RESITES PROJECT – INTERREG CENTRAL EUROPE PROGRAMME

ACTIVITY A.T1.1 ANALYSIS OF CURRENT SITUATION OF BROWNFIELD IN 9 FUAS OF THE PARTNER REGIONS

Analysis of current situation of brownfield in FUA Rijeka

Version 1
01 2017

1. FUA GENERAL CONTEXT & MAPPING OF FUA BROWNFIELDS

The English term 'brownfield' is also used in the Croatian language in several fields (economics, civil engineering, computing). Just as in English, it is used in economics and civil engineering to label abandoned, neglected, unused or polluted/contaminated land (brownfield sites), and abandoned, neglected or underutilized industrial and commercial facilities or infrastructure, namely, the land, facilities or infrastructure that require some kind of intervention in order to be restored to use.

Brownfield sites can be part of both very big and small urban and rural areas. The appearances of effects caused by abandoned and unused real estate that negatively affect primarily health but also the environment initiated the first serious investigations of this problem. In the last 20 years, the issue of unused real estate and the inevitable need to repurpose it has attracted the interest of European and international scientists. Research and model solutions for repurposing focused primarily on two areas: the conversion of properties that are no longer used and have been neglected due to inadequate development strategy, which made it impossible to produce high-quality spatial planning documents and successfully manage the relevant land and buildings on the one hand, and the real and perceived risks associated with the existence of unused real estate, primarily those associated with adverse effects on the environment and human health, on the other.

Policies traditionally often view contaminated land problems from two main perspectives. The first is the perspective of protection - relating to the impact of contamination on human health and environmental quality, and consequently to risks – existing and perceived ones. The second perspective is seen as a consequence of inadequate spatial planning and land use, while in the last decade or two more emphasis is given to protection of greenfields. The major trend in policy development is to address these two aspects simultaneously. This is increasingly evident in the development of a more holistic approach to management of urban development.

Primorje-Gorski kotar County and the City of Rijeka (administrative center of the County and the biggest port in Croatia) are among the most developed LGUs in Croatia, thus being interesting for analyzing potentials for sustainable development. Rijeka is limited in terms of spatial expansion, therefore being forced to make considerable shift in management of space, focusing on brownfields redevelopment sites in the City. Heavy industry marked the development of Rijeka, creating certain stigma of the City as not being particularly attractive for living. It is challenging to create a vision of Rijeka that will release the stigma of a dirty industrial city and color it by shades of desirable locality. Successful redevelopment usually lasts more than one political mandate, but stable political scene in Rijeka has the advantage in Rijeka redevelopment.

Mlaka is part of the City of Rijeka that stretches along the seashore within the city centre. It is a former industrial area, the size of 50 acres, which was once occupied mostly by the former oil refinery.

The Mlaka (INA Refinery) site in Rijeka is considered to have one of the highest development potentials of identified Croatian hot-spots. Local and national officials, as well as the site owner, agree that redeveloping this brownfield offers a chance to create access to the sea for the population of Rijeka, and significantly improve the coastal aspect of the city. The site is located in a prime location and promises to be an important source of tax revenue for the city when redeveloped. Obviously, the level of contamination will influence the timing, organization, and approach of the BFR process. Location and economic potential are to some extent dependent on manageable upfront costs.

2. GENERAL ASSESSMENT RELATED TO THE SELECTED BROWNFIELDS

The Primorje-Gorski Kotar County borders on the Republic of Slovenia in the north, on the County of Istria in the west, and on the Karlovac and Lika-Senj County in the east, while in the southeast it has a sea border with the Zadar County at the Gate of Kvarner Bay. The County also comprises part of Croatian territorial waters, with the state border at 22 km to the southwest of the island of Susak. The county is part of the Adriatic Croatia, one of the three defined (future) Euroregions NUTS II in Croatia. This classification is to be applied from 1 January 2013.

The territory of the Primorje-Gorski Kotar County comprises three regions - mountainous, coastal and island areas - and covers an area of 3,582 km^2, or 6.3% of the state territory. According to its administrative organisation, it consists of 14 towns, 22 municipalities and 536 settlements within the towns and municipalities. The City of Rijeka is the seat of the County.

Image 1. Location of Primorje-Gorski Kotar County

Image 2. Aministrative organization of County

The county is characterized by jagged coastline, distinct climate and the close proximity to Central Europe. Favorable geographical position has greatly influenced the economy of the region, with the most important economic activities related to the traffic and the sea. Such activity saw the development of various centres with large ports, intense maritime transport or shipbuilding and tourism, all of great national importance.

At international and national levels, the County has a major role in integrating the wider area of the Danube basin with the Adriatic region, and the Central European (Alpine) area with Southeast Europe. Two major international routes cross the County, owing to which Croatian areas are integrated in the European economic and transport system:

1. The Danube-Adriatic-Mediterranean route, which extends from Budapest through Zagreb, connects the Central European Alps and the Danube basin with ports in the Adriatic, and hence the Mediterranean. This route is the Mediterranean road corridor.
2. The Adriatic coastal route connects the Alpine region with the Adriatic Sea and the further on with the Middle East. This route has a great economic importance for Croatia.

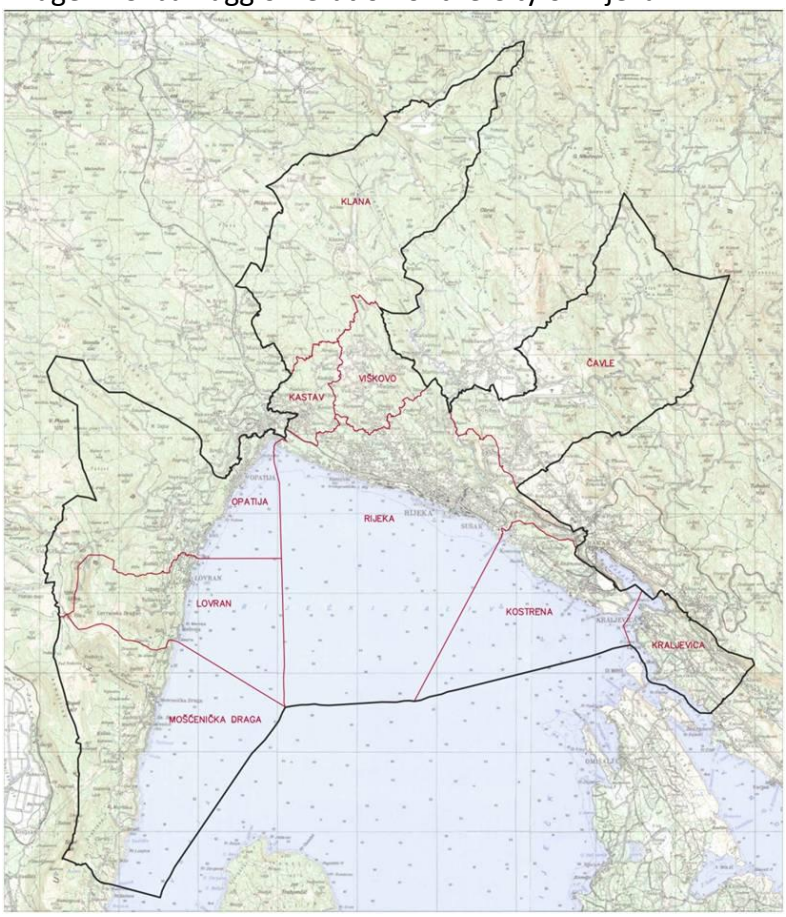
Image 3. System of corridors V. and X

The geographical position allows the county a significant economic flow of goods and passengers and offers a possibility of economic development, which is yet to be significantly exploited. What is more, geostrategic position provides it with the possibility of positioning itself as an energy and transport hub, but also as a tourist destination easy to reach.

The urban agglomeration of the City of Rijeka was formed in 2015 in accordance with the Law on Regional Development, with the City of Rijeka as its centre owing to its population of over 100,000. The consent for joining the urban agglomeration of Rijeka was given by nine

representative bodies of the neighbouring towns and municipalities, namely: the cities of Kastav, Kraljevica and Opatija, and the municipalities of Čavle, Klana, Kostrena, Lovran, Mošćenička Draga and Viškovo. The purpose of establishing greater urban areas which, according to the Law, in addition to urban agglomerations may include also large and small urban areas, is effective planning, coordination and implementation of the regional development policy, in particular its urban dimension, and more effective withdrawal of EU funds intended for urban development.

Image 4. Urban agglomeration of the City of Rijeka



The Rijeka UA is an integral part of the Primorje-Gorski Kotar County, with the area of 414 km2 and 188,797 inhabitants. Although it covers only 11.5% of the land area of the County, the Rijeka UA has as much as 64% of the total population of the PGC.

The City of Rijeka, as the centre of the County and of the conurbation, occupies an area of 13,600 ha, of which 4,355 ha on land. As it stretches along the Kvarner Bay, it has an ideal geographical location, which is also its biggest competitive advantage and a prerequisite for development. As already mentioned, Rijeka's traffic route is part of the Mediterranean road and rail transport corridor (Rijeka - Zagreb - Budapest), recognized by the EU as an important European transport route.

The city of Rijeka is located at 14° 26' east longitude 45° 21' north latitude. Its surroundings boast a wealth of natural resources, with the prevailing sea and forests and rich flora and fauna. The city of Rijeka has 1,528,182 m² of green areas. There are 8 large and 5 smaller parks in the city and green areas in its outskirts.

