes, lower birth rate and aging population.

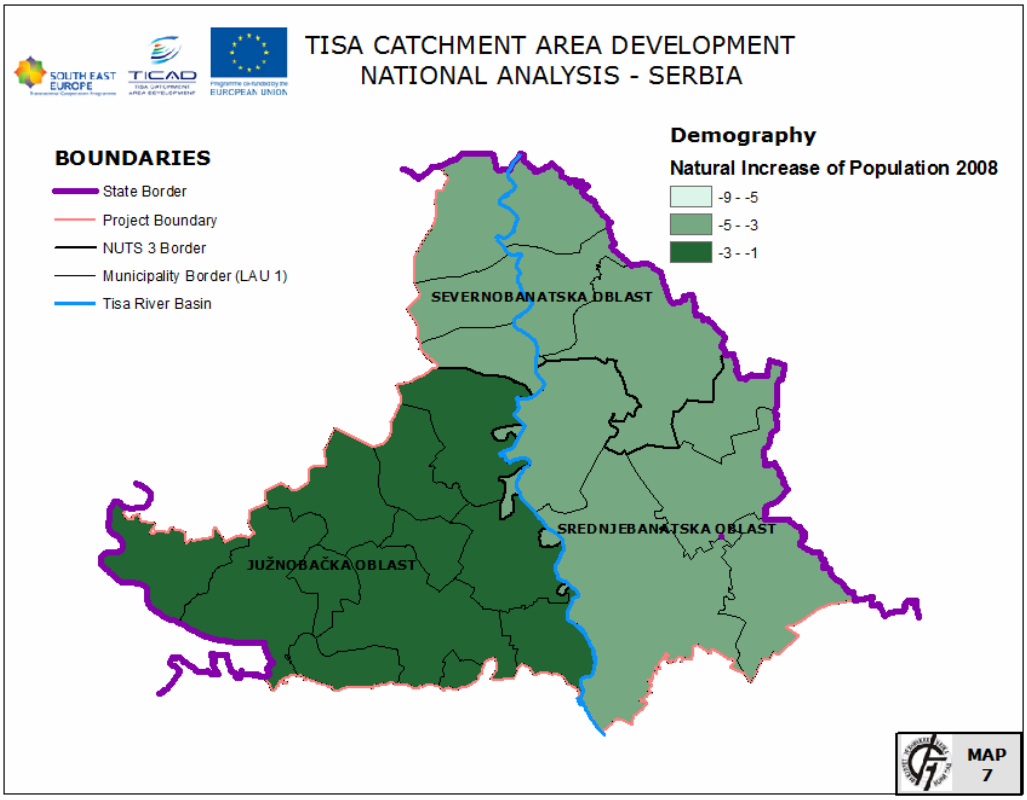
Increase in population has not been continued after 2002. Total population number decreased in 2002-2008 period for 11706 people (1.2%).

Picture 4. Changes in population number (1991-2008) in Serbian Tisza Catchment Area



Depopulation a phenomenon is present in Severni Banat and Srednji Banat counties, but slightly increased in Juzna Backa county.

Picture 5. Natural increase od population 2008 in the Serbian Tisza Catchment Area



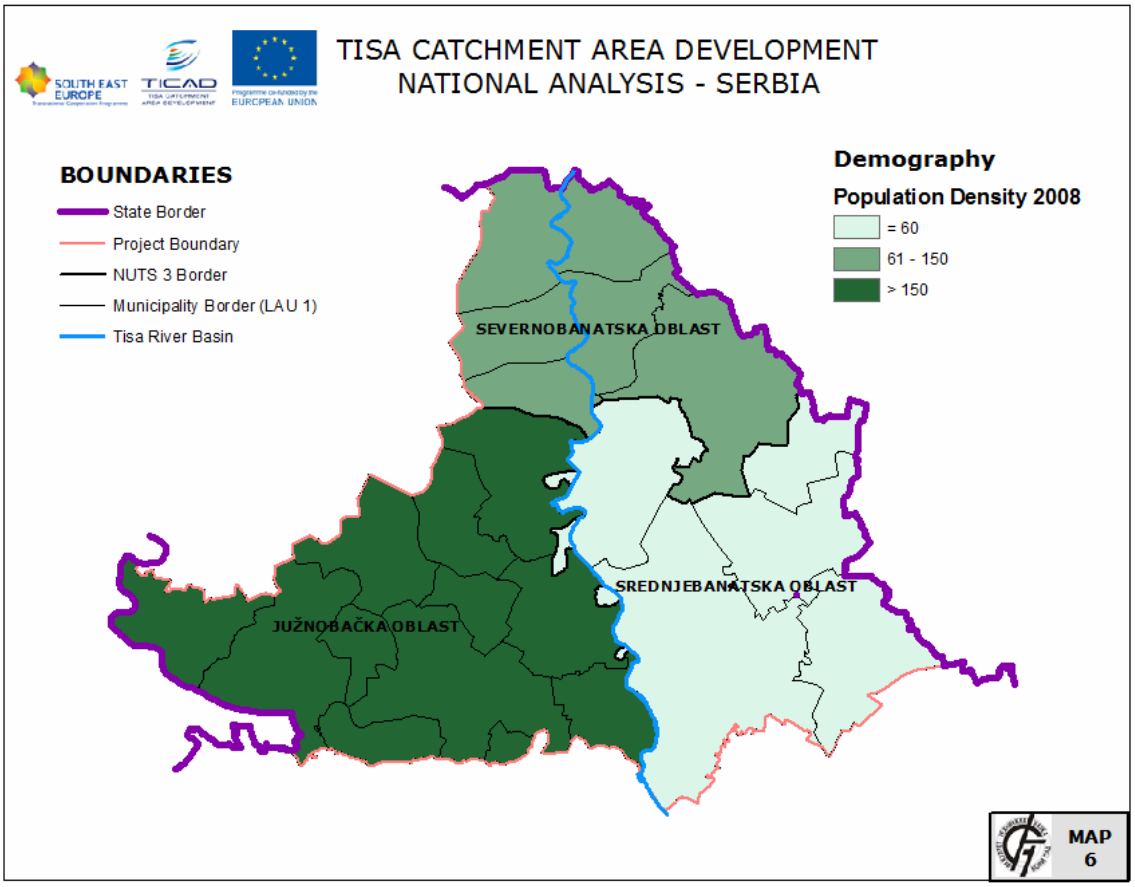
Demographic projections for 2021 are estimating that total population will drop for 5.2% in comparison to 2002. Depopulation will be registered in all counties. The lowest depopulation rate will occur in Juzna Backa county.

3.1.1.2. Population density

Average population density in the area measured in 2008 was 100 people per sq km which is slightly higher than the average for Vojvodina.

The population density in the area goes from as low as 60 people per sq km to 151 people per sq km. Juzna Backa county has the highest population density rate (151) while other regions have densities under the average. High density in Juzna Backa is the consequence of urban agglomeration of provincial capital Novi Sad. Comparing to previous periods, there is decrease in population densities in Severni and Srednji Banat counties.

Picture 6. Population density (2008) for the Serbian Tisza Catchment Area

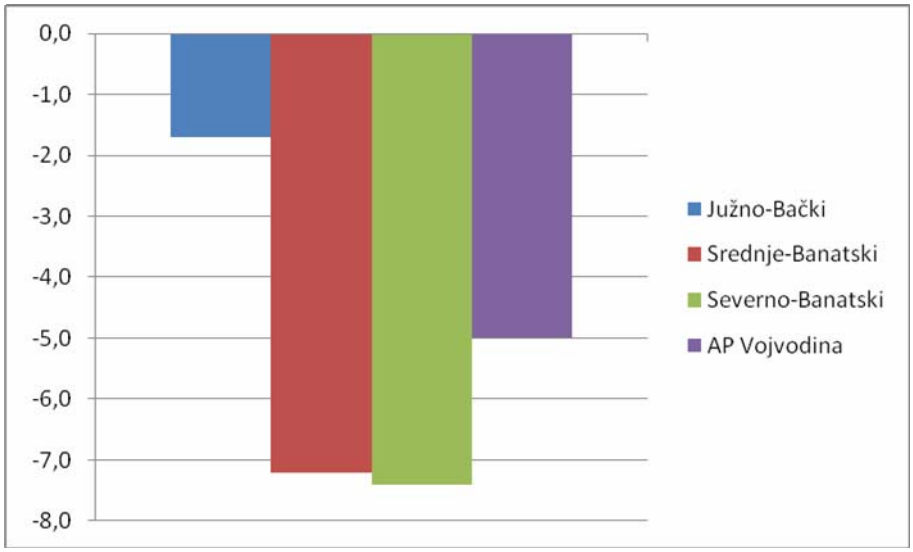


3.1.1.3. Demographic processes

Natural demographic tendencies show negative characteristics with the high mortality rate, low birth rate and negative population growth. Negative population growth affected all the regions in the plan area and negative trend increased in the 2002-2008 period.

In the observed period Juzna Backa and Srednji Banat counties minimally increased population while Severni Bant has negative birth rate. The population growth rate for the period 2002-2008 in the area was -1.7 ‰ (Juzna Backa), -7.2 ‰ (Srednji Banat), -7.4 ‰ (Severni Banat). Excluding Juzna Backa county the population growth rates in all other regions are lower that the average for Vojvodina (-5.00 ‰).

Picture 7. Natural increase/decrease of the population 2008 (‰) in Serbian Tisza Catchment Area

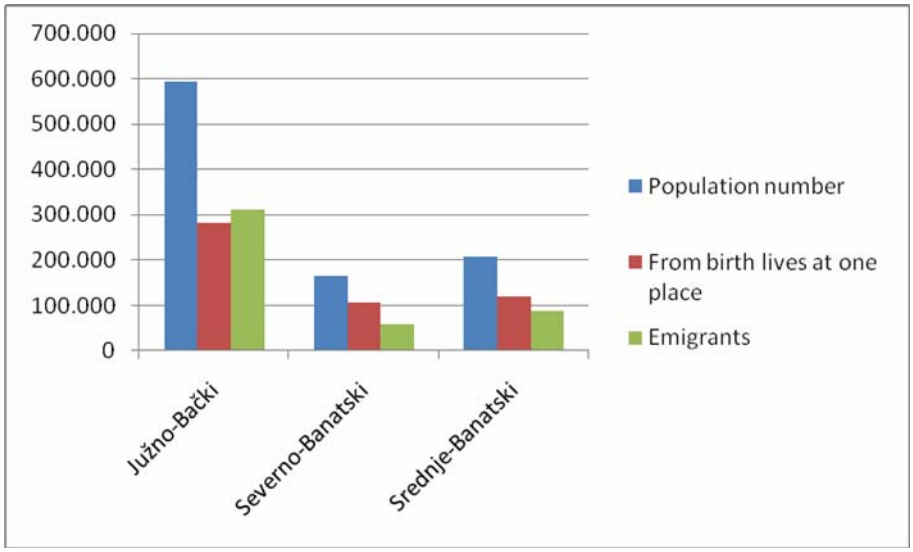


Life expectancy in 2002 in Vojvodina was 68.3 for men and 74.2 for women. Last decades the life expectancy rate had been extended for men and slightly for women. Life expectancy data by counties are available as the average rate for the period 2005-2007. The longest life expectancy is in Juzna Backa county (69.5 men and 75.7 women).

The Serbian Tisza Catchment Area has the transitive demographic characteristics especially notable in the last decade of 20th century (influx of refuges from ex Yugoslavian republics). Mechanical component influenced demographic tendencies and decreased negative population growth rate. According to 2002 census the migrant population in the area accounted 47.3% of total population. In Juzna Backa region migrant population is greater than autochthon population (52.3%). The highest rate of mechanical population influx occurred in the 1991-2002 period.

Severni Banat county had negative migration rate (-0.2%), while Juzna Backa and Srednji Banat recorded positive migration rate (9.5% and 2.8% respectively).

Picture 8. Migration processes in Serbian Tisza Catchment Area



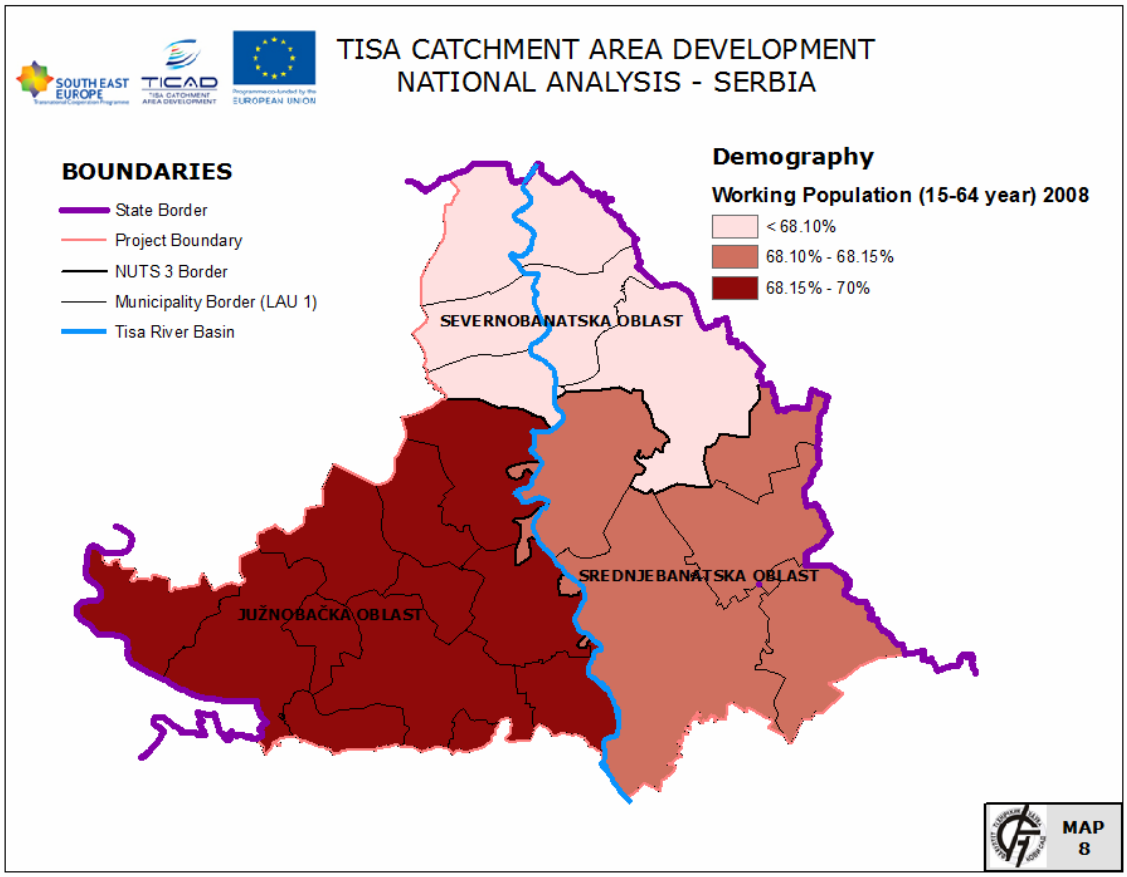
3.1.1.4. The population structure

The population structure and its basic components are showing disappointing age structure of the population. Aging index has negative trend and it is set dramatically above the critical level. Population older than 60 is higher than the population of young from age 0 to 19. These figures are showing that the population is aging which is a common characteristic for all counties in Vojvodina. Extremely high aging index is recorded in Severni Banat county (109.52), Srednji Banat county (107.11). The best age structure is in Juzna Backa (92.66) while the average for Vojvodina is 99.69.

Population from age group 0 to 14 accounts 15.5% of total population (2008). This age group further can be divided on two subgroups: from 0 to 7 (accounts 46 %) and from 7 to 14 (accounts 54%). This age group is generally declining in last 20 years (1991 - 20% and 2002 – 16.0%).

Working population (women from the age of 15 to 59, man from the age of 15 to 64) in 2008 was 68.9% of total population. It could be noticed higher working population percent comparing to previous inter census periods. Juzna Backa County accounts higer than average percent of working population (68.1%).

Picture 9. Working population (15-64) 2008 in The Serbian Tisza Catchment Area



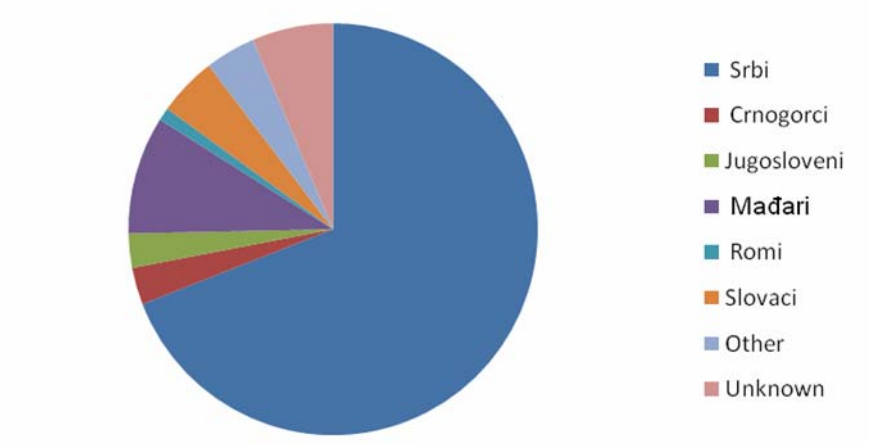
AP Vojvodina has significantly heterogeneous nationality and ethnicity structure and represents extremely multinational environment and those features are the same in counties of the Serbian Tisza Catchment Area.

The nationality structure (2002 census) has changed comparing to 1991. It was mostly the consequence of migrations caused by complex political situation after 1991 (it also influenced the people's nationality orientation). The most significant example was the decrease of population pleaded as Yugoslavians and significant increase of undefined population.

Serbian population is the most present in the project area accounting 65% (58% in 1991). Others are Hungarians 17% (20% in 1991), Slovaks 3.1% (3.6% in 1991), Yugoslavians 2.3% (8.4% in 1991), Montenegrins 1.9% (2.4% in 1991) and Roma 1.6% (1.5% in 1991). Other ethnicities account less than 1.5% (Croatians, Russians, Romanians, Muslims and other).

Undefined population increased from 3.3% in 1991 to 5.6% in 2002.

Picture 10. Etnic structure (2002) in the Serbian Tisza Catchment Area

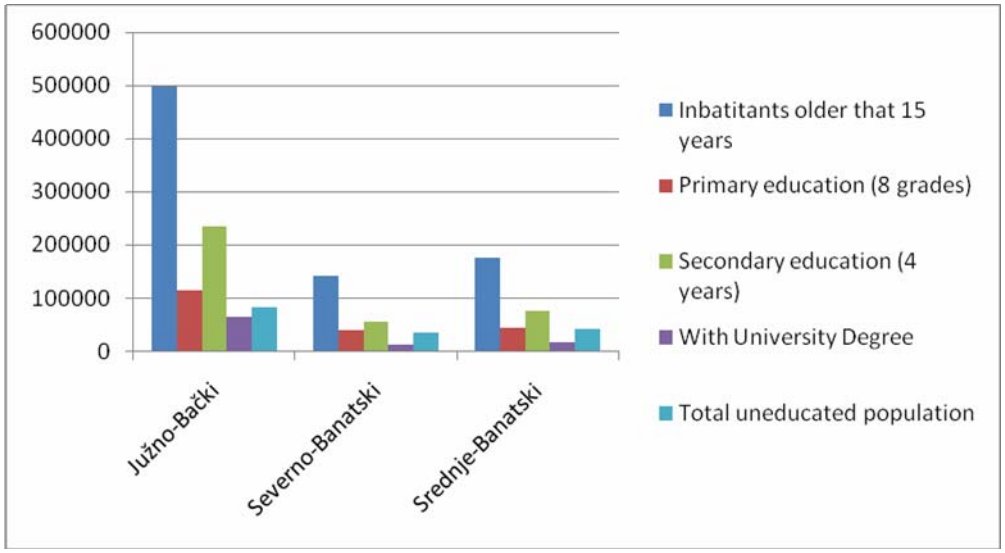


Considering three counties, Serbian population makes the greatest majority in Srednji Banat county (72%) while Hungarian population account 47% in Severni Banat county.

3.1.2. Education structure

The education structure of the population has been analyzed on the basis of 2002 census. The education level of the population older than 15 has been considered (84.0% of population). 45% of the population holds a high school level degree, 24% have finished education on primary school level and 11% holds university degrees. In comparison to previous periods when primary school was the dominant education level, it has been recorded significant development of overall population education level. The education development tendency continued and the number of people with no formal education seriously dropped. However, the percent of population with no formal education is still rather high (19.0%). 47% of people above 15 in Juzna Backa county have a high school degrees and 13% hold university degrees. The counties which population predominantly has just primary school education is Severni Banat county (28.0%). This county measure 25% of population above 15 with no formal education or not completed primary school.

Picture 11. Education structure in The Serbian Tisza Catchment Area



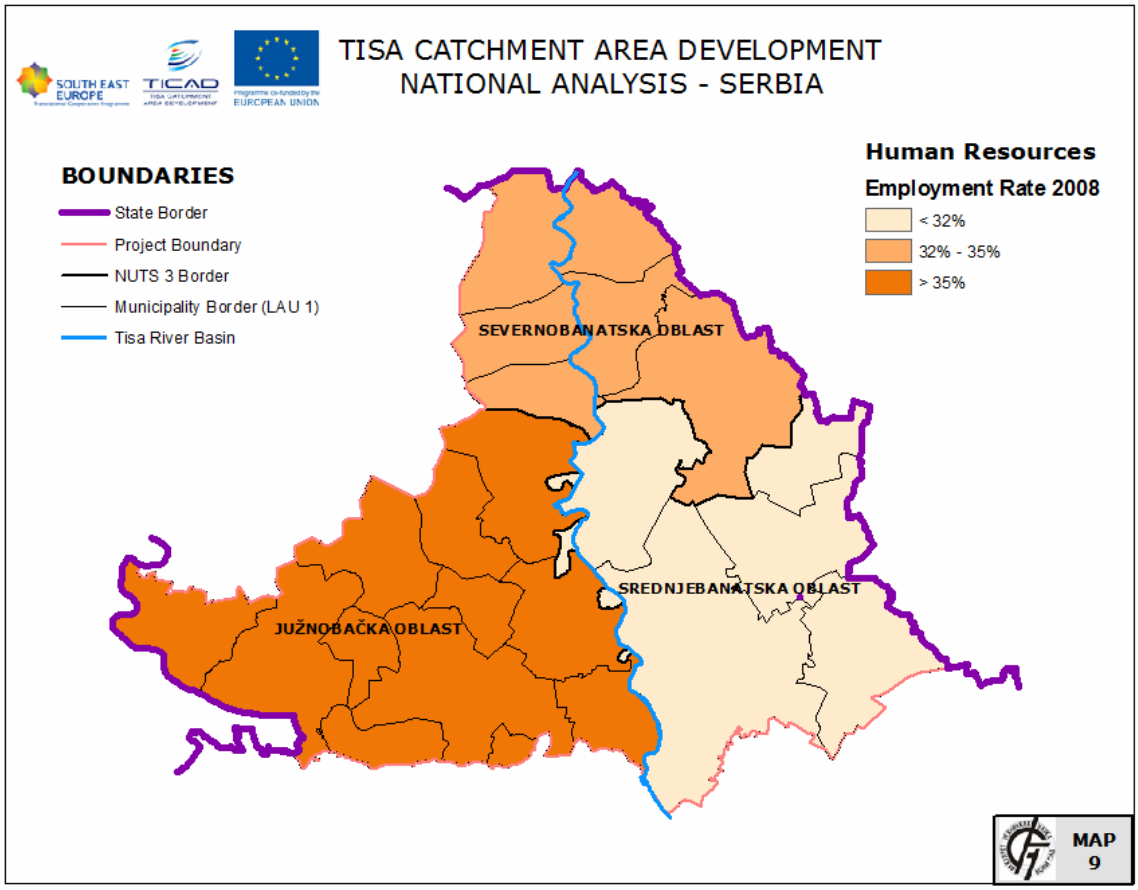
4. Employment, social position

4.1. Employment/unemployment

Total employed population (2008) in the planed area was 294349 or 55.0% of total emploied population in Vojvodina. Unemployed population on the same census (2008) was 101633 or 53.0% of total unemployed population in Vojvodina. Employment rate of the area is 45.0% and vary from 32% (Srednji Banat county) to 51% (South Backa county).

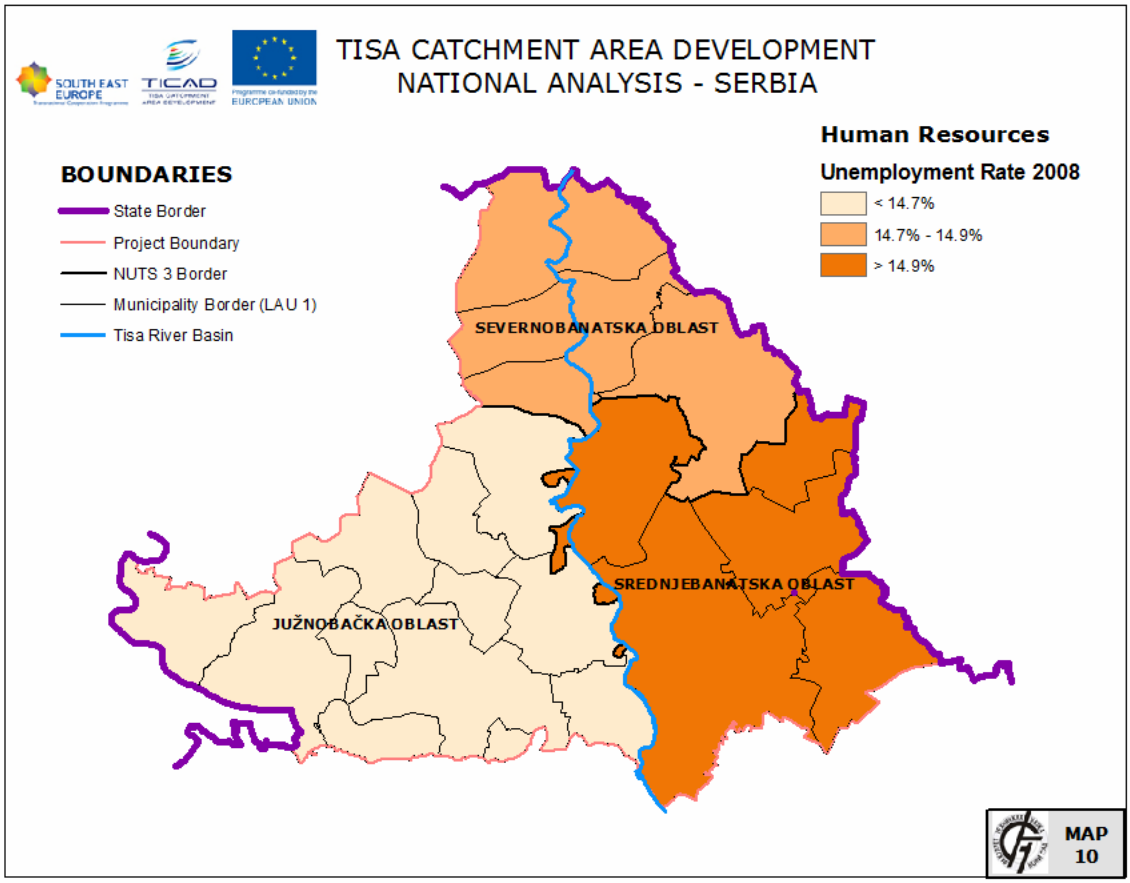
Juzna Backa county has the most employed people per 1000 people (356). The average for Vojvodina is 269; Srednji Banat 243 and Severni Banat 216.

Picture 12. Employment rate (2008) in the Serbian Tisza Catchment Area



Unemployment rate for the whole area is almost the same and accounts 15.0%.

Picture 13. Unemployment rate in the Serbian Tisza Catchment Area (2008)



The period 2002-2008 featured certain employment shifts by sectors:

Percentage of employed in agriculture, forestry, water management industries and fishery dropped from 7.6% to 4.5%. Srednji Banat county has the highest percentage of employments in those sectors (12%-8.5 % drop for 1991-2002). Juzna Backa has the lowest percentage of population employed in those sectors.

Building industry employment for the period experienced increase from 4.7% to 5.0% as the consequence of extreme increase in Juzna Backa county.

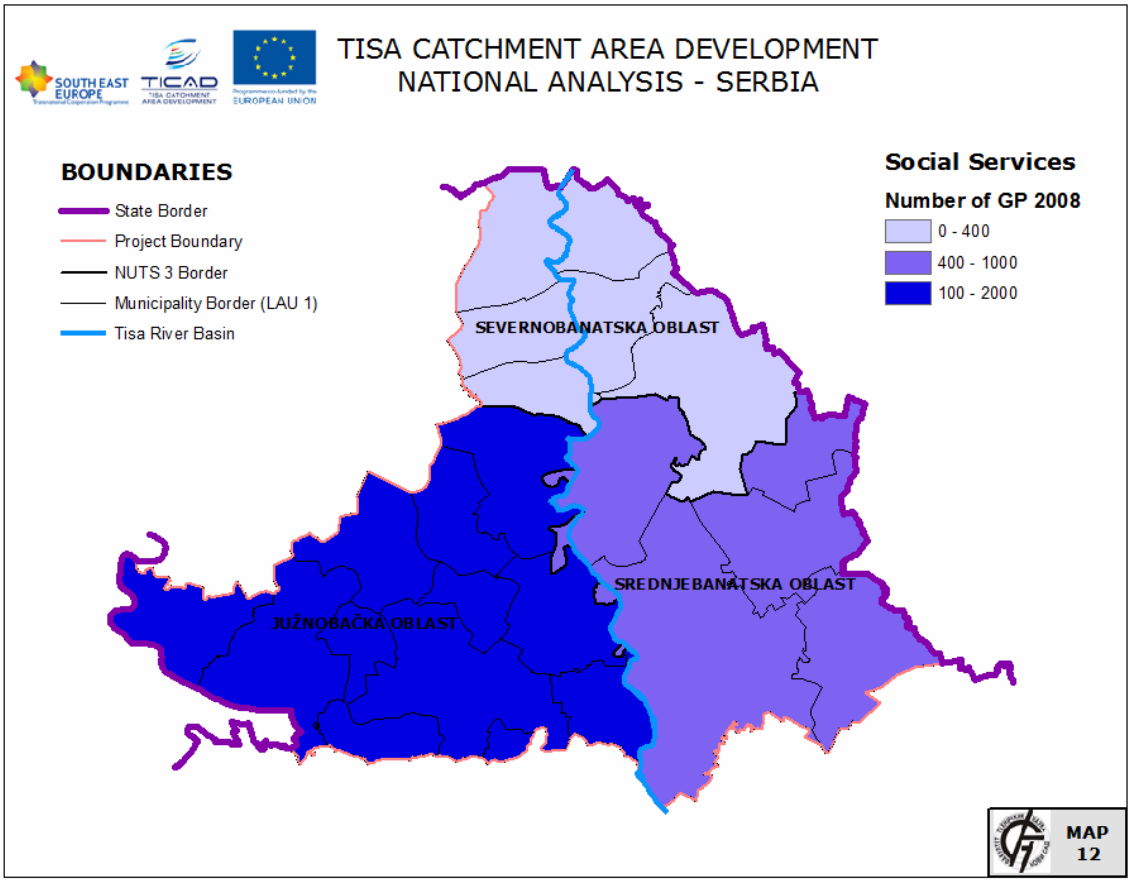
Industry sector also increased employment with the highest change in processing industry (18.0%) and with significantly higher employment rate in Juzna Backa county (3-3.5 times higher than in other two counties).

The highest growing employment rate have been recorded in services sector (Juzna Backa county accounts 5 to 6.5 times more than other counties).

4.2. Social services

2002-2008 period registered increase number of doctors (GP) in Juzna Backa (3%) and Srednji Banat (4%) county. Severni Banat number of doctors decreased for 13%. In the same period the number of doctors per 1000 people increased from 19.6 to 21.8 in Srednji Banat, in Severni Banat the number decreased from 23.3 to 21.6 and in Juzna Backa the number minimally increased from 31.2 to 31.6.

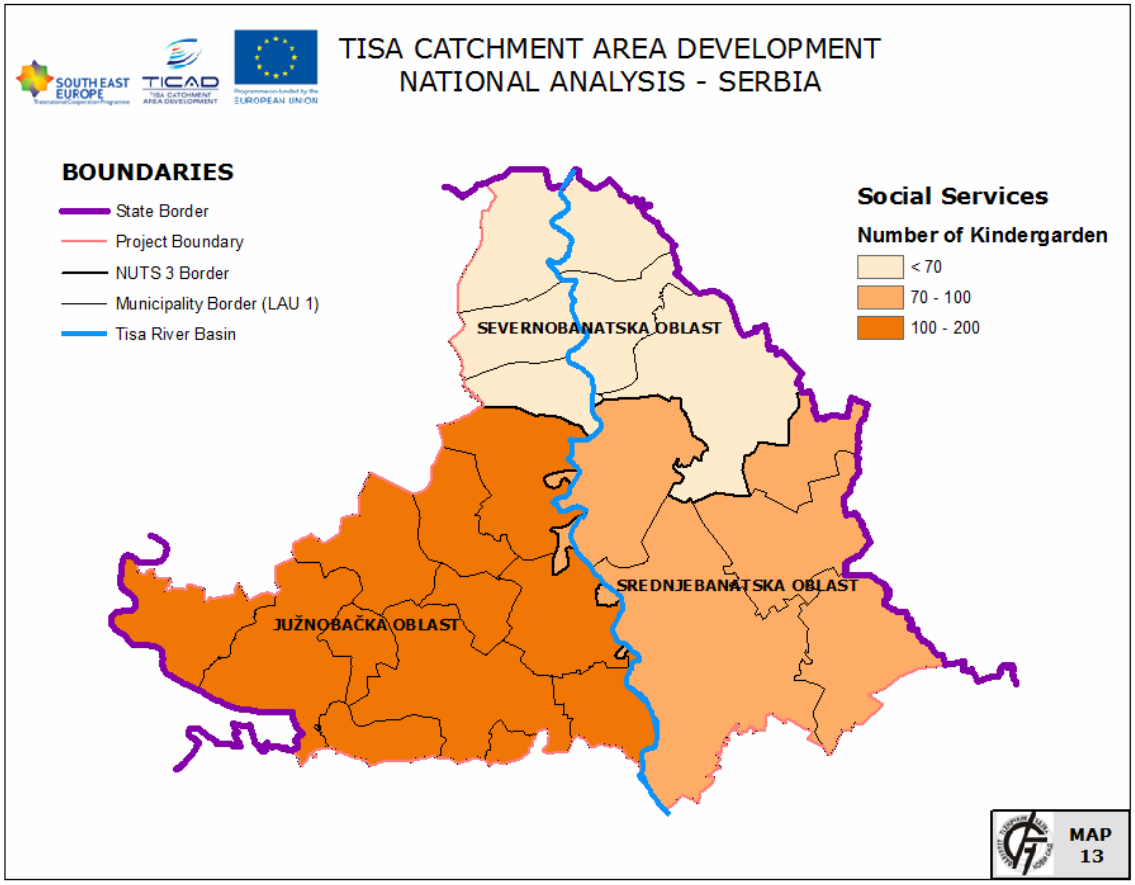
Picture 14. Number of GP (2008) in the Serbian Tisza Catchment Area



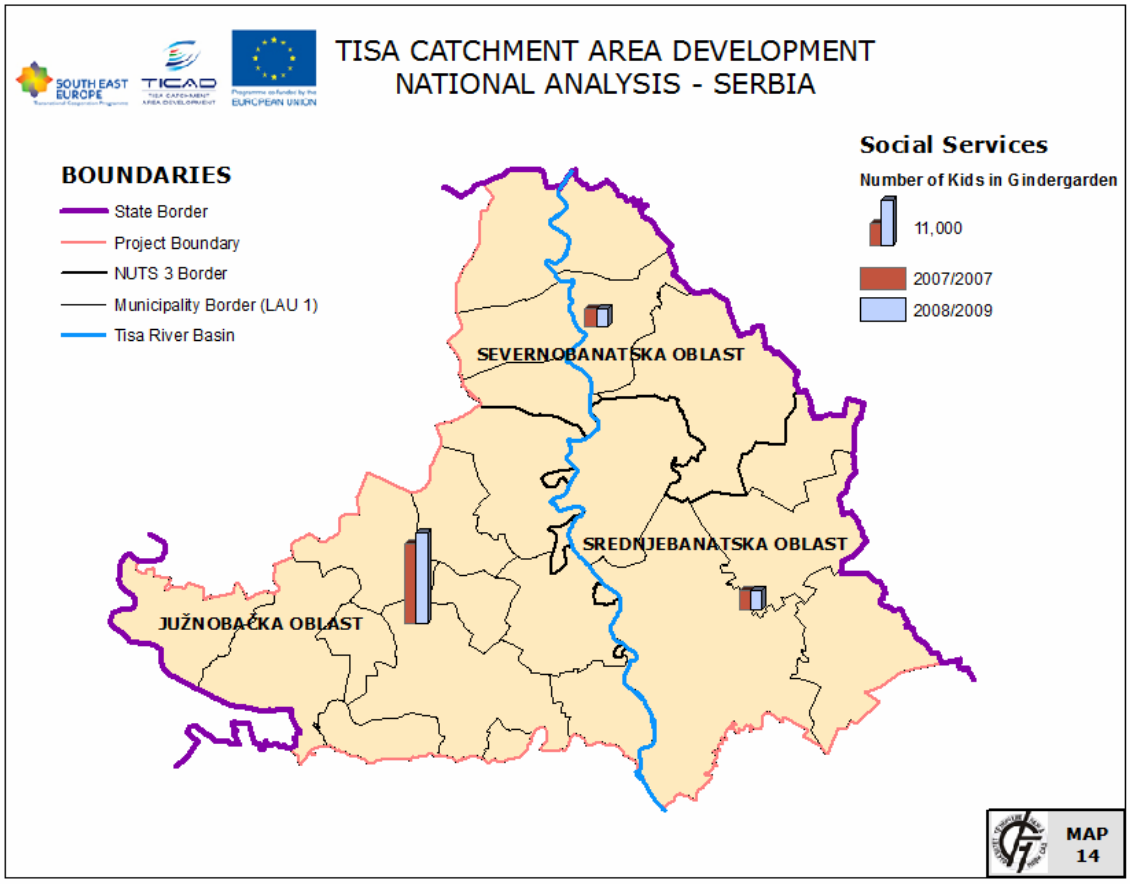
The number of hospital beds (data for the period 2006-2010) hasn't changed in Severni Banat and Srednji Banat, while in Juzna Backa increased for 2.4%.

