

# *Urban biodiversity and the city – 1. environmental degradation in the City of Pančevo (Serbia)*

**NENAD Č. BOJAT<sup>1</sup>, SNEŽANA KOMATINA<sup>2</sup>**

<sup>1</sup> FACULTY OF ECONOMICS AND ENGINEERING MANAGEMENT, NOVI SAD, SERBIA

<sup>2</sup> FACULTY OF TECHNICAL STUDIES, UNIVERSITY OF TRAVNIK, TRAVNIK, BOSNIA AND HERZEGOVINA

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## **ABSTRACT**

The most noticeable examples of environmental degradation in Pančevo are associated with the so-called Pančevo South Industrial Zone, where the economic power (=Chemical Industry Pančevo [CIP] "Azotara", CIP "Petrohemija" and Pančevo Oil Refinery) of the Municipality of the City of Pančevo is concentrated in close proximity to residential areas. The construction of these plants in the direction of dominant winds, their outdated technology – used for thirty to fifty years without adequate modernization, illegal construction without the required urban planning permits, constant violations of environmental protection laws, and consequences of NATO bombing in 1999, are considered to be the main sources of environmental degradation in Pančevo. Over the past few decades, the most important environmental concern of inhabitants residing in the City of Pančevo is poor air quality, although serious environmental problems are also detected in other sectors: the water supply, wastewater management, noise pollution reduction, public health protection, soil remediation, conservation of biodiversity, etc. The democratic transition in Serbia (October 5, 2000) in line with its strategic commitment to the process of European integration has led to major reforms in Serbia's environmental laws, necessary for the implementation of modern and more effective environmental protection policies. Given that the (urban) ecosystems in Pančevo have undergone significant degradation – which in turn results in various negative effects on (urban) biological diversity and peoples' livelihoods – immediate attention has to be paid to the complex ecological issues in Pančevo, at all governmental levels in Serbia, especially by the local government in Pančevo.

**Keywords:** Environmental degradation, urban ecology, Pančevo, Serbia.

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## **Introduction**

Pančevo is an industrial city which largely contributes to the economic growth of the Republic of Serbia, not only due to its proximity to the Serbian capital and the most populous Serbian city – Belgrade, but also to the fact that some of the most important energy, petrochemical, and other chemical resources of Serbia are located on its territory (Jelinčić and Djurović, 2009). The Municipality of the City of Pančevo spreads across 755 km<sup>2</sup> (75,500 ha) which equals 0.85% of the Republic of Serbia territory (see: The Statistical Office of the Republic of Serbia). The Municipality of the City of Pančevo has 123,414 inhabitants (based on the 2011 Census; see: The Statistical Office of the Republic of Serbia), representing 1.7% of the total population of the Republic of Serbia (see: The Statistical Office of the Republic of Serbia).

Extraordinary quality of available labour in Pančevo, proximity to major Serbian markets, a developed urban infrastructure, and excellent geo-strategic position of Pančevo – with ample roads (The Pan-European Corridor X), railway lines (The Belgrade-Constanta Railway and the Belgrade-Bar Railway), and water transportation options (The Pan-European Corridor VII) – considerably favoured the economic growth of the Municipality of the City of Pančevo in comparison to other Serbian municipalities (not including the Municipality of the City of Belgrade – which is economically the most developed municipality in Serbia) (Mitrović et al., 2013).

The Adria Oil Pipeline (Omišalj-Sisak-Slavonski Brod-Novi Sad-Pančevo) also passes through the city (see: PE Transnafta). Industry and agriculture are still the most prominent growth generators of Pančevo economy (see: The Serbian Business Registers

Agency). Since the early 18th century, Pančevo has had a long tradition of industrial production (Mitrović et al., 2013). The oldest industrial building in Vojvodina – the Pančevo Brewery (est. 1722) – still exists in Pančevo and is located in the city centre. Just a few decades later, the “Jabuka” starch factory as well as the plants for cotton yarn and silk threads manufacturing were also built in Pančevo (Mitrović et al., 2013).

From an economic standpoint, the period between the two world wars in Pančevo resonates powerfully, in many aspects; several manufacturing plants were constructed during that period (“Tesla” light bulb factory – est. 1931; The flat glass factory – est. 1932; “Utva” airplane factory – est. 1937) (Mitrović et al., 2013).