Rijeka's coastline is 26.20 km long, a portion of which belongs to 20 public beaches (area 52,343 m²), with two dog beaches. The Teaching Institute for Public Health of the PGC maintains a routine surveillance program for public beaches during summer months to ensure that the water quality is safe for swimming. The surveillance program begins in mid-May and continues until the end of September each year. The 15 public beaches are sampled from Kantrida to Preluk and 6 more from Brajdica to Grčevo . The results of samples in 2012 show that 16 out of 21 beaches had 'excellent' water quality and only 5 'good'.

The highest part of Rijeka is Podbreg, located on the quota of 441 m above sea level. In a year, the average temperature in Rijeka is 13.8°C, the average humidity 58% and with 86 rainy days the average rainfall is 1,228 mm. Rijeka has a mild Mediterranean climate, with slightly more precipitation in April and November.

Rijeka's main and most abundant natural resource is high-quality drinking water, with river Rječina as its major source. The river runs through the city with its entire length and flows into the sea in Delta. The northeast part of Rijeka is a water protection area because of river Rječina and water sources are in the heart of the city. Riječina estuary is one of the most important features of Rijeka and an area of great potential for economic development.

2.1. HISTORICAL BACKROUND

Throughout its history, Rijeka was substantially characterized by its favourable geographic position and good connections with continental and overseas countries.
Due to the repeated changes in the state borders, the city was constantly changing state hands and belonged to as many as seven states in the 20th century alone. Thus, while not moving out of the city, its residents were subsequently citizens of the Austro-Hungarian Empire, of La Reggenza Italiana de Carnaro, the Free State of Rijeka, the Kingdom of Italy, the Third Reich, Yugoslavia (in its various versions, from the Kingdom of Serbs, Croats and Slovenians to Yugoslavia), to finally become part of the Republic of Croatia.

The oil refinery in Rijeka was constructed as a direct result of the growing needs of the Hungarian part of the Austro-Hungarian Monarchy for petroleum products in early 1880s. Owing to its geographically most favourable point of access to the sea for the Hungarian economy, Rijeka was practically "naturally" destined to become the leading Hungarian export-import port, which is why it was in the focus of interest of Budapest's economic and political circles in the mid-19th century.

2.1.1. Industry and Urban Development

Urban Development

From the urbanistic point of view, the city Rijeka was fully formed within the Austro-Hungarian rule. Individuals such as Andrija Ljudevit Adamić saw full potential of Rijeka, lobbied within the ruling circles for the construction of roads, pointed to the importance of maritime routes and encouraged the development of production in Rijeka. However, what really made the difference was existence of Hungarian interests in the formation of Rijeka as an important economic and cultural center of the Monarchy. Although we are talking about coastal city Rijeka's ancient foundations have almost completely been paved over and shy Renaissance and Baroque impulses from the overseas Lagoon only had slight influence on the city's urbanism. What really defines Rijeka's urbanism in the emphasized continental spirit, which is reflected in wide avenues, high Historicist and Art Nouveau facades and the methodically planned city squares. That was the primary urbanistic process and, at the time, it certainly defined the city center. The secondary urbanistic process took place on the outskirts and was much more synergistic in its dual nature. On the close-by outskirts of the city industrial plants sprouted. The expansion of the city as well as the expansion of the industry led to formation of a unique and distinctive urban image we all know today. Rijeka undoubtedly developed in parallel with its industrial progress and, therefore, the industrial and residential architecture often complemented and enriched each other.

The first manufacturing plants – mills – depended on energy obtained from nature. Considering the geomorphological features of the area, the resources were located far from the city centre, on the banks of Rječina river. With the introduction of steam engines and the construction of power stations the industrial facilities started to approach, on the one hand, the centre of the city and, on the other hand, the sea and the docks, using the port and the railroad for their trading purposes. However, three ''original'' industrial zones can be pinpointed that are located in the city centre today: Ružićeva Street and Vodovodna Street, and facing them, on the west side of the city, **Milutina Barača Street** (former Industrijska Street). It is obvious that planned construction for industrial purposes can only be recognized in Industrijska Street.

Industry Development

We can talk about manufacturing as a method of production until the mid-19th century. The second half of the 19th century was a period of tangible industrial progress, the beginning of which is attributed to the founding of the Smith & Meynier Paper Factory in the 1830s. Regression was no longer possible and factory plants equipped with steam engines began to measure horsepower. Following the technological changes, the number of workers multiplied and productivity increased substantially.

During this period, Rijeka developed into a true European seaport with entire necessary infrastructure and a railroad towards the continent. At the same time, several shipyards started operation, such as Lazarus shipyard in today's basin of the port of Baroš, the Danubis shipyard in Brgud and smaller shipyards in Kraljevica and Martinščica. Foundries such as Cussar and Skull became indispensable and were very active in equipping the port. In the western zone of the city,

the **Oil Refinery** started operation, and, from that point on, further plant mushroomed: Rice-Husking Factory, Stabilimento tecnico Fiumano (later Silurificio Whitehead), Stabilimento di prodotti chimici, Hungaria Oil Mill, municipal Gasworks, Chocolate Factory, etc.

2.1.2 History of Refinery Rijeka

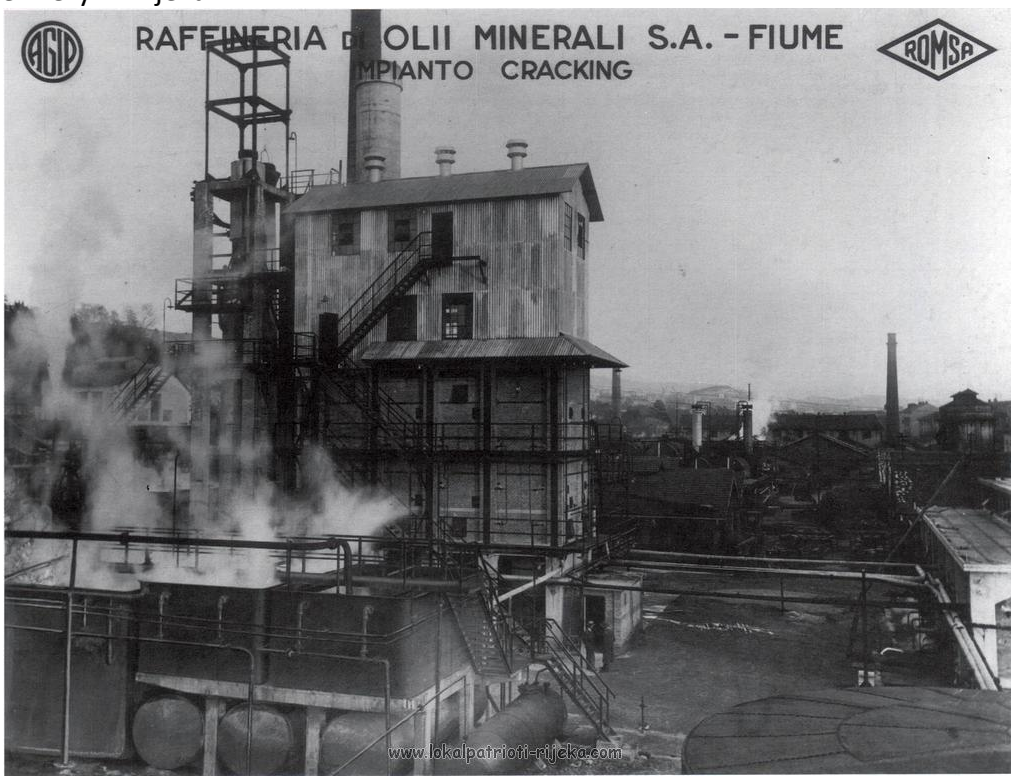
The initiative for the construction of **refinery in Rijeka** came in 1882 from Shale Oil Refinery Company from Pest. Instructions for the construction were compiled by Rijeka's municipal authority and the construction permit was issued in February 2883. A specific location was determined for the needs of the refinery, at a suitable distance from residential buildings.

After obtaining all necessary permits, the construction of the Oil Refinery, designed by architect Mate Glavan, began on Ponsal, next to the Rice mill. The refinery was commissioned in 1883. Engineer Milutin Barač was elected as technical director and he remained at the head of the Refinery until the end of the First World War. At the same time, plans were made for a petroleum port and construction work began soon after.

The production of paraffin started two years after the founding of the Refinery. The production plant was located in a house with double sided roof, which had basilical illumination in the central part of the roof. The facility was also designed by Mate Glavan.
At the end of the 19th century, the capacity of Refinery's plant amounted to 30,000 tons per year[1]. This amount was sufficient to supply 30% of the Monarchy's need for petroleum products. The most important products of the Refinery were petroleum, paraffin, various solvents, resins, coke and petrol. In order to meet the needs of the oil refinery, the Petrolejska luka port in Mlaka was built. The building material for embankment was provided by mining or rather by delevelling of the refinery area, which formed a plateau of 1.9 ha with tanks for oil from Russia, Galicia, Međimurje and the States. Petrolejska luka was the starting point for the oil transit of many Austro-Hungarian refineries, such as the company Adolf Berg and Co. The initial capacity of Petrolejska luka was five ships at the same time. Oil was transported in barrels by sailing ships until 1892, when the first oil tanker sailed into the port of Petrolejska luka.

[1] A houndred years later, the same quantity was processed in only two days.

Image 5. Refinery in Rijeka



The First World War significantly affected the Refinery's business and, from 1916 until 1918, the production decreased by almost two thirds. The number of employees also reduced to three hundred workers.