There are data available for the number of kindergartens and number of kids in kindergartens for the academic year 2002-2003 and 2006-2007. In that periods the number of kindergartens increased for 4.3% and the number of kids attending preschool institutions increased for 23%.

Picture 15. Number od kindergarden in the Serbian Tisza Catchment Area



Picture 16. Number of children in kindergarden in the Serbian Tisza CatchmentArea



5. Economy

5.1. Economy base of the region

The economy development analysis of the area will be up to certain level insufficient. Until 2005 the national statistics institute had different statistical data collection methodology. Recently the statistical indicators have been changed following the EU standards. In the moment there are just national GDP data available, while the data for counties and municipalities are expected in 2011. The National statistics institute is working on new criteria for municipality development assessment. However these data are still not available.

Present structure of Serbian economy has been profiled by late transition processes, long isolation from world markets, lack of investments and outdated technology.

In 2001-2008 period the industry sector shrank (which influenced general employment rate), most industrial centers were devastated

influencing serious weakening of some counties. In the same time the service sector has developed initiating relative increase of GDP (2,0% 2001., 5,7% 2007.). Traffic management and telecommunications, trade and finance business are sectors that influenced the rise of GDP the most.

Juzna Backa county with the provincial capital Novi Sad has significant concentration of economical development and together with Belgrade performs as the most developed area in the country. Therefore, TICAD project area includes the most developed area in Vojvodina.

According to the explanations given by the Statistical Office of Serbia, data on GDP represent a revision of previously published results of the calculation of GDP and other macroeconomic aggregates for the period 1997-2007 as well as estimations for 2008.

This has been done in accordance with the methodology of the System of National Accounts (SNA 93), the European System of National Accounts (ESA 95) and new international standards and recommendations. At the time of the preparation of the present General Scheme, official data on GDP were available only for the entire Republic of Serbia, official data at lower territorial units being in preparation.

In order to meet Project requirements, GDP data at the level NUTS 2 and NUTS 3 were calculated by the Republic Agency for Spatial Planning for Donauregonen project, and those data are presented in TICAD Project too.

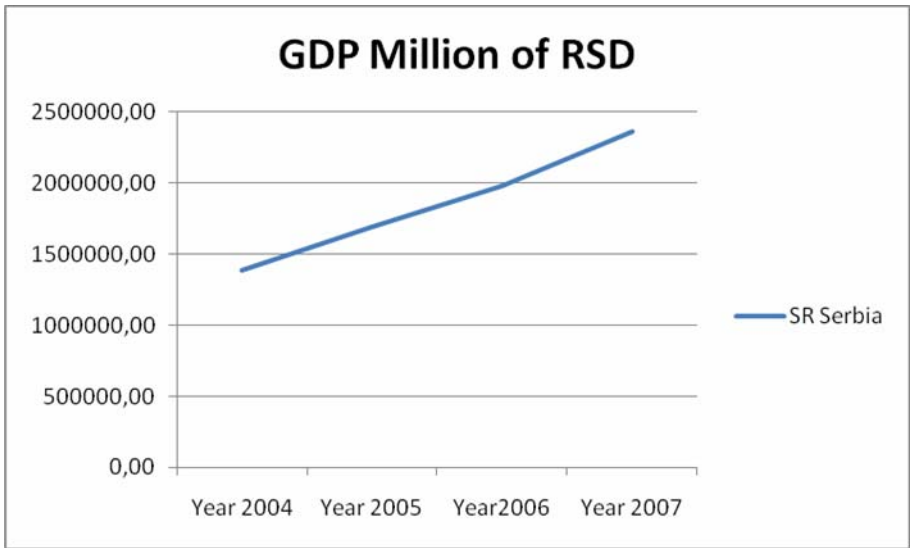
The calculation was based both on data on GDP at the level NUTS 0 / NUTS 1 (1999-2008) and data on so called "national product" (1999-2005) which includes only material production (non-material services being excluded). Lack of data on national income for the period 2006-2008 was overcome by the estimate of GDP at the level NUTS 3 based on realized annual growth rate for the period 2000-2005. GDP at the level NUTS 2 was estimated for the period 2006-2008 based on realized shares of GDP of Vojvodina and Central Serbia (2000-2005) in the total GDP of the Republic of Serbia. As exchange rates were not officially determined by the National Bank of Serbia for the period 1996-1998, data are given starting from 1999:

Table 1. Gross domestic product (GDP) at current market prices at NUTS level 2 (millions of euro)

Region	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Vojvodina	5,497.3	8,323.2	4,346.2	5,200.4	5,514.7	5,883.8	6,582.6	7,224.5	8,923.2	10,359.5
Central Serbia	12,417.7	18,108.1	8,840.1	11,611.4	12,494.0	13,839.7	14,525.3	16,080.4	19,861.4	23,058.4

Source: Statistical Office of Serbia, National Bank of Serbia

Picture 17. GDP in Milion of RSD in the period 2004-2007, Republic of Serbia



5.1.1. GDP for the region in euro per inhabitant[1]

GDP in Euro *per capita* had the following values in the period 1999-2008:

Table 2. Gross domestic product (GDP) at current market prices at NUTS level 2 (euro per inhabitant)

Region	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
EU - 27	17,800	19,100	19,800	20,500	20,700	21,700	22,500	23,700	24,900	25,100
Vojvodina	2,703.4	4,097.2	2,140.9	2,555.7	2,716.3	2,909.5	3,270.2	3,607.6	4,480.6	5,233.7
Central Serbia	2,254.9	3,301.4	1,615.1	2,124.6	2,292.3	2,543.7	2,676.1	2,972.9	3,684.8	4,293.3

Source: Statistical Office of Serbia, National Bank of Serbia, Eurostat

GDP in Euro *per capita* was extremely low compared to the EU-27 average. In 2008, Serbian GDP in Euro *per capita* was only about 18.1% of the European one. It was slightly higher in Vojvodina (20.8%) than in Central Serbia (17.1%). GDP in Euro *per capita* had the same trend as the GDP in current market prices, with a drop in 2001 and a slow recovery after that year. GDP values in Euro *per capita* at the level NUTS 3 depend, however, not only on the achieved GDP but also on the number of

[1] Republic Agency for Spatial Planning, 2010

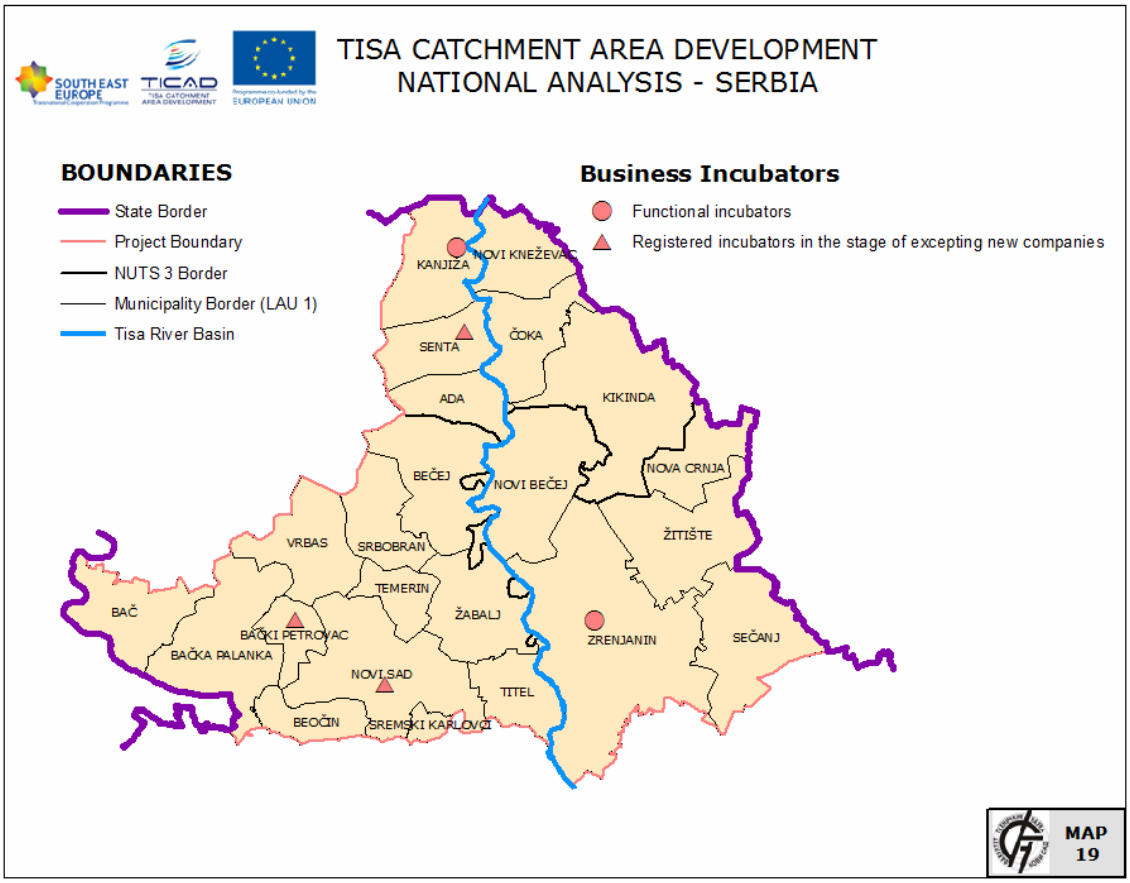
inhabitants, and that is why the situation at this territorial level is more diverse than at the level NUTS 2.

5.2. *Business activities and business structure*

The business infrastructure, approached from the perspective of industrial parks, is represented at the level of just few counties, but there are no data available in the Serbian Tisza Catchment Area.

There are several bussiness incubators in the Serbian Tisza Catchment Area (Picture 18) which contributes to the development of small enterprises.

Picture 18. Business incubators in the Serbian Tisza Catchment Area



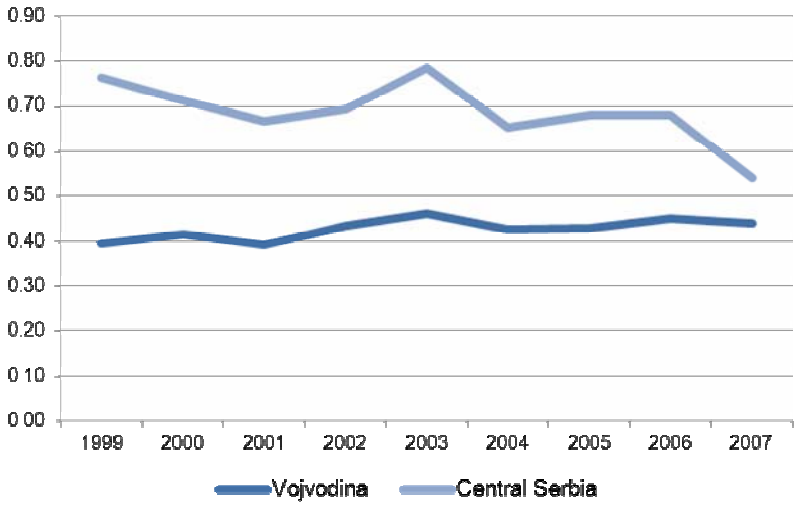
5.3. Research and development

Research and development are only beginning to be considered as an important economic activity and potential.

Differences between Vojvodina and Central Serbia are mainly a consequence of disproportional number of inhabitants, research institutions and budgets.

While the number of researchers in Central Serbia was decreasing from 1999 to 2002, in Vojvodina the number of personnel first increased and then decreased. The number of personnel again decreased in both regions after 2003 and increased after 2004.

Picture 19. Total researchers (% of total employment) at NUTS2 level



Source: Statistical Office of Serbia University Centers

In the Serbian Tisza Catchment Area there is 1 university -University of of Novi Sad.

5.4. Agriculture, food industry and forestry

5.4.1. Agricultural land use

Trans-category land use change analysis for the period 2002-2008 is showing different trends among counties.

Table 3. Land use 2002-2008 in the Serbian Tisza Catchment Area

County		Farm land and gardens	Orchards	Vineyards	Meadow	Pastoral land	Agriculture land TOTAL
Juzno Backi	2002	303712	2333	2253	2260	13770	330550
	2008	294593	3448	1918	7066	12543	326053
	Difference	-9119	+1115	-335	+4806	-1227	-4497
	Growing index $^{2008}/_{2002}$	0,970	1,478	0,851	3,136	0,911	0,986
Srednje banatski	2002	231027	2219	523	10666	30940	283868
	2008	228958	1816	561	10934	32979	285527
	Difference	-2069	-403	+38	+268	+2039	+1659
	Growing index $^{2008}/_{2002}$	0,991	0,818	1,073	1,025	1,066	1,006
Severno Banatski	2002	176929	1791	1195	5181	19019	207593
	2008	176889	1572	995	5872	19321	207748
	Difference	-40	-219	-200	+691	+302	+155
	Growing index $^{2008}/_{2002}$	1,000	0,878	0,833	1,133	1,016	1,001

Source: Statistical yearbook 2002, 2008

The farm land and small gardens total surface is slightly reduced in all three counties (Juzna Backa, Srednji Banat and Severni Banat). However, the growing index 2008-2002 differs by counties (Juzna Backa – 0.970, Srednji Banat – 0.991 and Severni Banat – 1.000).

Planted meadow surface notably increased in all three counties, but with different growing index (extreme increase occured in Juzna Backa – 3.136, Srednji Banat – 1.025 and Severni Banat – 1.133).

Common feature for all three counties is the increase of seeded meadows total surface. Srednj Bnat recorded slight increase index of 1.025 and Severni Bnat – 1.133, while Juzna Backa county experienced higher increase index – 3.136.

Orchard lands in Juyna Backa county increase index for the period 2002-2008 had been 1.478, while in other two counties this land use surface had been considerably reduced (Severni Bant – 0.878, Srednji Bnat – 0.818).

Vineyard areas also reduced their surface in two counties with significant grape growing tradition (Juzna Backa – 0.851 and Severni Bnat – 0.833).

Srednji Bnat, which is not traditional vine region, slightly increased vineyard surface (1.076).

Pasture lands were increased in traditional cattle breading regions (Srednji Banat – 1.066 and Severni Banat – 0.016). In Juzna Backa county it reduced (0.833).

Analyzing above mentioned figures it could be seen that total agriculture land has not been changing dramatically and that change indexes are balanced. Juzna Backa has reduced total agriculture land surface (0.986) mostly because of arable land and small scale gardens.

Srednj Banat (1.006) and Severni Banat (1.001) have recorded minimal increase (almost stagnating trend) of agriculture land change.

5.4.2. Animal husbandry

The animal husbandry sector has an important weight in the Serbian Tisza Catchment Area because agriculture represents one of the basic activities in the rural areas.

The tables below show the number of cattle, pigs, sheep and poultry in county during the surveyed years of 2002, 2006 and 2008, whereof it is apparent, that there is a total growth in the number of cattle and pigs and a drop in the number of sheep and poultry in 2008 compared to 2006.

Table 4. Animal husbandry structure 2002 in the Serbian Tisza Catchment Area

County	Cattle			Pigs			Sheep			Poultry total
	Total	Whereof: Cows and in-calf heifers	Cattle per 100 ha of arable land	total	Whereof: Sow and pregnant gilts	Pigs per 100 ha of arable land	Total	Whereof: Ewe for breeding	Sheep per 100 ha of arable land	
Srednje banatska	31561	16430	13	116507	15539	50	20812	14533	7	847714
Severnobanatska	23350	12500	12	162620	21600	92	26407	17509	13	514065
Juzno backa	37562	20035	12	307153	45541	101	20825	12777	6	1143392

Table 5. Animal husbandry structure 2006 in the Serbian Tisza Catchment Area

County	Cattle			Pigs			Sheep			Poultry total
	Total	Whereof: Cows and in-calf heifers	Cattle per 100 ha of arable land	total	Whereof: Sow and pregnant gilts	Pigs per 100 ha of arable land	Total	Whereof: Ewe for breeding	Sheep per 100 ha of arable land	
Srednje banatska	38657	20888	16	139379	16750	61	50755	33035	18	2551215
Severno-banatska	26981	14200	15	145384	20400	82	30105	19345	14	471266
Juzno backa	35499	18312	11	285222	37363	94	41696	28416	13	1086518

Table 6. Animal husbandry structure 2008 in the Serbian Tisza Catchment Area

County	Cattle			Pigs			Sheep			Poultry total
	Total	Whereof: Cows and in-calf heifers	Cattle per 100 ha of arable land	total	Whereof: Sow and pregnant gilts	Pigs per 100 ha of arable land	Total	Whereof: Ewe for breeding	Sheep per 100 ha of arable land	
Srednje banatska	41101	19240	15	148631	14867	54	47343	34242	17	1447604
Severnobanatska	30164	12708	15	176127	18317	86	31134	19410	15	641350
Juzno backa	38318	17646	12	333860	37417	105	34671	20194	11	1143484

5.4.3. Forestry

The ownership of forests in Serbian Tisza Catchment Area falls into two main categories:

- state and socially owned and,
- privately owned forest land.

The area of forests and woodland is 35294.84 ha accounting for 3.68 % of the total land area. The forest and woodland is grouping in two groups: land covered by forest and treeless land. Percentage of covered forest land by region is as follows: Juzna Backa - 78%, Severni Banat - 50% and Srednji Banat - 62,9%

State owned forest land is 34.146,05 ha which represents 96.75% and privately owned is 1148,75 ha or 3.25%.

Most of the state forests are managed by public enterprises: PE "Vojvodinasume", PE "Nacionalni park Fruska gora" and PE "Vode Vojvodine".

On the forest covered land the most common are mixed forest cultures with the dominant Euro-American tilia and mixed forests with pedunculate oak domination. The most of the forests were planted from selected plant sources.

Table 7. Forest land covered by forest in the Serbian Tisza Catchment Area

County	County area –ha-	Forest area –ha-	Forest cover in a county -%-
Juzana Backa	401.500,00	27.247,85	6,79
Severni banat	232.800,00	2.243,16	0,96
Srednji Banat	325.600,00	5.803,83	1,78

Source: Forest and greenery management basics in AP Vojvodina; Environment and forestry institute, Novi Sad, 2009.

Table 8. Ownership structure of forest land covered by forest in the Serbian Tisza Catchment Area

County	State		Private		Total	
	ha	%	ha	%	ha	%
Juzana Backa	26.185,57	96,1	1.062,28	3,9	27.247,85	100
Severni banat	2.229,75	90,4	13,41	0,6	2.243,16	100
Srednji Banat	5.730,73	98,7	73,10	1,3	5.803,83	100
total	34.146,05	96,75	1.148,75	3,25	35.294,84	100

Source: Forest and greenery management basics in AP Vojvodina; Environment and forestry institute, Novi Sad, 2009.

Forests are generally subdivided in three structural groups: with commercial, protection and recreation functions.

Table 9. Functional forest subdivision in the Serbian Tisza Catchment Area

County	Commercial		Protection		Recreation		Total	
	ha	%	ha	%	ha	%	ha	%
Juzana Backa	7.468,01	27,43	19.673,29	72,20	106,55	0,39	27.247,85	100
Severni banat	1.389,02	61,9	853,09	38,1	01,05	0	2.243,16	100
Srednji Banat	3.896,32	67,1	1.907,51	32,9	-	-	5.803,83	100
Total	12.753,35	36,13	22.433,89	63,65	107,60	0.30	35.294,84	100

Source: Forest and greenery management basics in AP Vojvodina; Environment and forestry institute, Novi Sad, 2009.

The vastest forest land areas (22.433,89 ha) have the protection function and the rest come with commercial (12.753,35 ha) and recreational (107,60ha) functions.

Forests with protection function are those within the protected nature areas with categorized protection zones. Category I protection zone requires strict level of protection. Category II protection level enables just those activities that are improving nature in the designated area. Category III protection level enables limited commercial use of a forest as well as commercial activities that comply with general regulations designated by the low on nature protection and other national legislation acts.

5.4.4. Hunting areas

Serbian Tisza Catchment Area includes 48 hunting areas of total surface area of 975.376,62 ha.

The Hunting union of Vojvodina and the Public enterprise Vojvodinasume are the main managing bodies of hunting grounds in Vojvodina.

Table 10. Number of hunting grounds by county in the Serbian Tisza Catchment Area

County	***Number of hunting grounds***	***Forest area –ha-***
Juzana Backa	*25 **	*416.928,60 **
Severni banat	*13*	*232.792,00*
Srednji Banat	*10*	*325.656,00*
Total	*48*	*975.376,60 **

** Two hunting grounds in Juzna Backa county are included in the table. However their area spreads over two counties (Srem county is another which is not within* the Serbian Tisza Catchment Area*). Those are hunting grounds Koviljski rit and National park Fruska gora.*

The hunting grounds are spreading over forest lands with and without forest, orchards, vineyards, meadows, pastoral land and most

commonly farm and arable fields. Most represented hunting wild animals are: European deer, mouflon, roe deer, wild boar, rabbit, partridge, and pheasant.

Some hunting grounds are spreading over more municipalities. Following table gives the number of hunting grounds by municipalities in the Serbian Tisza Catchment Area.

Table 11. Hunting grounds by LAU1 in the Serbian Tisza Catchment Area.

County	***Municipality***	***Number of hunting grounds***
Juzna Backa	*Bac*	*5*
	Backa Palanka	*3*
	Backi Petrovac	*1*
	Beocin	*3*
	Becej	*4*
	Vrbas	*1*
	Zabalj	*2*
	Novi Sad – grad	*6*
	Srbobran	*1*
	Sremski Karlovci	*3*
	Temerin	*1*
	Titel	*3*
Severni Banat	*Ada*	*2*
	Kanjiza	*1*
	Kikinda	*6*
	Novi Knezevac	*1*
	Senta	*1*
	Coka	*3*
Srednji Banat	*Zitiste*	*2*
	Zrenjanin grad	*5*
	Nova Crnja	*1*
	Novi Becej	*2*
	Secanj	*2*

Source: Hunting areas overview for the territory of Republic of Serbia. Hunting union of Serbia, 2008.

5.4.5. Enterprise structure

Small and medium enterprise sector has important role in the transition period and it is significant part of the structural changes of economy and employment. This sector is the most developed in cities which are regional development centers. In the Serbian Tisza Catchment Area, there are 53.0% of total small and medium enterprises of Vojvodina (of which Juzna Backa county accounts 79%). Small enterprises are dominating in all three counties (more than 90%). Medium enterprises account 4% in Juzna Backa to 5.3% in Severni Banat county.

Table 12. Number of enterprises (2008) in the Serbian Tisza Catchment Area

NUTS3 Name	Number of enterprises 2008		
	Small enterprises	Medium enterprises	Big enterprises
Juzna Backa	9502	411	98
Severni Banat	1194	68	17
Srednji Banat	1260	68	24
Total	11956	547	139
AP Vojvodina	22660	1004	248

68.0% of small enterprises are operating in service sector. Half of medium enterprises are operating in services and another half in industry. Big enterprises operating in industry are accounting 57%.

Table 13. Number of enterprises by sector (2008) in the Serbian Tisza Catchment Area

NUTS3 Name	Number of enterprises 2008			
	Sectors	Small enterprises	Medium enterprises	Big enterprises
Juzna Backa	A+F+W+F	441	50	10
	Industry	2538	170	49
	Service	6510	189	37
Severni Banat	A+F+W+F	119	18	1
	Industry	282	31	14
	Service	791	19	2
Srednji Banat	A+F+W+F	152	22	4
	Industry	329	29	16
	Service	776	15	4

A-Agriculture, F- Forestery, W- Waterworks supply, F- Fishing

5.4.6. Tourism

The river Tisza wide catchment area in Serbia is framed by whole Tisa basin, and in narrower sence it includes spaces near the river banks with its alluvial plain and the nearest space on the les terrace, on the both sides of the bank.

Serbian Tisza Catchment Area spreads over 157.186 sq km (7% of Serbia, 51,1% of AP Vojvodina). Significant caracteristics of Tisza as very distinctive river in Europe, and related to tourist valorization are:

- the river has the most specific morphogenesis
- characteristic flat-land flow that creates meandres, of which some are artificiall,
- it cuts the narrow channels in the clay and makes bank erosions
- some meanders, still filled with water are now protected natural areas of exceptional value (Ramsar);
- many aits with the potential to develop tourist resources,
- settlements in imediate river area are located on the river alluvial plains, which requires interventions for their convergence and co-existence with the river, establishment of recreational buffer-zones, access road, paths for walking and bicycle paths, the bank

regulation regulation, beach resourts, platforms, camping, theme parks, benches
- the river banks provide tremendous opportunities for tourism development that can include many outdoor activities, especially for benefit and welfare of local people.

Cultural heritage of the Serbian Tisza Catchment Area

Archaeological sites in the Serbian Tisza Catchment Area are from different periods, the most from the prehistoric, paleolit and bronze age. The largest number of archeological sites are located in the South Backa County, while those in Severnobanatski and Srednjebanatski are mostly unexplored, and unfinished as tourist sites.

Table 14. Locations of archaeological sites in the territory of the Counties in Serbian Tisza Catchment Area, with the status of cultural monuments of great and extremely important

NUTS 3	LAU1	Site
Južnobački	Beočin	**Gradina**, Cultural monument of great importance
Južnobački	Titel	**Kalvarija - Titelsko plato**, Cultural monument of great importance
Južnobački	Bačka Palanka	**Turski šanac**, Cultural monument of great importance
Južnobački	Bačka Palanka	**Čelarevo**, Cultural monument of extremly importance
Južnobački	Vrbas	**Čarnok**, Cultural monument of great importance
Južnobački	Novi Sad	**Kuva - Kastelum Onagrinum**, Cultural monument of great importance
Srednjebanatski	Novi Bečej	**Matejski brod**, Cultural monument of great importance

Cultural heritage in general has great tourist potential. The number and importance of cultural monuments in the area is the result of the rich and turbulent history of the region that over centuries has been one of major crossroads in the Balkans.

Table 15. Overview of cultural property of extremly importance in the in Serbian Tisza Catchment Area

County	Municipality-LAU1	Site
Južnobački	Bač	**Franjevački samostan**
Južnobački	Bač	**Manastir Bođani**
Južnobački	Bač	**Tvrđava i pregrađe**
Južnobački	Bačka Palanka	**Čelarevo, Dvorac Porodice Dunđerski**

Južnobački	Bačka Palanka	**Kuća u Neštinu**
Južnobački	Bački Petrovac	**Kuća u Bačkom Petrovcu**
Južnobački	Bečej	**Prevodnica „Šlajz"**
Južnobački	Beočin	**Manastir Beočin**
Južnobački	Beočin	**Manastir Rakovac**
Južnobački	Novi Sad	**Almaška crkva**
Južnobački	Sremski Karlovci	**Gradsko jezgro Sremskih Karlovaca**
Južnobački	Sremski Karlovci	**Mesto Karlovačkog mira 1699.**
Južnobački	Sremski Karlovci	**Patrijaršijski Dvor**
Južnobački	Sremski Karlovci	**Saborna crkva u Sremskim Karlovcima**
Južnobački	Titel	**Crkva velikomučenika Stefana Dečanskog u Vilovu**
Južnobački	Žabalj	**Srpska pravoslavna crkva u Čurugu**
Severnobanatski	Kikinda	**Pravoslavna crkva u Kikindi**
Severnobanatski	Kikinda	**Suvača u Kikindi**
Severnobanatski	Kikinda	**Pravoslavna crkva u Mokrinu**,
Severnobanatski	Novi Bečej	**Arača u Novom Bečeju**,
Severnobanatski	Čoka	**Rimokatolička crkva u Čoki**,
Severnobanatski	Kikinda	**Pravoslavna crkva u Kikindi**
Severnobanatski	Senta	**Mesto bitke kod Sente 1697**.

There are 30 cultural sites entitled as cultural monuments of great importance. Among them are network of Orthodox monasteries and temples on Fruška Gora, known as Serbian Holy Mountain. Beside religion architecture, there are protected monuments of residential architecture in Kikinda, Nestin, Backa Petrovac and Ogar. They are illustrating the traditional construction methods of residential houses in Panonija. Palaces, summer residences and castles are numerous, but few (except "Fantast") are arranged for tourist visits and programmed to sustain tourist development.

Events and festivals are numerous, both traditional and contemporary, but there is evident lack of clear strategy. One event is directly connected to the Tisza river ("Cvetanje Tise"), while others are related to settlements the area.

Churches and chapels are numerous. They belong to different religions and confesions. They are material evidence of cultural and ethnic diversity.l Institutions like museums, galleries and theaters are typical for larger cities, while the organization of cultural activities in smaller towns is in charge of cultural centers.

POSSIBLE FORMS OF TOURISM AND TOURISM DEVELOPMENT IN POTISJE

Current status and quality of tourism in the area of the TICAD project are:

- Storage capacities
- contents of spa / health tourism
- manifestations/events
- hunting and fishing tourism
- facilities of nautical tourism,
- facilities for rural tourism
- sport and recreation
- business and MICE tourism
- cultural and historical facilities and archaeological sites,
- landscape, natural reserves and habitats;
- efficiency / quality destination management.

Main tourism destinations

The most important tourist destination, with the greatest number of arrivals and overnight stays in the Serbian Tisza Catchment Area are: Novi Sad, Sremski Karlovci, Fruška gora, Bečej (South Bačka district), Zrenjanin in Srednji Banat district and Kanjiža Spa in Severni Banat district. These destinations represent important receptive markets that have developed or could develop and improve the business and MICE tourism, spa tourism, special interest tourism, rural tourism and cultural tourism.

Novi Sad is the second largest city in Serbia with over 300.000 inhabitants. The City of Novi Sad is the city of tourism and perfect City Break destination with rich cultural offer recognized with International Trophy by The Swiss National Tourism Board of the City of Lugano as The city of music and theater 2007. The City of Novi Sad is vivid mixture of different nationalities and cultural background and that reflects the name of the city which could be translated as the new garden. From the City Hall along the downtown promenade and Danube street the pleasant mini tour attracts ever more and more tourists. It is crowned with magnificent Petrovaradin fortress an architectural masterpiece built from 1692 to 1780. At the fortress the past and present meet in the most popular music festival in the SE Europe EXIT Fest held at the beginning of July with 150.000 young visitors / more than 20.000 from UK/. In the vicinity the Fruska gora national park with 17 monasteries, 14 lakes and health paths, wine testing and recreation possibilities provides excellent short nature breaks. Accommodation is possible in 14 hotels with over 2.500 beds and other facilities from Youth Hostels to the five star hotels. The M.I.C.E. offer of the City of Novi Sad includes newly opened Master Centre at the Fair ground as well as the centers incorporated in hotels. The excellent

taste of traditional cuisine and wines could be tried in many restaurants in the city or at the original Salaš- farm houses in the vicinity. Clubbing in the street of Laze Telečki, concerts, manifestations and festivals held all year long are just a part of very rich and interesting tourist offer of the City of Novi Sad.

A few kilometers away from Novi Sad on the right Danube bank there is the massive of **Fruška Gora** historically known by its monasteries and by its national park today. Sixteen orthodox monasteries have been united in a space 40 km long, so to say, there has been an impressive cultural offer. This mixture of the Byzantine style and the baroque architecture of the monastery ensemble well known in Serbia would at the same time be the place of the riches of the churches, the peaceful and the greenish place and the reception by the priests. There has been here the tradition of the reception of the foreigners with the greatest respect, so that the priest would not hesitate to invite you to the table after a short discussion, to taste a glass of dry šljivovica. All monasteries had been **constructed** between XV and XVI centuries in a mountain massive, and the monks had found a protection from the Turkish violence. The best known have been Grgeteg, Hopovo, Jazak, Krusedol and Velika Remeta. In this period Srem belonged to the kings of Hungary who had ceded to Stefan Lazarevic, then to Djurdje Brankovic the fortified places. About the middle of XV century the despot Brankovic had received the authorisation by the pope Nicholas V to be the founder of nine monasteries in the province of Srem. This designated the beginning of the development of monasteries of Fruska Gora.

Territorially, the **Sremski Karlovci** municipality is one of the smallest in Serbia and Vojvodina, but has a great significance in the history of Serbs. The municipality is located on the bank of the Danube River, on the slopes of the Fruška Gora with the Stražilovo excursion site nearby, on the main road and railway route and has rich cultural and historical heritage. Together with viniculture, tourism is the biggest long-term potential of the municipality. Sremski Karlovci is the most beautiful in June when thousands of linden trees bloom and in October when hundreds of hectares of vineyards give ripen grapes of which the famous wines are made.

Today, the special rosé wine called Karlovački tovajn is registered as a trade mark in Vienna.

Bečej is situated in the central part of the Tisa valley in the north of Serbia, in the heart of the Vojvodinian plain. It is a typical Pannonian town with 45.000 inhabitants, some 130 km away from Belgrade and 50 km from Novi Sad. Natural geographical conditions have enabled good development of agriculture and food processing industry. Bečej is also an important cultural regional centre. Archeological sites confirm the continuity in sedentariness in this part of the Pannonian plain dating back to ancient history. The first written evidence of Bečej's existence dates back to 1091.Favourable terrain facilitates development of tourism,

especially hunting and fishing. The rich sporting tradition has rightly given Bečej the title - city of sport. The main tourist attraction is the Fantast castle. This splendid castle was built by Bogdan Dunđerski, on his property in 1923. The castle is surrounded by the beautiful park with the chapel dedicated to St. George. Bečej is a hospitable city, with open heart, full of love and tolerance.

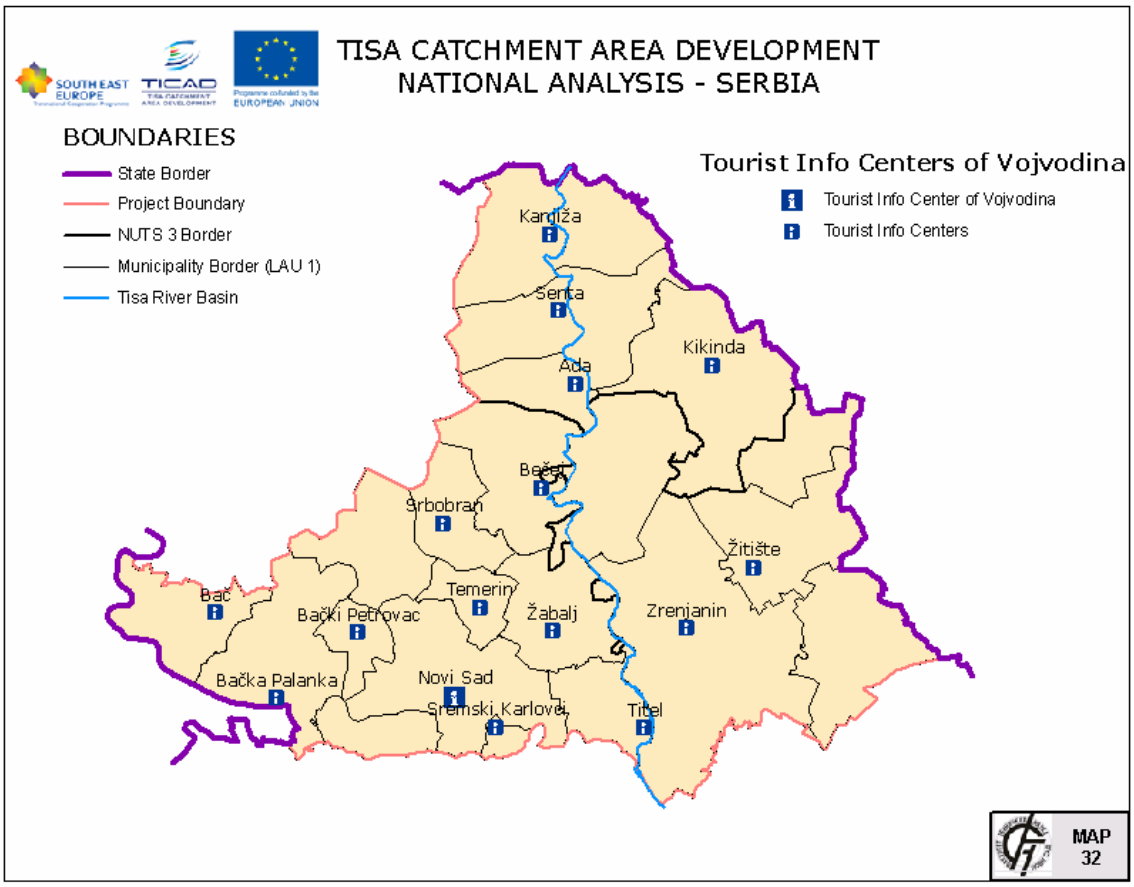
Zrenjanin is some 75 km north of Belgrade and 45 km east of Novi Sad, on the main routes that connect Serbia with Hungary and Romania: the Belgrade-Zrenjanin-Novi Knjaževac-Gyula-Szeged route, Belgrade-Zrenjanin-Srpska Crnja-Timisoara route and Belgrade-Zrenjanin-Novi Bečej-Kikinda-Nakovo-Arad route.Territory of the Zrenjanin municipality is one of the busiest river infestations in Europe. In the 30 km radius there are quite a few waterways: the rivers Tamis, Tisa, Karas, Danube and the Danube-Tisa-Danube canal. The town itself lies on the Begej river. The climate is moderately continental with the annual downfall of 617 mm. The municipality is comprised of the city of Zrenjanin and 21 settlements, with 25 different nations and nationalities living there (Serbs, Hungarians, Romanians and Slovaks are predominant). The total municipality's population is 132.051 whereas the city of Zrenjanin has 79.773 inhabitants. Zrenjanin is the administrative, political, economic, educational, and cultural and health centre of the mid-Banat and mid-Banat County. Agriculture, food processing, textile, metal processing and chemical industries are quite developed

City of Kanjiža, as the municipality's centre, has 10.193 inhabitants and it is considered a town of regional significance with the river Tisa and Horgos border crossing being nearby. The proximity of Tisa means that the landscape is picturesque with many possibilites for fishing and other tourist activities. Rich clay soil, oil, natural gas and thermal waters are all considered natural wealth and the basis of the municipality's economy (production of construction materials, health and recreational tourism). Thermal waters, therapeutical mud, river TIsa, vibrant surroundings, hunting grounds, the Selevenje woodland and wilderness, culinary specialties, cultural and sports' manifestations make Kanjiža a very attractive tourist place indeed.

