

## PROTECTION OF LAND IN THE REPUBLIC OF SERBIA AND ECOLOGICAL SECURITY WITH REGARD TO STRATEGIC AND LEGAL FRAMEWORKS

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### Summary

*It is widely known that ecological and socioeconomic functions of the land are the basis for social and economic well-being. Despite this fact, land is still a relatively neglected natural resource, which can be concluded by analyzing the pressures on the land and the lack of systematic monitoring, which involves considering the situation and defining the program for its protection. In addition, insufficient allocations for solving these complex problems are evident, which, in addition to the inefficiency of the start-up, an-institutional and legal framework for land protection in the Republic of Serbia, ultimately lead to degradation of environmental security. Bearing this in mind, this paper emphasizes the need of adopting effective land protection measures in order to preserve ecological security, that is, an environmental management system that would reflect the tendency to eliminate negative environmental and human health impacts.*

**Key words:** *land, land degradation, land protection, environment, ecological safety.*

**JEL:** *Q11, Q15, K32*

### Introduction

It is usually said that the story of the land is older than the story of human. The bondage of human to land has been immortalized in numerous film achievements, poems and novels. That's why the rule has always been that the "land as a gift" is transferred to the next

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generation in the best possible conditions. However, most people do not treat the land in an adequate way, despite the fact that fertile soil is the key to our existence and has a vital role in our survival, as it is linked to our food supplies. Healthy/fertile soil guarantees the survival of plants because it provides them with the nutrients they need for survival. Plants ensure the survival of people, because the nutritional ingredients needed for survival of all living organisms, including humans, come directly or indirectly from plants. Therefore, care of the soil is extremely important, because without healthy soil there would be no plants, without plants there would be no food, and without food, which is our basic physiological need and is necessary for our survival, there would be no us. According to statistics, the Republic of Serbia is among the European countries with favourable land resources. The area of the Republic of Serbia (without the region of Kosovo and Metohija) is 7,748,400 ha. Compared to the total area of the state, 46% is agricultural land, 29.1% are forests and 13.3% are meadows and pastures. The land of the Republic of Serbia is diverse, due to the positive influence of the climate, vegetation and micro fauna, and in relation to other countries, the cultivation of crops is possible over 200 days a year on two-thirds of the land. Bearing in mind the fact that soil protection plays a key role in the perspective of our environment, solving environmental problems must be strategically thought out, and decision makers must focus on the problem of land protection, in particular the reduction of contaminated land. In the Republic of Serbia, there are about 400 potentially contaminated and really contaminated soils that can endanger health safety in the country. The results of previous research in Serbia are identified as the main causes of public utility landfill, industrial-commercial sites and industrial waste landfill, with additional danger for the exposure of the Serbian population that resulted from the use of depleted uranium ammunition NATO forces used during bombing of military and civilian targets in 1999 in some parts of Serbia. Finally, endangering the environment and protecting it are multifaceted problems of humanity. The lack of harmony between nature and man has created various and many dangers that degrade the existing civilization achievements, inflict great damage on people, their life and health, their physical integrity and many other values. Therefore, the importance of protecting the environment is imposed as the most important global challenge for modern society. Hence, the positioning of ecological security as a significant security sector, in recent times, is a necessary and “healing” need. In order to reduce the threat to environmental elements and protect health of the population, a number of strategic documents in the field of agriculture and rural development have been adopted in the Republic of Serbia in the past few years.

### **Strategic and Legal Frameworks for Land Protection in the Republic of Serbia**

Clearly defined strategic, institutional and legal frameworks have significant contributions to the development of the agricultural sector. After endangering environmental security in certain countries and regions, awareness of decision makers, managers and politicians about nature protection have increased. Therefore, the newly emerging situation at the global level has influenced the development of the scientific field of environmental management - aiming to manage the environment through the adoption of a number of strategies defining the principles and criteria of nature protection. Among the group of important documents in this domain, in national frameworks, a

special place is taken by the Strategy of Agriculture and Rural Development of the Republic of Serbia for the period 2014-2024, adopted by the Ministry of Agriculture and Environmental Protection.<sup>4</sup>The Strategy states that each state has the responsibility to define the framework of political and institutional changes that contribute to more efficient development of the agricultural sector and the well-being of rural residents. In order to adequately fulfil this role, the state's obligation is to respond to the current challenges by a stable, long-term and efficient policy. In this respect, the development of this Strategy is motivated by the need to respond to the new concept of agricultural policy on internal and external challenges, such as:

- 1) The need to reduce technological development lag in competitor countries and enable more efficient confrontation of the agricultural sector with the effects of climate change;
- 2) The necessity of increasing the efficiency of the food chain and the competitiveness of the food sector;
- 3) Providing a stable income and business environment for farmers and other entrepreneurs;
- 4) Achieving the economic, ecological and social goals of sustainable development, where multifunctional agriculture and rural development take a special place;
- 5) The willingness to respond to the demands arising from the process of joining the World Trade Organization and the European Union.