At the end of World War I, the Rice Mill[2] closed down and the plant facility and the administration building became property of the Joint Stock Company of the Mineral Oil Refinery (ROMSA). The complex then lost its functionality and the area was rearranged and adapted to the needs of the Refinery. Significant changes occurred in 1938, when Eneo Perugini, using the skeleton of the large and long operations building of the Rice Mill, designed the new ROMSA Headquarters Building and created a completely different appearance of that representative modern palace. At the same time, the Refinery became one of the most modern complexes for the production of gasoline and petroleum products, especially oils.

[2] One of the major enterprises of the food industry. The investor for this facility was the Hungarian General Credit Bank from Budapest in cooperation with local businessmen. In 1890, the annual production amounted to 25,000-30,000 tons of rice, and the factory employed 400 workers.

Image 6. Refinery in Rijeka

After the capitulation of Italy in 1943, the refinery came under the rule of the Third Reich and, for the second time in its history, forced to stop production. This, however, was not going to save Rijeka from the grim scenario that struck it at the very end of World War II when, from 21 January 1944 to 23 February 1945, British-American aircraft launched five air raids on it, hitting the refinery with 260 shells weighing between 250 and 500 kg. The bombing was subsequently followed by the explosion of 23 mines activated by members of the Wehrmacht immediately before their withdrawal in May 1945, which reduced the refinery to ruins: 83 percent of its plants, 65 percent of the buildings and 96 percent of the storage capacity were destroyed. Among the plants that suffered most substantial damage were the Vacuum Distillation (70 percent), Cracking (80 percent), the installation for discontinued refining of petrol and gas oil (80 percent), etc.

Although many refineries all over the continent, including the very old ones, were extinguished forever after air raids, Rijeka's refinery refused to share such fate. Indeed, Yugoslavia, the state of the post-war Rijeka, decided to revive it and given that the country was too poor at the time to build a completely new refinery, it decided to undertake restoration of the demolished facilities.

Production was relaunched at the end of 1945, the mere fact by far outweighing the symbolic amount of the 1,807 tonnes of oil processed at the time. The task facing the restorers was enormous, but equally vast was their desire to restore the facility to what it once was. Thus, within just seven months, by January 1946, 40 percent of had been put in operation. The reconstruction of more complex plants lasted considerably longer, however, but already in 1946, 12,726 tons of crude oil were processed, and 39,485 tons in 1947. In the three years following the war, more or less all plants were reconstructed, so in 1948, when 111,244 tons of crude oil, mainly imported, were processed, the production reached the level it had in 1939. As of 1 January 1964, Refinery Rijeka merges with Refinery Sisak and Naftaplin, a company for exploration and production of oil

and gas. The joint company was first named Multi-Plant Works for Petroleum and Gas Refining, and then, as of 1965, INA – Oil Industry, the largest Yugoslav oil industry company.

The production expansion of the Refinery continued until the 1980s, when Yugoslavia was struck by the economic crisis which caused the Refinery huge financial difficulties. Actually, the state transferred the burden of cost of maintaining social peace on strong companies, among them the Refinery as well.

In late 1980s, the Yugoslav economic crisis turned into a deep political one and then, in early 1990s, into the war, with the resulting dissolution of the country. The brutal attack on the newly established Croatian state threatened to destroy the two plants of Rijeka Refinery. Indeed, a written order was written for the cannons of the Yugoslav People's Army, located above the city, to open fire on Rijeka, in which the Refinery seemed an ideal target. Moreover, the naval blockade exposed the Refinery also to cannons from enemy warships. Luckily, agonizing negotiations eventually managed to preserve peace and spare Rijeka and its Refinery from total destruction.

In 2011 the Refinery was completely shut down and today it is an abandoned site without any activities but under 24-hour security service surveillance. Today, the complex is in the possession of the oil company Ina d.d..

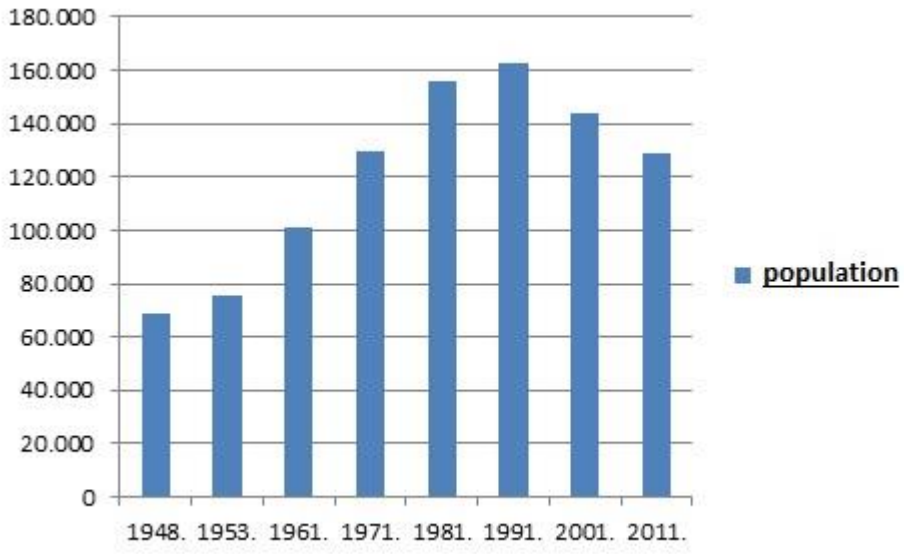
Images 7. and 8. The current appearance of the former refinery

2.2. SOCIO-ECONOMIC STATUS

2.2.1 Population

The 2011 census shows that Rijeka has 128,624 inhabitants, of whom 60,951 men and 67,673 women. The age structure is dominated by people of 55-59 years of age (10,778 inhabitants), followed by the 50-54 (10,252 inhabitants), the 60-64 (9.817 inhabitants) and the 30-34 (9,286 inhabitants) age groups.
According to the 2001 census, the total population of Rijeka was 144,043, which means that its population decreased by 9% in relation to the 2011 figures.

Chart 1. Population growth in the City of Rijeka in the period from 1948 - 2011



The dynamic population growth of Rijeka up to the 1981 census was the result of a strong inflow of population, as well as natural growth. The 1980s were followed by a phase of stagnation after which, since the 1991 census, Rijeka has seen a constant decrease in its total population.

Data for the Primorje-Gorski Kotar County, which includes data for Rijeka as well, clearly indicate that the population of Rijeka is dispersed all over the county, so this is not about the loss of the overall number of inhabitants, but the migration of population from the largest urban centre to a wider area.

- Kastav, with 8,891 people in 2001 saw population growth in 2011 to 10,472, an increase of 18%.
- Viškovo, with 8,907 people in 2001 saw population growth in 2011 to 14,495, an increase of 62%.
- Matulji, with 10,544 people in 2001 saw population growth in 2011 to 11,274, an increase of 7%.
- Čavle, with 6,749 people in 2001 saw population growth in 2011 to 7,215, an increase of 7%.

The total population growth in just these four cities and municipalities of the Rijeka ring is 8,365 inhabitants.

Based on available data, it is possible to discern demographic trends that have led to Rijeka's population decline:

• The negative trend of natural population growth - According to the Teaching Institute for Public Health of Primorje-Gorski Kotar County, 17,010 inhabitants died and 12,145 were born (- 4.865) in Rijeka from 2000 to 2010.

• The negative trend of the mechanical movement of population (migration) - More people moved out from Rijeka than they moved in, mainly to the surrounding towns and municipalities.

This negative trend of the mechanical movement of population is due to the territorial organization of Rijeka from 1993, which points out at the obvious lack of space in the city, as mentioned earlier.

Migration data show that over the 2000 – 2011 period, 33,328 people moved from Rijeka, while 21,533 moved to Rijeka. Of the total number of people who left the city, 66.4% moved to other municipalities and towns in the Primorje-Gorski Kotar County. Of those who moved to other counties, the largest number chose Zagreb as their destination, and more people moved to Rijeka from abroad than they went to live abroad.

The City of Rijeka is organized administratively into 34 local boards, including the local board of Mlaka, which is part of the western industrial zone of Rijeka.

Image 9. Borders of the Local Board of Mlaka

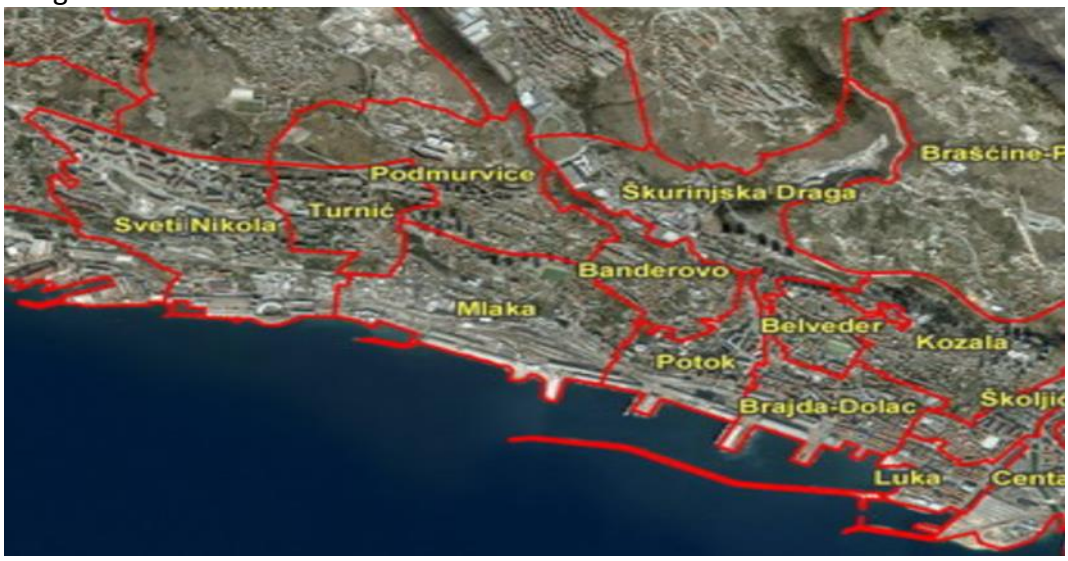


Table 1. Population of the City of Rijeka and the Local Board of Mlaka

Year	2001	2011	
	Population	Population	Size of the area
City of Rijeka	143,800	128,624	4,355 ha
Mlaka	5,039	3,992	83.52 ha
Ratio in %	3.5%	3.1%	1.92%

The table shows that the proportion of the population of Mlaka in the total population of the City of Rijeka is small, given that this part is mostly an industrial zone.