The city of Kikinda lies on 82 m altitude. It stretches over 13,5 square kilometres and is a typical Pannonian town. It is built in the Empress Maria Theresa's style. There are many valuable archeological findings of ancient cultures and civilizations in the city. Numerous mounds, necropolis and archeological sites in the Kikinda's surroundings are the testament of the fact that people have been living here in organized communities since 5.000 years B.C. This area was a temporary or permanent residence of many nations which continuously have been arriving to the Pannonian Plain. The traces of early stone and bronze age, the Celtic civilization and Sarmatians could be found here. By mid 16th century Banat fell under the Ottoman Empire. The Turks were present in this area by 1718. The first Eastern Orthodox Church in Kikinda was built

in 1753, during the time when the Mures Serbs started to settle down in the town area. The church was a wooden shack covered by batten with the separate belfry. Current Eastern Orthodox Church was built in 1771, and the iconostasis was made by Teodor Ilič-Češnjar in 1780. In the latter 19th century, around 1880, a Roman-Catholic church was built. Because of their contribution in fight against the Ottoman Empire, in 1774, the citizens of Kikinda, together with the 9 neighbouring villages were granted a privileged position and certain rights within the Great District of Kikinda which existed up till 1876. In 1893, Kikinda was given a city status and at that time had 24.500 inhabitants. The City Council Hall, today the headquarters of the municipal administration, was built in the same year. Since the mid 20th century the town has started to grow rapidly and the number of inhabitants has been increasing steadily. Today, Kikinda has approximately 43.000 inhabitants. Kikinda is a modern industrial town, with numerous healths, educational and cultural institutions.

Picture 20. Tourist info centers in the Serbian Tisza Catchment Area



The contents of spa tourism

The area is characterized by significantly developed spa tourism. The most distinctive ones are banja Kanjiža and Bečejska banja. It is particularly important that they differentiate the offer and physically separated facilities for medical treatment visitors and for tourist visitors.

On the Tisza riverbanks are a few mineral water sources, which are used in spas for treatment. There are several mineral water sources that have not yet been tapped, and their exploitation is expected. Those sources are in the municipalities of Senta, Coka and Ada.

Hunting and fishing tourism

Hunting and fishing are certainly important activities in terms of tourist attractions. While hunting sector in Vojvodina has been devastating last two decades, fishing tourism have developed by opening the mostly private-controlled and fully equipped fishing grounds.

Nautical tourism

Development of boating and nautical tourism in the Tisa River has not yet begun. There are only the natural resources on which it appeared Tourism Strategy of Serbia 2005-2015.

Nautical seson on Tisa can last from april till october. Nautical season, therefore, unlike of cure, lasts much longer, which is a possible extension from the summer season to the spring and autumn. It is necessary to point out that in the spring and autumn Tisa has far more water than in the summer so the sailing is safer and much more pleasant.

Rural tourism

Rural tourism can be placed in the fourth place, as tourism sector which recently experienced an expansion, and up to now has 30 sites in AP Vojvodina. Farms are located along major travel corridors and roads, and mostly rely on weekend trips and transit tourism. They are located in Severna Backa around Subotica, along the highway Subotica-Novi Sad, near Novi Sad (Čenejska farms), along road Novi Sad, Zrenjanin, etc..

The existence of these sites significantly stimulates circular tours, a significant segment of the tourist offer of Vojvodina. In Potisje there are many attractive properties put in the function of rural tourism.

Business and MICE Tourism

Business tourism is characteristic of large cities, as well as segments of MICE tourism. This segment of tourism is well developed in Novi Sad and Zrenjanin, but also other smaller towns, can with additional

facilities, to offer tourists an adequate program for the meetings, incentives, conferences and exhibitions organized

Events/manifestation

The basic tourism offer in AP Vojvodina are series of events. It is estimated that in AP Vojvodina per year are held over 600 events that at least in one segment could be called „tourist" (festivals, parades, games, sports and recreational events, meetings, fairs and exhibitions, tastings, memorials, cultural events). 80 events can be called Mega events because of gathering more than 50,000 individual visitors.

Sport and leisure activities

Significantly, the sustainable tourism development involves the development of infrastructure and supply conditions for recreation, both tourists and local residents. The modern world practice shows that tourism development is meaningful only when it contributes to long-term welfare of the local population in a sustainable manner.

When we talk about dealing with tourism in local and regional framework, a very important fact the fact that the coastal parts of the Tisza long been used in swimming and recreational purposes and nautical purposes occasionally, continuously cultivated fish stocks, and there are some specific conditions for the development of sports and recreational tourism. On the other hand, the development of such forms of tourism must be responsible and sustainable, and in accordance with Agenda 21 which is corroborated by the fact that many experts actually stand cycling tourism as a sustainable form of tourism, as well as horseback riding, flying and the like. The current state of these forms of tourism is at the lowest level of development, but it is encouraging that it is possible to identify them. In Project area is a fairly large number of objects and content for rest and recreation. It could be say that the bigger problem is that the objects are mostly in poor condition and which is underused, as well as accommodation facilities. And the causes are the same: the lack of attractive programs to attract tourists, or lack of strategy of development of tourism and leisure activity for the locals. As for the spatial location of these facilities, they are mostly in urban centers, which suggest that they were constructed for the local population so that almost are not actively involved in a tourist industry. On the other hand, their spatial distribution is uneven, and probably the result of the ambition of local administration and the ability to at some point provide funds for their construction.

Destination Management – the key for tourism development

The holders of destination management in the Serbian Tisza Catchment Area are tourist organization of municipalities (Žitište, Kanjiža, Bečej, Zrenjanin, Senta, Ada, Kikinda, Bač, Bačka Palanka, Bački

Petrovac, Žabalj, Novi Sad-grad, Srbobran, Sremski Karlovci, Temerin, Titel) and The Tourist Organization of Vojvodina.

The main weakness in their work is recognized in inadequate professionals capacity, lack of good programs for the evaluation of tourist resources, and insufficient information of population and potential providers of tourism services.

The future development of tourism in this area will depend primarily on municipal organization ability to recognize their role and importance in the adoption and implementation of strategic documents, especially in the implementation part.

Tourist infrastructure

Tourist infrastructure as a prerequisite for the realization of the tourism industry includes:

- Provision of optimal storage capacity,
- Provision of infrastructure for certain types of tourism (the specific branch of tourism) and
- Provision of enough information about the tourist destinations (tourist information centers, tourist sites, brochures, databases of tourism industry, setting the mark in tourist resorts and on the Tisza for nautical tourism, etc.).

MAIN TOURIST INDICATORS

The tourist traffic analysis has been done on the basis of both official statistical data and the information collected on the fieldwork. The analysis has been done for the period of last 6 years on county unit level and it is showing simple structure for the number of tourist and number of overnight visits (foreign and domestic). Following lines are showing the results of the comparative analysis of tourist movements in Vojvodina and Serbia.

The most receptive markets for both domestic and foreign tourists are South Backa and Severni Bant regions. The most attractive tourist destinations are city centers: Novi Sad, Kikinda and Zrenjanin; spa center in Kanjiza and other destinations which are not laying on the Tisa river banks.

The Serbian Tisza Catchment Area (area along the river Tisa) is significant and important tourist receptor with more than 50% of total arrivals and overnight stays in Vojvodina. The Serbian Tisza Catchment Area holds 6-8% of total tourist visits in Serbia. That is negative indicator considering area’s potentials and capacities.

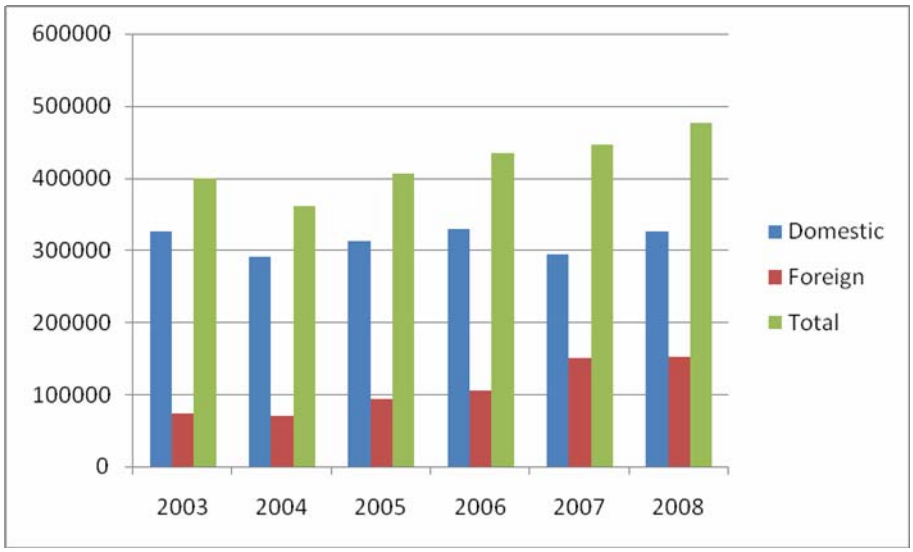
Intensifying tourist offer and creating adequate tourist strategy is important to extend the average stay of both domestic and foreign tourists in the area. The average stay in the assessed period was 2-4 days.

Table 16. Tourist arrivals for the period 2003-2008 in the Serbian Tisza Catchment Area

NUTS 3	2003	2004	2005	2006	2007	2008
Severni Banat	23271	23778	26161	23271	33321	29510
Srednji Banat	23890	24795	29438	25743	14656	24351
Južna Backa	91613	79061	83466	92801	116513	127805
TOTAL	138774	127634	139065	141815	164490	181666
AP Vojvodina	245614	239067	260503	267198	314222	330556
% of AP Vojvodine	56,50%	53,39%	53,38%	53,07%	52,35 %	54,96%
Serbia	1997947	1971683	1998469	2006488	2306558	2266166
% of Serbia	6,95%	6,47%	6,96%	7,07%	7,13%	8,02%

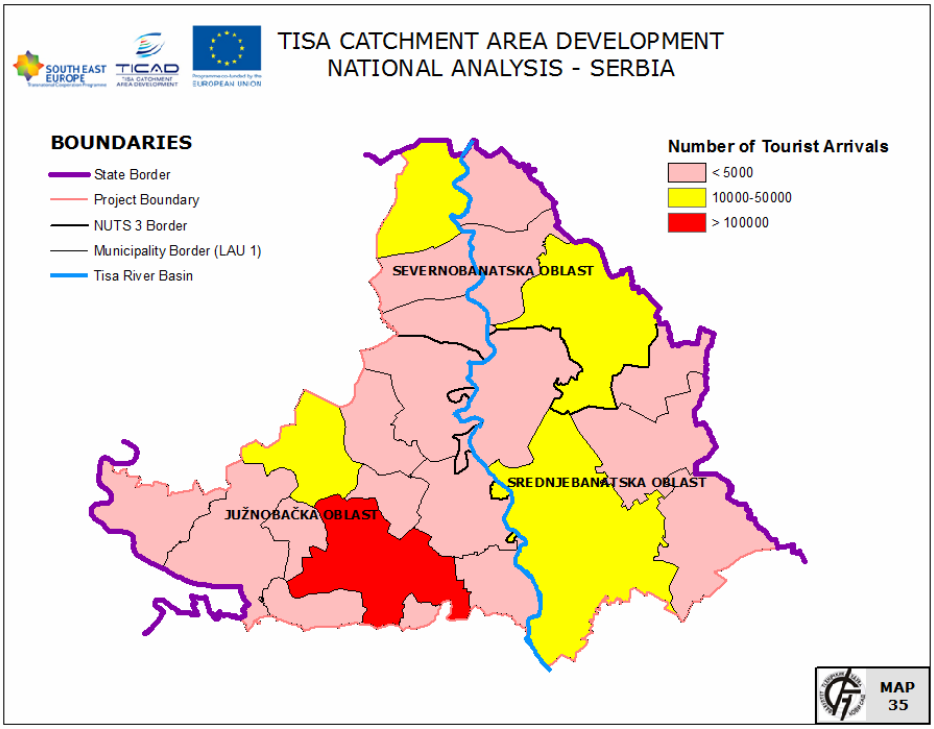
Source: Statistical office of the Republic of Serbia

Picture 21. Tourist arrivals for the period 2003-2008 in the Serbian Tisza Catchment Area (domestic and foreign)

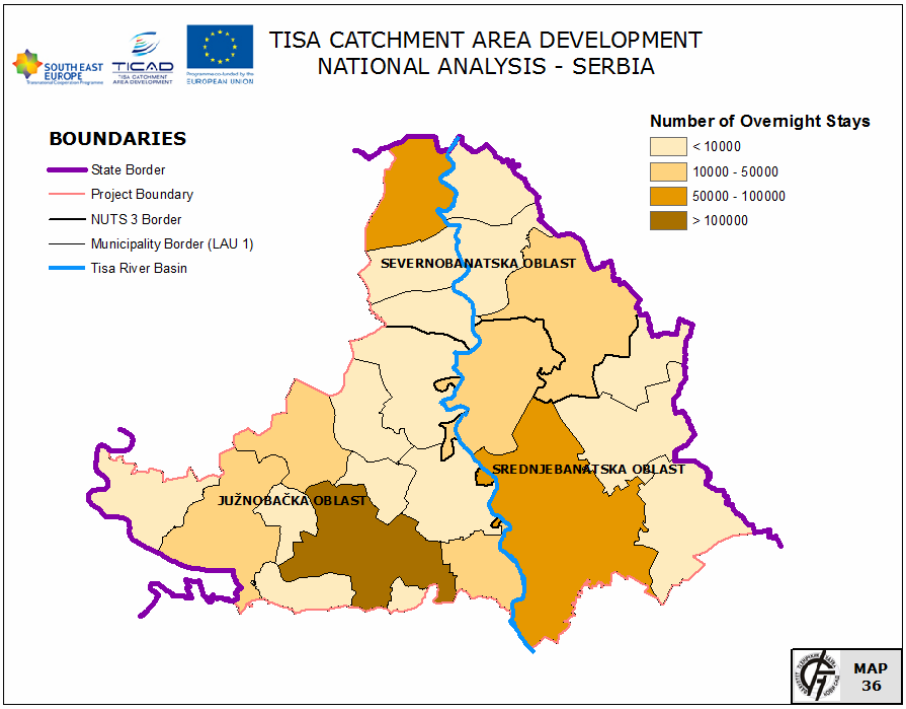


Source: Statistical office of the Republic of Serbia

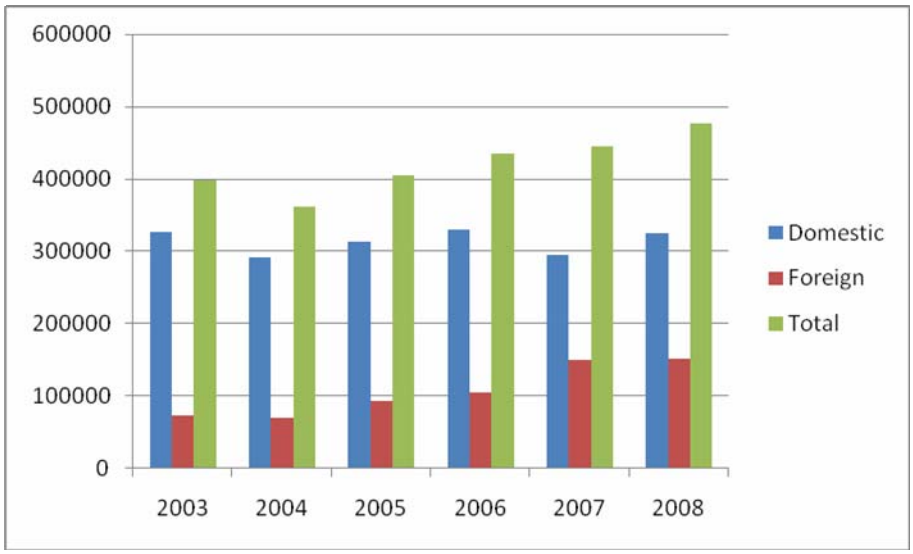
Picture 22. Tourist arrivals for the period 2003-2008 in the Serbian Tisza Catchment Area (domestic and foreign)



Picture 23. Tourist overnight stay for the period 2003-2008 in the Serbian Tisza Catchment Area



Picture 24. Share of toursts (domestic/ foreign) according to the number of overnight stays in period 2003-2008. in the Serbian Tisza Catchment Area



Source: Statistical office of the Republic of Serbia

Table 17. Average tourist stay for the period 2003-2008 in the Serbian Tisza Catchment Area

Tourists	2003	2004	2005	2006	2007	2008
Domestic	3,97	3,73	3,83	4,27	3,83	3,80
Foreign	2,53	2,23	2,47	2,57	2,73	2,60

Source: Statistical office of the Republic of Serbia

Accomodation facilities in Tisa Catchment Area

Throughout the region of the Tisa River, registered accommodation facilities are in the function of tourism supply. It is observed that some municipalities (Novi Sad, Kanjiza, Zrenjanin,) have varied and numerous accommodation facilities, while most of them have less diverse gastronomic offer and / or facilities with a lower category is particularly evident with Coka, N. Knezevac,Žabalj). In some municipalities there is no hotel accommodation at all, while in others there is insufficient accommodation capacity in private households. For some objects informations about the type, capacity and category are uncleard, and traffic data are missing completely. According to the Republican Institute of Statistics, which refer to the number of beds in accommodation facilities wich are divided into two groups, the data about the beds until 2004. were analyzed, while for the period since 2004. there are no data by districts, but were processed for the regions. Accordingly, for comparison, and determining of accommodation facilities in the Tisa

region in Serbia will be considered 2002nd and 2008. years when the processed data on the type and structure of accommodation facilities. The accommodation facilities in Serbia are divided into two groups: primary and complementary capacities. The main facilities are: hotels (first, second, third, the Fourth, fifth category and unclassified), boarding houses, motels, tourist resorts, tourist apartments, holiday resorts, inns, restaurants and more. Complementary facilities include: spa resort, climatic health resorts, mountain lodges and houses, workers holiday, children and youth resorts, camps, housing (private rooms), private homes and apartments, cabins, sleeping. Thus, in 2002. year in the districts covered by the project were a total of 199 hospitality facilities with a total storage capacity of 3739 beds, which accounted for 48.95% of the total number of beds for the territory of AP Vojvodina

Table 18. Accomodation facilities (number of beds) in the Serbian Tisza Catchment Area

County	Hotels					Motels			Pansion	Tur. apartments	Kamps
	5*	4*	3*	2*	1*	3*	2*	1*			
Srednje banatski	-	-	1	1	1	-	-	-	-	-	-
Severnobanatski	-	2	2	2	-	-	-	-	1	-	-
Južnobački	2	1	9	7	3	1	1	-	1	1	-
Total	**2**	**3**	**12**	**10**	**4**	**1**	**1**	**-**	**2**	**1**	**-**

Table 19. Accomodation facilities- hotels in the Serbian Tisza Catchment Area

Hotels												
	5*		4*		3*		2*		1*		Total	
County	rooms	beds	rooms	beds	rooms	beds	rooms	beds	rooms	beds	rooms	beds
Srednjobanatski	-	-	-	-	103	118	17	27	29	61	149	206
Severnobanatski	-	-	77	112	135	281	91	150			303	543
Južnobački	271	410	27	37	406	732	77	120	148	361	929	1660
Total	271	410	104	149	644	1131	185	297	177	422	1381	2409

Table 20. Other accomodation facilities in the Serbian Tisza Catchment Area

County	Motels			Pansion	Tur. apartments	kamps
	3*	2*	1*			
Srednjobanatski	-	-	-	-	-	-
Severnobanatski	-	-	-	8/17	-	-
Južnobački	34/58	9/19	-	4/8	22/43	-

Based on the table it can be seen that the accommodation facilities in the Serbian Tisza Catchment Area increase. The table did not include accommodation in village homes, houses and apartments as well as farms that represents complementary tourist infrastructure. At this time, In

Serbia is performing a list of the number of beds in this storage capacity, which is a very large job, and is currently not possible to obtain relevant information on complementary tourist accommodation.

SWOT ANALYSES

The SWOT ANALYSIS is focusing on the status and opportunities for the development of tourism sector in the Serbian Tisza Catchment Area.

Strengths	Weaknesses
• The most important natural resource with rich rivers Tisa and channel DTD- significant amounts of water • A good resource potential for tourism development, • Very beautiful panoramic views, places of rich cultural and historical heritage and gastronomy, which represents good potential for development of river tourism Multiculturalism in districts in Vojvodina is significant potential for development of additional tourist attractions • Image of relatively cheap, peaceful and safe tourist destination • Relatively well- developed regional cooperation • Good conditions for agricultural production and food industry	• Insufficient development of existing infrastructure and superstructure for the development of nautical tourism • Lack of accommodation and catering facilities with adequate level of servicing • Unused tourism potentials • Lack of adequate strategies for the development of Tisa Municipalities • The complicated and expensive procedure of obtaining permits for the construction of marinas on the river • Slow entrepreneurial restructuring and under- representation of SMEs in tourism • Decline of the importance of agricultural production and the inclusion of agriculture in tourism resources • Lack of knowledge and insufficient level of awareness and promotion of nautical tourism products Unfinished strategies for sustainable development and the lack of a comprehensive approach to environmental protection • Lack of extra services: school fishing, river boating courses
Opportunities	**Threats**
• Attracting foreign investment in infrastructure and tourism Simplification of procedures for obtaining permits for the construction of marinas • Improving collaboration between private, public and NGO sectors particularly in tourism and environmental protection • A policy for wider use of the	• Slow economic development, unstable political situation and poverty that domestic demand is too long kept at a low level affects tourism • Disposal and under-use of EU funds • Lagging behind the neighboring regions (in Hungary and Romania)- export of labor, slow construction of traffic and tourist infrastructure

capabilities of the Tisa river as an integrating factor for cross-border and transnational tourism development, linking the tourist markets of Tisa countries and development of common tourist products • Encouraging the development of economic sectors directly linked to the development of different forms of tourism (wine and grape processing, food industry, handicrafts, commerce, etc.). • Using the opportunities of EU funds and individual donor programs for the implementation of projects in tourism	• Lack of motivation of local authorities to use the resources available for development of tourism sector • Continuing underestimating the potential of public-private partnership for the realization of the major projects in tourism in the smaller municipalities near Tisa

6. Natural and environmental features

6.1. Natural features

The Serbian Tisza Catchment Area is situated in Central Europe, more precisely, the southern part of the Pannonian Basin. It stretches over the northern part of the Republic of Serbia, taking up the central position in the Autonomous Province of Vojvodina, generally in the meridional direction.

Picture 25. The River Tisa catchment area

This area is characterised by expressed complexity of the contents, functions and activities, giving it a specific polymorphic and polyfunctional structure.

The River Tisa catchment area in Vojvodina is situated in the south-eastern part of the Pannonian Basin, which has undergone various, more or less turbulent stages in the course of its geological history. To comprehend the stratigraphic relations between various geological formations underlying the young Quaternary sediments present in the surface sections of the studied area, it is necessary to analyse the evolutional development of the entire Pannonian Basin. In fact, even before its creation, the entire space stretching from present-day Alps in the west to Turkmenistan in the east, parallel with the Tethys, had been taken up by a spacious interior sea, known as Paratethys. The turbulent stage of Alpine orogenesis, which took place at the time of transition form Palaeocene to Neocene, more precisely, in Oligo-Miocene, was the period of intensive tectonics, especially in the western areas of the Parathetys. These processes of uplifting and folding resulted in the creation of the Alpine, Carpathian and Dinaric mountain ranges, and simultaneous tectonic sinking of large blocks along the deep rift lines resulted in the spacious intramontaneous depression, i.e. Pannonian Basin, with the Pannonian Sea within it (Aksin, Kukin, 1996).

The creation of the Pannonian Basin was followed by intensive sedimentation on the old geological base of the sunken Pannonian Mainland, structurally comprised predominantly of crystalline rocks of Palaeozoic and Mesozoic age, first in a marine, then lacustrine, and finally paludal and swamp environment. All of these point to a highly complex structural and tectonic constitution of the Pannonian Basin, which passed through five consecutive stages during its evolutional development – Mediterranean, Sarmatian, Pannonian, Pontian and Levantine.

- the *Mediterranean stage*, i.e. Oligo-Miocene period, is related to the main formative phase of the Pannonian Basin and Sea. The Pannonian Sea was mediterranean in character, warm, with characteristic flora and fauna;
- at the beginning of the *Mediterranean stage*, all the straits between the Pannonian Sea and the Tethys were closed. The newly-arisen conditions led to desalinisation and marked changes in the structure of the marine fauna of the Pannonian Sea. As this stage saw not only the continued elevation of the surrounding mountains but also foundering of the central parts of the Pannonian Depression, the coastline was constantly shifting.
- towards the end of Miocene begins the *Pannonian stage*, when the closure of the Carpathian Straits resulted in the separation Pannonian Sea from the remaining part of Paratethys, and its consequent isolation into a self-contained entity. Due to constant inflow of fresh water from the mountain ranges, its salinity kept decreasing, causing a total extinction of saltwater fauna, and

subsequent appearance of fauna characteristic of freshwater habitats – the so-called caspibrackish fauna. At the beginning of the Pannonian stage the sea was shallow, but in time it extended, flooding the formerly dry areas of the Pannonian Depression;

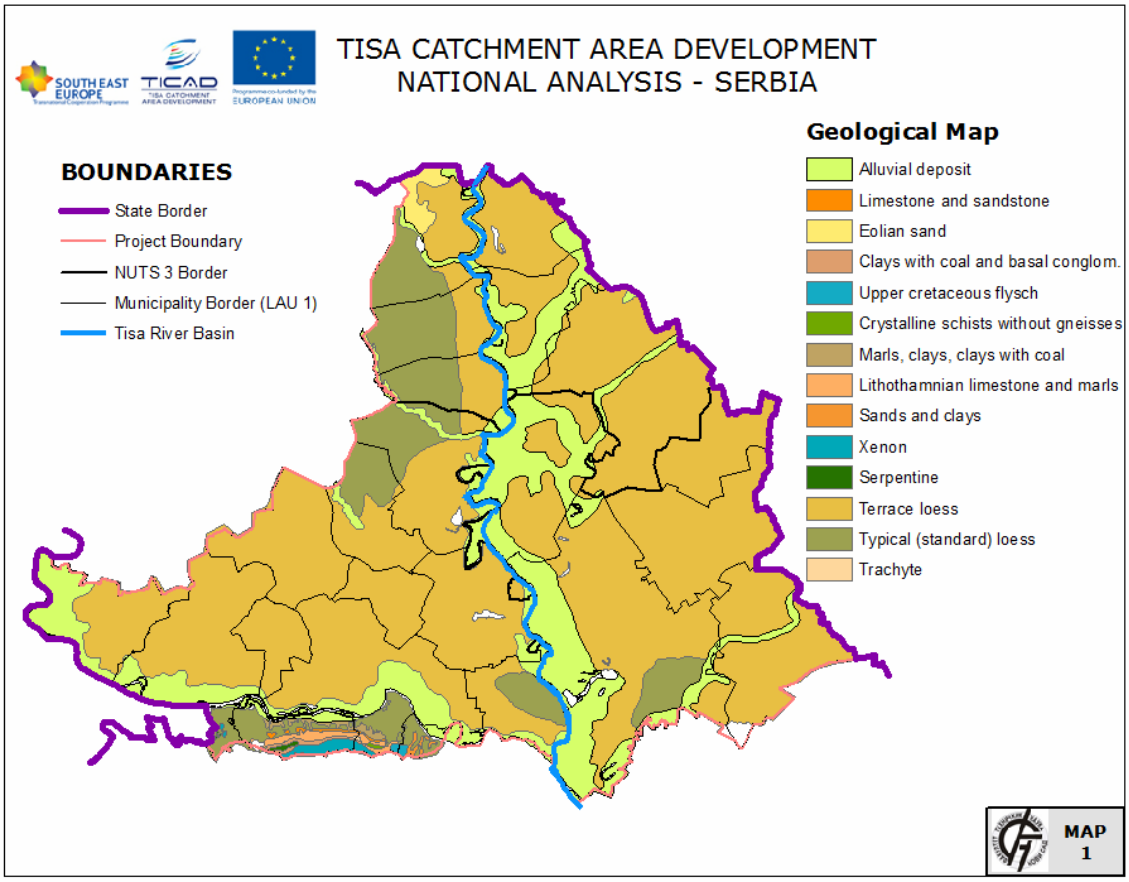
- during the *Pontian stage*, the Pannonian Sea was reconnected by a hiatus to the Gethyc Sea, which consequently covered the entire Pannonian Basin. Mixing with the salty water of the Gethyc Sea led to a slight increase in the salinity of the water in the Pannonian Depression. The Pontian Sea reached the greatest depth in the central parts of the basin, especially in the newly-formed depression;
- the Pontian stage was followed by *Levantine*, as the final stage in the evolution of the Pannonian Basin, which saw a sudden narrowing of the Sea's contours. Having lost the connection with other marine environments, it was transformed first into a single lake which subsequently, by gradual water attrition, divided into a large number of smaller lakes which, in time, disappeared and turned into swamps and ponds. The Levantine stage saw the development of the so-called paludine fauna, typical of lacustrine and paludal ecosystems.

The end of the Levantine stage, i.e. Pliocene, was followed by the Quaternary period, which saw the build-up of aeolian sediments in the area of the Pannonian Basin. The build-up of these sediments and drainage of the excess water by way of Danube, the Pannonian Basin became typical mainland with typical, primarily fluvial and aeolian relief, as well as a normally developed fluvial network, lacustrine, paludal and swamp ecosystems (Aksin, 1998).

Analysing the development of the Pannonian Basin, it is obvious that the geologic structure of the area encompassed by the Study was created under identical or very similar conditions:

- the oldest geological formations originate from the **Palaeozoic** – metamorphic, magma tic and sedimental rocks;
- the Palaeozoic foundation is overlain with younger **Mesozoic** formations represented by Triassic, Jurassic, cretaceous metamorphites and sediments;
- the Mesozoic formations are covered with sediments of the younger, **Cainozoic** formations, i.e. Palaeogenic, Neogenic and Quaternary sediments;
- the geological profile of the Pannonian Basin finishes with the above mentioned, the youngest, surface Quaternary deposits.

Picture 26. Geological map of Serbian Tisza Catchment Area



The top of the geological column of the studied area contains the loess and sand layers of the Quaternary age (Picture 25.).

Loess is the most frequently found surface rock on the studied area, appearing in two varieties. Namely, the *typal terrestrial loess* participates in the structure of Bačka Loess Plateau, Titel Knoll and Tamiš Loess Plateau, whereas the so-called *terrace, partially hydromorphic loess* is in the structure of the loess terrace.

Terrace loess is considered as compound, having the character of overlain, paludal, i.e. mainland loess.

Generically, overlain loess is aeolian-fluvial formation of subaerial materials previously deposited elsewhere.

Sand deposits within the examined area are also considerably widespread.

The composition of Subotica-Horgoš Sands includes *aeolian sand*, while the composition of the alluvial plateau of the Tisa includes very fine-grain, almost dustlike alluvial sand which, due to its fine-grained character, reminds of loam and clay. Near the Tisa River mouth, this fine-grained sand is mixed with the sandy formations included in the composition of the Danube alluvial plateau.

Observing the *structural and tectonic composition* of the studied area, it is important to note that the significantly unconformable relief of the old Palaeozoic crystalline base generally slopes towards the central part of the catchment area. The slope of the paludal as well as Pleistocene and Holocene sediments points to the fact that the tectonic foundering movements are constant, especially in the Tisa Catchment area. One piece of evidence is that the Tisa never built an alluvial terrace, because it has been accumulating material constantly. Among the numerous rifts along which the neo-tectonic foundering movements are occurring within the studied area is certainly the so-called *Tisa rift line*, generally stretching in the north-east direction.

Climate

The climatic characteristics of the Serbian Tisza Catchment Area are one of the natural factors making an impact on the development of tourist industry, forms of tourism and trends in tourism in general. Viewing from this aspect, this factor was analysed as a significant element in multiple evaluation of marines on the Tisa. The types and form of tourist trends, length of tourist season and other elements related to tourist management of the area depend on the characteristic values of climatic elements (air temperature, relative humidity, overcast and insolation, precipitation, winds etc.).

The scope of the Serbian Tisza Catchment Area also includes the analyses and values of climatic elements for the period 1951-1990 published in *The Climate of Banat*[2] for the Senta and Zrenjanin weather stations, and Meteorological Yearbooks[3] of the State Weather Bureau in Belgrade for the Bečej Weather Station. More precisely, the data from these three stations will be interpolated so as to view the average values of individual climatic elements in the area encompassed by the Study.

Air temperature is a significant element for certain tourist activities. Air temperatures exceeding 20°C with water temperature above 18°C during summer months are of great significance, determining the duration of the bathing season.

For the region in question, the median annual air temperature values over the observation period at the selected weather stations in the area encompassed by the Study range from 10.9°C (Senta weather station) to 11.2°C (Bečej weather station).

[2] Lazić, L. & Pavić, D (2003). *Klima Banata*. Novi Sad: PMF, Geography Department.
[3] Meteorological Yearbooks for the period 1991-1950. Belgrade: State Weather Bureau.

Table 21. Median monthly and annual air temperature values (in °C).

Weather stations	Months												
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Median annual
Senta	-1.3	1.1	5.9	11.4	16.7	19.8	21.4	20.8	16.9	11.4	5.7	1.5	10.9
Bečej	-0.5	5.9	5.6	11.2	15.9	19.9	24.2	21.0	15.4	12.0	3.1	1.2	11.2
Zrenjanin	-0.9	1.3	5.9	11.3	16.3	19.7	21.3	20.8	17.2	11.6	5.7	1.4	11.0
Median monthly and annual value in the area encompassed by the Study	-0.9	6.1	5.8	11.3	16.3	19.8	22.3	20.9	16.5	11.7	4.8	1.4	11.0

The highest median monthly air temperature values are recorded in July (from 21.3°C to 24.2°C) and August (from 20.8°C to 21.0°C), and the lowest in January, when the temperatures drop below zero (from -0.5°C to -1.3°C).

The absolute maximum air temperature recorded in the area treated in the Study for the period from 1951 to 1990 was 39.2°C, recorded on August 15, 1952 at the Senta weather station. The absolute minimum temperature of -39.2°C was recorded at the Zrenjanin weather station On January 24, 1963, so that the absolute oscillation amplitude for the observed area is 69.6°C.

From the aspect of tourist activity valorisation, the shown data point to a conclusion that, for the most part of the year, the Tisa River Basin is highly suitable for sport, recreation and other forms of tourism.

The total median annual number of frigid days (Tx<0°C) over the observed period ranges from 20.5 to 21.3 days. The median annual number of summer days (Tx≥25°C) over the observed period ranges from 90.8 to 92.5 days. The highest number of such days is recorded in the summer months of July and August.

The median annual number of tropical days (Tx≥30°C) ranges from 27.3 to 28.9 days (Senta), mostly in July and August.

Considering all the above data, the conclusion is that the best conditions for various forms of tourism (bathing, sports, recreational and nautical) during the summer months.

Relative air humidity

The values of relative air humidity as a climatic element, in combination with other climatic elements – air temperature and moderate wind – give the area a feeling of certain comfort. For the human organism, the most favourable relative air humidity is 60%, and 20°C air temperature.

According to relative humidity percentage, bio-climatology distinguishes the following categories:

- very dry air (55% relative humidity);
- dry air (between 55% and 75%);
- moderately humid air (between 75% and 90%); and
- very humid air (over 90%).

Table 22. Median monthly and annual relative air humidity values (in %) for three weather stations – Senta, Bečej and Zrenjanin – for the period 1951-1990.

Weather stations	Months												
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Median annual
Senta	85	82	76	71	71	72	69	71	74	78	85	87	77
Bečej	82	73	67	58	60	63	53	58	68	61	80	80	67
Zrenjanin	85	82	74	70	70	71	68	69	71	75	83	87	75
Median monthly and annual values in the area encompassed by the Study	84	79	72	66	67	69	63	66	71	71	83	85	73

The lowest median annual relative air humidity value for the observed period was recorded at the Bečej weather station (67%) and the highest at the Senta weather station, where the average median annual value in the scope of the Study is 73%. Maximum median monthly values occur during winter months (from 73% to 87%), and the lowest values are recorded in summer (from 53% to 72%). As regards bio-climatological classification, the area encompassed by the Study is classified among areas with exchanging dry and moderately humid air periods over the year.

Insolation is a significant element in view of the fact that it makes an indirect impact both on the other climatic elements and the tourist appeal of the area in question. When choosing the potential marina sites, it must be borne in mid that this climatic element is of primary significance for heliotherapy, length of the bathing season, landscape appearance and other values.

Table 23. Median monthly and annual insolation values (in hours) in the area encompassed by the Study for Bečej and Zrenjanin weather stations for the period 1951-1990.

Weather stations	Months												
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Median annual
Bečej	42.5.0	145.6	132.7	197.3	225.9	236.1	341.1	258.4	186.8	213.6	56.4	32.3	2068.7
Zrenjanin	71.0	92.0	150.0	175.0	226.0	245.0	287.0	272.0	213.0	172.0	80.0	57.0	2039.0
Median monthly and annual values in the area encompassed by the Study	56.75	118.8	141.4	186.15	226	241	314.1	265.2	200	192.8	68.2	44.7	2053.9

As the area encompassed by the Serbian Tisza Catchment Area is located in the temperate continental zone, it can be regarded as characterised by relatively high average insolation – over 2000 hours annually on the entire area, or average 5.6 hours daily. The highest average

insolation values are recorded by the Bečej weather station, whereas Zrenjanin has somewhat lower annual average of 2039 hours. The higher average insolation value is recorded at the Bečej weather station, while in Zrenjanin it is somewhat lower, with average 2039 hours a year.

Overcast is a highly significant climatic element, as insolation is directly dependent on it, which has a great influence on some forms of tourism (recreation and bathing).

Table 24. Median monthly and annual relative air humidity values in the area encompassed by the Study at Senta, Bečej and Zrenjanin weather stations, for the period 1951-1990 (in %).

Weather stations	Months												
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Median annual
Senta	72	67	61	57	54	51	42	40	42	48	69	75	57
Bečej	68	44	61	51	53	51	31	47	49	27	74	84	53
Zrenjanin	69	67	59	56	55	52	40	36	41	46	66	72	55
Median monthly and annual values in the area encompassed by the Study	70	59	60	55	54	51	38	41	44	40	70	77	55

From the data shown in the table, one can conclude that the overcast intensity is the lowest during the peak tourist season in July and August (average value for the area encompassed by the TICAD project from 38% to 41%), and the highest during winter months.