A very important part of the industrialization in Pančevo took place in the 1960's and 1970's, when a large and newly built industrial complex was erected in the so-called Pančevo South Industrial Zone, with several plants belonging to the Chemical Industry Pančevo (CIP) (e.g., CIP “Azotara” – a fertilizer plant, est. 1962; and CIP “Petrohemija” – a petrochemical plant, est. 1979) and the Petroleum Industry of Serbia (Pančevo Oil Refinery, est. 1968) (Mitrović et al., 2013). In the 1980's, factories for metal processing and several food processing and leather dyeing plants were also built on the territory of the Municipality of the City of Pančevo (Mitrović et al., 2013).

A very difficult and critical period for Pančevo's economy and inhabitants started in the 1990's with the break-up of the Socialist Federal Republic of Yugoslavia (SFRY; 1991) and several civil wars that were held in the territory of the SFRY – causing economic sanctions and diplomatic isolation of the Republic of Serbia (1991-2001). It was followed by a massive destruction of Serbian infrastructure and factories during the NATO bombing of the Federal Republic of Yugoslavia (FRY; 1999).

During the air strikes against the FRY, the NATO hit the CIP and Pančevo Oil Refinery during 23 separate days causing 58.500 tons of crude oil / oil derivatives, tons of vinyl chloride monomer and other petrochemical products to be burnt in fire and uncontrollably released into the air, water, and soil (Schmetzer, 1999; Bogojević et al., 2002). The surrounding soil, ground water, and industrial wastewater of Vojlovica's wastewater canal

(L = 2 km / W = 76 m; a branch of the river Danube located in Pančevo) – were contaminated with large quantities of toxic substances (e.g., 5.000 tons of crude oil / oil derivatives, 23.000 tons of 1,2-Dichloroethane, 600 tons of HCl, 8 tons of mercury, 3.000 tons of NaOH, 230 tons of ammonia / ammonium hydroxide, etc.) leading to the unseen environmental catastrophe in Pančevo / Serbia / SE Europe (Bogojević et al., 2002).

## Environmental degradation in Pančevo

Over the last four decades, Pančevo has been unfortunately recognized as the Serbian “environmental black spot”, namely one of the most gravely jeopardized urban industrial areas not only in Serbia, but also in the Southeastern Europe (Jelinčić and Djurović, 2009).

Major environmental degradation in Pančevo began with the municipality's speedy industrialization in the 1960's and intensive processing in the Pančevo South Industrial Zone, which is located in the vicinity of residential areas and in dominating wind directions (Jelinčić and Djurović, 2009).

An outdated technology used in the Pančevo South Industrial Zone – with plants that had been working for decades without modernization, illegal construction in the Pančevo South Industrial Zone – without the required urban planning permits, and everyday violations of environmental protection laws are mapped as the main sources of environmental degradation in Pančevo, besides the diverse environmental issues due to the NATO bombing of the FRY (Jelinčić and Djurović, 2009).

The biggest environmental polluters in Pančevo are also identified a long time ago (CIP “Azotara”, CIP “Petrohemija” and Pančevo Oil Refinery) and all are situated in the Pančevo South Industrial Zone, just a few kilometres away from the Pančevo's city centre and two hundred meters from Pančevo's residential neighbourhood – Vojlovica, the most environmentally deprived neighbourhood in the Municipality of the City of Pančevo (see: The City of Pančevo). In addition to the plants of CIP “Azotara”, CIP “Petrohemija” and Pančevo Oil Refinery, plants of the “Messer Tehnogas” Company are also located in the Pančevo South Industrial Zone (see: The City of Pančevo). However, the negative effects of

production in this company on the environment and inhabitants of Pančevo is incomparably smaller than the negative effects of business operation from the above mentioned companies in the Pančevo South Industrial Zone (see: The City of Pančevo).