2.2.2 Empoyment situation

In late October 2016, Rijeka registered 7,918 unemployed persons, of whom approximately 21% are young people aged between 20-29 years. Of the total number of the unemployed, 60% are women, while in terms of qualifications, the largest share are those with secondary education (secondary 3-year vocational education for skilled and highly skilled workers, and vocational secondary education lasting 4 years or more), who make up 51% of the total unemployed.

In consideration of the high rate of unemployment among the young, it is of utmost importance to amplify the projects already implemented in towns and municipalities which can help reduce youth unemployment. Through cooperation of the local government and local sectors, Rijeka has established Info-Centres for the young, but their activity could be strengthened by organizing additional training and providing more information to the unemployed. Courses aimed at retraining are also offered by the People's University in Rijeka, an accredited institution for education and culture. The capacity of the Rijeka University, its Polytechnic and the Business School PAR are also in the function of training the young unemployed for the purpose of increasing their competencies. These are all programs that can be implemented at the level of agglomeration, which is especially important in view of the fact that Croatia is one of the countries with the highest rate of youth unemployment in the EU.

Due to changes in the structure of the economy, the transition processes and the economic crisis, the unemployment of people older than 50 years presents an additional problem. The fact is that these people do not have the necessary competencies for the labor market and have difficulty finding opportunities for additional education. Specialized training for the unemployed 50+ could be provided in the whole of the Rijeka conurbation, and an integrated web portal could assemble all the information about the programs of lifelong learning.

2.2.3. Economic development

The gross domestic product (GDP) is an indicator of the general trend but also of contribution in the national economy. According to the methodology of the European system of national and regional accounts (ESA 2010), the lowest level for which GDP is calculated in the Republic of Croatia are counties. In 2013, the GDP of the Primorje-Gorski Kotar County amounted to HRK 28.86 billion, which is an 8.7% share of the total GDP structure of the Republic of Croatia. According to the latest data of the Central Bureau of Statistics for 2013, the GDP per capita in the area of Primorje-Gorski Kotar County was HRK 97,924, which is a slight decline when compared to the year 2012, when it was HRK 98,556.

Rijeka is one of the strongest Croatian regional centres.

Rijeka is also the administrative centre of the Primorje-Gorski Kotar County, which, according to basic economic data, is one of the most developed counties in Croatia. The County is extremely heterogeneous in geographical terms, but also in terms of development. Its favorable geographic and traffic position contributed to the development of shipping and other related economic activities, which in turn helped Rijeka develop into a strong maritime centre with strong port, maritime transport, shipbuilding and tourism activities of significance for the whole of Croatia.

In the past twenty years, the structure of Rijeka's economy has greatly changed, especially the role of its individual economic sectors. In the conditions of the new economy based on science and knowledge, it has become of utmost importance to transfer knowledge and technology from the University to all sectors of the local economy, which inevitably includes industries based on new technologies.

Rijeka already has a strongly developed pharmaceutical industry and a series of small businesses turned towards new technologies. For example, Jadran Galenski Laboratorij d.d. (Galenic Laboratory) currently employs more than 600 people, is present in the markets of 35 countries and invests HRK 350 million in new production plants. The development of the STeP Science and Technology Park is an important factor for further penetration of new technologies into the sector of clean industries such as biotechnology, molecular medicine and biochemistry, the development of renewable forms of energy and of new technologies in shipbuilding.

The role of tourism as a tertiary activity is not negligible, either. Tourism, and in particular the development of its relatively new branch - health tourism, which uses high technology, creates a large number of new job opportunities.

The economic structure of the economy is a dynamic category, but a synergy of all sectors is always important.

Table 2. The main economic and financial indicators of entrepreneurial activity in Rijeka for the 2012 – 2015 period

Description *	**2012**	**2013**	**2014**	**2015**
Number of entrepreneurs	3,886	4,013	4,207	4,391
Number of small entrepreneurs	3,842	3972	4165	4,350
Number of employees	31,216	30,367	29,381	30,443
Total revenue	2,251,969,508	2,147,469,852	2,202,760,638	2,428,153,567
Total expenditures	2,071,946,176	2,113,027,673	2,171,954,034	2,325,462,449
Profit before taxation	258,779,760	108,026,786	127,620,132	160,390,444

Loss before taxation	78,756,427	73,584,606	96,813,528	57,699,326
Gross financial result	180,023,332	34,442,180	30,806,604	102,691,118
Investments in fixed assets	127,303,437	160,213,580	125,382,333	146,965,123

**** All numbers are converted in EUR***

There was a growing trend in the number of small businesses in the period from 2012 to 2015 in Rijeka. In 2015, the number of small businesses was 4% higher than in 2014, while in comparison with 2012 the number increased by 8.3%. Due to the fact that small businesses account for over 90% or even up to 100% of the total number of entrepreneurs in the Rijeka UA, this increase in the number of entrepreneurs after years of decline is a significant fact.

The above table shows that 2013, in most indicators, marked a significant drop when compared to 2012. The only growth was recorded in the number of businesses and investments in fixed assets. After the decline in the economic activities in 2013, a gradual growth was noted in 2014 and 2015.

When we consider Mlaka as an area separate from Rijeka, we can only talk about comparing the number of entrepreneurs in this industrial area. There are 117 business entities operating in the industrial zone Mlaka, which makes for only 2.6% of registered entities in the city of Rijeka. Most of the 117 subjects are registered as small businesses. Given the fact that it is an industrial part of the city, this number is quite small. It also signals the problem of unused brownfield in Mlaka, an area with a vast potential as Rijeka's industrial centre and a history to prove it.

Table 3. Total income and expense for business entrepreneurs Rijeka 2015 by sector

Activity sections *	Total revenues in 2015	Total expenditures in 2015	Index 2014 = 100	
			Revenues	Expenditures
AGRICULTURE, FORESTRY AND FISHERY	5,389,285	5,033,150	99.95	105.13
MINING AND QUARRYING	31,703	62,745	67.61	66.60
MANUFACTURING	474,674,048	421,299,694	117.20	101.68
ELECTRICITY, GAS, STEAM AND AIR CONDITIONING	16,119,853	16,114,099	103.96	97.59
WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	47,630,967	46,036,733	108.87	106.66
CONSTRUCTION	144,756,413	158,680,385	145.36	161.75
WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	970,437,548	955,793,688	106.91	106.57
TRANSPORTATION AND STORAGE	310,071,262	300,192,103	101.05	99.05
ACCOMMODATION AND FOOD SERVICES	49,331,874	49,948,407	113.14	117.68
INFORMATION AND COMMUNICATION	45,149,418	42,556,381	106.63	96.72
FINANCIAL AND INSURANCE ACTIVITIES	4,329,930	4,533,993	96.60	95.80
REAL ESTATE	28,153,959	31,499,745	86.48	85.72
PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	177,613,565	151,149,099	106.24	105.77
ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES	67,951,326	66,576,504	122.65	121.66
EDUCATION	5,634,275	5,374,055	110.65	114.94
HEALTH AND SOCIAL WELFARE	31,926,802	25,198,458	110.03	108.42
ARTS, ENTERTAINMENT AND RECREATION	39,517,541	35,986,386	131.23	111.18
OTHER SERVICE ACTIVITIES	9,433,799	9,426,822	103.48	103.03

**** All numbers are converted in EUR***

Looking at these results by sections on a mid-year basis (2014/2015), it is clear that the largest increase in total revenues was recorded in the construction sector (45.36%), arts, entertainment and recreation (31.23%), as well as in the administrative and support service activities (22.65%). The largest drop in revenues by far in 2015 compared to 2014 was generated in the mining and quarrying (32.39%). Being the representative of this sector in Rijeka and due to its location, the INA oil company is relevant to Mlaka and the area of the former refinery.

Business support infrastructure includes industrial and technology parks, business incubators, centres of excellence and other forms of support to the development of entrepreneurship. In the Rijeka UA there is significant capacity as far as the business support infrastructure is concerned.