Precipitation is a highly significant climatic element, whose values influence the characteristics of a given area (maintenance of hydrographic bodies and vegetation). As regards the impact of precipitation on the development of certain forms of tourism, notably bathing, sports and recreational, days without precipitation are more significant.

Table 25. Median monthly and annual precipitation values at Senta, Bečej and Zrenjanin weather stations, for the period 1951-1990 (in mm).

Weather stations	Months												
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Median annual
Senta	39.0	39.7	37.0	45.0	66.5	79.2	47.9	52.6	37.3	32.6	48.1	48.7	573.6
Bečej	62.6	40.8	50.6	39.6	42.3	143.0	58.0	45.0	63.5	35.0	53.4	86.0	685.9
Zrenjanin	36.1	37.3	36.6	46.6	60.7	80.5	58.3	46.4	36.0	34.4	45.4	47.8	566.1
Median monthly and annual precipitation values in the area encompassed by the Study	45.9	39.3	41.4	93.7	56.5	100.9	55.7	48.0	45.6	34.0	49.0	61.0	609.0

The highest precipitation amounts in the area encompassed by this project occur in June – 100.9 mm, and the lowest in October – 34 mm. The total average precipitation amount for the given area is 609 mm.

Windiness as a climatic element is also significant in the nautical tourism development context along the Tisa banks. The wind has a great impact, reflected in several key facts:

- it influences the lowering of high air temperature in the shoreside and riverside regions of various hydrographic elements;
- lower intensity is favourable for yachting;
- strong wind can significantly hinder river navigation.

Table 26. Median annual wind frequencies and speeds at Senta, Bečej and Zrenjanin weather stations, for the period 1951-1990 (in ‰ and m/s).

Weather stations	N		NE		E		SE		S		SW		W		NW		C
	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	
Senta	125	1.9	81	1.5	58	1.5	170	2.2	111.0	1.9	84	1.8	108	1.9	188	2.1	75
Bečej	108	1.8	92	1.5	97	2.1	196	3.0	79	2.4	152	2.4	129	2.2	113	1.8	129
Zrenjanin	108	2.4	74	1.8	61	1.8	208	2.8	134	2.6	140	2.0	140	2.2	141	2.5	65
Median values in the area encompassed by the Study	113.7	2.0	82.3	1.6	72.0	1.8	191.3	2.7	108.0	2.3	125.3	2.1	125.7	2.1	147.3	2.1	89.7

Data analysis shows that the dominant winds values in the area encompassed by the TICAD project are southeast-northeast direction, i.e. 191.3‰ (southeast 147.3‰, northeast 147.3 ‰). The situation is similar in terms of speeds, where the highest average speed of 2.7 m/s is recorded for the most frequent southeast wind. The average silence frequency in this area is 89‰.

It must also be pointed out that gale-force winds preventing navigation occur along the Tisa in July and August, but do not last long.

Seismic characteristics

According to the data of the Geological Atlas of Serbia (Seismo-tectonic and Seismologic map, scale 1:200000), the Autonomous Province of Vojvodina is located in a potential earthquake zone, more precisely, the so-called II (second) compression zone, 200 to 400 km from the subduction zone of the African Plate under the European, where this process generates enormously high tension fields in the rocks that are the principal causes of the occurrence of tectonic earthquakes.

The territory encompassed by the study is locates in the zones of possible 7° and 8° MCS intensity.

In addition to natural earthquakes, artificial earthquakes, occurring due to anthropogenic activities, i.e. environmental impact, are also possible. The most frequent example of such activities occurs in areas with formed large artificial reservoirs, causing the occurrence of the so-called induced earthquakes. The group of artificial earthquakes also

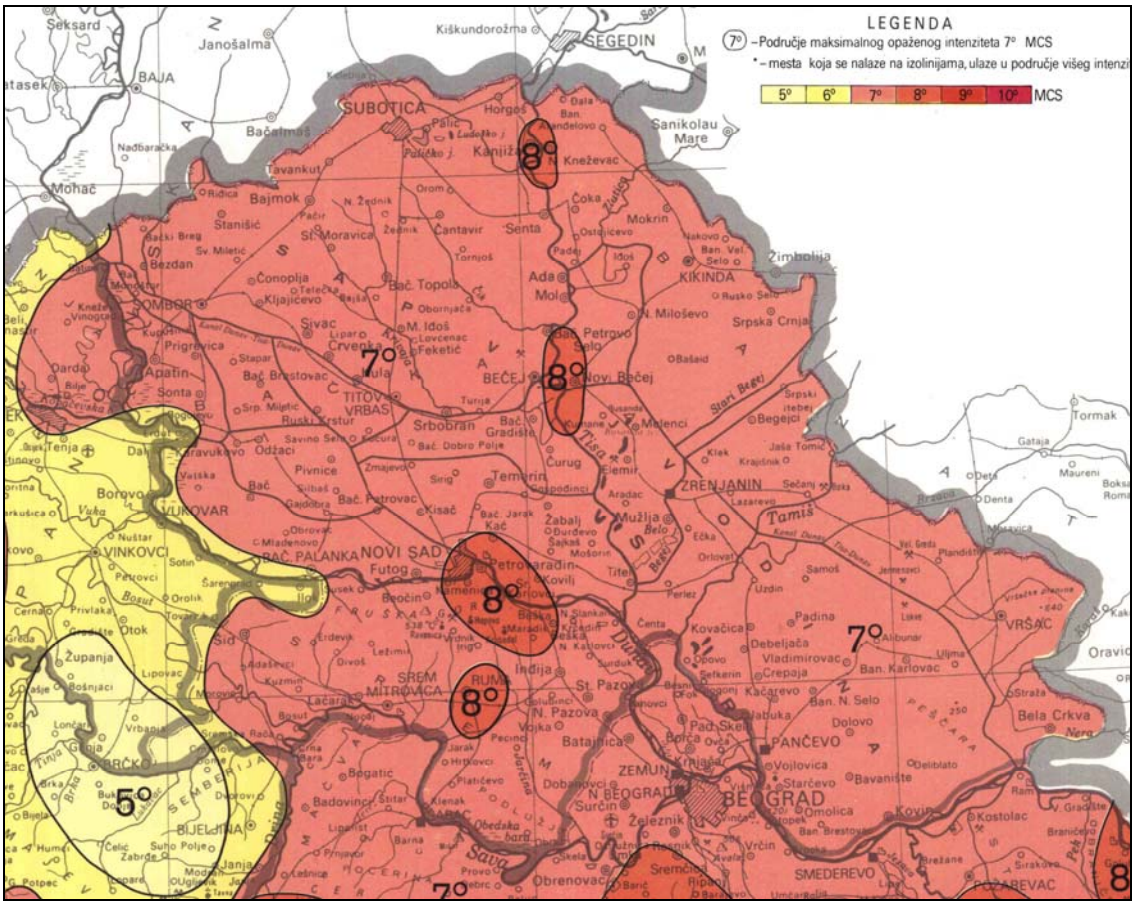
includes the seismic activity stimulated by pumping water into deep wells, for instance for geothermal energy exploitation purposes (underground dry heat sources).

As the entire territory of the AP Vojvodina, including the territory encompassed by this study is potentially endangered by earthquakes whose intensity causes damage on buildings, the design and construction requires the implementation of all technical norms for construction in accordance with the degree of the seismic area.

The basic degree of terrain seismicity

The seismic intensity of an area depends on the length of the time period (the so-called tracking period) considered in the design of planning documents, planning and designing facilities. For this reason, the data on the tracking period of 100, 200 or 500 years are not identical. The attached maps, obtained from the Republic Seismological Office in Belgrade, show the expected maximum earthquake intensities for the tracking period of 100 and 200 years on the territory of AP Vojvodina.

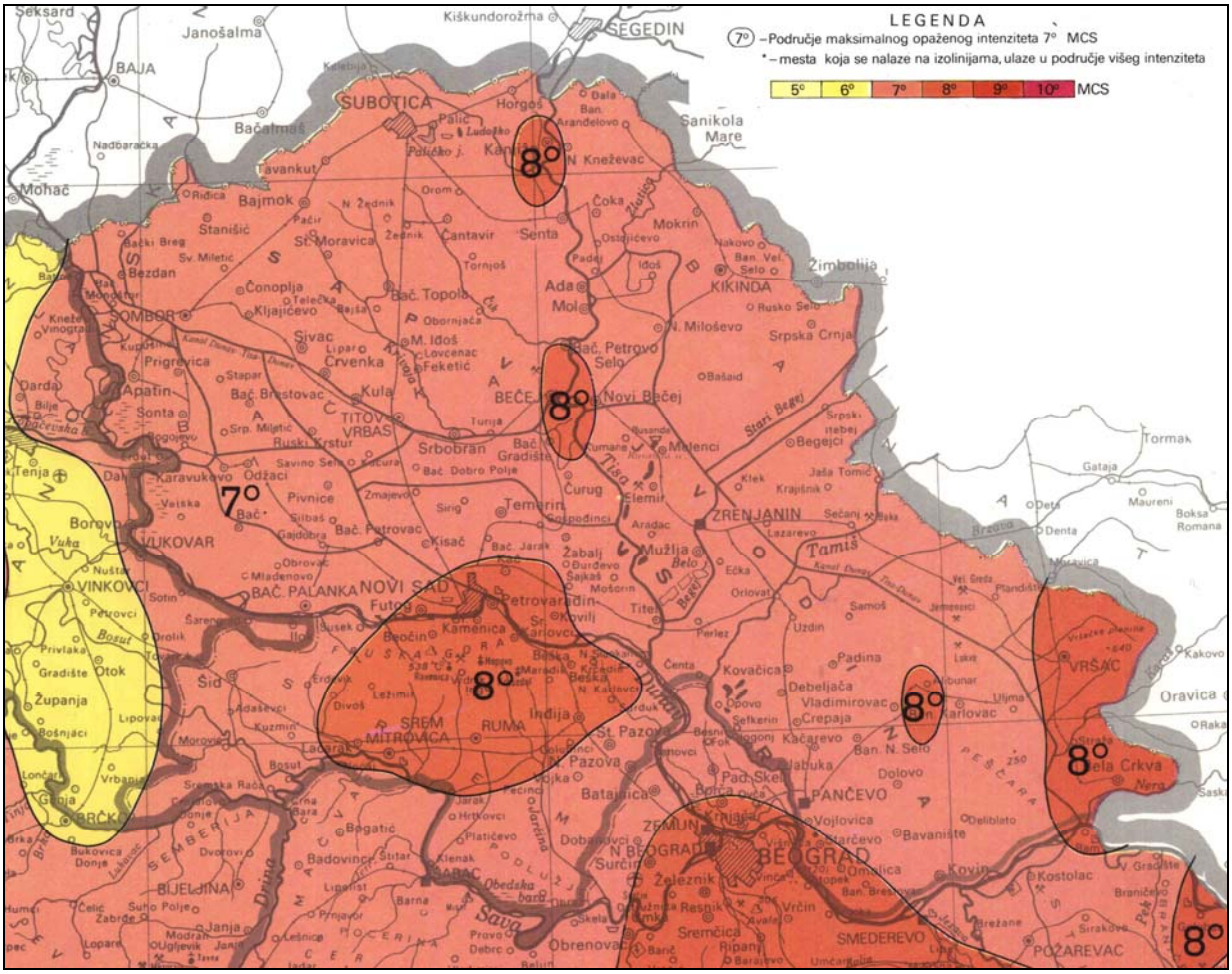
Picture 27. The seismic map of AP Vojvodina for the tracking period of 100 years.



The modified basic degree of seismicity

After determining the specific locations for accommodation facilities, it is necessary to obtain the micro-seismic conditions for each of them, as these can differ from the basic seismicity degrees. The attached maps show the expected macro-seismic intensities on terrain surface for 'characteristic' ground. This term refers to all grounds of various geo-mechanical features, causing the equal value effect in terms of earthquake impact spreading. The expected maximum earthquake intensity will be obtained for a specific location, in relation to local terrain and its geo-mechanical features (micro-regionalisation).

Picture 28. The seismic map of AP Vojvodina for the tracking period of 200 years.

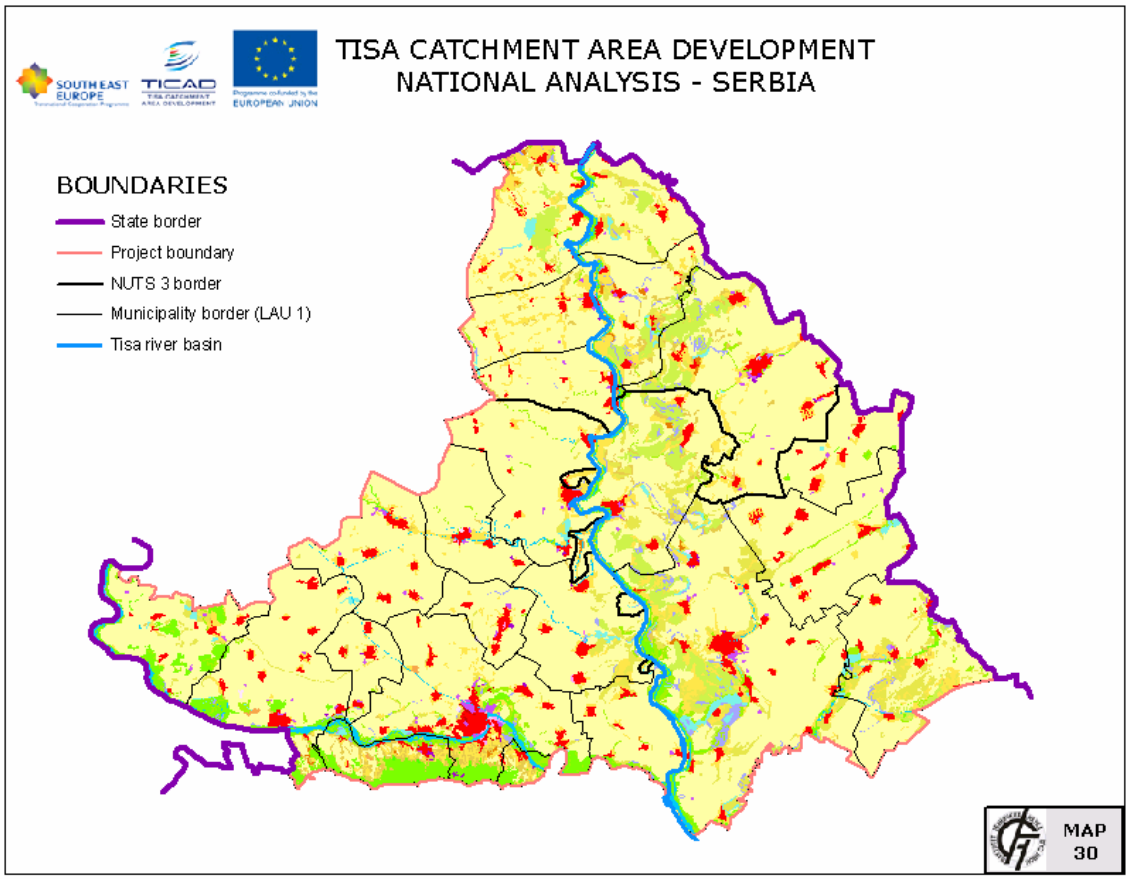


6.2. Landscape use

The analysis of the land use structure and of **the dynamics of land use structure** has been performed with the help of CORINE Land Cover database, versions 1990. and 2000.

According to the CORINE Land Cover classification (2000 version), 24 different land uses are highlighted across the territory of the 3 analyzed counties.

Picuture 29. The land use structure (1990) in the Serbian Tisza Catchment Area



Source: Corine, 1990

Land use changes have been monitored on the basis of differences over the period of 10 years (1990-2000).

Irrigated arable land areas have recorded the sharpest surface decrease of 2817.73 ha, for the period 1990-2000 which is understandable as it is the most spread land use in Vojvodina.

It is important to slow down or to stop this trend as arable land is nonrenewable resource. Similar situation is also with other agricultural land use areas which surface shrank for 908.42 ha.

Surface of broad leaf forests also significantly decreased losing 556.61 ha while natural grasslands shrank for 423.95 ha.

The decrease of some land uses was significantly lower: areas generally used for agriculture (150.74 ha), inland marshes (79.91 ha), beaches, dunes and sands (23.92 ha), dump yards (16.70 ha) and orchards (5.77 ha).

However many land use categories increase the surface in the ten year period (1990-2000).

Lands that increased the surface the most are water bodies areas (1546.43 ha). That was the consequence of increase building of fish farms.

Transitional woodland/shrub lands used the opportunity of broad leaf forests and grasslands shrinkage to extend over 1192.62 ha and pastures 712,79 ha.

After many years of stagnation vineyards have recorded minimal increase (117.02 ha) which is very positive tendency.

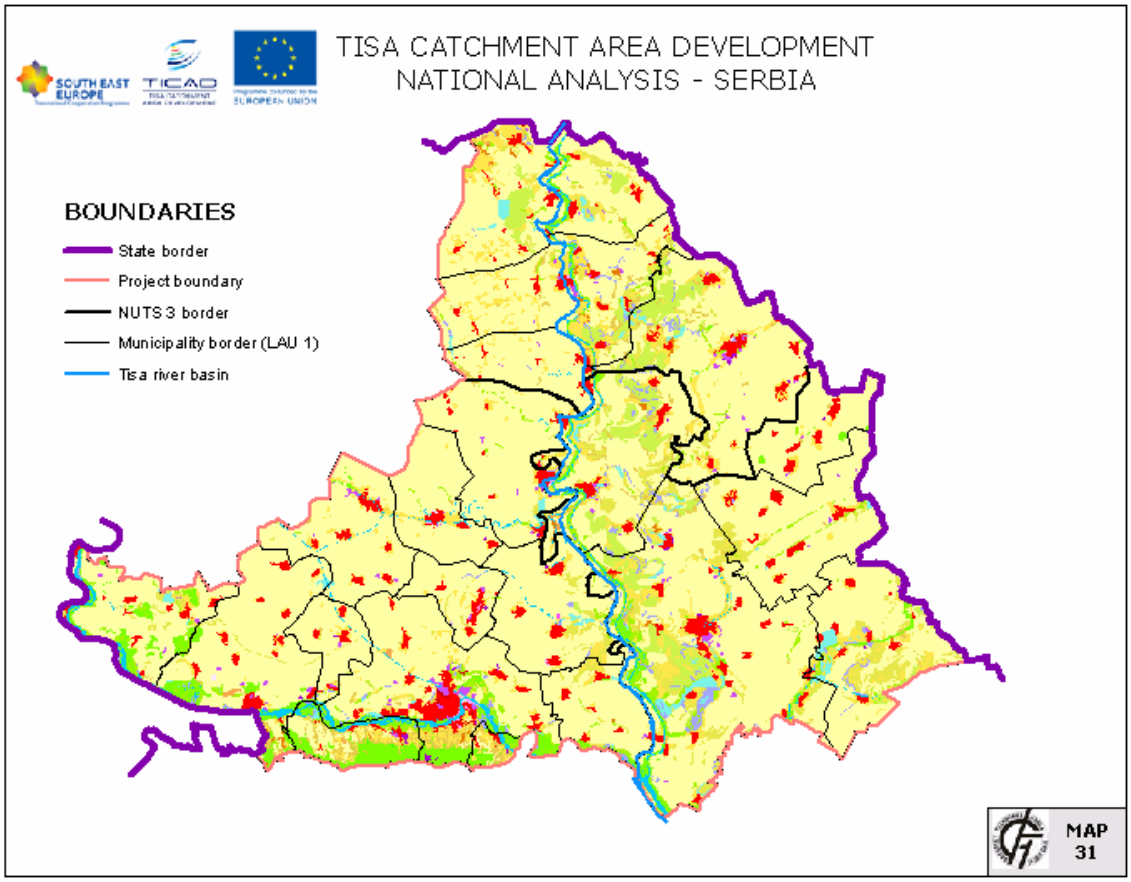
There is 47.65 ha increase of lands for mineral resources exploitation.

Areas related to extensive urbanization processes and infrastructure development have significantly increased surface.

The most notable is the increase of the discontinuous urban sprawl (1044.5 ha) which is in the most cases related to vacation houses zones and other urban and working zones outside settlement building zone.

The rest of land uses have minimally changed their surface: water courses – extension of ports and regulation of courses (135.58 ha), Industrial and commercial units (78.21 ha), recreational and sport areas (10.55 ha), road and rail networks and objects (6.63 ha).

Picture 30. The land use structure (2000) in the Serbian Tisza Catchment Area



Source: Corine, 1990

6.3. Environmental features

6.3.1. Water bodies

The water bodies of the studied area comprise smaller streams, numerous lakes of fluvial or artificial origin, as well as the DTD Hydro-system canal network.

The River Tisa

By length (966 km) and basin size (157,220 km^2), the Tisa is the largest tributary of the Danube. It begins at the confluence of the Black and the White Tisa near the town of Rahov in Ukraine. It runs through Ukraine, Hungary and Serbia, touching the territories of Romania and Slovakia. It enters our country from Hungary, 6 km downstream from Szeged, and represents a natural boundary between the two countries at the length of 4 km (km 164-160). The last sector of the Tisa's riverbed in our country stretches generally in the meridional direction, as a boundary between Bačka and Banat, at the length of 160 km. Carrying 870 m^3 of water, it flows into the Danube at its km 1214.5 opposite Stari Slankamen, at 72.4 mAHB.

The most significant tributaries of the Tisa are Maros/Mureş, Szamos/Someş, Körös/Kereš, Bodrog etc. On the Serbian stretch, the most significant tributary is Begej, whereas other tributaries (the Kereš/Körös, the Zlatica/Aranca, the Budžak, the Čik and the Jegrička) bear very little hydrologic significance.

The stream of the Tisa can be divided into three stretches: upper (from Novoselica to Szamos/Someş mouth), middle (from Szamos/Someş mouth to Maros/Mureş mouth) and lower stretch (downstream from Maros/Mureş mouth to the point of entry of the Tisa into the Danube).

Analysing the slopes on the longitudinal profile for individual sectors, one can conclude that The Tisa has the features of a mountain stream only in its upper stretch, whereas in its middle and lower stretch it is a typical flatland river. In fact, along its upper stretch from the confluence of the Black and White Tisa down to the Szamos/Someş mouth, on the 266 km long stretch, the total slope of the main river bed (*h*) amounts to approximately 375 m, which is 1.34 m/km (1.34‰) on the average (*J*). Viewed from the headwaters of the Black Tisa, as the longer confluent, the total slope down to the Szamos/Someş' mouth is about 1,577 m, or 5.01 m/km (5.01 %) on the average. The energy of the relief in the Tisa's headwater area is best evidenced by the average slopes on the longitudinal profile of its confluents, the Black and White Tisa, exceeding the values of 24 m/km (25‰).

In its middle stretch, the Tisa has a significantly lower slope on the longitudinal profile. On the 523 km sector from Szamos/Someş mouth to Maros/Mureş mouth, the total slope of Tisa at low water levels amounts to 27 m, or 5.20 cm/km (0,052‰) on the average. In the 177 km lower stretch, the Tisa has a total slope of only about 5 m at low water levels, which is 2.80 cm/km (0.028‰) on the average. If the upper and middle stretch, comprising 72% of the entire river, are viewed, the total slope of the Tisa amounts to about 32 m, or 4.57 cm/km (0.0457‰) on the average. Due to such mild slopes, the middle and lower sector of the Tisa's river bed has the character of a typical meandrous stream.

At this point, it is certainly important to note that the average slopes in natural conditions, especially on the middle and lower stretch of the Tisa, used to have far lower values, which were increased by the regulation of its bed. In fact, after shortening the Tisa, the average falls have apparently increased, especially in view of the fact that, for most of its length, it is a typical flatland river. Thus, along the entire treated section of the Tisa, between Vylok and its mouth, the average water mirror slope increased from 3.68 cm/km (0.0368‰) to 5.98 cm/km (0.0598‰). On the sector from Szeged to the mouth, the average slope increased from 1.86 cm/km (0.0186‰) to the above mentioned 2.80 cm/km (0.028‰).

The above analysis shows that the lower stretch of the Tisa has an extremely low water mirror slope. This is particularly obvious at lower water levels, when the average slopes on this sector mostly range between 1 cm/km and 3 cm/km. However, it occurs very frequently that these values are even quite lower than 1 cm/km, both upstream and downstream from the Novi Bečej dam. This is a consequence of the hydro-meteorological conditions and the current dam operation regime, as well as the actual elevation of the water mirror at the Tisa's mouth.

Table 27. The widths and depths of the Tisa[4]

Water levels	Widths (m)	Depths
low	100-150	2.80-6.00
medium	180-250	9.00-15.00
high	500-2500	11.00-18.00

The lower Tisa has a rather uniform width of the main bed, amounting to approximately 200-250 m. Before the regulation, the width was somewhat smaller. Thus, between Szeged and Novi Bečej it amounted to 166 m on the average, and on the downstream sector, stretching to the mouth, it was 197 m. After regulation, the average width of the upstream section increased to 188 m, and downstream to 240 m. Measurements performed soon after WWII showed that the average width of the river bed at medium water level from Szeged to Novi Bečej was 180-200m, and from Novi Bečej to the mouth – 200 to 250 m. Analysing the bed depth of the lower Tisa, B. Bukurov found that it was rather great, and that it increased by 20-40 cm immediately upon completion of regulation works, but it decreased equally in the second half of the 20th century. The same author states that the median depth of the Tisa's bed in Serbia is 3.8 to 4.0 m. The width and the depth of the Tisa in our country were measured several times in the post-war period. According to the values in Table 8, depending on the water levels the width of the Tisa in Serbia ranges from 100 m up to as much as 2,500 m, and the depth along the mainstream from 2.80 m to 18.00 m.

[4] Source: Bukurov, 1948.

The water pollution of the Tisa is very similar to that of the Danube, and often even higher. It is usually rated as quality class III. Due to smaller water quantity and lower speed, self-purification is significantly lower than in the Danube, so that great pollution incidents with fish demise occur sometimes. The heaviest water pollution event occurred in the spring of 2000, when the Tisa received large quantities of cyanides and heavy metals from its tributary Szamos/Someş flowing from Romania. The polluted water multiply exceeded the limits permitted by legislation, and the dead fish floated not only down the Tisa but also the Danube downstream from Slankamen for Days. The pollution levels were so high, that the use of water from both the Tisa and the Danube was forbidden on the territory of the entire country for full four months.

Smaller streams

The text below presents the basic features of the Tisa's tributaries in Serbia, starting from the most upstream, down to the most downstream.

The **Kereš/Körös-ér** is a right, and northernmost tributary of the Tisa in Serbia. It stems from a large water-filled depression (136 mANV) north of the town of Kiskunhalas in the neighbouring Hungary, entering our country near Jasenovac Forest, and then flows along the state border at the length of about 14 km. The average water flow of this stream for multi-annual period amounts to 3.13 m^3. Based on the analysis of multi-annual data, it can be concluded that the water quantity in the Kereš/Körös is decreasing (it used to reach the amount of up to 18 m^3).

The **Zlatica/Aranca** is a left tributary of the Tisa, springing in the neighbouring Romania, and entering the territory of the Serbian part of Banat from the north-east direction, about 3.5 km east of the village of Vrbica. The subsequent 35 km flows south-westward, and enters the Tisa downstream from Padej, at its km 105, and the absolute altitude of about 75.5 mAHB. Depending on the Tisa water levels and the overall hydrological conditions in the catchment area, the water levels in the Zlatica's bed are mostly man-managed.

The **Budžak** or the **Ada Pond** is a short, approximately 25 km stream flowing down the loess valley of the general west-east direction formed on an alluvial terrace west of Ada. The water is supplied mainly from a considerably sized depression northwest of the village of Ada, more precisely, at the foot of the section of the Central Bačka loess plateau named **Gornji Breg**. The 350 km^2 catchment area is drained into the Tisa, entering it at its km 103 as a right tributary. In fact, the water from this small stream is transferred into the Tisa by way of a pumping station. For most of the year, the Budžak contains a small quantity of water.

The **Čik** is a 95 km long Tisa's Tributary. It emerges from the area of Čikerija prairie (about 130 mANV), northeast of the village of Kobino Selo, in the border strip next to the neighbouring Hungary. Keeping a general south-east direction along the entire stretch, this river formed its

valley of loess vale type, up to several hundred meters wide, on the Central Bačka loess plateau, and a smaller section stretches through a loess terrace. At the lowest water levels, the flow is non-existent, at normal low it amounts to only 1 m^3/s, and at the highest – about 15 m^3/s. It is also important to note that in extremely dry conditions the Čik's bed can remain waterless, which occurred along most of the stream during the extremely dry summer of 2003.

The **Jegrička** is an autochthonous Bačka stream, springing and flowing almost full-length down the Bačka loess terrace. Only a short section of the stream of this river, immediately before the mouth, is cut through Tisa's alluvial plateau. The sprawling river system of Jegrička is formed within the boundaries of a spacious catchment area with a surface of about 1,440 km^2. This southern Bačka stream is generated on a broad space in the north-eastern (87 mANV), western (84 mANV) and south-western (84 mANV) part of the southern Bačka loess terrace, where the two source confluent arms emerge, the so-called North (about 40 km) and Southwest Jegrička (about 20 km). Today, after recent hydro-technical intervention, and especially since the introduction of its main stream (from Despotovo to the river mouth) into the basic DTD Hs canal network (in the late 1960s), this 'river' has been acquiring a managed regime. For these reasons, the Jegrička can be regarded as a canal rather than a natural stream.

The **Begej** is a left, and at the same time the most significant tributary of the Tisa in Serbia. It is formed by two arms, the Old Begej and the Begej Canal, i.e. the Navigable Begej. The Old Begej enters the territory of Serbia south of Hetin, and the Navigable Begej – northeast of Srpski Itebej. The arms flow parallel south-westward to Klek, where they join, more precisely, to the Old Begej flows into the Navigable Begej. The confluence forms a unified stream (Begej or Begej Canal), which then flows through Zrenjanin, then past Ečka, Stajićevo and Perlez to the Tisa, which it enters about 3 km upstream from Knićanin, i.e. opposite Titel, at the Tisa's km 10 and the absolute altitude of 72.2 mAHB. From the point of formation of a single stream to the exit from Zrenjanin, the Begej generally flows south-westwards, then bends south-eastwards, and south-westwards again near Stajićevo. It keeps this direction all the way to Perlez, where it turns westward and finally flows into the Tisa.

The *Old Begej* springs at the foot of Mt Lipova in the neighbouring Romania, at the absolute altitude of 250 mANV. The main stream of this river is formed at the junction of three torrent-type confluents: Beregszo, Niraj/Nyárád and Jer. The length of the Old Begej is 138 km, 37 of which flow through Serbia. Out of the total 3,135 km^2 of catchment area surface, 895 km^2 of this stream's catchment area belongs to Serbia.

The *Navigable Begej* or *Begej Canal* springs in the Craiova Mountains (Pojana Ruske) under the peak of Mt Padeş in the neighbouring Romania, at the absolute altitude of 1,135 mANV. The length of the stream, including the unified section of the stream from Klek to the mouth, is 233 km, and

the total catchment area surface is 3,340 km^2. Together with Begej Canal (34.9 km), the Navigable Begej (32.2 km) gloss through Serbia at the length if 67 km, while the basin area within the borders of our country is 1,198 km^2. After all the regulation work, especially inclusion into the DTD Hs, the Begej is acquiring a managed river regime. Anthropogenic impact on water quantity management in Begej riverbed is the highest during wet and dry period of the year. Analysing water levels for multi-annual period on the Begej downstream from Klek, i.e. at the water measurement station in Zrenjanin leads to the following conclusions:

- maximum water levels occur in spring, in April, and then in May and June. They result from intensive snow melting on the Carpathians and spring rains;
- the Begej has minimum water levels in winter, in January and February, as a consequence of low temperatures, i.e. snowfall.

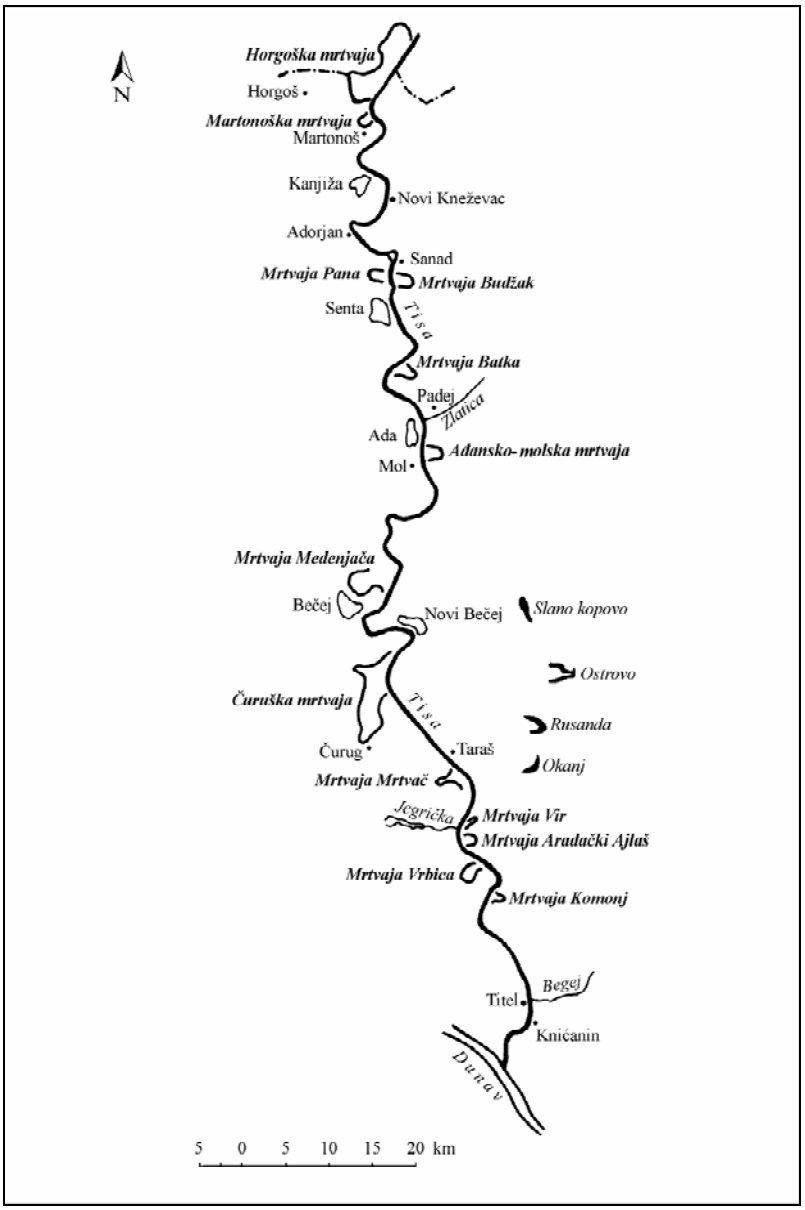
The Begej carries about 50 m^3/s of water into the Tisa. The canalised riverbed is designed for a maximum capacity of 83.5 m^3/s, so that the excess water, arriving in spring from the unregulated upper stretch (up to 450 m^3/s) is transferred into the Tamiš/Timiş through a canal near Mali Topolovac. The flow of the Begej is reduced during the dry summer period down to only 1.5-2 m^3/s, so that about 5-6 m^3/s is brought into the Begej from the Tamiš/Timiş through a canal near Koštelj, which is the quantity required for navigation. Thus, the Begej influences the water regime of the Tamiš in spring, and the Tamiš influences the regime of Begej at the times of low water levels in this stream.

Lakes and ponds

The lakes and ponds within the project area represent a significant part of surface hydrography, which is, among others, the result of considerable proportion of lowland terrains with shallow phreatic water bodies. Viewed genetically, these surface hydrological bodies are of fluvial and artificial origin. The basins of **fluvial lakes** and ponds were created by erosive and accumulative work of the Tisa. In fact, these surface hydrological bodies, the so-called oxbow lakes or bayous, are abandoned river meanders in the Tisa's alluvial plateau and loess terrace. These bayous are naturally or artificially separated from the mainstream. The numerous *natural meanders*, mainly found along the Tisa's banks on the Banat side, are nowadays, in most cases dry, elongated, arch-shaped depressions, largely filled up with fluvial and aeolian material. Still, there are also such naturally separated meanders which have kept their hydrological function, often with anthropogenic assistance. The most representative examples of such bayous are Slano Kopovo, Ostrovo, Rusanda and Okanj. These lakes are situated east of the Tisa, in the area where this river used to flow and build its alluvial plateau before the most recent loess accumulation. The succession of bayous stretches in a general north-south direction. Despite

their considerable distance from the mainstream, the sizes and shapes of these bayous evidence that these are former active meanders of the Tisa.

Picture 31. Tisa bayous (Pavić, 2006) in Tisza basin



As the picture shows, the most prominent bayous in the Serbian sector of the Serbian Tisza Catchment Area are:

- Slano Kopovo (Veliko Kopovo, Kopovo)
- Ostrovo
- Rusanda
- Okanj
- Horgoš Bayou

- Martonoš Bayou
- Budžak and Pana
- Batka
- Ada-Mol Bayou
- Medenjača
- Čurug Bayou
- Mrtvač
- Vir
- Aradački Ajlaš
- Vrbica
- Komonj

When one also considers the very small accumulations (pits or gullies) located near a considerable number of settlements, created by the excavation of construction materials, the **artificial lakes and ponds** are a very common feature of the Tisa Basin in Vojvodina. However, these smaller artificial accumulations will not be discussed here, but rather the considerably larger artificial accumulations formed by damming natural streams, accumulations on canal terraces, and the fishponds formed in natural depressions or on embanked low alluvial terrains.

The most significant artificial lakes formed by damming natural streams (the so-called transit accumulations) include:

- **Accumulation on the Tisa** was formed in 1975, upstream from the dam built near Novi Bečej on km 63. The total amount of backwater detention, which is felt at the length up to 180 km, is 50 million m^3. The lake is primarily used for DTD Hs water supply in Banat, for irrigating large agricultural areas, and flood control;
- ***Velebit* accumulation** is situated in the east part of the Bačka Loess Plateau, about 3 km west of the namesake village. It is specific by the fact that it was not formed on a natural stream, but on the Adorjan-Velebit Canal route. It is primarily used for irrigation and water supply, but also for fish farming. The lake's volume is about 5.27 million m^3 at maximum water levels; the lake is 5.1 km long and 1.18 km wide.