During a decade of sanctions imposed on the FRY, these companies were constantly facing difficulties in purchasing quality raw materials and equipment for their reconstruction and technological modernization and were not able to manufacture under the defined technical and environmentally acceptable conditions (Bogojević et al., 2002). Facing many economical restrictions, these companies were also largely unable to pursue their environmental plans and programs (Bogojević et al., 2002). Moreover, the managements of these companies were not able to organize the implementation of modern / ecologically friendly technologies and basic remediation of existing environmental issues in the vicinity of their plants (and / or somewhere else on the territory of the Municipality of the City of Pančevo) (Bogojević et al., 2002; Jelinčić and Djurović, 2009).

Due to the many environmental issues caused by production in the companies of the Pančevo South Industrial Zone, one of the greatest problems of inhabitants from Pančevo is poor air quality, although serious ecological problems in Pančevo are also detected in other sectors: (1) the water supply system; (2) wastewater management; (3) noise pollution reduction; (4) public health protection; (5) soil remediation; (6) conservation of biodiversity, etc. (Jelinčić and Djurović, 2009).

The ecological situation in Pančevo is far from being good, but some legal and institutional reforms have been made. To improve certain aspects of environmental degradation in Pančevo, various donors have also invested significant funds, including the Government of the Republic of Italy, the United Nations Development Program, and European Commission Delegation to the Republic of Serbia (Jelinčić and Djurović, 2010).

As many as the top three Pančevo polluters that survived unfavourable economic transition in Serbia, started investing time and money in mitigating effects of the historical pollution in Pančevo, mostly through modernization of manufacturing processes. For example, the Gazprom Neft – a subsidiary of the Petroleum Industry of Serbia – has recently invested 547 million Euros in upgrading and rebuilding the Petroleum Industry of Serbia, including Pančevo Oil Refinery (see: Gazprom Neft completes refinery

modernization project at Pančevo). However, there is a long way to go.

The benefits of turning Pančevo and its surroundings from a “black spot” on the eco-map of Serbia (and SE Europe) into an area with a high quality of life are clear. Only with healthy environment and healthy inhabitants all potential advantages of Pančevo location and the heritage of its urban zone might be used completely to propel socio-economic progress of Pančevo itself and its surrounding areas (Jelinčić and Djurović, 2010)

The improvements of environmental quality would also promote public health quality of Pančevo’ inhabitants and increase the prices of residential and business real estate, as well as land – which are currently depressed – and therefore would significantly contribute to the general well-being, creating a possibility for Pančevo to become one of elite satellite residential areas of Belgrade and one of the most beautiful small urban spaces in the mid Danube area (Jelinčić and Djurović, 2010). This must be a definite goal for all – present and future – local governments in Pančevo, as well for the governments of the Autonomous Province of Vojvodina and the Republic of Serbia.

## Intensive agriculture and (urban) biodiversity loss in Pančevo

Pančevo is also regionally known as the city with centuries of tradition in agricultural production as well as for its famous fertile chernozem soil (Duš et al., 2013). Agriculture still plays a major role in Pančevo’s economy (see: The City of Pančevo). According to the available agricultural resources, Pančevo is one of the richest municipalities in the Republic of Serbia, with 63.322 ha of high quality agricultural soil (see: The City of Pančevo).

In addition, there are many different types of soil determined in Pančevo, including carbonated chernozem on loess terrace, carbonated chernozem on loess plateau, chernozem on sandy loess, chernozem on clayish loess, carbonated marshy black soil, non-carbonated marshy black soil, meadow black soil, gleyic vertisol, alluvial soil, and non-carbonated swamp soil (Jelinčić and Djurović, 2009). It is well known that climate and hydrological characteristics of terrain are very important for

agricultural production (Hamjah, 2014). Pančevo has moderate continental climate with warm and dry summers, and short and mild winters (see: Climate data for cities worldwide – Climate – Pancevo).

Hydrological characteristics of territory belonging to the Municipality of the City of Pančevo and its surroundings are also very favourable for intensive agricultural production, as well are the major geomorphological characteristics of the terrain (Hamović et al., 2010).

Territory belonging to the Municipality of the City of Pančevo is an integral part of the Pannonian Basin with further geomorphological units: (1) loess plain (part of the Southern Banat loess plateau); (2) Pančevo loess terrace; and (3) alluvial plains, formed along the banks of the Danube and Tamiš (Hamović et al., 2010).