The City of Rijeka has developed a business infrastructure consisting of business incubators for production and services. Although the incubators are the city owned property, they are managed by the Riječka razvojna agencija Porin d.o.o. / Rijeka Development Agency Porin Ltd. (hereinafter: RDA Porin), a company wholly owned by the City of Rijeka. These incubators comprise about 4,000 m^2 and consist of 52 incubator units with an open workspace (coworking). There are 30 businesses with 94 employees operating within the incubators. The essence of the incubators lies in the favourable conditions of the office space lease in the period of five years. From 1996 to 2013, over 110 businesses with more than 500 employees went through the incubators. Along with creating various analysis, studies and policy documents and ten years' experience in managing EU projects, RDA Porin provides educational programs for entrepreneurs and employees of cities and municipalities. In 2015, RDA Porin started implementing projects aiming to raise the technical and technological level of the incubator. A 3D printer was purchased and it is used to both educate entrepreneurs, as well as to provide them with new services. The project continued in 2016 with the planned acquisitions of a 3D metal printer and a CMC machine, thus allowing entrepreneurs mass production of products created by 3D printing. This has enabled entrepreneurs to significantly cut costs, but also to raise technological standards of running a business, which will in turn help achieve one of the fundamental objectives of the Development Strategy of the City of Rijeka for the period of 2014 - 2020. In addition, the CNC machine will serve in training and retraining of the unemployed.

Start-up Rijeka is an incubator for young people launched in February 2013 as a special form of business infrastructure. Start-up is developed in partnership with the University and the Polytechnic of Rijeka in order to help all young people with a business idea and a wish to see that idea implemented on the market. Start-up Rijeka is focused on project development in the field of ICT, design and biotechnology, which stems from the Development Strategy of the City of Rijeka for the period 2014 - 2020. The Start-up incubator provides a free, 270 m^2 large working space, free internet access and a free mentoring network. The free mentoring network consists of 27 mentors, all entrepreneurs and experts with a background in business management, industrial

design, computer and mobile apps design, communication, marketing, finance, intellectual property protection, 3D technology and law. During a six-month cycle, individuals and their teams develop their business ideas with the support and the expert advice of their mentors. In six generations of the programme, Start-up has catered for the business needs of 260 young people working in 85 teams and organized a series of specialized workshops and consultations with mentors. Upon completion of the Start-up programme, the participants have founded 8 business entities and 40 of them have found their jobs through business cooperation and contacts acquired in the start-up. In future, Start-up Rijeka is planning to develop an accelerator, but for the time being the clients are instructed to use the accelerators in other regions. One such example is the Pointme mobile app for marketing activities - Rijeka's first team who received an investment and entered the ABC accelerator in Ljubljana. This team is currently intensively working on contracting jobs and building partnerships. In mid-November 2015, the Vital Shock team's mobile app that merges fitness activities with a game will take part in the final selection in the accelerator and venture capital fund Eleven in Bulgaria.

While the idea of social entrepreneurship is still quite new in Croatia, the City of Rijeka organized a conference on the subject in 2014 and is planning a new start-up incubator for social entrepreneurship. The fact that the Croatian government adopted the Strategy of Social Entrepreneurship Development for the period from 2015 – 2020 on 30 April 2015, only helps create a positive environment for social entrepreneurship.

On 12 September 2014, K.E.Š. (Kreativno-edukativna škola / Creative and Educational School) programme presented its last year's activities and announced a new series of educational activities. Regular workshops for young entrepreneurs have been made a part of extracurricular activities since last school year, thanks to the collaboration of the City of Rijeka and the Dom mladih centre from Rijeka, as well as the cooperation with the elementary school Škurinje. The EnterYOUTH project, aiming at developing entrepreneurial competencies among young people, was approved for co-financing under the Slovenia-Croatia Operational Programme 2007 - 2013, and preparation for the education of young people and the unemployed were set in motion. In addition, a call for design and development of educational computer games on entrepreneurship was announced. As part of the Operational Programme Human Resources, the Work is the Key project was approved and the City representatives will participate in creating the preconditions for the economic independence of female victims of violence.

Occasional activities related to the start-up, but without a permanent incubator, have been successfully implemented by the STEP RI Science and Technology Park, University of Rijeka (hereinafter: STEP) and the Business School PAR (hereinafter: PAR). PAR is actively promoting women's entrepreneurship, as well as lifelong learning. In addition, STEP has been running a continuing education programme for beginner entrepreneurs, as well as entrepreneurs who want to develop their business. In cooperation with companies from the ICT sector, STEP has been

developing a new programme that would aim at rapid training of unemployed young people for programming in the ICT sector. The University of Rijeka, STEP, the City of Rijeka and the PGC are actively working on finding a new location for STEP 's expansion (the so-called STEP2 project) in order to develop new technologies.

Preparatory activities on setting up the competence centres for smart cities (CEKOM) in Rijeka were particularly intense in 2015. The activities regarding CEKOM for smart cities brought together a group of stakeholders aiming to develop new products and/or services via research projects. The CEKOM expert team for smart cities includes the University of Rijeka, the Faculty of Engineering in Rijeka, the Faculty of Management in Tourism and Hospitality, the Energy Institute Hrvoje Požar, and a number of interested companies (i.e. Ericsson Nikola Tesla, Zagreb; Multilink, Rijeka; 3t cable, Opatija; Cler, Rijeka; Kreativni odjel, Rijeka; and Exevio, Rijeka). The CEKOM expert team for the quality improvement in the shipbuilding industry is Uljanik Pula, Shipping Institute Ltd. Zagreb, the Faculty of Engineering in Rijeka, the Faculty of Mechanical Engineering and Naval Architecture in Zagreb, USCS Pula, Tehnomont Pula and the Association of Small Shipbuilders at CCE (Croatian Chamber of Economy). The main activities pertain to creating a positive environment for new products and/or improving the existing ones in order to enhance the shipbuilding industry competitiveness. With this goal in mind, the project of the Biotechnology and Bioeconomy Competence Centre is a joint collaboration of the University of Rijeka - Department of Biotechnology, JGL - Jadran Galenski Laboratorij, Mi-plast, Milenij Hotels and the City of Rijeka. Founding CEKOM is in line with the Industrial Strategy of the Republic of Croatia 2014 - 2020 (adopted by the Croatian government on 11 September 2014) and the Croatian Smart Specialization Strategy (public consultation in progress).

The City of Rijeka is preparing the project for the entrepreneurial zone Bodulovo. In order to develop a new business incubator which will be part of the business support infrastructure, the zone of total surface area about 52,000 m^2 will have a central facility of approximately 8,500 m^2 and 10 pitches of 1,000 – 3,150 m^2. The project proposal will be submitted for the EU funding.

In view of everything mentioned regarding business environment in the Rijeka UA, it is obvious how vast the possibilities of using ITI mechanisms are when it comes to building an advanced business infrastructure.

2.3. ENVIRONMENTAL STATUS & CRITICAL ASPECTS

2.3.1 Air quality

The urban environment with its specific features suffers most in terms of air quality, quality of drinking water, waste management, waste water management, noise, lack of public spaces and green areas, uneven urbanization and failure to comply with spatial plans.
Regarding the protection of air, it should be noted that special regulation adopted pursuant to the Air Protection Act divided Croatia into seven areas (zones) and six populated areas (agglomerations) with regard to air quality management.

The air quality in the area the Rijeka conurbation is monitored through data obtained from the monitoring stations of the state and local network for permanent monitoring of air quality.
Pursuant to Article 24 of the Law on Air Protection (Official Gazette 130/11 and 47/14), the air quality of a specific area can be classified in two categories for each parameter monitored:
• First category of air quality - clean or slightly polluted air
• Second category of air quality - polluted air

The results of measurements of air pollution in 2015 in the Primorje-Gorski Kotar County show as follows:

1. The quality of air over the majority of the territory of the Primorje-Gorski Kotar County is of the first category, the air being clean or slightly polluted.
2. Increased air pollution in the County, similar to previous years, is present in the areas of industrial plants, the pollution being due to local sources, primarily low industrial sources and boiler rooms, and partly to the traffic. The influence of cross-border transport of air-borne pollutants, especially ozone, is also noticeable.

The second category of air quality, or air pollution, according to the measured concentrations of ground-level ozone was registered also at the measuring station at Mlaka.

Air pollution by ground-level (tropospheric) ozone has been observed for some years in the entire county. In addition to the ozone as a secondary pollutant resulting from chemical reactions of ozone precursors emitted from local sources, it is estimated that part of the ozone reaches the City of Rijeka and the County through cross-border transport, which is corroborated by the high ozone concentrations during the night. Since this problem is present throughout the Mediterranean basin, it is expected that a national plan to reduce air pollution by ozone will be adopted for the whole territory of the Republic of Croatia.

2.3.2 Surface and ground water quality

In the entire urban agglomeration of Rijeka, the quality of water (ground and surface waters captured for water supply, and the input of pollution by inland waters in the sea) is continuously monitored. Protection zones have been determined for all drinking water sources included in the public water supply and relevant decisions adopted. Public water supply in the territory of the Rijeka conurbation is provided by two water supply systems operated by the utility companies of Rijeka and Opatija (respectively, Vodovod i Kanalizacija and Liburnijske Vode). The percentage of population connected to public water supply systems is high and amounts to 96%. The main water resources in the Rijeka conurbation are groundwaters (90%) of highly changeable yield. The water supply system of Rijeka covers the City of Rijeka and the 78 settlements in the former municipality of Rijeka, totalling 190,000 inhabitants. The health safety of the drinking water supplied to Rijeka in 2015 was excellent.