The Tisa basin also contains a large number of artificial lakes specialised for fish farming. The largest and most significant among them are:

- ***Ečka*** fish farming ponds
- ***Bečej*** fish farming ponds
- ***Jazovo*** fish farming ponds

Other major fishponds within the boundaries of the studied area are: Jegrička (420 Ha) Kapetanski Rit (350 ha), Novi Kneževac (280 ha), Iđoš (220 ha) and Sajan (100 ha). In addition to these, the Tisa basin also contains a large number of smaller fishponds, many of which are privately owned.

The Danube-Tisa-Danube Hydro-system

The DTD Hydro-system is one of the largest multifunctional regional hydro-systems in Europe, and ranges as one of the most significant systems of this type worldwide. The major parts of the DTD Hs canal network stretch across the area encompassed by the Study. The Hydro-system can be divided into two separate entities, in Bačka and Banat, mutually dependent to a low extent. Like a water bridge, they are connected by the polluted Tisa upstream from the Novi Bečej dam, the hydro-system's central hydro-technical facility. Thus, immediately upstream from the dam, there is a hydro-node, an intersection of 'live' waterways, which is completely unknown in totally natural conditions. The River Tisa can therefore be regarded as the central hydrological component of the DTD Hs, connecting the two large entities, Bačka and Banat, into a unified system. This conclusion is also supported by the fact that the Tisa has a key role in the functioning of the DTD Hs. This river, in fact, is one of the main recipient of waters from the Bačka said, and also the basic supplier of the canal network in Banat.

The **Bačka side of DTD Hs** comprises a sprawling canal network consisting of sections of completely new, as well as more or less reconstructed old canals and canalised natural streams and depressions (the Mostonga, the Jegrička, Crna Bara). This part of the hydro-system includes the following canal stretches: the *Baja Canal* (12.7 km); *Vrbas – Bezdan* (80.9 km); *Kosančić – Mali Stapar* (21.1 km); *Prigrevica – Bezdan* (31.7 km); *Odžaci – Sombor* (27.8 km); *Bečej – Bogojevo* (90.0 km); *Bački Petrovac – Karavukovo* (52.0 km); *Novi Sad – Savino Selo* (39.1 km) and the *Jegrička* (65.4 km). The total length of all these canal sections is 420.8 km.

The specific feature of the **Banat side of DTD Hs** is that it comprises a main trunk canal stretching from the Tisa near Novi Bečej to the Danube near Bačka Palanka, crossing or receiving streams flowing from the neighbouring Romania. In fact, along its northwest-southeast route, the *Banatska Palanka – Novi Begej* trunk canal first receives the waters of the *Old* (37.4 km) and the *Navigable Begej* (31.2 km. It then crosses the stream of the *Tamiš* (116.8 km), and further southeast it receives the waters of the *Brzava* (19.9 km), the *Moravica* (17.8 km) with the *Rojga* (12.4 km), the *Vršac Canal* (21.0 km) and the *Karaš* (30.0 km). The *Zlatica/Aranca* stream (35.5 km), situated north of the trunk canal, is connected to it by way of the *Kikinda Canal* (50.3 km), whose main section runs through a canalised bed of the *Galacka*, formerly a natural stream. All the received and crossed canals, as well as he regulated and reconstructed natural waterways, together with the basic DTD Hs canal network, comprise a single hydro-technical entity, According to the Vode Vojvodine Public Water Management Utility Statute, the basic canal network of the Banat side of the hydro-system, 261,1 in length, includes the following canals: *Banatska Palanka – Novi Bečej*; the *Navigable Begej*; *Begej*: the *Tamiš*

(only a 2.2 km section – from the intersection with the trunk canal to the *Tomaševac* Weir); the *Kikinda Canal* and the *Zlatica*/*Aranca* (a 10.3 section from the junction with the Kikinda Canal to the junction with the Tisa).

In terms of altitude, the entire DTD Hs is divided into the so-called sub-basins, referring to a single or several canals framed with weirs, lock gates and pumping stations, regulating the water passage and levels in the relevant sub-basin. The water regime in the sub-basins is managed with regulation weirs, in accordance with technical facilities and relevant directions. The Bačka region has eight, and Banat six separate basins, gradually managing the altitude difference of about 16 km, corresponding to the slope of the Danube between Bezdan and Banatska Palanka.

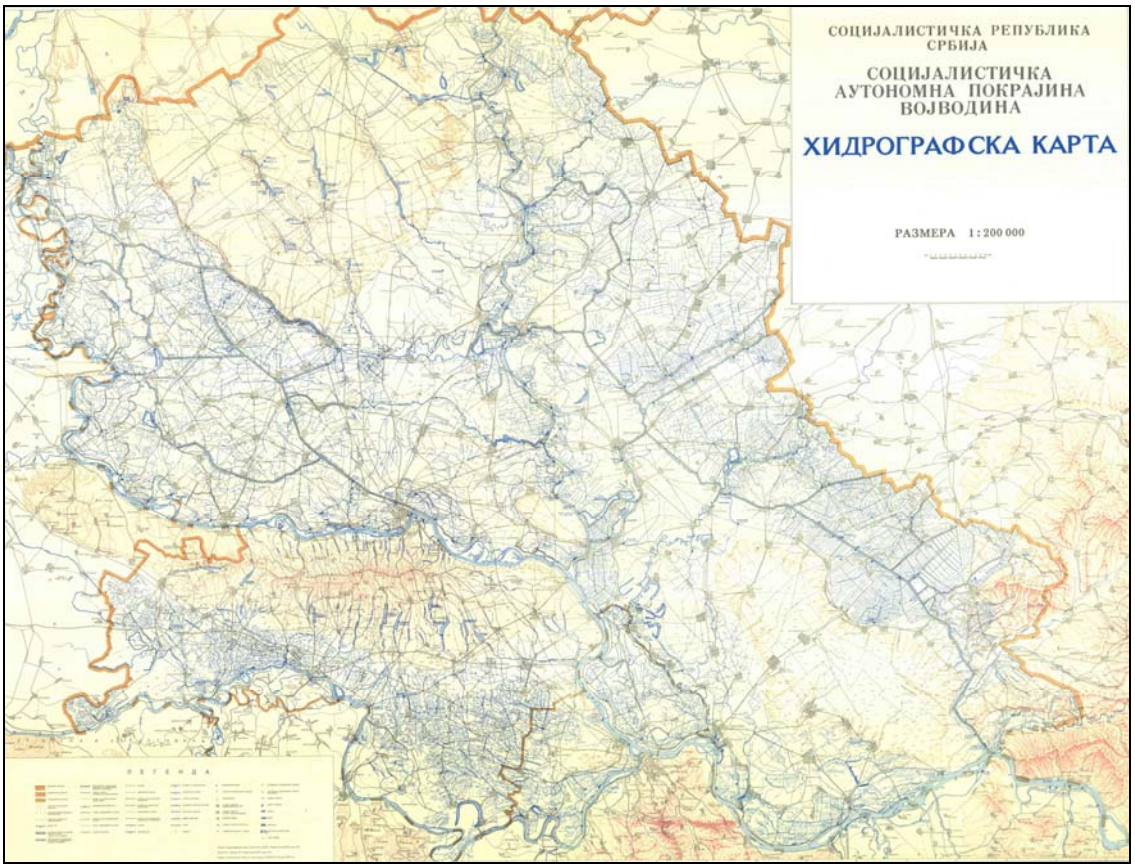
- Sub-Basin I – *Bezdan* lock gate, *Bezdan I* pumping station, *Bezdan II* pumping station, *Šebešfok* weir, *Sombor* lock gate, *Mali Stapar* weir and lock gate, and *Ruski Krstur* weir;
- Sub-Basin II – *Mali Stapar* weir and lock gate, *Vrbas* weir and lock gate;
- Sub-Basin III – *Bezdan* weir, *Sombor* lock gate, *Srpski Miletić* weir and lock gate;
- Sub-Basin IV – *Ruski Krstur* weir, *Srpski Miletić* weir and lock gate, *Bogojevo* lock gate, *Bogojevo* pumping station, *Novi Sad* weir and lock gate, *Kucura* weir and lock gate, and *Despotovo* weir;
- Sub-Basin V – *Vrbas* weir and lock gate, *Bečej* lock gate, *Bečej* pumping station, and *Bečej* weir;
- Sub-Basin VI – *Despotovo Zmajevo* weirs;
- Sub-Basin VII – *Zmajevo* and *Žabalj* weirs;
- Sub-Basin VIII – *Žabalj* weir and *Žabalj* pumping station;
- Sub-Basin IX – *Padej* weir and *Sajan* and *Granična (Valkanj)* weirs;
- Sub-Basin X – *Sajan* weir, *Novi Bečej* weir, *Novi Bečej* lock gate, *Klek* weir and lock gate, *Tomaševac* weir, *Botoš* weir and lock gate;
- Sub-Basin XI – *Srpski Itebej* weir and lock gate and state border;
- Sub-Basin XII – *Klek* weir and lock gate and *Srpski Itebej* weir and lock gate;
- Sub-Basin XIII – *Botoš* weir and lock gate and *Kajtasovo* weir and lock gate;
- Sub-Basin XIV – the Tisa dam and state border.

The so-called *Lower Tamiš*, consisting of two reaches, comprises a unified technical entity with the above listed sub-basins. The first reach stretches upstream from the *Tomaševac* weir to the *Opovo* and *Čempa* weirs, and the other is downstream from the *Opovo* weir to the junction of the Tamiš and the Danube, near Pančevo.

In the most general sense, the **objective** of the multipurpose DTD Hs is complex water regulation within the coverage area. The complexity of the objective is illustrated by the fact that it comprises of the following segments, which can also be viewed from the aspect hydro-system's purpose: *drainage*; *irrigation*; *acceptance of waters from the territory of neighbouring countries*; *urban and industrial water supply*; *used (waste)*

water acceptance and disposal; *water quality protection*; *navigation*; *forest management*; *fish farming*; *recreation*, *sports and tourism*.

Picture 32. The hydrographic map of Vojvodina



6.3.2. Soils

A comparative analysis of the pedological map Vojvodina (scale 1:50000) in the Serbian Tisza Catchment Area registers the following soil types: *initial soils*, *brown prairie silt loam*, *chernozem*, *alluvial soils*, *prairie black soil*, *marsh black soil*, *vertisol*, *swamp gleysoil*, *solonchak* and *solonetz*. The distribution of these types of soil with all their sub-types and varieties is shown on Picture 32.

In the pedological map of Juzna Backa region are located 59 different systematic units which are possible to group in 14 soil types. The most frequent soil types are chernozem and alluvial soils with high level of humus. These soil types have high production characteristics and mark Juzna Backa as productively fertile and valuble pedologic area in the country.

Srednji Banat county has more uniformed pedologic charcteristics than other regions. There are 36 systematic units of soil located which are grouped in 9 types. Chernozem is by far the most common soil type which

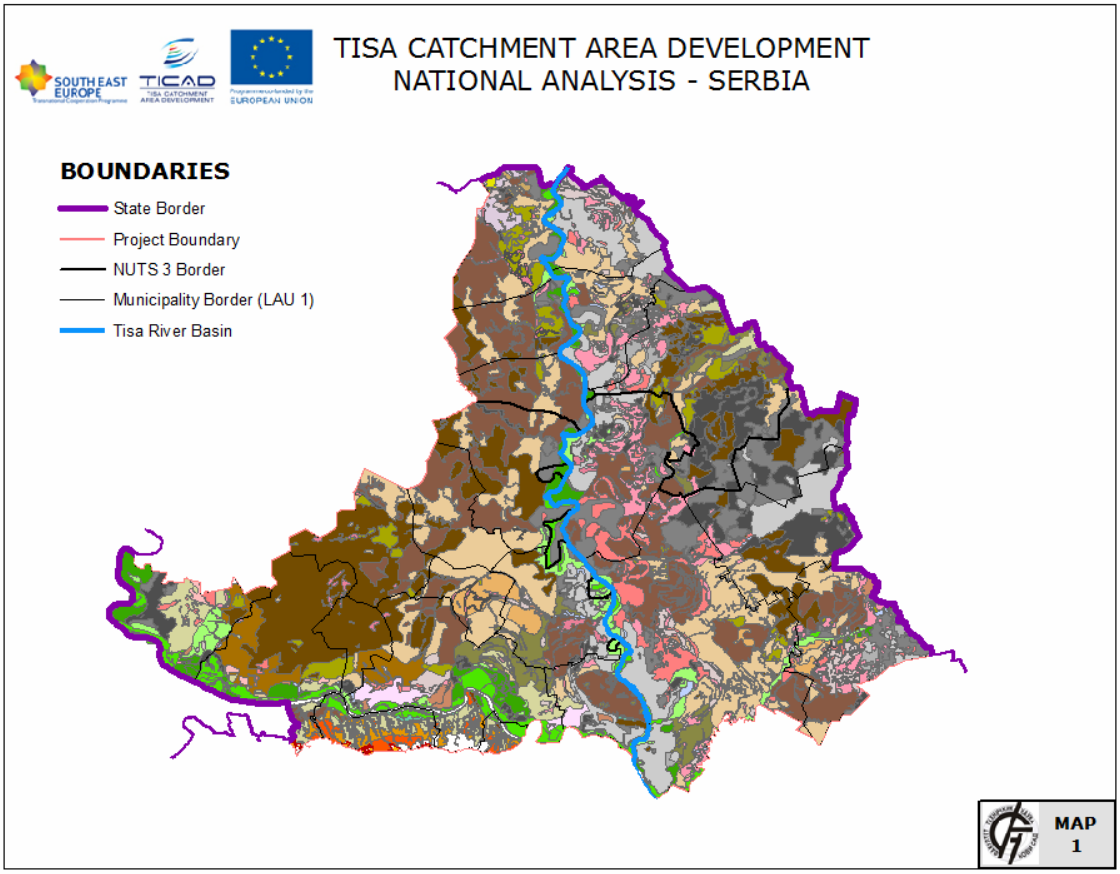
suggests that this region is also productively fertile. There are also vast areas of slatina soil types with less productive fertility characteristics that are generally reducing the regional production potential.

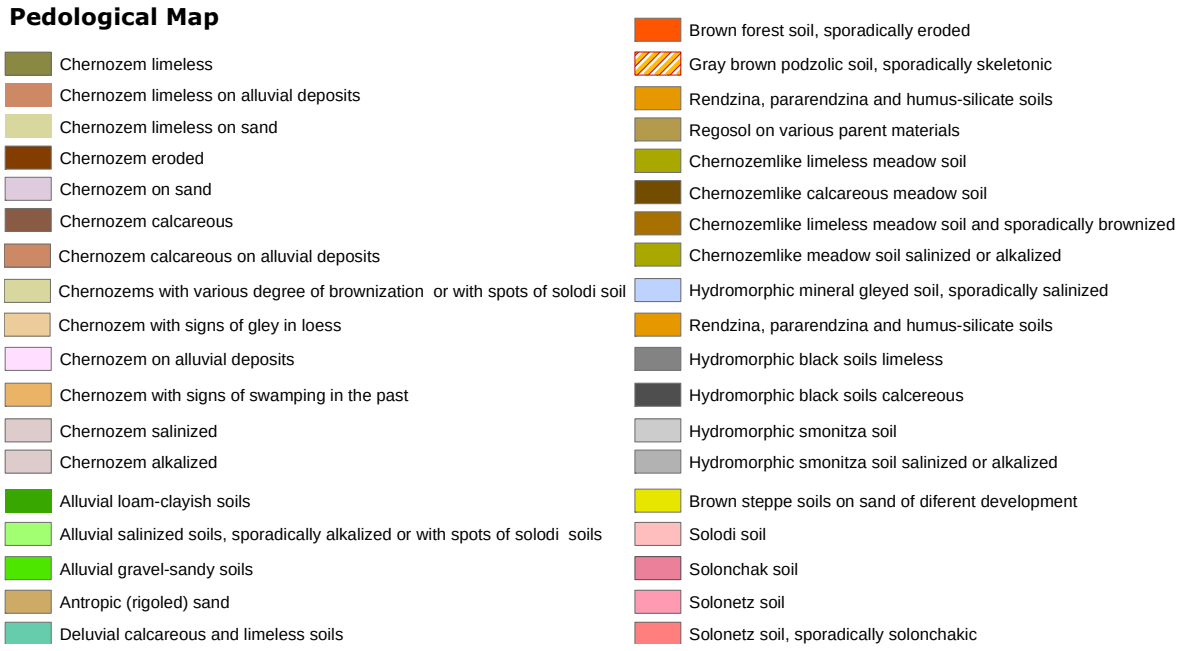
In Severni Banat county has been noticed 45 systematic soil units grouped in 12 soil types. Chernoyem is once again the most common soil type, but significant areas are covered by slatina soils. Generally, estimating the soil types, the region has good production capacity. Particular physical characteristics of slatina soil types require specific cultivation in order to reach the maximum productivity.

Results of soil samples analysis, in systematic fertility control process, show that soils in all three regions are predominantly of neutral or alkaline nature.

In the cultivating soil layer, there is more than 3% of humus. Phosphor and calium have the satisfying level (between optimal and higher). The level of heavy metals in the analyzed samples was far below the limit.

Picture 33. Pedological map of he Serbian Tisza Catchment Area





6.3.3. Air quality

The environmental quality of the area has greater weight together with the quality and attractiveness of tourist resources and the necessary infrastructure. This holds true for eco and the other types of tourism.
The exhaust fumes emitted into the air come from various sources such as energy and industrial polluters (enterprises), transport, households, etc.

Data on SO_2, smoke and NO_x immissions[5] in 2009. are presented in the following table:

The following table shows data on emissions of Particulate Matter (suspended particles), SO_2 and NO_x in the Serbian Tisza Catchment Area in tons per year and their relative share in the total emissions in Serbia in 2009:

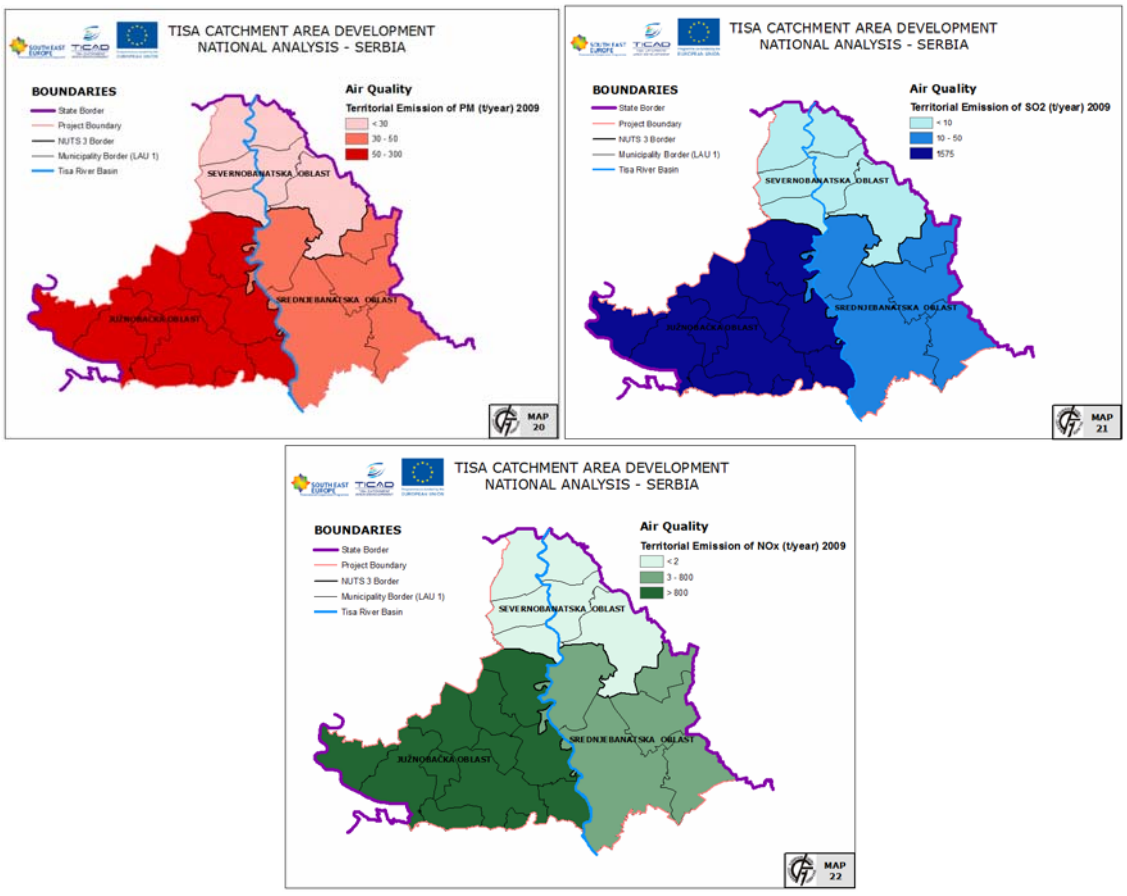
Table 28. Emissions of the elementary air pollutants according to the NUTS 3 (2009) in the Serbian Tisza Catchment Area

NUTS III	PM	SO_2	NO_x
	t/god	t/god	t/god
Juznobacki County	298,476	1574,274	4960,2678
Severnobanatski County	29,908	4,1171	1,855
Srednjebanatski County	46,0482	40,632	755,472

Source: Environmental Protection Agency

[5] According to the Law on the protection of environment (The RS Official Gazette *nº 135/04*), **immission** implies concentration of polluting agents and an energy level in the environment, expressing quality of the environment of a specific area in a specific moment.

Picture 34. Territorial emmsions of PM, NOx, SO2 (t/year 2009) in the Serbian Tisza Catchment Area



6.4. Value protection

6.4.1. Nature protection

Protected natural areas

Natural environments within the Serbian Tisza Catchment Area protected on the basis of national legislation acts (Law on Environmental Protection - The RS Official Gazette *nº* 36/09), are:

- one part of the national park Fruska gora
- 5 nature parks (’Stara Tisa’ kod ’Bisernog ostrva’, ’Begecka jama’, ’Jegricka’, ’Kamaras’ and ’Tikvara’)
- 7 special nature reserves (’Stari Begej-Carska bara’, ’Slano Kopovo’, ’Karadjordjevo’, ’Bagremara’, ’Koviljsko-petrovaradinski rit’, ’Selevenjske pustare’ and ’Pasnjaci velike droplje’) and
- 38 nature monuments

Seven natural enviroments areas spreads on the surface vaster than 1000 ha (The National park Fruska gora, the nature park 'Jegricka' and special nature environments 'Stari Begej-Carska bara', 'Karadjordjevo', 'Koviljsko-petrovaradinski rit', 'Selevenjske pustare' and 'Pasnjaci velike droplje') while the rest spreads over the areas of less than 1000 ha.

Table 29. Spatial distribution of protected natural areas among counties[6]:

Region	**Environment protection level**			
	National park	Nature park	special nature reserve	nature monument
Juzna Backa	1	4	3	26
Severni Banat		1	2	4
Srednji Banat			2	8
total	**1**	**5**	**7**	38

Areas with the international significance are those inscribed in RAMSAR list and potentially National EMERALD network areas.

There are special nature reserves two RAMSAR wetland sites within the TICAD project area: 'Stari Begej-Carska bara' and 'Slano Kopovo'.

EMERALD network is an ecological network of *Areas of Special Conservation Interest.* It includes areas of special ecological significance for vulnerable species and habitat types protected on the basis of the Convention on the Conservation of European Wildlife and Natural Habitats (Official Gazette of RS – ***International*** Treaties No. 102/2007 from 07.11.2007).

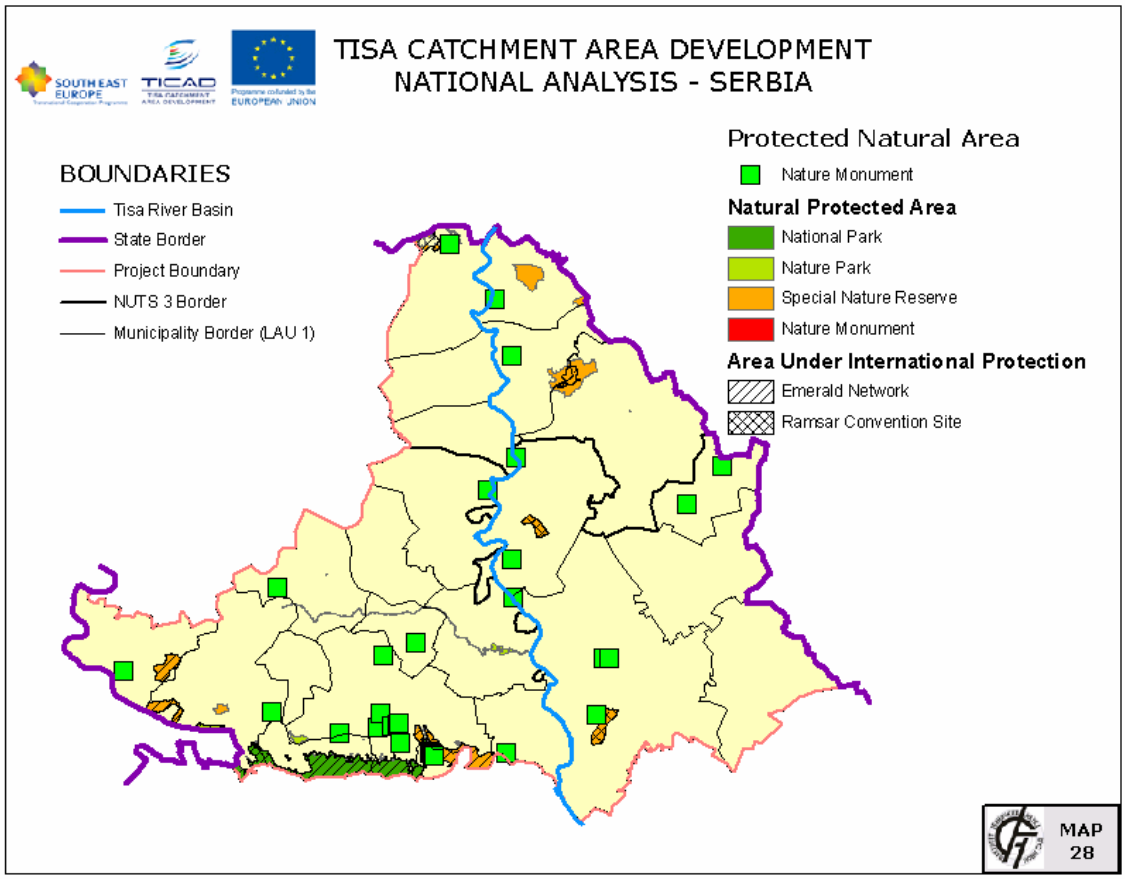
In the Autonomous Province of Vojvodina and within the TICAD project area, there are 8 potential national EMERALD network sites: ' Fruska gora', 'Slano Kopovo', 'Koviljsko-petrovaradinski rit', 'Stari Begej-Carska bara', 'Karadjordjevo', 'Tikvara', 'Selevenjske pustare' and 'Pasnjaci velike droplje'.

[6] Regional Spatial Plan of AP Vojvodina- Draft, ITPV, 2010

Table 30. Spatial distribution of RAMSAR and EMERALD environments within the Serbian Tisza Catchment Area [7]:

NUTS 3	CODE	Emerald	Ramsar
Juzna Backa	RS0000007	National Park Fruska Gora	
	RS0000021	Special Nature Reserve Koviljsko petrovaradinski rit	
	RS0000038	Special Nature Reserve Karadjordjevo	
	RS0000053	Special Nature Reserve Tikvara	
Severni Banat	RS0000023	Special Nature Reserve Selevejske pustare	
	RS0000022	Special Nature Reserve Pasnjaci Velike droplje	
Srednji Banatski	RS0000024	Special Nature Reserve Stari Begej-Carska bara	Special Nature Reserve Stari Begej-Carska bara
	RS0000010	Special Nature Reserve Slano Kopovo	Special Nature Reserve Slano Kopovo
TOTAL		**8**	**2**

Picture 35. Protected natural areas in the Serbian Tisza Catchment Area



[7] Regional Spatial Plan of AP Vojvodina- Draft, ITPV, 2010

7. Regional and local infrastructure

7.1. Transport infrastructure

The transport infrastructure in the Serbian Tisza Catchment Area comprises of point and linear components of the road, railway, port and partially airport infrastructure.

The Serbian Tisza Catchment Area is without Pan-European Transport Corridors but several main roads ond roads of national importance (1st and 2nd roads)crossing pass through the Project Area: DP-22 (E75) (section Srbobran - Novi Sad – Temerin – Beska - Indjija - Stara Pazova - Novi Banovci – Belgrade town.

The road infrastructure in the Project Area comprises of national and municipal roads. Data in **Table 31.** shows the length of the roads from the national road network in the relevant area.

Table 31. Length of the roads from the national road network in the Serbian Tisza Catchment Area (by class of the road)

NUTS 2 Regions / NUTS 3 Counties	Total	Motorways incl E roads	First-class (DP I, II rank)
Republic of Serbia	40 845	634	17 065
Severnobanatska Oblast	810,41	8,47	297,9
Srednjebanatska Oblast	992,01	0	403,36
Južnobacka Oblast	1602,32	64,72	653,72
Project Area (DAT)	3 405	73	1 355
Serbia total (SR)	40 845	634	17 065
% of DAT from SR	8.34%	11.51%	7.94%

Source: *PE ROS[8] and GIS data and PE ITPV*

The motorway are 73 km in the area, which means 11,51% of the motorways in Serbia. The first-class roads[9] are 1355 km long which accounts for 7,94% of the same roads in Serbia.

The sections of greater importance are on the following roads: DP-3 (section Odzaci – Kula – Vrbas – Srbobran – Becej – Novi Becej – Novo Milosevo), DP-7 (section border crossing point Backa Palanka – Novi Sad –Zrenjanin – Zitiste – Nova Crnja - Srpska Crnja), DP-7.1 (Zrenjanin – Secanj – Plandiste), DP-18 (section Odzaci – Srpski Miletic - Bac – border crossing point Backa Palanka), DP-21 (section Novi Sad – Iriski Venac - Irig), DP-22.1 (section Srbobran - Novi Sad - Sremski Karlovci), DP-24 (section Senta – Coka – Kikinda - Melenci – Zrenjanin – Ecka - Kovacica), DP-24.1 (section Ecka – Perlez–- Centa).

For known considerations, the transport links between the countries nearby Serbia in border region along the Tisza river not existed. Internal

[8] Public enterprise Roads of Serbia and ITPV

9 First class roads in this case means main and regional roads (DP I and II rank)

ferry lines in past time almost is deactivate, mostly for economical reasons.

The railway network comprises of 2nd main line - E 85 : (Belgrade) - Stara Pazova - Novi Sad - Subotica – state border with Hungary - (Kelebia).

Intraregional connections are implemented via *branch lines (*lines branching off the main lines) for the regional-local traffic. The following branch lines are operating in the Project Area*: Subotica-Horgos-drzavna granica-(Roszke),Pancevo glavna stanica - Zrenjanin - Kikinda - drzavna granica - (Jimbolia), (Novo) Banatsko Milosevo - Senta – Subotica, Novi Sad - Odzaci - Bogojevo, Novi Sad - Rasputnica Sajlovo - Rimski Sancevi – Orlovat.*

Water (river) transport

There are four waterways within the Serbian Tisza Catchment Area in Serbia, namely Danube, Tisza, Sava and a system of canals Danube – Tisza – Danube, situated in Vojvodina (regions of Banat and Backa). Total length of all waterways is 1,385 km (Danube 588 km, Tisza 99 km, Sava 207 km and DTD canals 491 km). Juznobacki and Borski County have the longest sections on the Danube waterway (170 km and 164 km).

Table 32. Length, importance and navigation class by river flow in the Serbian Tisza Catchment Area

Name	Length (km)	Importance (international, national, regional)	Navigation class (I to VII)
Danube	588	international	VIc and VII
Sava	207	international	III and IV
Tisza	99	International/interstate	IV
DTD Canals	491	national/regional	IV and V and less

River Danube as European Corridor VII is the strategic link that encourages development of trade, tourism and services. Navigable through the entire territory of Serbia, it participates with 85% in the total freight transportation on Serbian inland waterways. Depending on the sector, the Danube falls into navigable class VIc and VII. From border with Hungary (km 1433) to Pancevo bridge in Belgrade (km 1167) it falls into category VIc, from there to the dam Iron Gate II (km 862) it falls into category VII and then downstream from the Dam to the border with Bulgaria (km 845.65) it falls again into class VIc. International waterway Sava meets requirements for navigable classes III and IV. Tisza is also navigable on its entire course through Serbia. Presently it has a status of inter-state waterway and it belongs to the navigable class IV. Canal System Danube-Tisza-Danube (DTD) is a multipurpose hydraulic system, with main purpose to control the regime of surface and ground water. It provides, however, very good conditions for sailing on 600 km. According

to the UNECE criteria, 55% of the system falls into navigable classes IV and V, around 20% into navigable class III, and the remaining 25% in lower classes of navigability. Still, the DTD system is currently in a very poor condition.

Table 33. Waterway features at the level NUTS3 in the Serbian Tisza Catchment Area

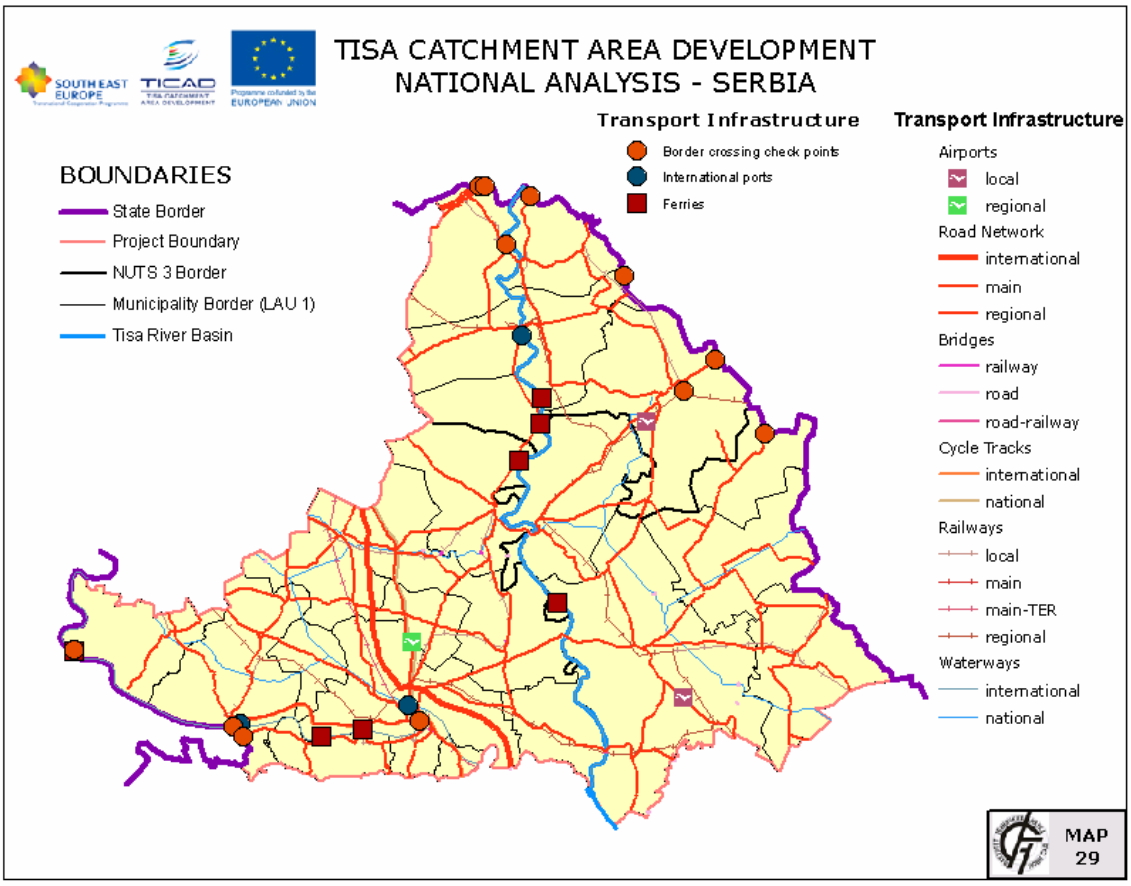
NUTS 3 / Counties	Place	Number of ports	Port type	Port importance
Severnobanatski	Senta	1	freight	international
Srednjebanatski	-	0	-	-
Juznobacki	Backa Palanka, Novi Sad	2	freight	international international

In Serbian Tisza Catchment Area Novi Sad, Backa Palanka, are the main international ports along the Danube. Important port are Senta (like a international port), on Tisza river. Ports' infrastructure is however in poor condition. River ports have enough capacity for handling cargo (exception Senta), but do not always have the right equipment, the existing one being old and inefficient.

Air transport is organized via 3 special airports – Novi Sad, Zrenjanin and Kikinda.

All counties have three airports. Airports: Novi Sad (Cenej), Zrenjanin (Ecka) and Kikinda (Drakslerov salas) being for civil purposes other than transportation (sport, agriculture, training, tourism). Entire Passenger and cargo transport provides by Belgrade International airport "Nikola Tesla".

Picture 36. Transport infrastructure in the Serbian Tisza Catchment Area



7.2. Energy management, energy supply systems and alternative energy sources, and telecommunications

Energy Infrastructure

There are no significant facilities for **electrical power generation** aside from the smaller individual facilities of the Thermal Power Plant-Heating Plant in Novi Sad and Zrenjanin, and power plants with the total nominal electrical power at 405,50 MW and the total thermal power at about 500 MW. If about 6000 h/a (electrical) and 4000 h/a (thermal) of the available resources were to be used, they would transform one segment of the high-priced primary energy (about 0,60 mtoe/a). However, due to the high production cost, the electrical energy from these power plants is used mainly as peak production (356,45 in 2005 and 138,50 GWh_e/a in 2006), amounting below the 15% of the technical possibilities at the mentioned higher capacity utilisation.

To a great extent, a segment of the primary energy of thermal plants and larger boiling stations (natural gas, crude and light distillate oil about 0,1450 mtoe) is transformed into thermal energy, and 93% of the produced thermal energy is used in domestic consumption.