There is plenty of surface and ground waters in Pančevo (see: The City of Pančevo). Ground waters encompass shallow (phreatic) and deep (artesian) water-bearing layers. Surface waters could be divided into natural ones (rivers: Danube, Tamiš, Nadela, and Ponjavica) or artificial (melioration canals and artificial lakes) (Hamović et al., 2010).

According to the aforementioned facts, the territory belonging to the Municipality of the City of Pančevo has quality arable land and many other agricultural advantages (e.g., a developed system of canals for agricultural irrigation) and thus possesses a great potential for economically efficient and versatile crops and livestock production (see: The City of Pančevo).

On the other hand, it is shown that intensive agricultural production alters hydrological cycles in many (agricultural) areas in the world due to the complex soil preparation (e.g., artificial terrain drainage, irrigation and the like) (Haygarth and Jarvis, 2001).

Agricultural production is also assumed to be one among the main threats to biodiversity (see: The Belgian clearing-house mechanism of the convention on biodiversity). Agriculture and biodiversity are unfortunately often treated separately, even though it has been evidenced that biodiversity underpins much of modern agriculture and that conventional agriculture causes a significant biodiversity loss (Rodrigues et al., 2004; Scherr and McNeely, 2008).

As the biodiversity crisis has become more apparent, a significant increase in the number of protected areas in recent years is monitored world-wide (see: New UNEP report unveils world on track to meet 2020 target for protected areas on land and sea). The global network of protected terrestrial areas covers 15.4% of the world's surface area at the moment, with the majority of these falling within categories I-IV of the IUCN's classification (see: New UNEP report unveils world on track to meet 2020 target for protected areas on land and sea). At the same time, our knowledge regarding the extent of which the current (global) protected natural areas accomplish their goal of protecting biodiversity is still insufficient (Rodrigues et al., 2004).

## Conclusion

Since the economists see the future of Pančevo in the context of intensifying agricultural production, especially organic agricultural production of healthy and safe food, of both – plant and animal origin, it is necessary to improve the quality of the environment in Pančevo (Jelinčić and Djurović, 2009; see: The City of Pančevo).

To promote future sustainable land use in areas with significant environmental degradation, well planned restoration of degraded agricultural soil (e.g., soil polluted by heavy metals and other pollutants / toxicants – from various agricultural and / or industrial wastes, etc.) should be considered way before any ecological action is taken.

Besides the urgent investments in soil remediation in Pančevo – in accordance with the highest standards stipulated by the European Union – a sustainable agriculture and complex prevention of biodiversity loss on the entire municipal territory should be considered the key action by the local government in Pančevo (as well as of its counterparts on provincial and national levels) (Duš et al., 2013).

A detailed analysis of relevant documents done by Duš et al. (2013) revealed that during the period 2000-2010, the Municipality of the City of Pančevo initiated only one soil quality examination on its territory (2003/2004), with the aim of preventing future soil degradation and pollution, as well for planning necessary soil remediation procedures / methods. If sporadic efforts in this context are excluded, it may be concluded that a planned soil remediation on the territory of the Municipality of the City of Pančevo was not done during last 4 decades

(Jelinčić and Djurović, 2009; Duš et al., 2013)! The Ministry for Environment, Land and Sea of the Republic of Italy and the Ministry of Environmental Protection of the Republic of Serbia signed, in 2002 in Johannesburg, a Memorandum of Understanding, to which the City of Pančevo acceded in an Annex (Jelinčić and Djurović, 2009; Duš, 2011). Subsequently the project: "Monitoring Environment and Sustainable Requalification of Selected Industrial Zones in the Republic of Serbia: Pilot project Pančevo" – was designed.

In early February 2005, the Italian Ministry opened a local office in Pančevo, and as a part of the Action Plan for Pančevo, the Italian experts drafted, in 2006 and 2007, twelve projects to determine the state of the environment and promote its quality in Pančevo and submitted them to the Pančevo Environmental Protection Secretariat in the form of technical reports and project designs (Jelinčić and Djurović, 2009, 2010; Duš, 2011). Nothing more than project designs and feasibility studies were unfortunately done (Jelinčić and Djurović, 2009, 2010; Duš, 2011).