2.3.3 Soil quality

Soil pollution is a specific topic with no systematically processed data in Croatia. A contaminated site is a site at which pollutants occur in concentrations that pose a threat to human health and the environment (i.e. soil, ground- and surface water and air). The most important and thee most dangerous sources of soil pollution are human activities that directly and indirectly affect the damage or loss of important soil functions. The main sources of soil contamination in the Rijeka UA are old industrial plants, non-repaired landfills and illegal dumps, abandoned quarries and gravel pits. The so-called black spots are sites polluted by waste due to inadequate long term management of industrial (technological) waste and as such pose a threat to the environment and human health. Black spot remediation is (co)financed from the Environmental Protection and Energy Efficiency Fund (the Fund), which also monitors remediation processes depending on the ownership structure of the site. One such black spot in Rijeka's region is the Sovjak pit in Viškovo, about to be rehabilitated. The rehabilitation will be financed by the EU funds, while the project documentation is developed thanks to the IPA funds (85%) and the Fund (15%). In addition to the Sovjak pit, the soil is contaminated in the area of the former INA -Rijeka Oil Refinery on Mlaka and in and around the area of the INA Refinery Rijeka in Kostrena (both land and sea).

In the case of Mlaka refinery, the risk of soil contamination is exponentially greater due to a century long production history. Every world reference indicates that the soil in the Mlaka area is an extremely contaminated territory, even without precise analyses and research of the soil which are otherwise necessary. The gravity of the situation is made worse because of the proximity of the sea, which poses a serious threat of rainwater carrying dangerous and mostly carcinogens substances into the sea, into the eco system and consequently into the food chain.

Another issue is long-lasting leakage of liquid petroleum products from the existing underground tanks, as the tanks are too old. It is a common issue worldwide for the tank bottoms for liquid fuels tanks to be leaking due to old age. In modern tanks, which is not the case in Mlaka, this problem is solved by placing a layer of gas at the bottom of the tank, under the tank, controlled by pressure gauge.

Since Mlaka is missing such adjustments, it is safe to assume that there has been enormous leakage of the contents of the tanks. Without too much hesitation it can be concluded that there is a potential environmental hotspot and a permanent source of massive and hazardous pollution in the very city centre, a fact that we do not necessarily have to be aware of. Beyond doubt, the pollution in Mlaka is massive.

Generally speaking, all around the world the refineries or ex-refineries are among the most dangerous and the most contaminated areas. Worse than that is only radioactive waste or nuclear power plants.

2.3.4 Natural heritage

According to the Nature Protection Act (Official Gazette 162/03), protected areas are classified as being of international, national or local significance, and are divided into:

- strict nature reserves,
- national parks,
- special reserves,
- nature parks,
- regional parks,
- natural monuments,
- important landscapes,
- forest parks,
- monuments of park architecture.

The area of the Primorje-Gorski Kotar County boasts all these areas with the exception of the regional park, which was not included in previous regulations. A total of 33 valuable natural areas or sites, totalling 28,105 ha, are being protected, for some the protective legislation is in progress, and for a very large number of registered valuable parts of nature the legal protection procedure still needs to be initiated. A total of 140 valuable natural areas (on land and in the sea) of different categories of protection have been registered for protection, which, together with the already protected areas, accounts for about 17% of the County territory.

Due to the predominantly karst character of the County soil, special attention needs to be given to the parts of nature valuable from the geomorphological and hydro-geological aspect, due to their underground spaces and water network, as well as to the natural and cultivated karst landscapes,

which are of vast scientific and cultural importance due to the richness and specificity of their living world, but also because they have significant economic potential opportunities in the form of ecotourism. In the karst area, the need to protect nature inevitably significantly overlaps with the need to protect drinking water resources and valuable fertile agricultural soil of the county, without which future life and development of this area cannot be expected.

Of the 33 protected natural areas, only one is located in the City of Rijeka itself, and it is the Zamet cave. As for the areas of valuable natural heritage on land and in the sea envisaged for protection, three are located in the City of Rijeka, namely the Heroes Park, the Nikola Host Park and the **Mlaka Park**.

The **Mlaka Park**, also known as the Giardino Pubblico, is one of the oldest and most beautiful parks in Rijeka. It was designed in 1874 by Dr Filibert Bazarig upon suggestions of Rijeka's mayor Giovanni Ciotta as a kind of border between the city centre and the western suburbs, as well as a gate to the historic centre for those coming to town from that direction.

Originally a spacious park irrigated by natural water sources and a popular meeting place, the park now occupies a smaller area because of buildings that were subsequently built in the surrounding area. Despite this reduction, however, this park located near the railway station is still a pleasant place in which to relax or take a walk.

Image 10. The Mlaka Park

Data on the impact of refineries on the natural heritage does not exist, but it can be assumed that due to certain soil and air pollution, there is a negative impact on the natural heritage near the refinery area.

2.3.5 Land consumption in urban areas

In terms of population density, Rijeka is among the most densely populated places in the region with 2,923 inhabitants per km². The average population density of the Primorje-Gorski Kotar County is 82.55 inhabitants per km2. The territorial organization implemented in 1993 made Rijeka not only the most densely populated area in Croatia but also in this part of Europe.

The average population density of Rijeka and the towns and municipalities of its conurbation shows that, regardless of the demographic trends between the two censuses, Rijeka proper is the most densely populated. Its population density is still 3-4 times higher than that of the neighbouring towns and municipalities, and is twice the density of the City of Zagreb (1,232 inhabitants per km2), which points to the complexity of the issue of finding a solution for the needs of its residents and of its urban development.

2.4. INFRASTRUCTURE, LOGISTICS, LEGAL CONSTRAINTS

2.4.1. Waste water treatment plants

The public utility company Vodovod i Kanalizacija (Water Supply and Sewerage; hereinafter: KD VIK) is a supplier of water services - public water supply and public sewerage - in the area of four towns: Rijeka, Bakar, Kastav and Kraljevica, and five municipalities: Čavle, Jelenje, Klana, Kostrena and Viškovo. In addition to providing for the needs of households and the industry in the City of Rijeka itself and the Rijeka ring, drinking water is supplied for the needs of the water supply company Liburnijske Vode d.o.o. Ičići (formerly Komunalac d.o.o. Opatija), and the public utilities companies Ponikve Voda d.o.o. Krk (formerly Ponikve d.o.o. Krk) and Vodovod Žrnovica – Novi Vinodolski.

The quality of water for human consumption supplied by the public water supply system is very high and can be considered to be health-safe. All water sources of the wider Rijeka area are situated in a very sensitive karst area. The water is soft or moderately hard (7.90 dH – 10.10 dH), it has very favourable physico-chemical properties and is naturally suitable for drinking, requiring only chlorine dioxide disinfection. Tap water is safe for drinking and does not require the use of a water filter or any household appliances for the preparation of drinking water. Quality tests and analyses of samples of water for human consumption extracted from the public water supply system show that the public water supply can be considered safe and reliable for human health because it supplies water that is safe for human consumption.

Appendix 44 shows data on the coverage of the territory by water supply and sewerage system that have been obtained from KD VIK and Liburnijske Vode of Ičići. It is evident that water supply has a high coverage in the whole area of the agglomeration, while the coverage of sewerage infrastructure is lagging far behind and is even completely absent in some areas.

KD VIK continuously carries out activities aimed at creating conditions for further development of the public drainage system alongside the works carried out on the water network. It also continues to invest in the construction of municipal water works as part of road construction, development of squares and other public spaces in accordance with the priorities of the City of Rijeka. In cooperation with the Hrvatske Vode (Croatian Water Management), VIK is making preparations for the construction of six kilometres of sewage system with two new pumping stations in the area of Srdoči, Gornji Zamet and Donja Drenova, as well as reconstruction of the existing sewage pumping station at Kostabela. KD VIK plans to construct 26 km of the public drainage system and 13 km of the water supply network in Rijeka and Kastav, which is to be financed through a loan from the European Bank for Reconstruction and Development in the amount of EUR 13 million. The completion of these works is planned for mid-2016 and is expected

to improve the quality of water supply and connect about 700 facilities to the drainage system in the area of Pulac, Tibljaši and Škurinje, Pehlin and Marinići, Grbci and Gornji Zamet, Srdoči, Brašćine-Lukovići and Donja Drenova. As part of the plan to build a new plant for the treatment of waste water of the Rijeka conurbation, project documentation required for project proposals to apply for EU funds is currently being prepared. Within the framework of the second stage of the Jadranski Projekt (Adriatic Project), which refers to protection from water pollution in coastal areas, the construction of a sanitary sewage system in the City of Rijeka and the municipality of Čavle is still in progress. The second phase of the Adriatic Project comprises several parts, so that within the sub-project Rijeka-Grobnik about 35 km of sanitary sewage system and seven pumping stations are being built.

Liburnijske Vode Ičići is a supplier of water services - public water supply and public sewerage - in the area of Liburnia. The plan of development and construction of the water supply system of the City of Opatija is aimed at increasing the capacity of own water sources on Mt Učka, finding new water sources and securing the required amount of water from the water supply systems of Rijeka and Ilirska Bistrica in Slovenia. The spatial plan envisages also the construction and reconstruction of water tanks and pumps, construction of new and reconstruction of old water supply pipelines in order to minimize losses and enhance the capacity and efficiency of the system, and increases the optimization of the system through remote control systems facilities and remote reading of water meters. According to the plan, the future service facility on the planned Liburnian bypass will also be connected to the water supply system along the bypass. All settlements are fully covered with a water supply network, and the construction of new buildings should be accompanied with the corresponding construction of a new or expansion of the existing water supply network. Alongside the construction of a water supply system, provisions are being made for waste water disposal in accordance with the prescribed category of land defined in the plan in order to balance the two systems. The planned drainage system is defined as a distribution system according to the accepted conceptual design of the sanitary sewage system of the Opatija-Liburnia Riviera. The plan of development and construction is based on the expansion of wastewater treatment facility with a higher degree of purification, and the construction of a sewage network in the agglomeration of Opatija-Lovran which would enable all residents to connect to the sewerage system. In water protection areas, it is compulsory to build a sanitary sewer system with a facility for the treatment of wastewaters. The efficiency of the system can be increased, and thus the environmental protection as well, with the reconstruction of the existing dilapidated network and introduction of automated systems with advanced technology. Given that septic tanks are a constant source of problems, in small or remote settlements this issue could be resolved by using the public drainage system with the appropriate mini systems for wastewater conditioning.