The production facilities have been set up outside the Serbian Tisza Catchment Area, on the territory of the Republic of Serbia, under the jurisdiction of the Electric power industry of Serbia, and they have been presented in the chart below:

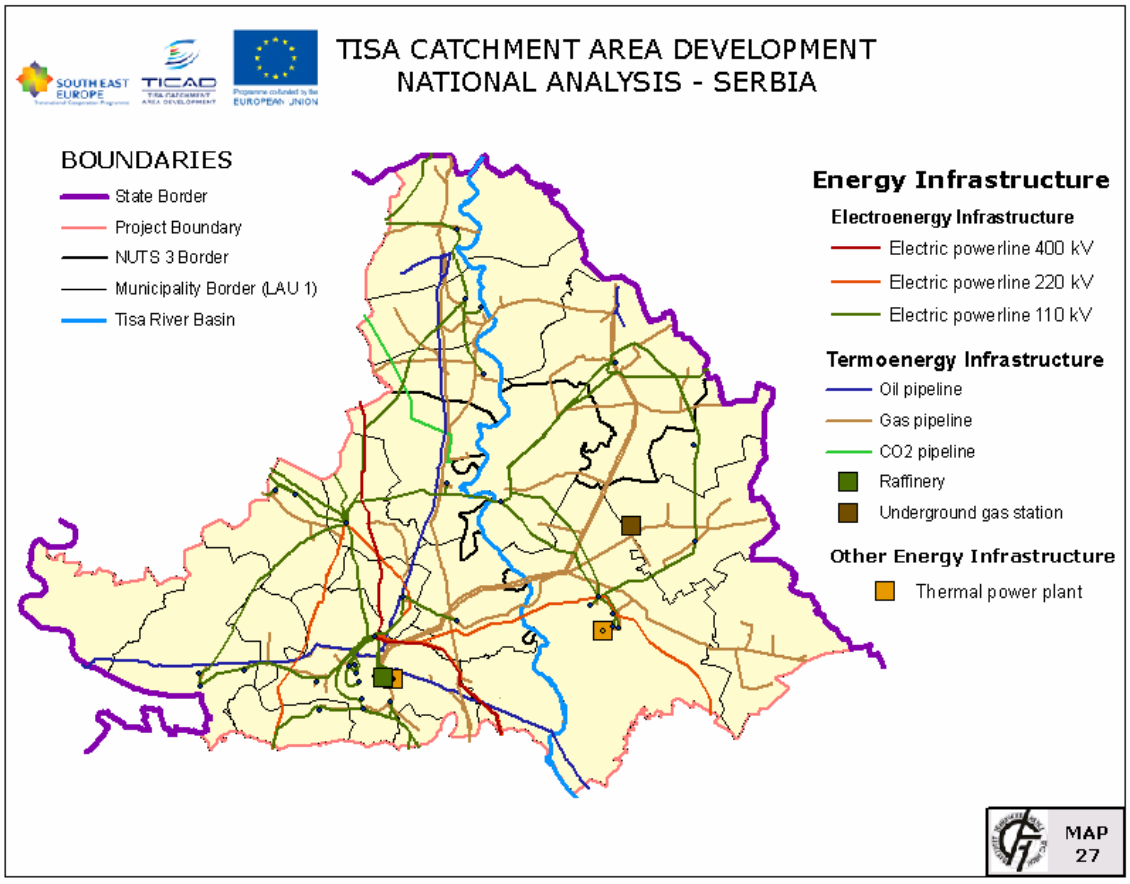
Tabela 34. Production facilities of Electric power industry od Serbia

Electric power plants	At plant gate MW
TPS "Nikola Tesla" A	1502
TPS "Nikola Tesla " B	1160
TPS "Kolubara"	245
TPS "Morava"	108
TPS "Kostolac" A	281
TPS "Kostolac" B	640
TPS Kosovo" A	627
TPS "Kosovo" B	618
Thermal Power Stations -total	**5171**
TPP-HP "Novi Sad"	208
TPP-HP "Zrenjanin"	100
Thermal Power Plants-Heating Plants-total	**308**
HPP "Đerdap" I	1058
HPP "Đerdap" I I	270
HPP "Vlasina"	129
HPP "Pirot"	80
HPP "Bajina Bašta"	364
PSHPP "Bajina Bašta"(Pumped Storage Hydroelectric Power Plant)	614
HPP "Zvornik"	92
HPP "Elektromorava"	13
HPP "Limske"	211
Hydroelectric Power Plants	**2831**
Electric power plants of the Electric Utility Company of Serbia	**8355**
HPP "Piva "	**342**
HPP "Gazivode"	35
Other electric power stations	377
Total	**8732**

The electric power transmission system belongs to the main electric power transmission system of the Republic of Serbia i.e. AP Vojvodina, at the voltage level ranging from 400kV, 220kV and 110kV, and also with significant interconnections of transmission at 400kV i.e. 110kV of voltage level towards Hungary, Romania and Croatia, energy

facilities for voltage transmission (transformers 400/H kV, 220/H kV, 110/H kV), telecommunication systems, information systems and other infrastructure necessary for electric power system's functioning. In virtue of the Law on Energy, the PC Elektromreza Srbije from Belgrade and the Transmission operation division Novi Sad, on behalf of AP Vojvodina, are found accountable as transmission system operators for technical performances of the system's operation, system's operational safety and the reliability of energy supply, maintenance, planning and construction of the transmission network.

Picture 37. Energy infrastructure in the Serbian Tisza Catchment Area



Regardless of the broad coverage of the electric power transmission's network and facilities, the state of the transmission network and energy facilities can be described as highly unfavourable due to the high average age of the facilities, from 20 to 40 years.

All settlements, as well as the existing capacities outside the settlements, tourist sites, operating complexes and other, remain covered by the distribution network and electric power supply facilities. The coverage of the area has been ensured, but the necessary safety and quality of energy power supply has yet to be.

Basic Feature of all segments of the energy system is its exceptional technological obsolescence, low energy efficiency, extremely unfavourable state of affairs related to environmental protection, irrational energy consumption and falling behind in energy indicators, compared to the EU member states and the neighbouring countries.

Table 35. Energy consumption in the Serbian Tisza Catchment Area

County	Energy consumption in 2009 (MWh)
Juzna Backa	4 125 909
Srednje banatski	1 135 718
Severno banatski	466 036
TOTAL	5 727 663

SWOT ANALYSES

Factors	Strengths	Weaknesses
Electro-energetic Infrastructure	- existing electro-energetic trasfer and distribution network -Existing electro-energetic facilities, thermal plants, thermal power plants, county heating, distribution facilities -Existing cross border inter-connective transfer networks	- there are energy distribution facilities with outdated technology that are massive environmental pollutors -Old age of electro-energetic facilities, networks of all voltage levels and devices -Inadequate public lightning network -Non-existent but necessary inter-connective transfer networks -Irrational use of electrical power, especially for household heating
Renewable energy Sources (RES)	-Huge potential of using RES (biomass, wind energy, hydro-potentials of larger and smaller water flows, accumulation, geo-thermal energy, solar energy) -Locating production power generating facilities close to consumers and decreasing losses in transfer and distribution -Advantage in supplying with el. power buildings (consumers) far awaz from the existing power network -The technological process in the production of el. power from these sources does not contribute to environment pollution -Existence of teaching staff, scholars and institutions	-Low level of using RES -Unsatisfactory infrastructure for using RES -Incomplete legal framework for using RES -Lack of reliable data about the potentials of RES -Non-existence of an efficient system of financial instrument for a wide-spread use of RES -Industry for the production of equipment for using RES is underdeveloped and technologically lagging behind -Most of the equipment for RES is imported -Insufficient information for applying RES and unwillingness to accept a new technology -Lack of organisation in forestry

		and agricultural activities for using biomass for the production of bio-fuels -Dependance of raw material production on climatic conditions
Telecommunications infrastructure And information systems	Modern digital commutation node for international central and all measure group centres built -High capacity optical telecommunications transport network in a ring infrastructure built and it covers the main level and a satisfactory volume in lower levels -There is a telecommunication infrastructure For landline phones -The implementation of wide-band network has started -Good legal framework -There is a telecommunication infrastructure for Mobile telephones	- Low infrastructure level for supporting Information and commutation technology -The de-monopolisation of landline telephone network has not been done -Poor quality of radio-diffusion network - Unbalanced level of development of the wide-band Telecommunication infrastructure in Vojvodina AP -A number of analogous commutation centres still in operation and there are double phone connection users -The use of radio-telephone systems for scarcely populated areas has just begun - Low digitalisation level of the telephone Network, lack of digital centres -Insufficient penetration in relation to the EU - Low level of mobile Telecommunication network and Coverage of settlements

Renewable Energy Sources

Through the ratification of the Treaty establishing the energy community in South East Europe (in 2005), the Republic of Serbia has accepted the obligation to implement all directives related to the use of renewable energy sources (2001/77/EC and 2003/30/EC). It has been estimated that in the coming ten-year period, the share of the non-conventional energy sources is to reach 20% of the total consumption on the territory of the AP Vojvodina.

The potential energy from **biomass** is the most significant energy potential of renewable energy sources on the territory of Vojvodina, given the percentage of agricultural and forest area i.e. the percentage of sources from the residues of the crop and forest production. Based on the actual studies and available data, stored at the Secretariat for Energy and Mineral Resources of Province, the energy potential ranges from 20.500 TJ/a (~0,50 mtoe/a) amounting to about 11% of the demand in

Vojvodina, reduced to the primary energy form. For now, the exploitation of this resource has not been organised to a sufficient degree.

The solid biomass (waste biomass from the agro-complex) is being used, for now, only to heat individual households and boiling stations of industrial agro-complexes for steam production i.e. for subsistence. Waste biomass briquetting and palletising is still not present, except in certain cases. There is no cogeneration plant that uses waste biomass or biogas.
For now, the communal waste is not used for energy purposes, although there is an intensified interest from mainly foreign investors for the use of communal waste in generating energy and in combining the production of thermal and electrical energy for the local community demand.

Actually possible organised biomass production on larger animal farms amounts to about 7 million /a (oko 160 TJ/a ~ 0,004 mtoe/a), therefore that is a negligible energy resource, but ecological and immensely significant for organic production of fertilizers. There is not even an estimate on the probable production of this energy resource from the city sewerage waste water and from the food industry, where even greater amounts could be expected. The primary energy of the municipal, medical and industrial waste in Vojvodina has been quite accurately estimated to about 6,65 TJ/a ~ 160 ktoe/a, which is completely insignificant related to energy, but immensely significant from an ecological aspect.

On the level of the Province, due to the significance of biomass energy, two councils have been formed for co-ordination in the application of biomass on the territory of AP Vojvodina, the Council for biomass and waste utilisation for energy purposes on the territory of AP Vojvodina and the Council for biofuels on the territory of AP Vojvodina.

The utilisation of **geothermal energy** is presently at a precarious level. Average annual production of geothermal energy for mainly balneology purposes, according to the data of the NIS oil company, amounts to 0,95 M m per year, or 0,002 Mten, with a declining trend in use, partially due to the relatively high energy price from the existing borings to meet the facility's heat demand, or due to the unresolved property-legal relations (ownership issue) on the existing potential borings that would eventually be reactivated.

Wind energy is still not being used on the territory of Vojvodina, even though many activities have been undertaken to ensure its use. Aside from the statutory and incentive frameworks adopted on the national level, the Executive Council of AP Vojvodina has formed a Council for the utilisation of wind energy, and the Secretariat for energy and mineral resources of the Province has financed the development of the WIND-atlas or the assessment of the wind speed at certain locations.

Measurements were started, largely performed by foreign investors, in the municipalities of Kanjiza and Titel.

Solar energy is not utilised at all. There is significant potential for the utilisation of solar energy that makes up 20-30% higher intensity in insolation than the European average. There are 267 sunny days and the average insolation amounts to 1000 kWh/m2. The potential has been estimated at 565 GWh/a (if only 10% of households installs new PV panels). That is a significant potential (6,8% of today's electric energy consumption) and conditions need to be created for its utilisation. The thermal solar effect of the thermal solar collectors is used on smaller separate buildings, and a tendency of using them in hospitals and tourist facilities has been observed. According to the radiation level, this region has greater potential than Germany where 3,9 GW in photovoltaic (PV) panels have currently been installed for the production of electric energy. The main obstruction for more intensive utilisation of solar energy lies in relatively high initial investments into plants and in the lack of tax and custom's benefits, as well as in the absence of state incentive grants. A Solar Section has been formed, within the Council for the utilisation of geothermal energy, and there is high interest regarding its activities.

Hydroelectric power potential of the Serbian Tisza Catchment Area is not being utilised, and no hydroelectric power plants have been built.

Recent research have shown that there is a possibility to utilise the hydroelectric power on Danube (HPP Novi Sad, 130-210 MW in capacity, with mean annual production at 985 – 1500 GWh).

Moreover, the construction and the utilisation of smaller hydroelectric power plants are only being discussed. According to the recent analysis, it is possible to build 13 small hydroelectric power plants with 20,2 MW of power summary and 90,7 GWh of mean annual production (about 1,2% of the present electricity consumption).

Rise of the share of small hydroelectric power potentials in the total production of electric power, presents a general orientation of the world energy policy and that of the professional community, taking up a significant place in the energy plans of all progressive industries. The EU awards special significance to this potential.

The greatest potential is found on the Danube-Tisa-Danube hydro system, where small hydroelectric power plants would be built within the actual water gate (including also the dam on Tisa), given that we already have formed water sluices. Primary functions of the hydro system would still have priority, but the forced activities would be implemented with the objective to increase hydroelectric power potential.

The utilisation of the hydroelectric potential would result in other benefits, such as the improved flow of the channel network (significant from the environmental protection standpoint) and the dual function of some hydroelectric power plants (pumps-turbines).

7.3. Telecommunications and Information Systems

In the recent period, the development and the improvement of the telecommunication system on the planned territory was implemented mainly according to the General plans of the telecommunication network of the competent companies. New capacities were built alongside the main ones, as well as traffic directions of lower rank down to the municipal ones, and the optic cable was used as the main media in addition to the existing cable connections and the PP system. In larger urban centres, and in many smaller ones (down to rural settlements), in the recent period, digital switching systems were provided, achieving a significant enhancement of the network's capacities, high quality, reliability and availability, and also the introduction of up-to-date postal services (broadband services)

Table 36. Data on the number of the users and the service type on the territory of AP Vojvodina

Service type	In 2005/2006	
	Total number of users	Number of users in urban areas
PSTN telephone system	738.227	590.582
ISDN Basic Access	13.887	13.193
GSM	600.000	300.000
GPRS	60.000	60.000
EDGE		
IP Phone System (VoIP)		
Video Phone System		
Video Conference		
ISDN Primary Access	500	500
UMTS	100	100
ADSL	1.048	1.048
VDSL		
Triple-play (Internet, TV, telephone)		
Rapid data transmission without	300	250
Data transmission without Internet at	20	20
Data transmission without Internet at speed up to 20 Mbit/s Mbit/s		
Internet access at speeds up to 2 Mbit/s	67172	44782
Internet access at speeds from 2 Mbit/s to 20 Mbit/s Mbit/s	6	3
Internet access at speeds over 20 Mbit/s		
Virtual private networks (VPN)	13	11
Distribution of TV signal up to 10		
Distribution of TV signal from 10 to 75	283.575	180.236

Distribution of TV signal over 75 channels		
IP TV		
Video on Demand		
E-commerce, e-banking, etc.		
E-management		
E-learning		
E-medicine		
Video surveillance		
Remote control in industrial plants		
Interactive games		
Private video transmission		
Distribution of music and sound signal		
High-definition television		
Interactive digital television		
Web/mail hosting services	160	150
Frame Relay	450	

Table 37. Percentage of users per county in the Serbian Tisza Catchment Area

County	In 2005
Juzna Backa	33.7 %
Severno banatska	4.2 %
Srednje banatska	8.7 %
Number of companies – service	6

The presented percentage distribution per county indicates that development is not balanced, respectively. The Juzna Backa County with its seat in Novi Sad is significantly more developed than other parts of AP Vojvodina. The reason behind this division should be looked for in the economic development of the Juzna Backa County.

Analysis of the number of narrowband and broadband Internet access users in AP Vojvodina.

Table 38. presents the state of the numbers of active landline telephone connections per 100 residents and the number of telephone connections per household.

Table 38. The number of active landline telephone connections in the Serbian Tisza Catchment Area

County	Population rate (the 2002 Census)	The number of telephone connections (31 December 2006)	Number of telephone connections per 100 residents	The number of telephone Connections per household
South Backa	593666	246565	41,5	1,2
Severno banatska	165881	31026	18,7	0,5
Srednje banatska	208456	73300	35,2	1,0
Vojvodina	2031992	738226	36,3	1,0
The City of Novi Sad	299294	157093	52,5	1,5

According to the available data, the EU27 average is that 72% of households own a fixed telephone line and about 50 telephone connections per 100 residents (E-*Communications Household Survey).* The number of connections per 100 residents falls behind the EU27 average, but in relation to the neighbouring countries the relation is better than their average.

The chart presents the use of Internet with the dial-up access. The EU27 average amounted to 13% in 2006, which is by 3% less than in 2005. The actual percentage of the number of households using the dial-up Internet access is on the level as in the EU27, but the problem presents half the total percentage of Internet users.

Table 39. The use of Internet with the dial-up access in the Serbian Tisza Catchment Area

County	Per 100 residents	households (%)	Percentage in relation to the the number of telephone connections (%)
Juznobacka	7,90	22,23	19,01
Severno banatska	0,83	2,33	4,43
Srednje Banatska	3,78	10,63	10,74
Vojvodina	4,72	13,Č0	13,00
The City of Novi Sad	10,02	28,22	19,10

Research indicated that dial-up Internet users dial more often the 042 numbers than the direct access numbers of the Internet provider. As much as two-thirds of Internet users use the Internet through dial-up access.

Average in Internet use in households of the AP Vojvodina, falls behind significantly with relation to the EU27, where it amounts to 44%. The city of Novi Sad, as a separate entity, is the only one that has an average above the mentioned one. The obtained results point out significant differences between the counties and the uneven development towards the IT society (Table 40).

Table 40. Internet use in the Serbian Tisza Catchment Area

County	Per 100 residents 2006. in 2006	Households in 2006 (%)	Per residents 2007. in 2007	Projection of households at the end of 2007 (%)
Juzno backi	12,11	34,09%	14,60	41,10%
Srednje banatska	5,26	14,80%	6,63	18,65%
Severno banatska	1,40	3,95%	2,33	6,56%
Vojvodina	6,94	19,52%	9,09	25,59%
The City of Novi Sad	17,53	49,36%	21,30	59,95%

Table 41. indicates the state of the number of users that have the option of Internet access at speeds equal to 64 kbit/s or higher. In relation to 2005, the state in this area is slowly changing, with improvements to be expected in the second half of 2007. In relation to the EU27, where the average per 100 residents amounts to 16,9 i.e. 28% for households, the AP Vojvodina falls dramatically behind. In this case, the City of Novi Sad has almost reached the same average as the EU27. With this data, the South Backa County is also approaching the latter average. The overall poor situation and the extremely uneven development rate within the AP Vojvodina, present a concerning matter.

Table 41. Internet access at speeds totalling 64 kbit/s or greater the Serbian Tisza Catchment Area

County	Households In 2005 (%)	Per 100 residents In 2006	Households In 2006 (%)	Projection per 100 residents at the end of 2007	Projection of households at the end 2007 (%)
South Backa	2,53	5,22	14,70	7,92	22,31
Severno banatska	0,64	0,69	1,95	1,70	4,77
Srednje banatska	1,18	1,92	5,40	3,40	9,57
Vojvodina	1,81	2,79	7,85	5,12	14,42
The City of Novi Sad	4,64	8,97	25,26	13,05	36,74

Services of mobile telecommunications have been introduced to the largest part of AP Vojvodina via radio transmission, and to a minor extent, also via optic cables and by constructing radio relays and radio base stations.

SWOT ANALYSES

Strengths	Weaknesses
• Opportunity of using the remained hydro-power potentials • Potentials in renewable energy sources • Well developed power supply system in Serbia • Technical characteristics of the supply system are in line with UCTE requirements • Supply systems are regionally connected • Geographic location of the transfer systems between regions with excess and regions with a deficiency in electrical power • Developed transport and distribution gas supply system • Developed county heating system in cities • Power infrastructural systems in relatively good status • HR expertise and experience in energetics	• Irrational use of power, especially of the electrical power for heating purposes • Massive specific energy consumption per product unit • Low level of investments in investigating energetic potentials • Absence of building of new energy capacities over the recent twenty years • Too old age of energy supply facilities, equipment and network • Limited funds for investments and maintenance in power supply capacities • Massive technical and non-technical losses in power transport and distribution • Absence of harmonisation of plans among the producers, transporters and distributors of electrical power • Minimum co-generation of electrical and thermal power in the electrical power system • Low level of using renewable energy sources • Large scale gas supply in cities and settlements is not at high level • Seasonal unbalanced consumption of gas and a need to build gas storage facilities • Supplying the gas supply network is provided from one direction only – from Hungary • Energy source prices, especially of the electrical and thermal energy, are not cost effective. • Weak economic status of public companies for supply • Technological lagging of domesting elektro and mechanical engineering in building supply facilities and infrastructure. • Lack of many standards and regulations, insufficient readiness to implement international and European standards related to energetics.
Opportunities	**Threats**
• Improving energy efficiency, especially in households • Building new electro-energetic capacities (Kovin) • Building plants for combined production of gas and coal generated electrical and thermal energy (Novi Sad DH Company and others) • Building new capacities for electrical power transfer • Developing the market of electrical power in the country and the region • Modernising and regenerating power supply networks and facilities • Implementing the agreement with Gasprom • Building the South Stream main gas pipline and the Constanza-Trieste Pan-European crude oil pipeline.	• Significant dependance on imported energy (crude oil and natural gas) • Massive inefficiency in using energy • Lagging and slow development of energetic systems due to unfavourable economic situation • Lack of funds for the accelerated development of energetic networks and facilities in order to keep up with progress • Insufficient substitution for the electrical energy for heating purposes through DH, gas supply and renewable energy sources in cities. • Poor efficiency in using internal reserves in the energetics system • Drop in the reliability of energetics infrastructure network and equipment due

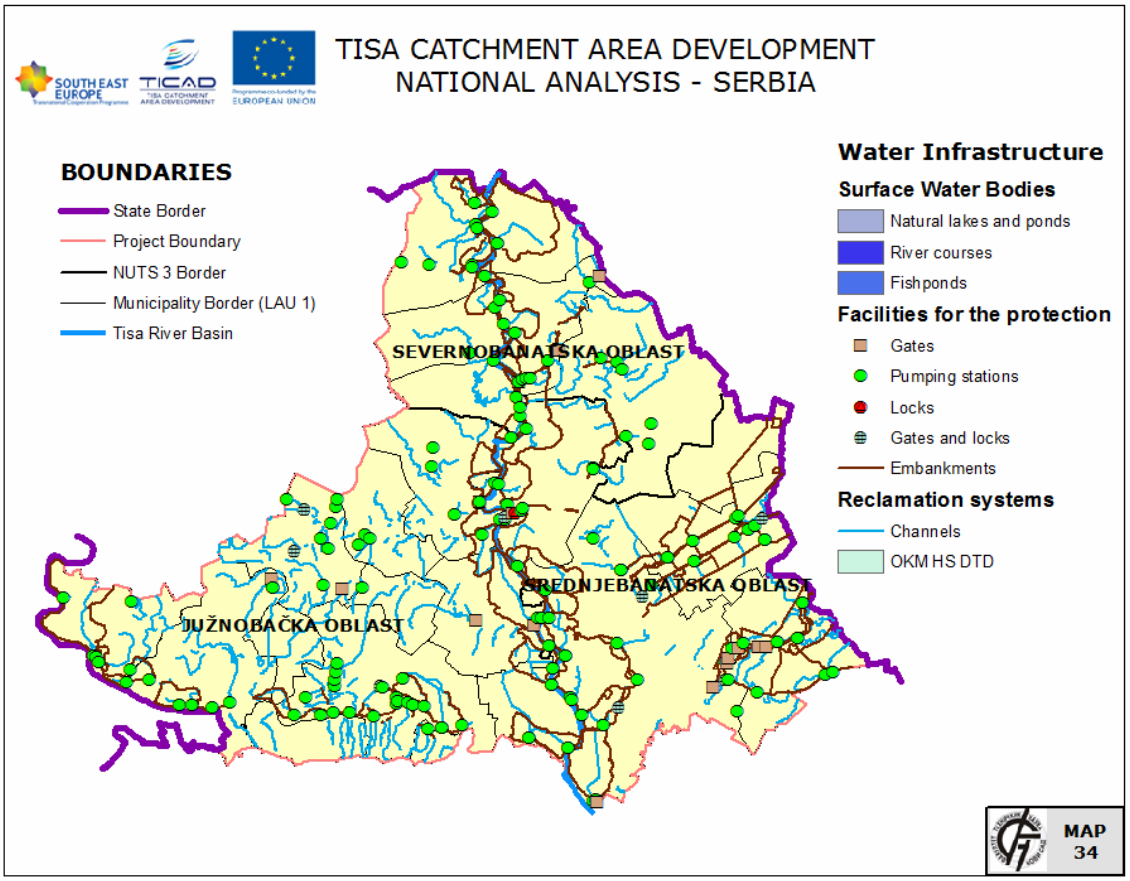
• Modernising refineries in line with EU standards • Intensifying the building of gas supply in cities, primarily in high-consumption sectors, with environment protection aims • Using hydro-potentials, especially small water flows • Increased use of renewable energy sources • Providing the connection to renewable energy source transfer system (especially small hydro-power generating plants and wind-parks) • Use of modern measuring devices and integrated management of infrastructural systems • Increasing the total economic competitiveness of power supply systems. • Attracting foreign partners, banks and investors to invest safely and on a long run into energy supply systems in Serbia.	to their old age • Lack of and non-harmonised standards and regulations with the EU • Weak willingness to prepare international (IEC) and European (CENELEC) standards from the field of electro-energetics. • Lack of interest among the young and quality HR to work in the field of energetics because of low and limited wages.

7.4. Water management

More serious hydro-technical works on the middle and lower course of the Tisa started in the 19th century. At first, the focus had been on erecting floodbanks along the river course and transecting more accentuated meanders, and later it was shifted to building hydrostructures in the Tisa basin, embankments and creating barrages.

The Serbian section of Tisa from its Danube mouth to the Hungarian border is about 164 km long. The length of dikes along the Tisa is 284,5 km, whereof their length on the left bank (Banat) is 147 km and on the right bank (Backa) is 137,5 km. Dikes protect some 260.000 hectares of coastal area from floods, whereof 190.000 hectares are on the left coast comprising the settlements of Kikinda, Zrenjanin, Novi Becej, Novi Knezevac etc., and 70.000 hectares are on the right coast including the settlements of Kanjiza, Senta, Ada, Title, Zabalj etc.

Picture 38. Water infrastructure in the Serbian Tisza Catchment Area



Dike construction along the Tisa had started as early as the 18th century, during the Austro-Hungarian Empire. In the fight against flood flows of the Tisa, dikes had been improved and extended several times. After the disastrous flood of the Danube (1965) and the Tisa (1970) and the immense damages these floods caused, the Executive Council of the Vojvodina Autonomous Province adopted a decision on implementing a uniform system of protection against floods in Vojvodina at the level of 1% of flood flow. It demanded extensive works and significant financial sources for building new, or for regenerating the existing systems of protection, hence it had been implemented in stages over the following 25 years. In the period between 1970 and 1990 the regeneration of the dikes along the Tisa was carried through, yet, due to the lack of funds, it has not been completed fully.

Table 42.

SECTION	Dike embankment and border dike length /km/	Local dike length /km/	Durable protection of embankment top (km)	FACING		No. of monitoring points (pcs)
				Length (m)	Area (m2)	
RIVER TISA						
State border (B.P. Selo)	66.60	5.20	12.10	1,780.00	20,652.00	9
B.P. Selo (Curug	31.58	13.20	7.00	4,200.00	6,300.00	4
Curug (mouth in Danube	43.22	15.85	7.57	22,919.00	104,578.00	7
State border (Kumanska Pump	97.11	28.79	15.83	2,730.00	14,590.00	11
Kumanska Pump (mouth in Danube	51.12	85.55	4.46	236.00	700.00	6
Total	289.63	148.59	46.96	31,865.00	146,820.00	37

Non-regenerated sections both on the left and the right bank of Tisa were in the focus of the flood control during the flood in April 2006. These sections have neither the necessary height nor the necessary dimensions of the dike. The water was successfully kept below the embankment line owing to immense human efforts and the employment of hundreds of machines, vessels, water management professionals and military, and at high costs. After that event, the Province Secretariat for Agriculture, Water Management and Forestry provided funds for the recovery of the most threatened sections and for the continuation of regeneration works.

Reconstruction priorities:

- On the **right bank of Tisa** there is an un-reconstructed section from the Mosoring breg (**km 21+000**) to Jegricka mouth (**km 36+022**), which was built in late-19th century, during the Austro-Hungarian Empire. The embankment top at certain places along this section is for 40 cm lower than the standard 1% flood flow, i.e. it is necessary to improve the dike and to raise its top for 1,4 m. Would overspill occur in this section of the dike (and it could have happened in 2006, if its topping with sand filled sacks was not done, though even so the water flooded its lowest sections for 0,5 m) eight settlements (Titel, Lok, Vilovo, Gardinovci, Sajkas, Mosorin, Zabalj and Djurdjevo), 10.600 inhabitants and 16.600 hectares of mostly arable land would be flooded, likewise many industrial buildings, the Novi Sad-Zrenjanin main road and the local road infrastructure. During the 2006 flood, this section was protected by immense human efforts of the professionals, military and citizens and at high costs. The works on this section started in 2007, and the reconstruction was accomplished on the stretch from Jegricka 2,5 km downstream.

- There are non-reconstructed dike sections on the left bank of the Tisa: from the Begej Canal (**km 10+400**) to Ecka Fishery (km 16+540), from the Muzlja Pump Station (km 17+600) to Elemir-Aradac Pump Station (km 29+546) and on the right coast of the Begej Canal from its mouth to the Tisa (km 0+000) to Stajicevo Hydrohub (8+850), which

represents a whole together with the non-reconstructed dike sections along the Tisa and should have the characteristics of a Tisa-dike. The embankment top at certain places along this section is for 20 cm lower than the standard 1% flood flow, i.e. it is necessary to improve the dike and to raise its top for 0,2 m to 1,2 m. Would overspill occur in this section of the dike (and it could have happened this year, if its topping with sand filled sacks was not done m) five settlements (Zrenjanin, Muzlja, Lukino selo, Belo Blato and Aradac), 12.000 inhabitants and 19.000 hectares of mostly arable land, a lot of industrial buildings, the Novi Sad –Zrenjanin main road and the local road infrastructure would be threatened. The non-reconstructed sections on the left bank of Tisa were protected by immense human efforts of the professionals, military and citizens and at high costs during the 2006 flood.

- The regeneration of the right-bank dike along the Tisa on the Makos-Zuti Breg strech from km 107+260 to km 11+170. During the 2006 flood control, a temporary dike was built on the section of the high bank along the Makos-Zuti Breg stretch in a total length of 3,9 km. The average height of the recently built dike of about 1,5 m, at maximum water level in the Tisa at Senta 926 cm, stops a water column of 1 m and prevents the flooding of Senta and Ada settlements and the neighbouring agricultural land. In order to raise the safety level of the built dike, it is necessary to implement its reconstruction, superelevation and strengthening by coherent material.

SWOT ANALYSES

Strengths	Weaknesses
- Large number of formed source areas - There is a significant coverage of users of organised water supply - Satisfactorily developed pipeline-network in settlements - Almost fully solved drainage of excess inland waters (drainage) - Developed canal network /DTD Hydrosystem/ providing water for irrigation in certain parts of Backa and Banat - A large number of facilities built in the DTD Hydrosystem - A large number of projects on sewage and waste water treatment plants (WWTP) were made - Existing network of dikes for flood control	- The usage of only underground waters for citizens' water supply - Poor underground water quality on the whole territory covered by TICAD - Absence of raw water treatment - Unsatisfactory quality of supplied water - Uncontrolled individual water supply drills - Excess exploitation of basic aquifer-Construction and use of rural water supply networks Without expert surveillance – lack of system maintenance - Vast number of micro-supply communities without public control - Poor quality of and dilapidated Pipelines (asbestos – cement) - Supply network massive losses (20 to 50%) - Run-down meliorative canal network due to the lack of maintenance - Very poor water quality in the DTD HS - Lack of maintenance on the facilities of DTD HS - Absence of organised approach to irrigation - Scarse number of settlements with developed sewage for waste water

	- Even fewer number of WWTP, while the existing ones have insufficient capacity or are not completed.
Opportunities	**Threats**
- Presence of more potential source in the alluvium of rivers - Implementation of EU Water Framework Directive 98/93 - Raising the capacity of present sources - Developing regional water supply systems - Introducing adequate raw water treatment - Water supply and water protection strategy for Vojvodina AP brought forth. - Reasonable use of present resources - Citizen education and raising consumer awareness - Implementing the double-purpose use of drainage canals for irrigation - Irrigation opportunities in the TICAD - Regenerating and reconstructing hydro-system facilities - Presence of hydro power potentials - Developing nautical tourism	- Water resources unprotected from pollution, both existing and planned - Absence of accident situation protocols - Building of industrial capacities in protected source areas - Use of chemicals in agriculture in protected areas - Legally unresolved ownership relations - Legal regulations not harmonised and not implemented - Lack of finances for project implementation

7.5. Waste management

Waste management

Solving waste management issues is one of the most serious environmental challenges. Considerable volumes of municipal solid waste are generated in the Serbian Tisza Catchment Area.

According to the Waste Management Strategy of the Republic of Serbia for the period 2010-2019.,[10] there are more then 60 **landfills for communal waste** within the TICAD area. Data on communal waste amounts that are generated at LAU1 (municipal) level are incomplete and unreliable[11]. Estimated amounts of communal waste produced on yearly basis in the Serbian Tisza Catchment Area[12] are:

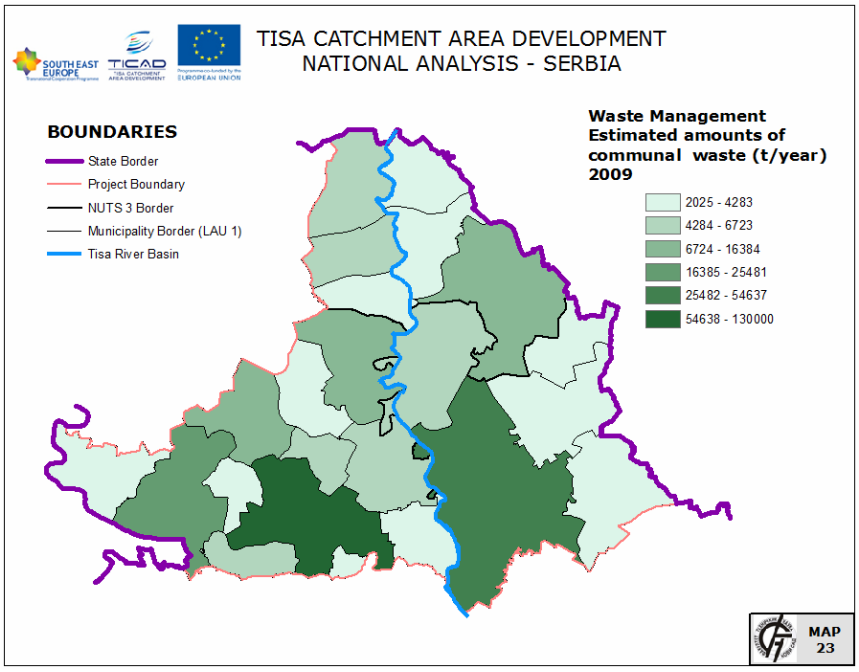
[10] Waste Management Strategy of the Republic of Serbia for the period 2010-2019, (*Official Journal of the Socialist Republic of Serbia n °* 29/2010)
[11] Spatial Plan of the Republic of Serbia, Draft, 2010
[12] Yearly amounts of communal waste were **calculated** on the basis of measurings conducted in representative municipalities.

Table 43. Estimated amounts of communal waste per year in the Serbian Tisza Catchment Area

NUTS 3	Municipality LAU1/City	t/2009
Juznobacki	Novi Sad-grad	130000
	Bač	3415
	Bačka Palanka	25481
	Bački Petrovac	3082
	Beočin	6723
	Bečej	10015
	Vrbas	11212
	Žabalj	5777
	Srbobran	3755
	Titel	3580
	Temerin	6194
	Sremski Karlovci	3694
Srednjebanatski	Zrenjanin	54637
	Žitište	4283
	Nova Crnja	2667
	Novi Bečej	6583
	Sečanj	3438
Severnobanatski	Ada	3988
	Kanjiza	5776
	Kikinda	16384
	Novi Knezevac	2025
	Senta	5368
	Coka	2904

Source: Waste Management Strategy of the Republic of Serbia for the period 2010-2019

Picture 39. Waste management estimated amounts od communal waste (t/year) 2009 in the Serbian Tisza Catchment Area

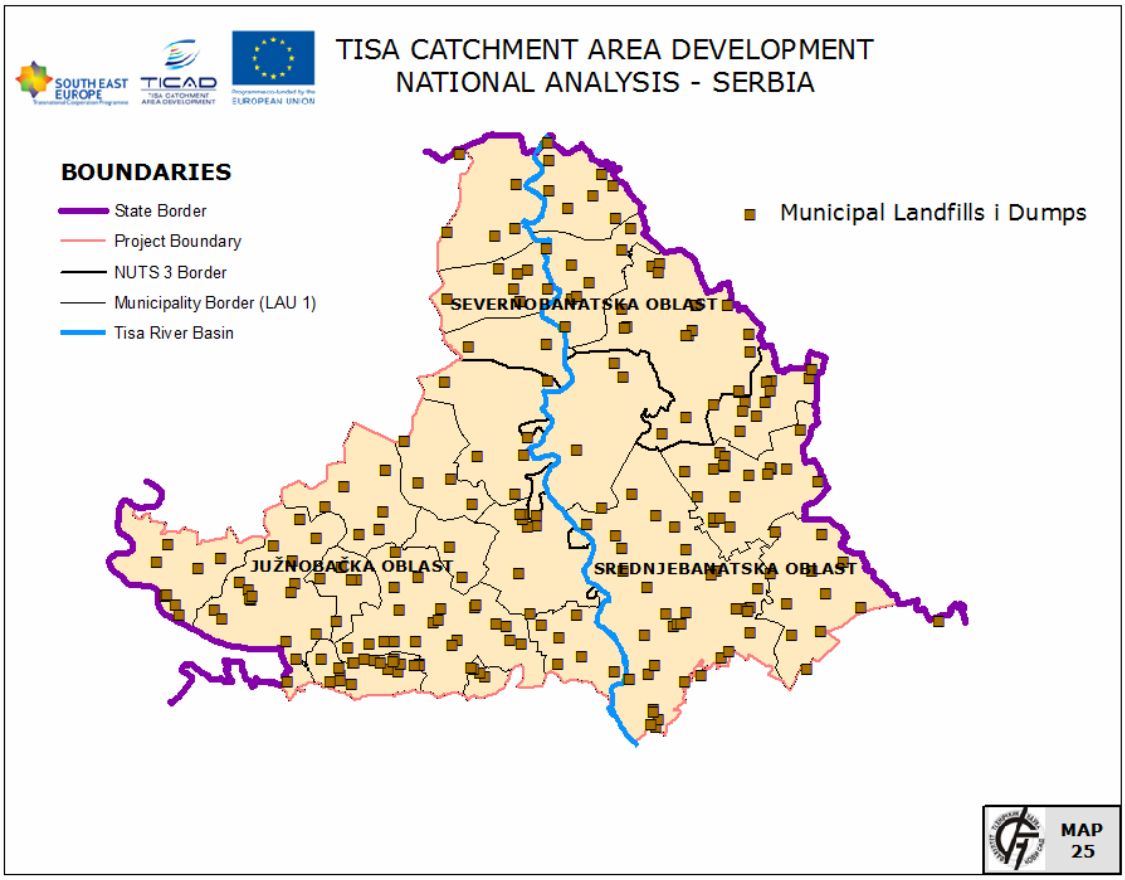


Source: Waste Management Strategy of the Republic of Serbia for the period 2010-2019

Installations for biological treatment and incineration of communal waste do not exist. Installation for treatment or disposal of **dangerous waste** does not exist either. Biggest amounts of **non-dangerous industrial waste** come from processing industries. Important amounts of waste come also from agriculture, exploitation of mineral resources and construction[13].