To successfully address these challenges, the Strategy aims to define:

1. Directions of future development of agriculture and food industry, based on the concept of sustainable development, which affirms the preservation of the environment and sound management of natural resources;
2. A model of support that would lead to acceleration of development of the agro-food sector, which has significant potentials for increasing production volumes and a long-term sustainable growth of competitiveness in an environment wider than local-regional one;
3. The directions of future reforms of agricultural policy and institutional framework, in the three most important segments. In addition to the aforementioned Strategy in the Republic of Serbia, there is an extensive legislation on environmental protection, which directly or indirectly affects the protection of land and systematic monitoring of land quality:
  - National Strategy for Sustainable Use of Natural Resources and Goods (The Strategy was published in the “Official Gazette of the Republic of Serbia” No. 33/2012 of 15 April 2012);

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4 Ministry of Agriculture and Environmental Protection, Agriculture and Rural Strategy 2014-2020 available at: <http://uap.gov.rs/wp-content/uploads/2016/05/STRATEGIJA-2014-2020-.pdf>

- Decree on the Program for Systematic Monitoring of Land Quality, Indicators for Assessing the Risk of Land Degradation and the Methodology for Development of Remediation Programs (“Official Gazette of RS” No. 88/10);
- Law on Land Protection (“Official Gazette of the Republic of Serbia”, No. 112/2015);
- Law on the Spatial Plan of the Republic of Serbia from 2010 to 2020 (the Law was published in the “Official Gazette of the Republic of Serbia” No. 88/2010 of 23 November 2010);
- Decree on Determining Activities Whose Performance Affects the Environment (the Regulation was published in the “Official Gazette of the Republic of Serbia” No. 109/2009 and 8/2010);
- Decree on the Establishment of the List of Projects for which the Impact Assessment is mandatory and the List of Projects for which an Environmental Impact Assessment may be required (the Regulation was published in the “Official Gazette of the Republic of Serbia” No. 114/2008 of 16.12.2008);
- Law on Environmental Impact Assessment (The Law is published in the “Official Gazette of the Republic of Serbia”, No. 135/2004, 36/2009);
- Law on Strategic Environmental Impact Assessment (The Law was published in the “Official Gazette of the Republic of Serbia”, No. 135/2004 and 88/2010);
- Law on Environmental Protection (the Law is published in the “Official Gazette of the Republic of Serbia”, No. 135/2004 and 36/2009);
- Law on Packaging and Packaging Waste (“Official Gazette of RS”, No. 36/2009);
- Law on Amendments to the Law on Environmental Impact Assessment (“Official Gazette of RS”, No. 36/09);
- Law on Amendments to the Law on Environmental Protection (“Official Gazette of RS”, No. 36/09);
- Law on the Prohibition of the Development of the Production of Chemical Weapons Storage and Use and its Destruction (“Official Gazette of the Republic of Serbia”, No. 36/09 of 15 May 2009);
- Law on Protection and Sustainable Use of Fish Fund (“Official Gazette of the Republic of Serbia”, No. 36/09 of 15 May 2009);
- Law on Protection against Ionizing Radiation and on Nuclear Safety (“Official Gazette of RS”, No. 36/2009 and 93/2012);
- Law on Air Protection (Official Gazette RS, No. 36/09, 10/13);
- National Strategy for Sustainable Development (Official Gazette RS, No. 55/05, 71/05 - correction and 101/07);
- Decree on the Conditions for Monitoring and Air Quality Requirements (Official

Gazette of RS, No. 11/10, 75/10, 63/13);

- Decree on Determining Zones and Agglomerations (Official Gazette of RS, No. 58/11 98/12);
- Decree on Determining the Air Quality Control Program in the State Network (Official Gazette of RS, No. 58/11).