Rijeka has a long history of managing drainage and sewage disposal. However, due to the fact that the Construction Office back in the past did not keep record of the sewerage as a separate subject, it is somewhat difficult to pinpoint the exact time of its construction. This network of the utmost

importance for the city hygiene was managed in 19th century by the Health Committee, thanks to which there is information on the public sewerage disinfection in 1870 and 1871.

In 1872, Rijeka received the status of a municipium, a moment which marked the beginning of its sudden urban boom. It was only natural that such a vast expansion was followed by a well-constructed sewage and water network. A number of drinking water sources and their water flows were directed towards the coast and then covered, which in turn made them suitable to be used as natural collectors for waste- and storm water.

2.4.2. Waste treatment plants

According to the obligations and responsibilities in waste management deriving from the Act on Sustainable Waste Management (OG No. 94/13), cities and municipalities are responsible for municipal waste management and construction of facilities intended for treatment, storage and disposal of waste is of interest to the Republic of Croatia. In the Rijeka UA, Viševac landfill (Viškovo) has been closed for further disposal since 1 January 2012 and remediated through international aid programs. It was the largest landfill in the PGC that served as the disposal site for waste materials from Rijeka and its surroundings. The waste has since been disposed of at the Marišćina County Waste Management Centre (CWMC) Marišćina, at the so-called "zero" phase plateau. A biogas power plant is under construction in the Viševac sanitary landfill zone and it will exploit combustible biogas produced under the rehabilitated landfill. In the Liburnija area (i.e. Opatija, Lovran, Opatija and Matulji), waste is disposed in Osojnica landfill, in Matulji. As far as the Rijeka UA is concerned, the registered landfill for industrial waste is at the INA - Refinery site in Urinj (Kostrena).

The Marišćina County Waste Management Centre is in its final phase of realization. The Marišćina project is co-financed through the IPA funds in the amount of 71% and the remaining funds have been secured by the Government, the PGC, the City of Rijeka, other local government units and Ekoplus Ltd. The concept of technical and technological waste management in the Zone refers to the mechanical and biological treatment of municipal waste collected, extraction of valuable components and their further use, and disposal of residual parts. It also includes establishing a system of primary selection - separate collection of certain waste materials in local government units which will process their waste in the Marišćina CWMC. As the first CWMC in Croatia, Marišćina was put in operation in November 2015, as a test run in order to monitor its proper running. The Marišćina CWMC will cater for the needs of 300,000 people in the PGC and its operation will cause all landfills in the county to be closed and remediated within a year.

Image 11. Marišćina project

The Rijeka UA has opted for an integrated waste management system. There are two utility companies performing waste management in the Rijeka UA: Čistoća (Rijeka) and Komunalac (Jurdani). The utility company Čistoća Ltd. is owned by nine local government units, where it is in charge of urban sanitation and waste management. These municipalities are: Rijeka, Kastav, Bakar, Kraljevica, Viškovo, Kostrena, Čavle, Jelenje and Klana. The utility company Komunalac (Jurdani) is owned by four local government units (i.e. Opatija, Matulji, Lovran and Mošćenička Draga), where it performs its activities. In the Rijeka UA however, the waste management system based on primary waste selection is being established. Such selection is a prerequisite for proper functioning of the Marišćina CWMC. Komunalac has chosen the 'door-to-door' waste collection system, where two fractions of waste are collected – the useful and the useless mixed waste. Čistoća has opted for collecting the waste in recycling containers (for paper and cardboard, glass, plastic, metal and so-called tetra packaging) placed in different locations in cities and municipalities, according to the estimate based on the population number. Both utility companies collect bulky waste by placing the containers in accordance with the annual plan.
Čistoća runs two recycling centres in Rijeka - the Recycling Yard Pehlin and the Recycling Yard Mihačeva draga - where citizens can recycle various types of waste free of charge up to 2 m^3. In addition, more recycling centres are planned in Opatija, Lovran, Kraljevica and Čavle. There is a total of 19 locations where two mobile recycling yards will be in use for a period of 14 days.

The amount of mixed municipal waste collected by Čistoća in 2015 is 44,004.72 t, while the amount collected by Komunalac is 8,653 t, which makes a total of 52,657.72 t of mixed municipal waste collected in the Rijeka UA. The amount of separately collected waste by Čistoća in 2015

amounted to 3,044.64 t and 997.36 t by Komunalac, which makes a total of 3,090.3 t of separately collected waste in the Rijeka UA.

The UA Rijeka has no adequate system of monitoring data on the quantity, type and manner of dealing with industrial waste, despite the fact that many industrial waste producers are included in the Environmental Emission Register (EER). Furthermore, there are no adequate facilities for storage, treatment and disposal of industrial waste. The data on the construction waste quantity (i.e. construction waste and demolition) and waste containing asbestos vary widely depending on the source, have large deviations and are highly unreliable.

The construction company GP Krk has the permit for the construction waste disposal and for its recycling and re-use in Klana and for the whole PGC, within the working zone and asphalt plants Marišćina. The problem is that the waste is not disposed of in full compliance with the regulations. Although the Rijeka UA is well covered by the waste collection system, illegal waste dumps are registered nonetheless. The process of waste disposal still greatly depends on landfills. It is necessary to direct the waste management in accordance with the order of precedence - to increase recycling, reusing, energy use and other types of waste materials recovery, and to encourage minimum amount of waste disposal. Moreover, it is vital to raise public awareness about the need for proper waste management. A further development of manufacturers' responsibility is greatly needed too, as well as a cleaner production. It is particularly important to act locally by informing and educating so that consumption patterns can be changed and to systematically encourage and monitor responsible behaviour regarding waste generation.

2.4.3 Power plants

Electricity in the UA Rijeka is supplied and distributed by HEP - Distribution System Operator - or its subsidiary Elektroprimorje Rijeka. The branching network makes electricity available to every household and business entity in Rijeka conurbation. Among major power plants, two are active: the run-of-river Rijeka Hydro Power Plant with the installed capacity of 36.8 MW (Rijeka) and the Rijeka Thermal Power Plant, with the installed capacity of 320 MW (Kostrena).
A high-pressure derivational power plant, Rijeka Hydro Power Plant is a run-of-river hydro power plant that uses the river Rječina watercourse. Such power plants have an upstream reservoir that can be emptied in less than two hours at rated power, or such accumulation does not exist at all. The kinetic energy of the water is almost directly used to run water turbines. They are very simple to perform, there is no water level rise and very little impact on the environment, but they are also highly dependent on the currently available water flow. The maximum annual production is 141 GWh (achieved in 2010) and in 2015 the production was 55 GWh.

Image 12. Rijeka Hydro Plant

Unlike the hydro power plant Rijeka, the Rijeka Thermal Power Plant is one of the biggest polluters on the coast. Outdated and expensive, this thermal power plant was built more than 40 years ago, and it has environmental impact in the following areas:

- Emissions into the air as a result of the electricity generation
- Emissions into the water as a result of the wastewater processing
- Potential discharge in the environment due to storage of large quantities of dangerous substances

For this reason, the Rijeka Thermal Power Plant ceased its production in 2014, and it only operates when additional electricity is needed. The future plans include its complete reconstruction and modernization, as well as switching to natural gas.

Image 13. Rijeka Thermal Power Plant

In line with the European Strategy 20x20x20, the City of Rijeka has developed and adopted (in 2010) the Sustainable Energy Action Plan for Rijeka (SEAP) and thus defined energy efficiency as one of its main tasks. The European Commission proposed an EU Energy Security and Solidarity Action Plan through a reduction of greenhouse gas emissions of 20% in 2020 (compared to 1990), 20% of renewable energy sources in gross final energy consumption in 2020, and a 20% reduction in total electricity consumption compared to the baseline projection in 2020. Rijeka was among the top two hundred European cities which, by signing the Covenant of Mayors in February 2009, decided to take the initiative for sustainable development. By doing so, European cities resolved to reduce greenhouse gas emissions and energy consumption by 2020 by 20%, while increasing energy production from renewable sources. It was a logical decision after signing the Energy Charter, which meant that Rijeka, as the leader of Croatian cities, is fully committed to the implementation of proactive energy policy in order to improve energy efficiency, reduce harmful effects on the environment and raise public awareness about the need for efficient energy use. The summary of this document can be found on the ENERGY CITIES website - the European association of cities promoting energy efficiency (http://www.energy-cities.eu/).

In order to implement the Sustainable Energy Action Plan for Rijeka (SEAP), the City has undertaken a number of activities contributing to energy efficiency, some of which are the following:

- Solar Energy in the City
- Green Energy in My Home
- Applying the principles of energy efficiency and renewable energy sources in new city facilities
- Energy management and energy certificates production
- Energy Week.