The most used collection of domestic waste is non-selective, mixed collection, selective collection has begun only in the major urban centres. At the level of the Serbian Tisza Catchment Area, there are more than 100 dumps (See picture 39).

Picture 40. Municipal landfills and dumps in the Serbian Tisza Catchment Area

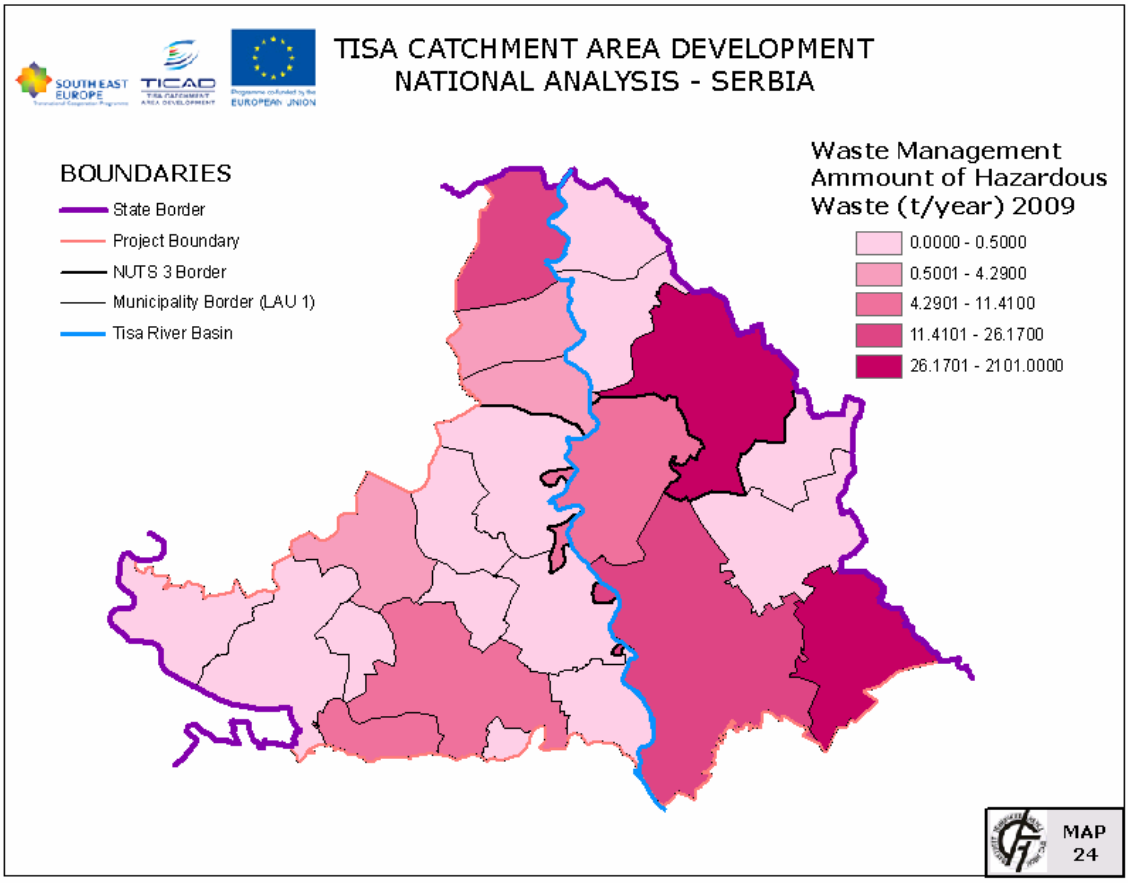


Source: Environmental Protection Agency

The **production of industrial wastes (tonnes)** reflects a differentiated situation, impossible to be represented graphically because of the lack of data. Acorting to the data given by Environmental Protection Agency, Table shows tha quantities of hazardous waste on the teritory of the Serbian Tisza Catchment Area.

[13] Spatial Plan of the Republic of Serbia, Draft, 2010

Picture 41. Waste management ammount of hazadrous waste (t/year) 2009



Source: Environmental Protection Agency

The current situation on waste management can be characterized by:

- a degree of coverage with sanitation services is about 90% of the total population in the Serbian Tisa river basin;
- lack of extensive programmes of separate collection at source of the recycling waste;
- lack of waste treatment facilities (minimization of quantities and recycling) (waste sorting stations, composting plants);
- exploitation of certain non-compliant municipal landfills and waste dumps.

It is necessary to implement an integrated household solid waste management system (separate collection system of household waste by fractions, separate collection of green waste from individual homes, construction of sorting stations, closure of the last municipal household waste deposits) supported by an investment plan.

SWOT Analysis - Waste Management

STRENGTHS	WEAKNESSES
The presence of the waste management national strategy	Insufficient education of the population
The existence of legislation in conformity with the EU legislation	
Initiative to form a waste management region and the beginning of construction of several regional landfills-regional centres.	Absence of awareness related to the necessity of waste separation, at the source location.
	Absence of central storage area and plant for the treatment of hazardous waste, on the national level.
	Extreme degradation of natural resources-water, land and air due to inadequate disposal and waste management
	A high number of degradation sites due to the presence of a large number of junkyards and wild landfills.
	Absence of organised waste collection and disposal in rural areas
OPPORTUNITIES	**THREATS**
Conforming the national legislation to the EU legislation in the field of waste management	Slow implementation of legal and institutional reforms
Enforcement of the public-private partnership in the field of environmental protection	Lack of financial resources
Rehabilitation of wild junkyards and remediation of contaminated soil	Lack of investments
Acknowledging waste as a market category	Slow empowerment of institutions at the local level and insufficient coordination
Potential for opening new jobs	Restrictive budget policy
Availability of EU funds and intensification of international cooperation through the integration process	Poor economic status of citizens and their inability to pay the actual price of communal services
Rising the level of awareness on the necessity of waste separation at the source location	Degraded environment
More efficient observation of the Polluter Pays principle	

8. Public utility supply

8.1. Housing

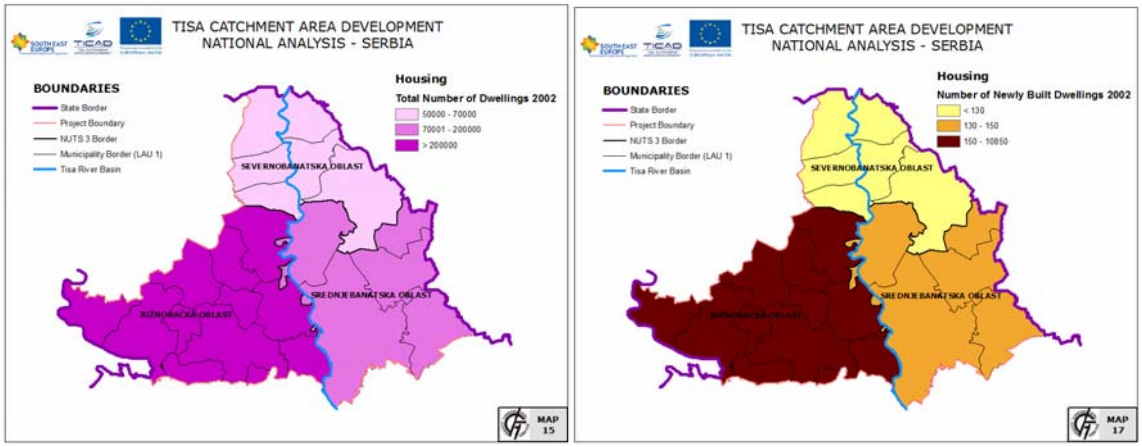
Dwelling units

In the Serbian Tisza Catchment Area according to Census 2002 year, there are 365 117 dwellings (49% of the total number of dwellings in AP Vojvodina). Number of dwellings per 1000 inhabitants in the observed area is 377 (or 369 for the Juzno backi county, 381 Srednje

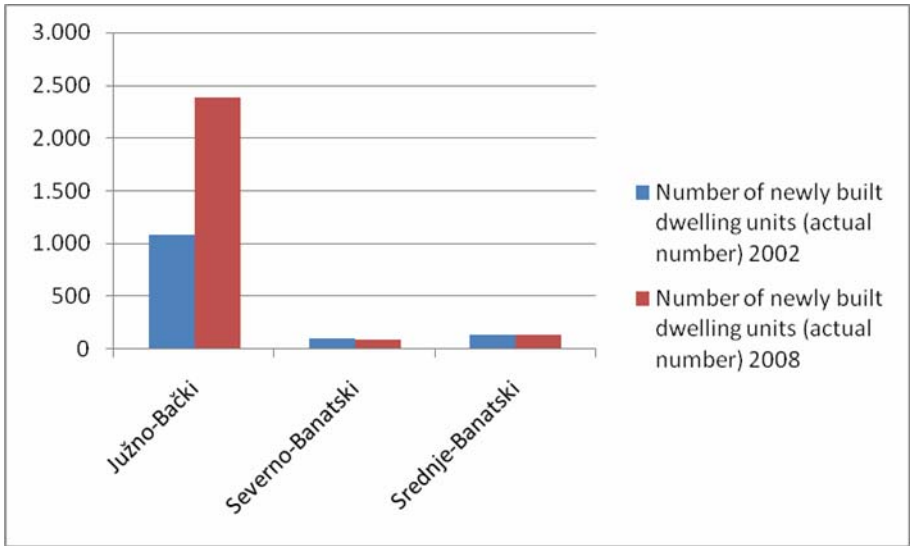
banatski county and 400 dwellings per 1000 inhabitants in Severno banatski county).

Total number of newly built dwelling units (houses and apartments) in 2002-2008 period increased for 83.0% which is certainly consequence of the construction expansion in Juzna Backa county with 1300 new dwelling units. The number of new dwelling units per county increased in Juzno Backi county from 1.9 to 3.9 units per 1000 units (in other two regions the situation minimaly changed 0.4 - 0.6 and 0.6 – 0.7).

Picture 42. Total number of dwelling unites/ newly built dwelling units in the Serbian Tisza Catchment Area



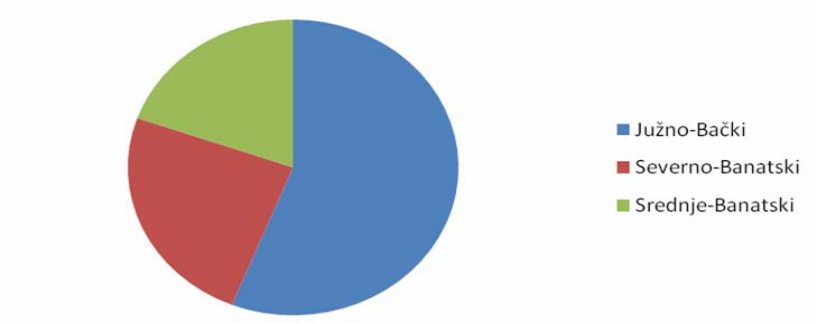
Picture 43. Number of newly built dwelling unites in the Serbian Tisza Catchment Area



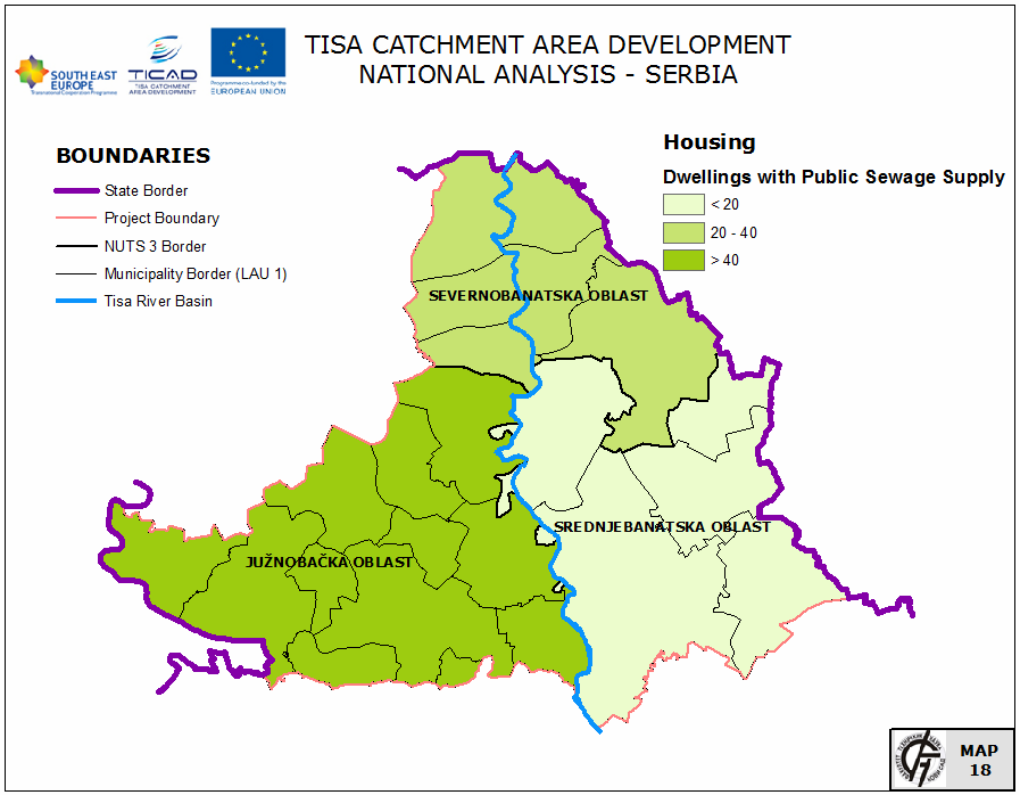
For the studied area, the indicator linking the population and number of dwellings, not allways particularly relevant for rural analysis.

Share of inhabitants connected to public sewage system in 2002. For this indicator the only available data are for 2002, the year of the housing census.

Picture 44. Share of inhabitants with public sewerage supply in the Serbian Tisza Catchment Area



Picture 45. Share of inhabitants connected to public sewage system (%) 2002



As a conclusion, the studied area is in process of developing the housing sector, both in terms of increasing the total number of homes (especially in the last analyzed period), a process due to the increased number of new dwellings and the number of dwellings per 1000 inhabitants. Regarding housing facilities - water supply and sewage systems, the situation is not very good because, in the studied area, the average value of households connected to water supply is over 75%, while the average value of households connected to public sewage system is under 30%.

8.2. Gas supply

The state-owned company "Srbijagas" is in charge of gas supply and distribution whereas the "Serbian Oil Industry - NIS" (owned by the State and the Russian "Gasprom") is in charge of oil supply and distribution. The production of oil and natural gas is carried out on 56 oil and gas fields and 139 deposits as well as from 800 oil and 110 gas wells.

The Serbian gas pipeline system comprises the main pipeline Horgos-Senta-Gospodjinci-Batajnica-Velika Plana-Paracin-Pojate-Nis, the systems of incoming and distribution pipelines and urban distribution networks of medium and low pressure. The gas system in Serbia is linked to the transport system of Hungary at Horgos, through which the Russian gas is imported. Since it is clear that the energy and infrastructure projects cannot be closed at borders, the plan is to connect countries in the region. There are two main projects in this respect:

- connection to the gas system of Croatia along the Danube energy corridor near Sotin; and
- connection to the gas system of Romania through section Arad-Mokrin.

The length of high pressure gas network in the Srbijagas system per counties is as follows:

- Srednje banatski County– 263.23 km
- Severno banatski County – 314.83 km
- Juzno Backi County – 355.92 km.

Table 44. Settlements in Juzna backa County with gas supply

Juzna Backa County	
BAČ MUNICIPALITY	
SETTLEMENT	**DEVELOPED GAS SUPPLY NETWORK**
BAČ	NO
BAČKO NOVO SELO	NO
BOĐANI	NO
VAJSKA	NO
PLAVNA	NO
SELENČA	NO
BAČKA PALANKA MUNICIPALITY	
BAČKA PALANKA	YES

ČELAREVO	YES
VIZIĆ	YES
GAJDOBRA	NO
DESPOTOVO	NO
MLADENOVO	NO
NEŠTIN	YES
NOVA GAJDOBRA	NO
OBROVAC	NO
PARAGE	NO
PIVNICE	NO
SILBAŠ	NO
TOVARIŠEVO	NO
BAČKI PETROVAC MUNICIPALITY	
BAČKI PETROVAC	YES
GLOŽAN	YES
KULPIN	YES
MAGLIĆ	YES
BEOČIN MUNICIPALITY	
BEOČIN	YES
BANOŠTOR	YES
GRABOVO	YES
LUG	YES
RAKOVAC	YES
SVILOŠ	YES
SUSEK	YES
ČEREVIĆ	YES
BEČEJ MUNICIPALITY	
BEČEJ	YES
BAČKO GRADIŠTE	YES
BAČKO PETROVO SELO	NO
MILEŠEVO	NO
RADIČEVIĆ	NO
VRBAS MUNICIPALITY	
VRBAS	YES
BAČKO DOBRO POLJE	YES
ZMAJEVO	YES
KOSANIĆ	YES
KUCURA	YES
RAVNO SELO	YES
SAVINO SELO	YES
ŽABALJ MUNICIPALITY	
ŽABALJ	YES
ĐURĐEVO	YES
GOSPOĐINCI	YES
ČURUG	NO
CITY OF NOVI SAD	
NOVI SAD	YES
FUTOG	YES
KAĆ	YES
KISAČ	YES
KOVILJ	YES
LEDINCI	YES
PETROVARADIN	YES

RUMENKA	NO
STEPANIĆEVO	YES
BEGEČ	YES
BUDISAVA	YES
BUKOVAC	YES
ČENEJ	YES
SREMSKA KAMENICA	YES
VETERNIK	YES
SRBOBRAN MUNICIPALITY	
SRBOBRAN	YES
TURIJA	YES
NADALJ	YES
SREMSKI KARLOVCI MUNICIPALITY	
SREMSKI KAROLVCI	YES
TEMERIN MUNICIPALITY	
TEMERIN	YES
BAČKI JARAK	YES
SIRIG	YES
TITEL MUNICIPALITY	
TITEL	NO
VILOVO	NO
GARDINOVCI	NO
LOK	NO
MOŠORIN	NO
ŠAJKAŠ	NO

Table 45. Srednje banatski County settlements with gas supply

SREDNJEBANATSKI COUNTY	
ŽITIŠTE MUNICIPALITY	
SETTLEMENT	**DEVELOPED GAS SUPPLY**
ŽITIŠTE	YES
BANATSKI DVOR	YES
BANATSKO KARAĐORĐEVO	YES
ČESTEREG	YES
MEĐA	YES
NOVI ITABEJ	YES
RAVNI TOPOLOVAC	YES
SRPSKI ITABEJ	YES
TORAK	YES
TORDA	YES
HETIN	NO
BANATSKO VIŠNJIČEVO	YES
ZRENJANIN MUNICIPALITY	
ZRENJANIN	YES
KLEK	YES
ELEMIR	YES
ARADAC	YES
BELO BLATO	NO
LUKINO SELO	NO
PERLEZ	NO
JANKOV MOST	YES
KNIĆANIN	NO
MELENCI	YES

MIHAJLOVO	YES
TOMAŠEVAC	NO
EČKA	YES
STAJIĆEVO	YES
LUKIĆEVO	YES
BANATSKI DESPOTOVAC	YES
BOTOŠ	YES
ČENTA	NO
FARKAŽDIN	NO
LAZAREVO	YES
ORLOVAT	NO
TARAŠ	YES
NOVA CRNJA MUNICIPALITY	
NOVA CRNJA	YES
SRPSKA CRNJA	YES
RADOJEVO	YES
ALEKSANDROVO	YES
VOJVODA STEPA	YES
TOBA	NO
NOVI BEČEJ MUNICIPALITY	
NOVI BEČEJ	YES
BOČAR	YES
KUMANE	YES
NOVO MILOŠEVO	YES
SEČANJ MUNICIPALITY	
SEČANJ	YES
BANATSKA DUBICA	YES
BOKA	YES
BUSENJE	YES
JARKOVAC	YES
JAŠA TOMIĆ	YES
KONAK	YES
KRAJIŠNIK	YES
NEUZINA	YES
ŠURJAN	YES
SUTJESKA	YES

Table 46. Severno banatski county settlements with gas supply

SEVERNO BANATSKI COUNTY	
ADA MUNICIPALITY	
SETTLEMENT	**DEVELOPED GAS SUPPLY**
ADA	YES
MOL	YES
OBORNJAČA	NO
STERIJNO	NO
UTRINE	NO
KANJIŽA MUNICIPALITY	
KANJIŽA	YES
HORGOŠ	YES
ADORJAN	YES
MALE PIJACE	YES
DOLINE	NO
MALI PESAK	NO

MARTONOŠ	YES
NOVO SELO	NO
OROM	NO
TOTOVO SELO	YES
TREŠNJEVAC	YES
VELEBIT	YES
VOJVODA TIMONJIĆ	YES
KIKINDA MUNICIPALITY	
KIKINDA	YES
BANATSKO VELIKO SELO	YES
BAŠAID	YES
MOKRIN	YES
NAKOVO	YES
NOVI KOZARCI	YES
RUSKO SELO	YES
IĐOŠ	NO
SAJAN	NO
BANATSKA TOPOLA	NO
NOVI KNEŽEVAC MUNICIPALITY	
NOVI KNEŽEVAC	YES
BANATSKO ARANĐELOVO	NO
FILIĆ	NO
MAJDAN	NO
PODLOKANJ	NO
RABE	NO
SIGET	NO
SRPSKI KRSTUR	NO
ĐALA	NO
SENTA MUNICIPALITY	
SENTA	YES
BOGARAŠ	NO
TORNJOŠ	NO
GORNJI BREG	NO
KEVI	NO
ČOKA MUNICIPALITY	
ČOKA	YES
SANAD	NO
VRBICA	NO
CRNA BARA	NO
OSTOJIĆEVO	NO
BANATSKI MONOŠTOR	NO
JAZOVO	NO
PADEJ	NO

The only company in Serbia with an integrated system of production, refining and trade of crude oil and petroleum products is NIS Gazprom Neft (Gazprom Neft bought 51% of the shares in the state company "Oil Industry of Serbia - NIS" in 2009). The NIS refining complex consists of two refineries located in Pančevo (Juzno banatski county) and Novi Sad (Juzno backi county. They produce a range of petroleum products – from motor gasolines and diesel fuel to mechanical lube oils and feedstock for petrochemical industry. The maximum capacity of

product lines of both refineries is 7.3 million tons of crude oil per year: Pančevo up to 4.8 million tons per year and Novi Sad up to 2.5 million tons per year. There is also an LPG production facility, the so-called Elemir LPG refinery.

NIS Gazprom Neft supplies 85% of the entire Serbian market at present and the share of imported oil in refined oil is 80%. Its central storages in the this Region are located in Novi Sad.

The spatial development concept in the sector of oil industry is based on suggested Pan-European Oil Pipeline (PEOP) that presents a real possibility for delivering Russian oil from the Caspian Basin, from the existing oil terminal in the Black Sea port of Constanza through the refineries in Serbia and Croatia to Trieste in Italy. At present, the priority is to increase the production capacities and modernize refineries in Pančevo and Novi Sad with the intention to increase the quality of final products in line with the Euro 5 standard.

The oil pipelines run through three counties: Srednjebanatski (44 km), Severno banatski (38 km) and Juzno backi (171 km).

Table 47. The major gas and oil fields in Srednje banatski county

Field	Petroleum deposit	Fluid type	Field coordinates		Number of drilled boreholes	Boreholes in Operation	Boreholes out Of operation	Exploited area km^2
			Y	X				
Banatski Dvor BD	A	Gas	7457600-7460500	5040800-5046000	25	1	24	17.1
	B	Gas						
Banatski Dvor-west BDz	I	Gas	7453900-7457000	5040000-5042000	7		5	7.31
	IIa	Gas						
	II	Gas				1		
	III	Gas				1		
	IIIa	Gas				2		
Begejci Be	I	Gas	7465000-7467300	5043000-5045500	6	1	5	9.62
	II	Gas						
Begejci Novi Beg	Beg	Gas	7466800-7469000	5040000-5044000	5		5	8.8
Vojvoda Stepa VSt	M	Gas	7471400-7473300	5058600-5057700	7		7	2.09
Vojvoda Stepa-east VSti	I	Gas	7478500-7479800	5057850-5059000	1		1	0.78
Elemir - east Eli		Gas	7445200-7445700	5035000-5035600	1		1	0.3
Elemir shallow El	Pl	Gas	coor.Elemira					8.1
Zitiste Zi	I	Gas	7458200-7461150	5035900-5040000	8	3	5	11.5
Zrenjanin-west Zrz	Paludin	Gas	7476500-7477850	5027500-5028600	1		1	1.48
Itebej It	g1a	gas	7478000-7480000	5047800-5050500	16		11	
	g1	gas						
	g1b	gas						
	g1c	gas						5.32

	g1d	gas						
	g2	gas						
	g3	gas				5		
	g1e	gas						
Banatsko Karadordevo Kdj	M	gas	7461200-7464000	5050000-5051500	21		21	4.22
Medja Mdj	Pn	gas	7483200-7847150	5042500-5048200	14		19	
	I	gas						
	II	gas						17.76
	IIa	gas				1		
	III	gas				4		
Melenci-shallow Mep	Mep	gas	7448000-7449100	5045250-5046150	1		1	1.52
Rusanda-shallow Rp	I	gas	7445300-7447200	5046900-5048500	4		3	3.36
	II	gas				1		
Srpska Crnja Cr	D1,D2,D3	gas	7475000-7479000	5064000-5068000	12	1	10	
	D1-I	gas				1		
	Dx-I,II,III	gas						16.12
	EI,II,III	gas						
	Ex-I,Ex-II	gas						
Cestereg Ces	Pl	gas	7463350-7464000	5045450-5046200	5	2	3	1.82
Banatsko Karadjordjevo Kdj	Mz+M	Naphtha	7464200-7464000	5050000-5051500	21		21	4.22
Boka Bo	M	Naphtha	7488300-7490400	5018000-5021100	45	19	26	26.04
Ban.Karadjordevo-sever BKs	M+Pl	Naphtha	7461400-7462350	5052850-5053700	1		1	0.33
Vojvoda Stepa VSt	Pn+M	Naphtha	7471500-7473300	5058600-5059750	7		7	2.09
	Pn	Naphtha						
Elemir El	El	Naphtha	7441400-7444150	5031000-5034000	69	31	38	8.1
Zrenjanin Zr	Bd	Naphtha	7452150-7452700	5030200-5030950	11	2	9	0.38
Zrenjanin- north Zrs	I	Naphtha	7450500-7452300	5031100-5033500	9	4	5	3.48
Itebej It	Mz+M	Naphtha	7478000-7480000	5047800-5050500	16		16	5.51
Melenci- deep Med	Med	Naphtha	7447500-7488000	5044300-5046800	4		4	4.45
Mihajlovo Mih	Mih	Naphtha	7452200-7453600	5033200-5035200	8	3	5	2.42
Nova Crnja-village NCs	M	Naphtha	7468800-7470300	5057300-5058200	8		8	1.82
Rusanda Rus	I	Naphtha	7444000-7467200	5043000-5045550	18	2		7.5
	II,IIa	Naphtha				5		
Hetin He	Pn	Naphtha	7481100-7482800	5057550-5059900	6		6	4.08

Table 48. The major gas and oil fields in Severno banatski county

Field	Petroleum deposit	Fluid type	Field coordinates		Number of drilled boreholes	Boreholes in	Boreholes out	Exploited
			Y	X	XX	operation	of operation	area km2
Banatsko Veliko Selo VS	VS	gas	7440150-7441000	5072850-5073800	5		5	0.82
Boćar Boc	Boc	gas	7439200-7442000	5067000-5072000	3		3	2.66
Idjos- north Idjs	Idjs	gas	7451000-7454000	5073500-5075000	1		1	4.52
Kikinda-shallow Kp	E3	gas	7457400-7463400	5066000-5072000				
	F-IIIa	gas						
	F-IIIb	gas						
	F-IIIc	gas						
	F-IIIe	gas						
	G1	gas						
	G2	gas						
	G3	gas						
	G4	gas						
	G5	gas						27.42
	G6	gas						
	G7iG7a	gas						
	G8	gas						
	G9,9a,9b,9c	gas						
	G10	gas						
	G11	gas						
	G12	gas						
	G3	gas						
	G4	gas						
Kikinda-upper Kg	Ig	gas	7453300-7461000	5074000-5079250	70			
	IIg	gas						
	IV	gas						38.62
	IV0	gas						
	IV1	gas						
Satelit Kikinda city Skv	C1	gas	7453300-7461000	5074000-5079250	3		3	38.62
Kikinda west Kz	Kz	gas	7450500-7452000	5077200-5078500	2		2	1.95
Majdan-deep Maj-x	IIg	gas	7445000-7446000	5102700-5104400	1	1		1.66
Mokrin Mk	MOKRIN North Gas Deposit Complex				198			
	M+TG	gas	7453500-7457000	5081500-5092000				
	b	gas				1		
	c	gas				1		
	d	gas						

	e	gas				1		81.12
	f	gas				5		
	MOKRIN West Gas Deposit Complex							
	c	gas						
	d1	gas				1		
Nakovo Nak	TG+M	gas	7466000-7467500	5082000-5084000	3		3	2.59
Novo Milosevo NM	a	gas	7444200-7447150	5063800-5066000	11		11	
	b	gas			11	2		6.38
	c	gas						
	d	gas						
Novi Knezevac NK	M+TG	gas	7428400-7430000	5096000-5097000	5		5	1.6
Srpski Krstur SK	I and II	gas	7430500-7433000	5108000-5110000	3		3	10.68
Milosevo – north-east Msi	Msi	gas	7448000-7450500	5065500-5067000	1		1	6.02
Basaid-west Bsz	M	Naphtha	7451000-7452000	5053300-5055500	2		2	2.22
Kikinda Ki	Ki-B	Naphtha	7457400-7463400	5066000-5072000	95	3		27.42
	Ki-D	Naphtha				5		
Kikinda-shallow Kp	E2	Naphtha			143	4		27.42
Kikinda- east Kis	A and B	Naphtha			5			

Table 49. The major gas and oil fields in Juzno backi county

Juzno Backi County

PLANT	Field	Petroleum deposit	Fluid type	Field coordinate		Number of drilled	Boreholes in	Boreholes out of	Exploited
				Y	X	boreholes	operation	operation	area km2
	Gospođinci Go	Go	gas	7423000-7425500	5026000-5028500	1		1	2.21
	Bečej Bč	CO2	gas	7442000-7429200	5052000-5059000	14	2	12	47.6
	Turija- north Tus	I	Naphtha	7406500-7412500	5043000-5046750	79	44	33	18.81
		I	Naphtha				1		
		Ia	Naphtha				2		

The situation related to coal supply has changed recently, i.e. coal consumption has decreased, whereas the basic reason is that most of the industries are connected to natural gas supply. Simultaneously, coal consumption has also dropped due to the fact that a significant part of the industry operates with lower capacity, while a number of households are supplied by the gas supply or the county heating networks.

The Banatski Dvor underground warehouse

The Banatski Dvor underground warehouse (PSG-BD) is being built as a continuation of exploiting an exhausted gas deposit which used to have a capacity of 3.3 billion m^3 of natural gas.

Plan documents foresee the construction of PSG-BD in stages. Storage capacity in stage I would be 300 million m3, and upon the full construction, the projected capacity would be 800 million m3 of natural gas and it would take 10 years to build up the full storage capacity.

PSG BD is located 22 km east from the city of Zrenjanin and 44 km from the main gas pipeline junction in Gospođinci.

At present, PSG BD is connected to two DN 200 pipelines, with ANSI 300 pressure class, with a distribution pipeline node in Elemir.

PSG BD is connected to the main distribution node in Gospođinci through a double-direction DV 04-18 DN 500 pipeline with ANSI 600 pressure class and 44 km long.

County heating systems

The present technical status in 2 co-generation plants in Juzno backa and Srednje banatska county are given in Table 50.

Table 50. Basic indicators of the status of co-generation plants in DH companies

Thermal power plants – county heating companies	Number of			Capacity MW_e - MW_t - t/h	Year of commission	Rated life (h)	Utilisation until Dec., 31 2005	Average efficiency until 2005
	Blocks	Boilers	Turbo-generators					
Novi Sad DH co. Novi Sad Juzno backi county	2	3	2	245-332-320	1981/84.	200 000	30,4%	~ 59%
Zrenjanin DH Co. Zrenjanin srednje banatski county	1	2	1	120-140-310	1989.	200 000	8,1%	~ 48%

Remark: (1) turbo-generator only (2) electrical energy generation efficiency ~ 21,3%

It has been planned to build a new gas and steam generated plant with 480 MW electrical power and 300 MW thermal power in Novi Sad DH Company in the Juzno backi county.

List of present DH companies per counties:

Juzno backi county
- Novi Sad DH Company
- Srbobran DH Company
- Vrbas DH Company
- Bečej DH Company
- Beočin DH Company,
- Bačka Palanka DH Company,

Severno banatski county
- Kikinda DH Company,
- Novi Kneževac DH Company,
- Senta DH Company

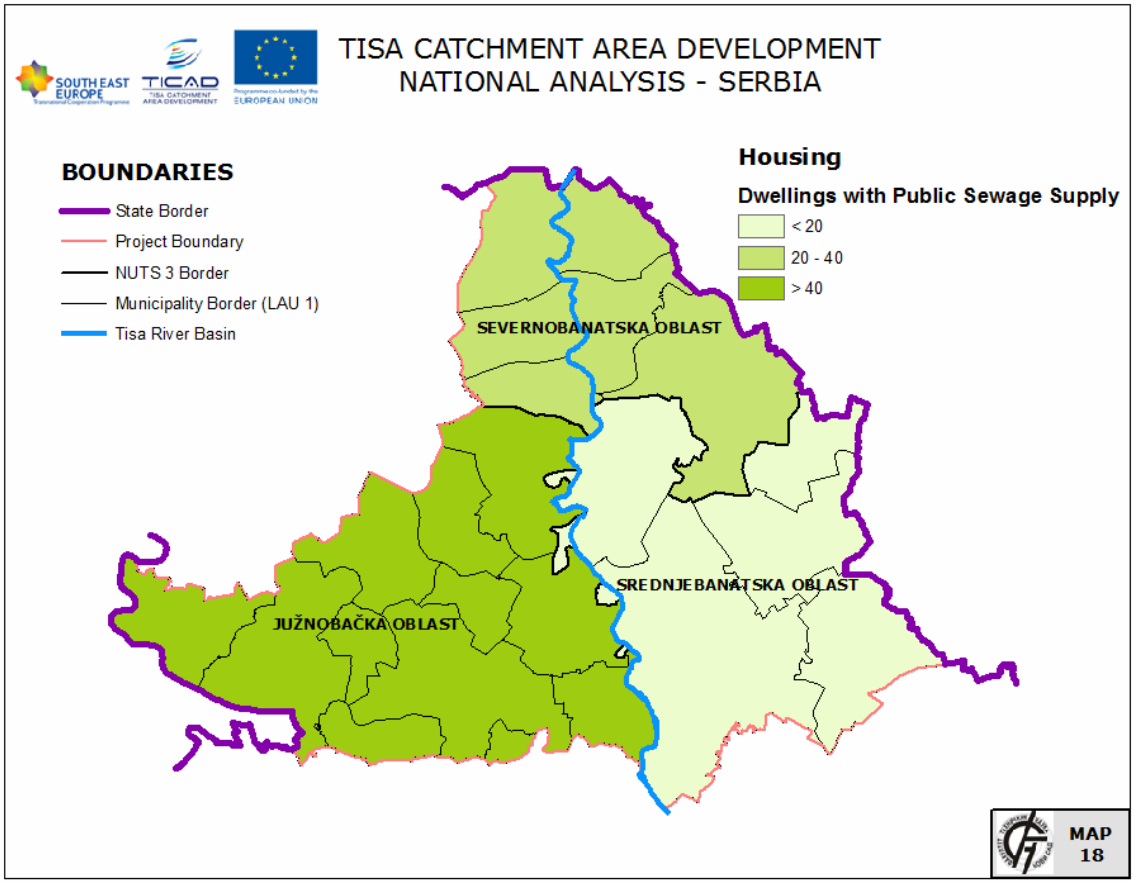
Srednje banatsky county
- Žitište DH Company
- Zrenjanin DH Company,
- Sečanj DH Company.