This devastating information also represents a cross-section of the general state in the environmental protection sector in Serbia, primarily since Pančevo – according to numerous independent estimates – is at the very top of the list of the biggest ecological "black spots" in SE Europe / Europe (Duš et al., 2013). At the same time little has been done to protect and improve the quality of the environment and natural resources / (urban) biodiversity conservation in Pančevo (Jelinčić and Djurović, 2009, 2010; Duš et al., 2013). It also depicts the unawareness regarding the importance of good environmental practices / (urban) biodiversity conservation for the development of sustainable agriculture in Serbia, as well as for the prospective Serbian relevance at the global market of organic food (Duš et al., 2013).

Investing in afforestation and sustainable agriculture sounds like a good model to improve (urban) biodiversity (Scherr and McNeely, 2008). Forests are among the most important repositories of terrestrial biological diversity (see: Biodiversity for a world without hunger). Biological diversity is the basis for a wide array of goods and services provided by forests (see: Biodiversity for a world without hunger).

Unfortunately, only 7% of the total territory belonging to the Municipality of the City of Pančevo is covered by forests – which has been estimated: insufficient (Jelinčić and Djurović, 2009, 2010). According to the Spatial Plan for the Republic of

Serbia, adopted in 1996 for the period of 15 years – an optimal afforestation for the Pančevo / South Banat District / is 17.9%. The integration of (urban) biodiversity conservation and sustainable agricultural production goals, therefore, should be the focus of any environmental policy created by the local government in Pančevo. One should bear in mind that (urban) biodiversity conservation and ecological restoration in human dominated ecosystems (=urban ecosystems) should be strengthened through real connections between sustainable agriculture and (urban) biodiversity.

Moreover, the managing landscapes on a multi-functional basis, that combines healthy food production, (urban) biodiversity conservation and the maintenance of (urban) ecosystem services, should be at the forefront of any effort to achieve healthy living in any urban areas in Serbia including the Municipality of the City of Pančevo.

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## *Biodiverzitet urbanih sredina – 1. Degradacija životne sredine u gradu Pančevu (Srbija)*

### **SAŽETAK**

Najuočljiviji ekološki problemi u Pančevu povezani su sa proizvodnjom u tzv. Južnoj industrijskoj zoni u kojoj su skoncentrisani najznačajniji ekonomski potencijali Pančeva (=Hemijska industrija Pančevo [HIP] „Azotara”, HIP „Petrohemija” i Rafinerija nafte Pančevo) i to nadomak naseljenih mesta. Izgradnja ovih fabrika na pravcu dominantnih vetrova, zastarela tehnologija, koja se u njima koristi već trideset do pedeset godina – bez adekvatne modernizacije, ilegalna (do)gradnja bez poštovanja važećih urbanističkih planova, permanentno kršenje zakona iz domena zaštite životne sredine, kao i posledice NATO bombardovanja tokom 1999. godine, smatraju se glavnim uzrocima degradacije životne sredine u Pančevu. Tokom nekoliko poslednjih decenija, najveći ekološki izazov za Pančevce predstavlja loš kvalitet vazduha, mada su ozbiljni ekološki problemi uočeni i u sektorima vodosnabdevanja, upravljanja otpadnim vodama, zaštite od buke, zaštite javnog zdravlja, remedijacije zemljišta, zaštite biodiverziteta i dr. Demokratska tranzicija Srbije koja se odigrala 5. oktobra 2000. godine, kao i strateško opredeljenje Srbije za proces evropske integracije, doprineli su reformi zakonodavstva u oblasti zaštite životne sredine, neophodnoj za implementaciju modernijih i efikasnijih politika zaštite životne sredine. S obzirom da su (urbani) ekosistemi u Pančevu pretrpeli značajnu degradaciju, koja je višestruko negativno uticala na stanje (urbanog) biodiverziteta i kvalitet života ljudi u ovom gradu, navedenim ekološkim problemima u Pančevu mora se posvetiti posebna pažnja na svim nivoima vlasti u Srbiji, a poglavito u jedinici lokalne samouprave u Pančevu.

**Ključne riječi:** Degradirana životna sredina, urbana ekologija, Pančevo, Srbija.