The City of Rijeka is running a project called Solar Energy in the City and as a part of which six photovoltaic plants were set up on kindergartens Potok and Srdoči (on the parking canopies), as well as on primary schools Pećine, Fran Franković, Kantrida and Zamet. The program is co-financed by the Environmental Protection and Energy Efficiency Fund in the amount of 36% of the total investment. Along with the solar power plant installed on the city administration building on Korzo 16, which is also an example of merging cultural heritage with the contemporary technology, the total power of all these installed power plants is 90 kW. The feasibility analysis of the photovoltaic power plant construction has shown that the investment will be profitable in approximately six years, and by using alternative sources of electricity the emissions into the environment will be significantly reduced.

The Green Energy in My Home project is carried out in collaboration with the Regional Agency Kvarner. The City of Rijeka has co-financed the project with 40% of the amount for the purchase of renewable energy sources (RES) for heating and hot water for the citizens of Rijeka. So far, 38 households have received subsidies for solar collectors as water heating systems and for biomass heating systems.

The principle of energy efficiency and renewable energy sources is applied in the new city facilities too. The kindergarten Srdoči is an example of an energy-efficient building with the A+ energy certificate and a photovoltaic system of 10 kW installed on the parking canopies. The new kindergarten in Pehlin is being built according to the energy efficiency principles, with solar collectors for hot water and photovoltaic panels to generate electricity (solar power plant of 30 kW).

In order to achieve energy efficiency, the City of Rijeka has been systematically implementing energy management, where one of the main requirements is issuing the energy certificates. Regarding that, the system that keeps track of monthly energy consumption called Energy Management and Information System (EMIS) has been introduced for all public buildings owned by the City of Rijeka. Furthermore, the city administration building on Korzo 16 is equipped with smart metering – a system recording consumption of electric energy. For large energy and water consumers, a remote energy consumption reading system is to be installed, which will collect the information via the EMIS app (Cro: ISGE/ Energy Management Information System). Energy audits are currently being performed and energy certificates issued for public buildings owned by the City of Rijeka.

The Rijeka Energy Week is part of the Sustainable Energy Week event organized by the European Union and held every year in order to educate citizens on the sustainable use of energy in everyday life.
The City of Rijeka and the company Energo Ltd, co-owned by the City, are responsible for new investments aimed at efficient energy use.

2.4.4. Transport connections

The Rijeka traffic route is part of the Pan-European Transport Corridor V-B (Rijeka - Zagreb - Budapest) and has been recognized by the EU as an important European transport route. In this context, Rijeka's greatest competitive advantage is its port.

The shipping route between the Far East and the Port of Rijeka via the Suez Canal is shorter by 5-10 days, and indeed the shortest, when compared with the ports of Northern Europe. Because of fuel economy, shippers aim to reduce the speed of navigation and so, although ever larger ships are being built, they sail at lower speeds (10-12 knots) and consequently the duration of travel, measured in days, varies primarily depending on their speed.
The geographical position of the port of Rijeka and the development of the Rijeka Gateway, Rijeka's traffic route, brings new benefits to the European Union (especially for the Far East market through the Suez Canal), the most notable ones being:

• Rijeka is the first port of call and the fastest route as an alternative route compared to Northern European ports.
• Balancing regional development (Northern - Southern Europe).
• Reducing the environmental impact - delivery of containers transported by ship and rail from Suez to Munich via the Rijeka port allows emission reduction by 135 kg CO2/TEU.
• Global market conditions (redistribution of the existing flows of goods will lead to creation of new companies).

The western port terminal is crucial for strengthening the competitiveness of the port of Rijeka in relation to its competitors because its full profile (length and depth of the draft) will certainly attract new cargo from even the most distant markets. It is planned that the Port of Rijeka will invest EUR 71 million for the initial 400 meters of new shore (the investment includes design and construction), and the future concessionaire are expected to invest additional EUR 100 million for the construction itself.

Image 14. Western port terminal - simulation

Related to the construction of the western port terminal is the construction of the new road D-403, a much needed vertical road link between the western part of the port and the highway (through Škurinje). Planning documents envisage an investment of around EUR 66 million for it. It is this investment of Hrvatske Ceste d.o.o. (Croatian Roads) that will provide an even better transport connection of the port with the hinterland, which is an essential prerequisite for the development of Rijeka's port. Investment in rail infrastructure is also important for the development of the port of Rijeka, so the Rijeka traffic route is the biggest of the Hrvatske Željeznice Infrastructure d.o.o. (Croatian Railways Infrastructure), which in turn will positively influence the development of the port of Rijeka itself as well. Investment in railway infrastructure will also contribute to connecting Rijeka to Pan-European railway corridor X.

When talking about the development of transport infrastructure in the function of tourism, mention should be made of the necessary investments in the Zračna Luka Rijeka d.o.o. (Airport of Rijeka), inevitable for further increase in primarily passenger, but also freight transport. Zračna Luka Rijeka is in the process of preparation of investment projects that are already estimated at about EUR 20 million and include investments in transport infrastructure in accordance with EU standards for air transport.

Image 15. Airport of Rijeka

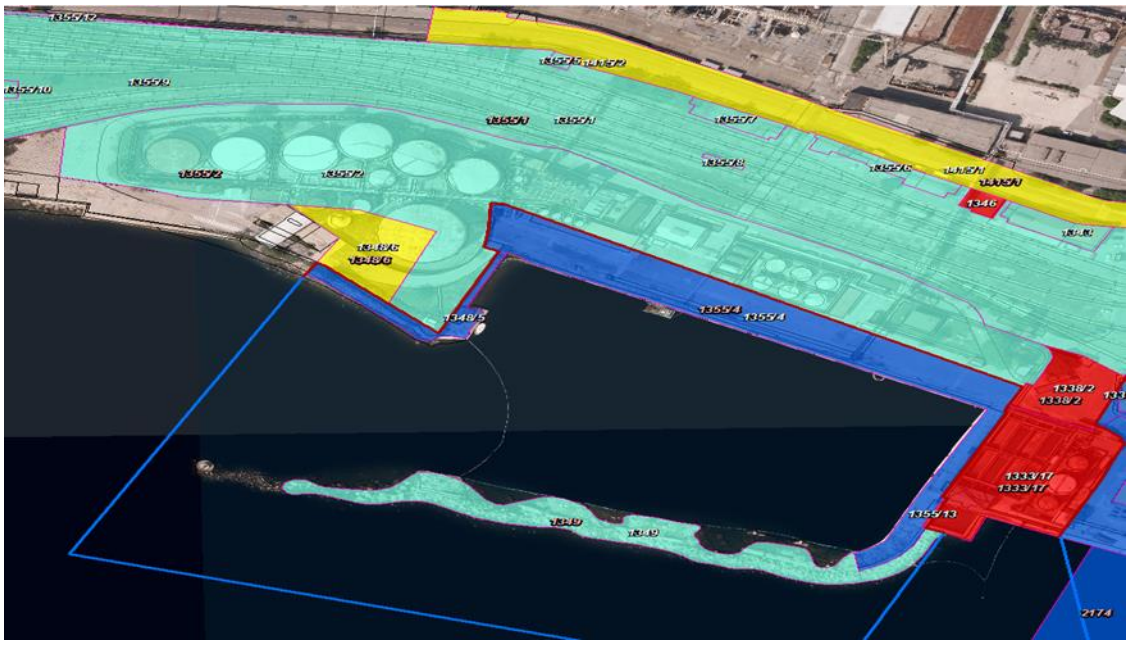
If new value is added to goods in the transport and passengers are provided with additional services, traffic can be a significant generator of the economy. In this respect, initiatives for the establishment of logistic chains are very important; they must be led by Luka Rijeka d.d. (Port of Rijeka) but must also involve all other interested businesses through logistics chains. It is therefore important to accelerate the modernization projects at Škrljevo port terminal (owned by Luka Rijeka) and the construction of new commercial and logistics zone at Miklavje, as well as develop a stronger orientation of the Industrial Zone Bakar towards the development of logistics. These zones are extremely important because they are well-connected with the port and have the appropriate space in which they can provide all the additional services that increase the added value, and thus also the profits from goods traffic.

The maritime passenger terminal on the Rijeka breakwater is of great importance for passenger traffic so the future concessionaire, besides the obligation to provide appropriate collaterals required by law, has also the obligation to develop the terminal in phases as a precondition for entry into force of the contract. This implies complex investments and a state of the property on the date of entry into possession that meets the anticipated needs of the service users. The bids received to date are currently being analysed.

In cooperation with relevant ministries, the City of Rijeka has also been working intensively on the preparations for the realization of European funds for the Western Žabica complex, which will include a modern bus terminal with the accompanying amenities for travellers. This is an investment of about EUR 42 million, and the City of Rijeka has also planned the construction of supporting municipal infrastructure and a new road, the so-called Riva 2, a traffic link between **Žabica and Mlaka**. This utility and transport infrastructure is an additional investment of around EUR 8 million. The whole project of Western Žabica, which is applying for EU funds in cooperation with the national authorities, is planned to need a total investment of about EUR 50 million.

2.4.5. Ownership

Image 16. The current status of ownership in the former refinery Rijeka



This image shows the current ownership of the area of ex Refinery in Mlaka:

- blue colour marks the port area i.e. maritime property
- green colour marks the area owned by private company INA
- red colour marks the area owned by the Republic of Croatia
- yellow colour marks the area of state roads

3. CONCLUSIONS

The Mlaka Plateau is of utmost importance for the city. The area has its own port which can be one of the most important and feasible way out of the city to the sea. Problems related to this area are mainly connected to the ecological status, due to the industry that was there for years (oil refinery), ownership relations and consequently responsibilities for its rehabilitation and future purpose.