8.3. Drinking water supply

The supply of drinking water within the Serbian Tisza Catchment Area fully relies on underground waters from shallow phreatic to deep sub-artesian and artesian (rare) aquifers. Local sources from deep aquifers are mostly insufficient in capacity, hence their exhaustion is apparent. In its original form, drilled water mainly fails to meet the criteria set for drinking water, thus its treatment is necessary. Regretfully, especially in small water supply plants, water treatment is absent, except for chlorination, so consumers are supplied with water, which fails to meet the requirements of the Rules on the Hygiene Requirements for Drinking Water.

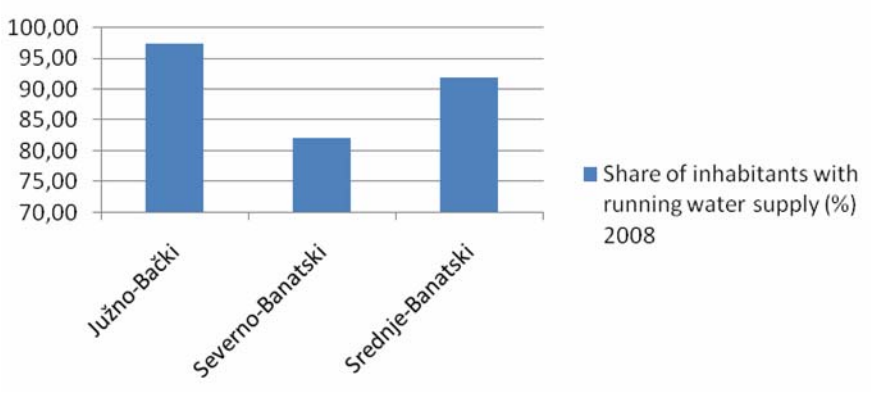
Of the total number of settlements in the Serbian Tisza Catchment Area, 75 have water supply organised through public companies (water supplies managed by municipal public companies or neighbourhood communities), while 6 settlements are without water supply. Supply is organised through 75 water supply systems whereof 58 are managed by public companies and 17 by neighbourhood communities of the settlement.

Picture 46. Dwellings with public sewage supply in the Serbian Tisza Catchment Area



Most of the citizens of the region along the Tisa live in settlements where water supply is provided. However, not all of them is connected to the public water supply systems. The rest of the citizens is supplied by public wells or from their own wells.

Picture 47. Share of inhabitants with running water supply (%) 2008 in the Serbian Tisza Catchment Area



The Juzna Backa County The regional water supply network of Novi Sad is located in this area and it is the largest and most developed one in Vojvodina. More than 12% of the population in Vojvodina is supplied by this system. The quality of the water from the Novi Sad regional system is relatively good. The drinking water supplied in Becej meets the prescribed quality in the area of microbiology, but in physical-chemical characteristics 60% of the examined samples fail to meet the criteria. The causes of it are: ammonia, iron, consumption of potassium-permanganate. The significant percent of microbiological non-conformities, likewise the causes of non-conformities of the drinking water from local supply networks in the settlements of the Juzno backi county indicate the presence of standing fecal contamination and, due to that, of health risks.

The Severno Banatski County Water quality fails to meet the requirements set by the Regulation on the Hygiene Requirements for Drinking water neither in it microbiological, nor in its physical-chemical parameters. Its phisical-chemical non-conformity is 100% (at least one parameter had a value over the maximum allowable concentration /MAC/ in all water samples), while microbiological non-conformity spans between 8 and 60%. Increased aerobic mesofil bacteria content and fecal contamination indicators (coliform bacteria of fecal origin *Pseudomonas, Proteus sp*. etc) are registered amont the root causes of microbiological non-conformity. The reasons for physical and chemical non-conformity are: increased ammonia content, potassiom-permanganate consumption, changed colour and others.

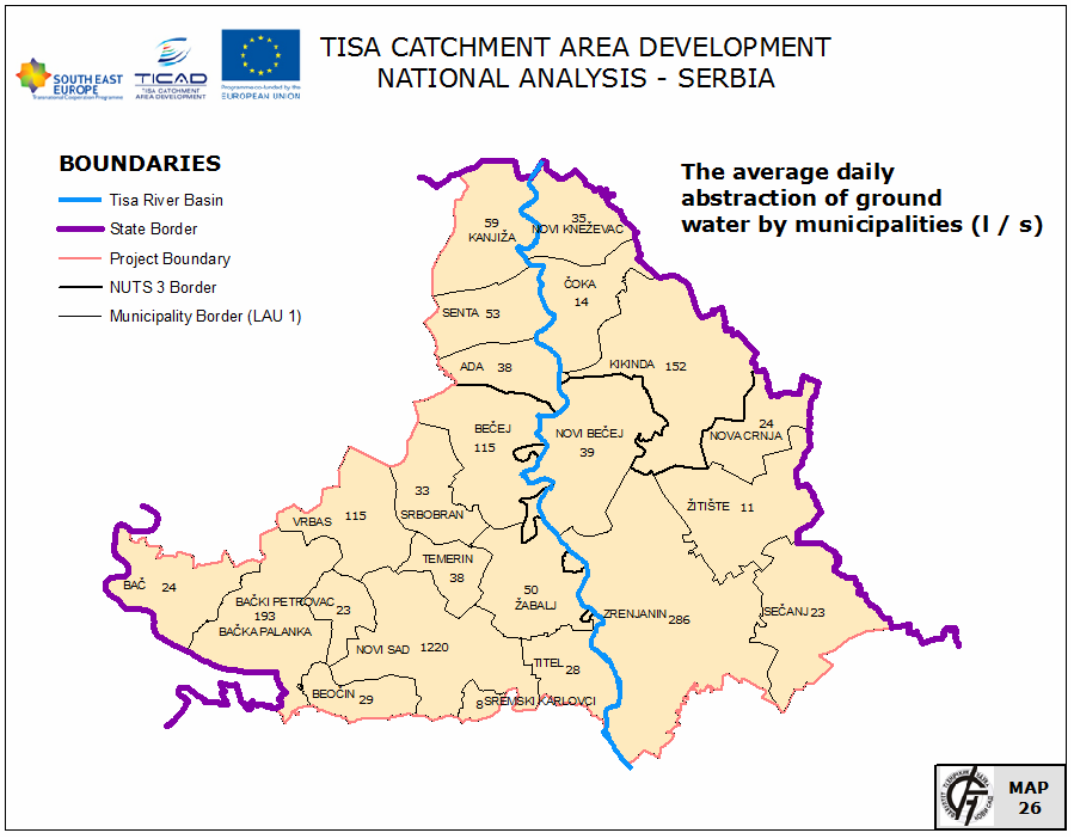
The Srednje banatski County In view of chemical non-conformity, all samples are non-conform, while some 14% of the samples are microbiologically non-conform as well Tabel 8). The most frequent causes of non-conformity are: inadequate colour, increased ammonia and iron concetration and potassium-permanganate consumption. Some analyses indicate the presence of arsenic, hence more detailled analyses are being implemented. The most frequent causes of bacteriological non-conformity

are the increased number of aerob mesophil bacteria, increased number of coliform bacteria (*Esherihia coli* found). The quality of water from this county fails to meet the prescribed quality standards.

Based on the above indicated, it can be concluded that, generally, water quality is unsatisfactory. The improvement of supply systems and their regeneration respectively, will surely solve the problem of microbiological quality, which is a priority. In view of the physical and chemical water quality, innovation and the introduction of water treatment technologies are indispensable, since these will result in water quality required by the Regulations on the Hygiene Requirements for Drinking Water. In this sense, regions affected by increased toxic matter (e.g. arsenic) concentration, should enjoy priority.

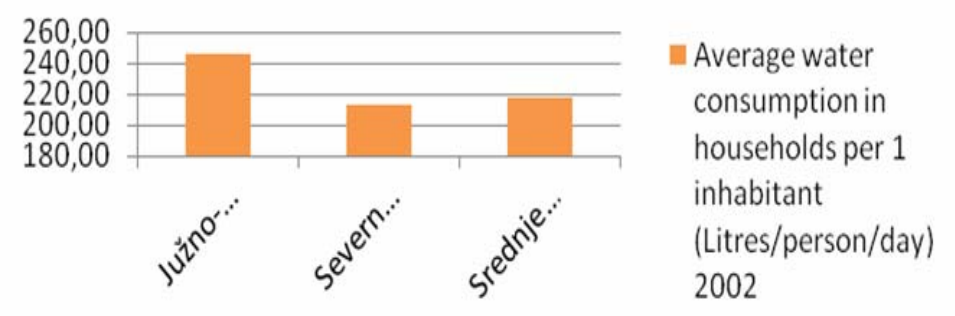
The specific water consumption indicates, that it is on the level, or even lower than recommended by the EU. Household water consumption is rather unbalanced and varies from 65 lit. /person a day to 220 lit/person a day. In average, households in the whole region along the Tisa consume 150 lit/person a day (calculated on the total number of inhabitants). Part of the industry and all public functions are supplied by the public networks, and they form the group of commercial consumers.

Picture 48. Average daily intake of underground water per municipalities (lit./sec) in the Serbian Tisza Catchment Area



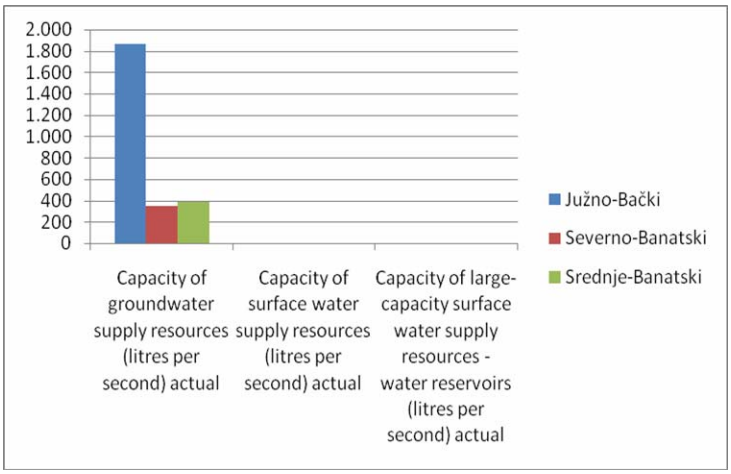
The above indicated water consumption values should be taken with certain reserves, since there are scarce measurements in the systems, and, most frequently there is no any measurement on water intakes and pump stations, thus all data are based on consumption measurements at the consumers and estimation of the water quantity pumped in the system, made on the base of pump features and time of their operation. The accuracy of consumption measurements on consumer water meters is highly suspectable in regard of the fact, that a vast number of water meters is inaccurate and their calibration is irregular. As a result of it, there is the fact, that in a large number of municipalities, it was not possible to establish the structure of water consumption, hence the consumption of commercial consumers with water losses was added to household consumption.

Picture 49. Average water consumption in households per 1 inhabitant (l/ person/day)- 2002 in the Serbian Tisza Catchment Area



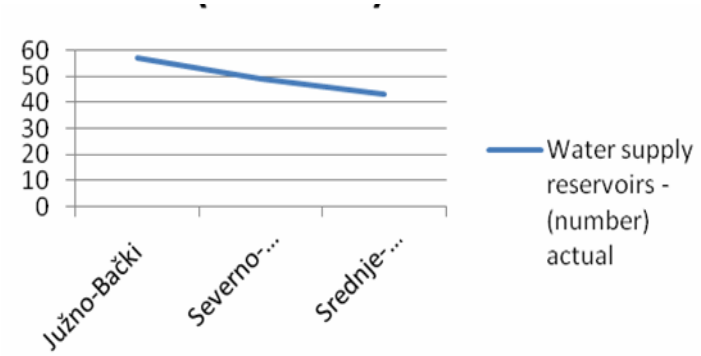
Only drinking needs (of the citizens, processing industry and specific consumers) are to be defined for this county in order to make the exploitation of the basic aquifer complex reasonable. The technical and technological consumer needs are to be solve exclusively from shallow aquifers, surface water flows and accumulation. On the banks along the River Tisa, sources of the larger cities have already been developed: for Horgoš, Martonoš, Kanjiža, Novi Kneževac, Čoka, Senta, Ada, Novi Bečej, Bečej. Alternative water supply sources in the region along the Tisa are to be examined in the very region.

Picture 50. Capacity of groundwater supply resources (l/sec) in the Serbian Tisza Catchment Area



It is expected, that higher quality underground water may be drilled from the aquifer sediments of the Quartar, which dip in smaller depths. The aquifer in the alluvial sediments of the Tisa River should also be examined in areas, where there is a possibility for infrastructure development in the future in order to open new source capacities for several hundred lit/sec. Examinations of this aquifer made so far are minimum, yet enough to indicate its prospects in view of capacity and quality. The wider coastal area of the River Tisa and the Titel breg area also present prospectous counties for further investigation.

Picture 51. Water supply reservoirs in the Serbian Tisza Catchment Area

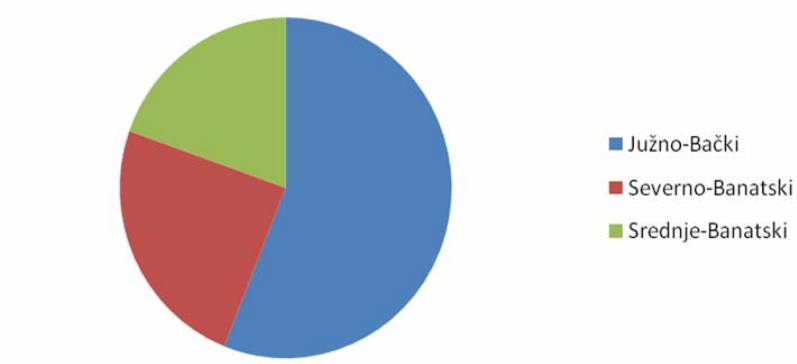


8.4. Waste water treatment

The situation in the field of drainage and waste water treatment is highly unfavourable. Only 8 of the 83 settlements in the River Tisa Region have some sort of waste water sewarage. About 91.500 inhabitants are

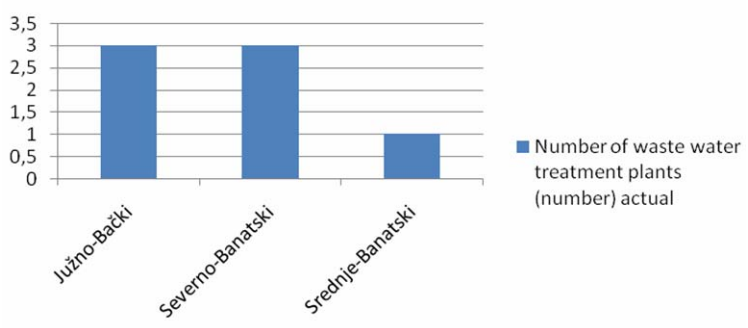
connected to the sewarage system, which makes cca. 33% of the total population. All that has been built in sewarages was mostly built by 1990. The largest number of sewarage systems is in the South Backa Sounty, and the smallest is in the mostly rural, Central Banat County.

Picture 52. Share of inhabitants with public sewerage supply (%) 2002 in the Serbian Tisza Catchment Area

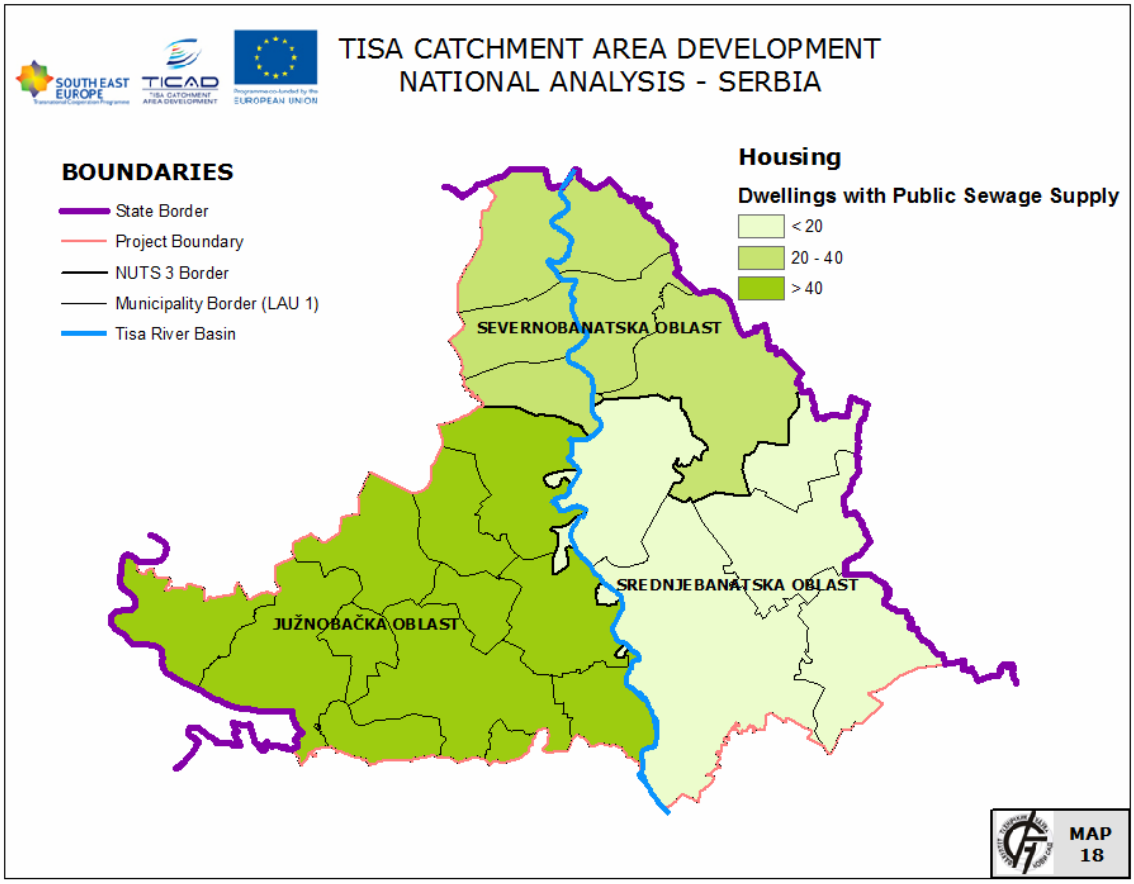


A total of 7 waste water treatment plants were built, whereof only few operates relatively well. In most cases, waste water is discharged into recipients without any treatment. Building sewarage canals in settlements and their respective waste water treatment facilities should be a priority task in the field of communal economy in the forthcoming period.

Picture 53. Number of waste water treatment plants in the Serbian Tisza Catchment Area

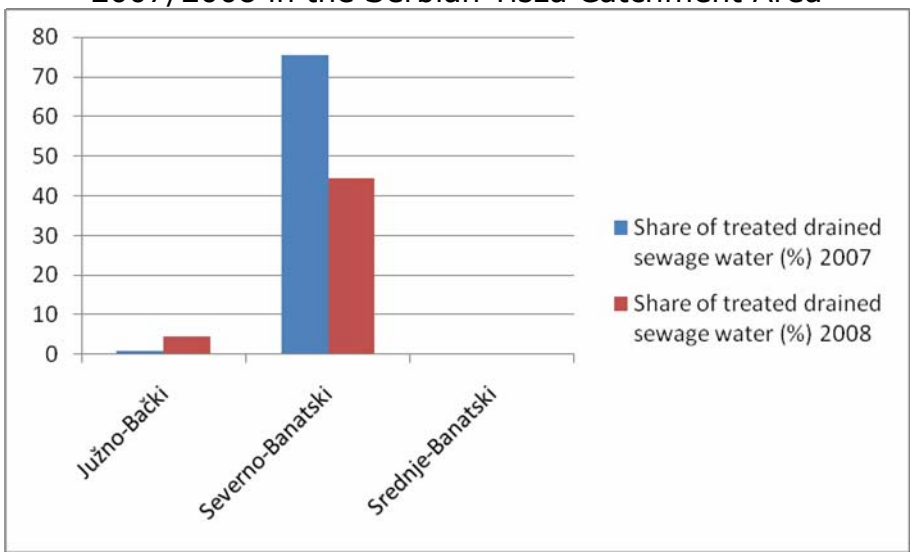


Picture 54. Dwelling with Public Sewage Supply in the Serbian Tisza Catchment Area



The basic sources of water pollution in Vojvodina are the settlements, the industry and the agriculture. These so call "concentrated polluters" discharge their waste waters in the sewarage systems or recipient canal or deposit it on the soil (in case of animal breeding). Waste water discharged in sewarage originates from settlements and industrial buildings and facilities for preparing supply water. Waste waters of smaller industries and precipitation water added to household wasters in sewarages are municipal waste waters. The content of such waters depends on the lifestyle of inhabitants and type of smaller industries located in the settlement. If there are larger industrial buildings in the settlement, their waste waters will have a significant impact on the household waste water content and the composition of common communal waste waters respectively. In such case, the method of waste water treatment and the control of its composition will differ from the one for household waste waters.

Picture 55. Share of throated drained sewage water (%) in period 2007/2008 in the Serbian Tisza Catchment Area

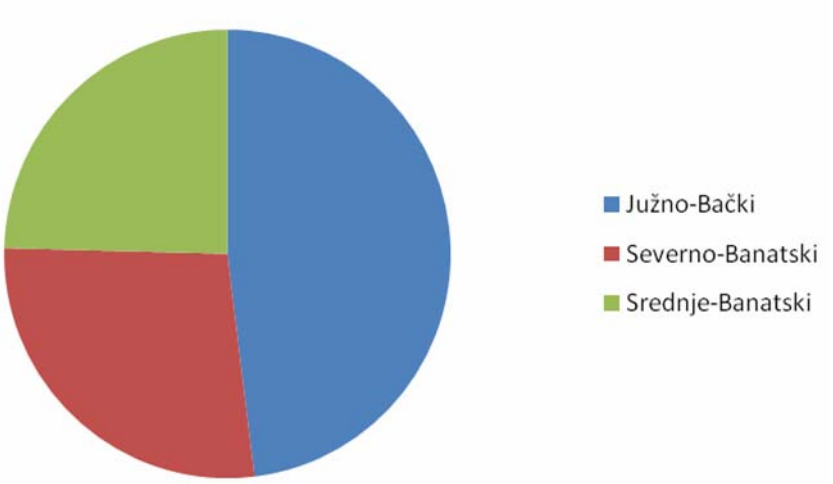


With regard to the fact, that there is a lack of developed sewarage network in most of the settlements, the building of such networks cannot be started without the construction of a waste water treatment plant, as defined by the water management fundaments. Smaller settlements, tourist localities and centres and rest and leisure zone will solve waste water sewarage by compact, mini devices for biological treatment. Wherever possible, so called "common systems" are to be used with a single WWTP treating waste water from the neighbouring settlements, which are connected with collector mainlines and adequate pump stations for sewarage.

8.5. Public utility gap

The waste water sewage system shows significant differences between urban and rural areas, the situation being more favorable in urban areas (Juzna backa County).

Picture 56. Public sewerage system gap (%) in 2007 in the Serbian Tisza Catchment Area



The share of consumer sewage in urban settlements exceeds 50% only in the Juzno backi county. The situation is worse in rural areas since there is a low coverage with sewers. The worst situation is in the Srednje banatski county.

Table 51. Drainage and waste water treatment systems per municipalities in the Serbian Tisza Catchment Area

Municipality	Number of settlements with sewarage	Number of sewarage connections	Coverage by sewarage (%)	Sewarage network length (km)	Sewarage recipient
ZRENJANIN	1	11116	68	110	Aleksandrovo Canal
NOVI BECEJ	1		30	15.4	Susanj Canal
NOVA CRNJA					
ŽITIŠTE					
SEČANJ	3 (Sečanj, J. Tomić, Krajišnik)	132	2	3.5	Tamiš/Timiş
KANJIŽA	2 (Kanjiža and Horgoš)	1500		34	Tisa (Kanjiža) and melioration canal (Horgoš)
SENTA	1	3683	50	36	Tisa
ADA	0	0	0	0	-
ČOKA	1		30	14	Tisa
NOVI KNJEŽEVAC					
KIKINDA	1		29	83	Kinđa Canal
BAČ	1	433	16	6.4	DTD Canal
BAČKA PALANKA	2 (Bačka Palanka and Čelarevo)		95+20	85+5	Danube
BAČKI	1		30		DTD Canal

PETROVAC					
BEČEJ	1	3668	38	55	DTD Canal
BEOČIN	1	1480	76	6.8	Danube
NOVI SAD	6	28000	75	788	Danube
SRBOBRAN	1		20	5	DtD Bečej-Bogojevo
SREMSKI KARLOVCI	1				Danube
TEMERIN					
TITEL	1	350	6		Tisa
VRBAS	1	4099		57.86	DtD Bečej – Bogojevo
ŽABALJ					

9. Regional structure and relationships

9.1. Structure of the Settlement Network

Settlement network and functional characteristics of settlements

Serbian Tisza Catchment Area comprises 182 settlements situated in 3 NUTS3 counties and 23 municipalities (LAU1). Settlement network in the area has very low settlement density. There are 1,9 settlements per 100 sq km and that is by far under the national average (7,0 settlements per 100 sq km).

Considering total population 17 municipalities recorded the decrease in population and 6 the increase for the period between 1991 and 2002 census. The biggest problem is that some municipalities are facing depopulation in all the settlements that consists of or majority of them (Zitiste, Nova Crnja, Novi Becej, Secanj, Coka, and some others). On the opposite side, some municipalities have population growth in all or most of the settlements (Novi Sad, Temerin). This trend is clearly showing provincial migration from less developed to more developed municipalities.

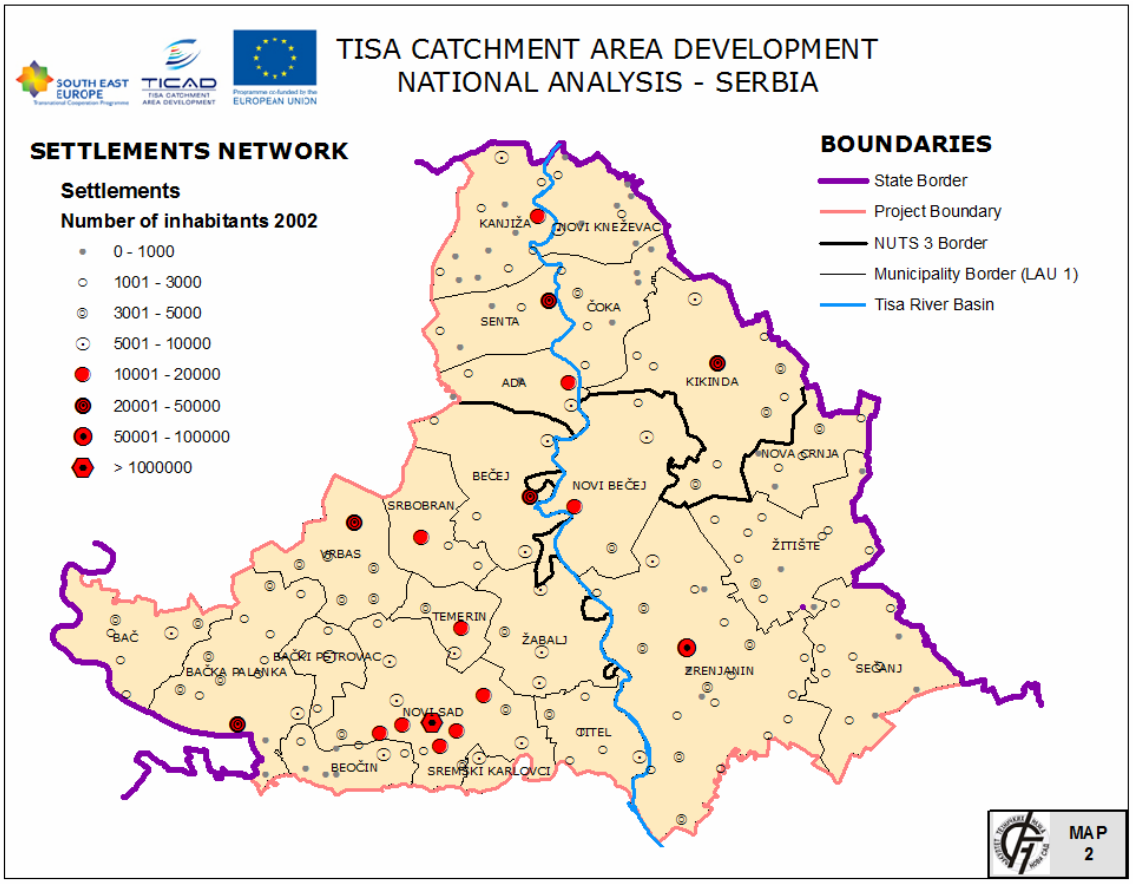
Settlements in the Serbian Tisza Catchment Area are categorized by their size in 8 groups.

The concentration of population, considered by the settlement size category is relatively balanced: the greatest concentration of population (20,09%) is in cities with the population over 100 000 inhabitants (Novi Sad); the settlements size category from 1001-3000 inhabitants is the second one with 15,15%. The population is relatively equal distributed among settlement size categories. Jus that the size category from 0 to 1000 accounts for 1,77% of total area population. There is just one settlement in the 50000-100000 category (Zrenjanin).

Due to the accelerated development of Novi Sad, Zrenjanin and Kikinda it is expected the population growth in these three cities for the

coming period. That would certainly affect the spatial development of the whole region and the country.

Picture 57. Settelment network in the Serbian Tisza Catchment Area



Settlement network on Serbian Tisza Catchment Area is spreading over part of Vojvodina region with the relatively structured and balanced settlement network. Due to the general planning reconstruction of the whole settlement network system in 18th century the region got basic population distribution guidelines that shaped the present settlement network. Basic characteristic of the settlements in Vojvodina region is strict geometrical spatial composition.

One of the most common features of cities is that their functions have the power to overcome the needs of the local (city) population. Therefore they are turning toward satisfying needs of the population of wider area and nearby settlements. It is not that all the city functions have the same emission power. Therefore the power emission of a city is not always within the same borders. Some gravitation centers have functions that influence vast area around, but other functions are having limited power that influence just immediate surrounding. Therefore there are smaller, lower rang gravitation centers formed within huge urban

centers. They are performing as secondary centers for settlements in their immediate surrounding. This phenomenon could generate many secondary center categories.

The connections between cities and the satellite settlements perform in both directions and commonly are stronger if they are closer.

Proximity of gravitation centers is causing both their eccentric position in the wither territory and formation of micro-gravitation areas with the small territory and fey settlements.

The spatial formations where the settlement center is set on the cross point of two roads are common for rural environments. Those are relatively low density territories without old urban centers and with new administrative subdivision. In many cases the main quality of a settlement location was just the crossroad that led the decision to announce it as the municipal center. Therefore the settlement evolves to be the gravitation center of wider area. If the crossroad was on the periphery of the gravitation area, the center would have developed as eccentric municipal center. Typical examples are Plandiste, Zitiste, Pecinci, Bac and Backi Petrovac municipalities.

9.2. Administrative classification of settlement

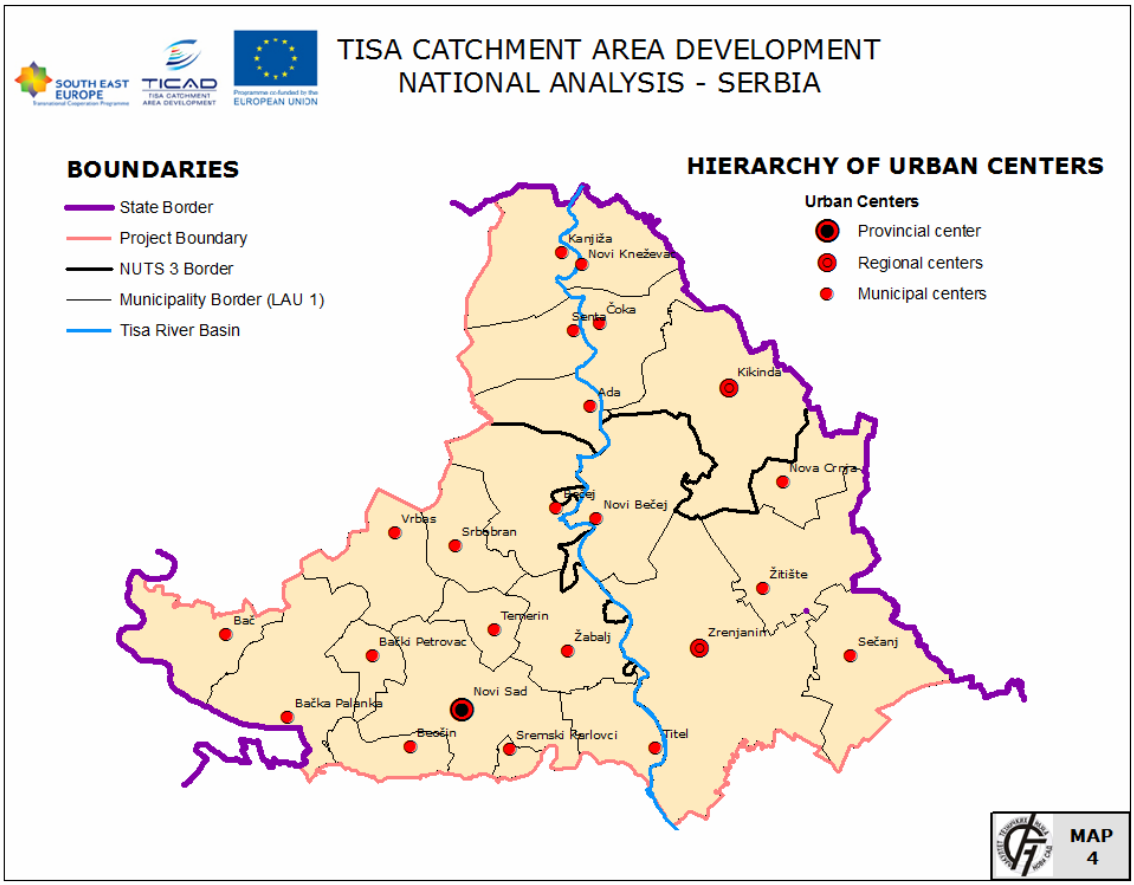
Taking in consideration the administrative criteria, the development level of some city functions, location and importance in the network, TICAD project area settlements are grouped in three following categories:

Cities – macro regional centers, provincial centers or regional centers

Urban settlements – municipal centers

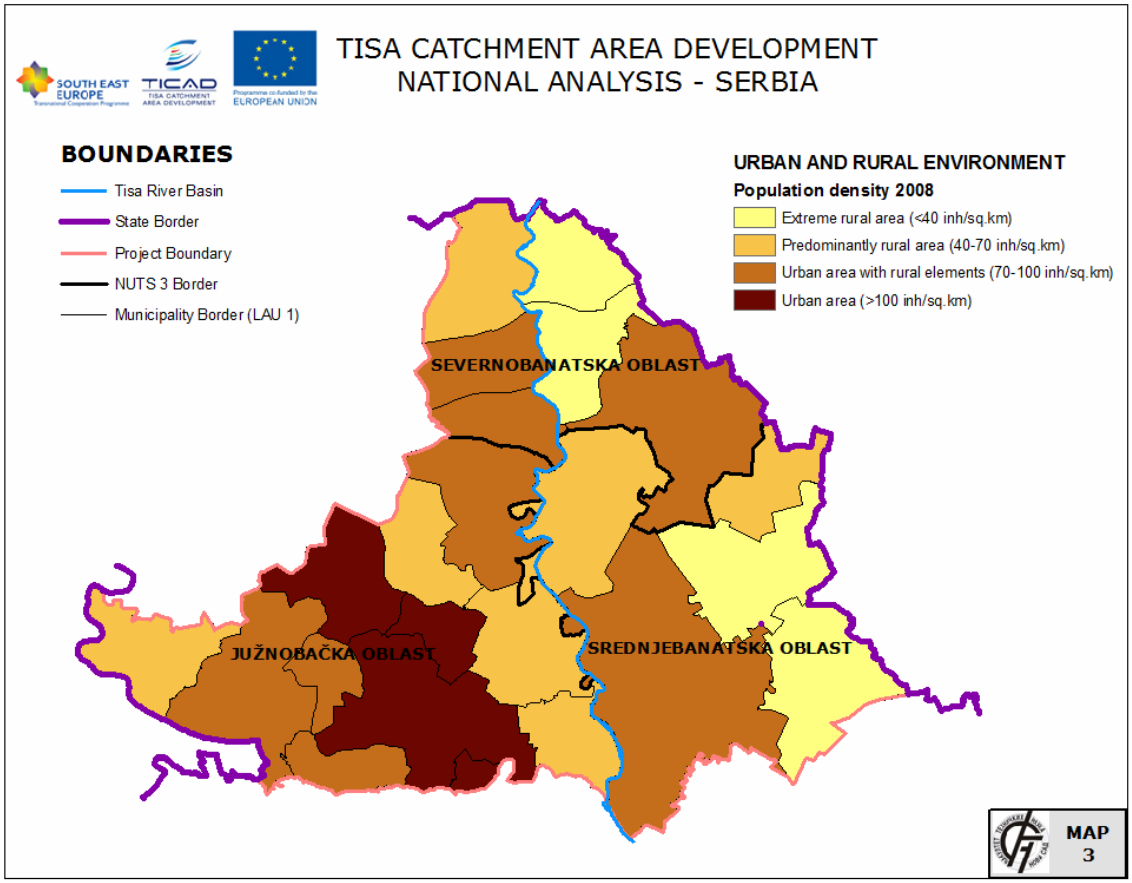
Rural settlements.

Picture 58. Hierarchy of urban centers (2002) in the Serbian Tisza Catchment Area



The map is showing the Provincial capital Novi Sad; regional centers Zrenjanin and Kikinda and municipal centers. The Novi Sad city area is dominating with its functional urban area. As there is low settlement density (few settlements per 100 sq km) and functional urban influence of Novi Sad is blurring, this area is characterized by exaggerated influence of regional and municipal centers. As a special feature of the settlement network are conurbations on the Tisza river banks that created the network of cross-river twin cities (Kanjiza-Novi Knazevac, Senta-Coka, Ada-Padej, Becej-Novi Becej).

Picture 59. Urban and rural environement (2008) in the Serbian Tisza Catchment Area



Through out the history migrations are common phenomena in Vojvodina. One of the most common reasons for population movements is economical rationality. Population distribution and population density changes have caused shifts in settlements network. Areas of Severni Banat and Srednji Banat are demographically vulnerable with significant depopulation trend and that negative tendencies have influenced settlement network structures.