### **Land as the Most Important Natural Resource for the Republic of Serbia**

Land is the most important natural resource for all countries. That is why its protection is vital for the survival of people and their surroundings. “Healthy land” in Serbia should be viewed not only in the context of quality and safe nutrition of the population although in the contemporary human culture food safety is one of the basic preoccupations (Bjelajac et al. 2015) this open space is needed to protect the supply of drinking water and clean air, promote a healthier, more active way of life, preserve habitats for original plant and animal species, and provide places for breeding and breeding birds. So, by taking care of the open space, we protect both forests and fields, plants, birds and animals that are essential for balance and biodiversity. At the same time, we provide conditions for children, young people and the elderly to have access to an open space for recreation, spiritual growth and health promotion activities.

Different types of soil have been created in the territory of Serbia under the influence of diverse composition of the climate, water and rock, and the quality and quantity of humus were taken as indicators of their quality; out of these, most important are:

- Crnica/Humuša -The most fertile soil in Serbia, rich in humus. It is most widespread in Vojvodina, Stig and in one part of Mačva;
- Gajnjača - Fertile and compacted clay soils, which are mostly cultivated on the low mountains of the South periphery of the Pannonian Basin and the basins of the South Morava;
- Smonica/Glinuša - It belongs to our most fertile soils.It is rich in humus and is widespread in the lower parts of Šumadija, the largest part of Mačva, at the bottom of the basin and in the valleys of Timok, the South Morava and the Western Morava;
- Aluvijalnozemljište/Peskuša - It occurs along all rivers. It consists of river deposits, silt, sand and gravel deposited during floods. It belongs to fertile soil rich in nutrients and is easily processed;
- Pepeljuše - Our most widespread and least fertile ground with little humus. It can be found in our mountainous regions. It is the land of forest vegetation;
- Crvenica - It was formed from an insoluble part of the limestone. It is locally distributed in the Starovlaška and Raška highlands, the Metohija Basin and Eastern Serbia.

**Table 1.** Types of soils in the Republic of Serbia with basic data on their characteristics

Type of soil	Surface area (ha)	Worthiness	
		limitations	productivity
Kamenjar (litosol)	77,757	serious	unproductive
Eolski pesak (arenosol)	86,000	worthy	poor to medium well
Krečnjačko-dolomitna crnica (kalkomelanosol) i smeđe-krečnjačko (kalkokambisol)	910,000	worthy to medium well	poor to medium
Humusno-silikatno zemljište (ranker)	324,000	moderate to worthy	productive for meadow-pasture production
Černozem	1,200,000	without	highly productive
Smonica (vertisol)	680,000	moderate	productive
Eutrično smeđe-gajnjača (eutrični kambisol)	437,000	moderate	productive
Distričnosmeđe-kiselosmeđe (distrični kambisol)	2,607,000	worth	poor to medium productive
Zemljišta na serpentinu (ranker eutrično smeđe)	268,000	worthy to medium	poor to medium productive
Pseudoglej	500,000	moderate to worthy	conditionally productive
Aluvijalno zemljište (fluvisol) i ritska crnica (humoglej)	675,000	without restriction to serious	Conditionally highly productive (melioration)
Solončak i solonjec (zaslanjena i alkalizovana zemljišta)	233,000	worthy	poor to medium productive
Ukupno	8,836,757	-	-

Source: Law on Spatial Plan of the Republic of Serbia from 2010 to 2020 (“Official Gazette of the Republic of Serbia”, No. 88/2010)

As it is noticed from the enclosed soil cover of Serbia, it is specific to a large number of systematic units that were created as a result of complex conditions of development and land development, which resulted in very diverse land: from fertile plains in the north, lime and base soils in the east, clay soils on the mountains and hills in the southeast, to humusy, clayey, sandy, humus-silicate, etc.

From the table above, which describes the types of soil in Serbia, we can notice that the largest territorial distribution from the productive land has černozem with 1,200,000 ha, smonica with 680,000 ha and aluvial land with 675,000 ha. Out of the less productive land, the most widespread isdistillate brown soil with 2,607,000 ha. It is interesting to note that after fifty years, for the first time in 2012, the Agricultural Survey in the Republic of Serbia was conducted. The inventory was carried out in accordance with the World Census Program and the Eurostat’s Methodology. The goal of implementing the Agricultural Census was to obtain a clearer picture of the state of the agricultural sector, as well as to create an internationally comparable database and a statistical registry of RS agriculture. According to the results of the Agricultural Census 2011/2012 in

the Republic of Serbia, there is a total of 3,437,423 ha of agricultural land, out of which 73.1% are arable and gardens, 20.7% meadows and pastures, 4.8% orchards, 0.6% vineyards, 0.7% house gardens and 0.1% other plantations. In the group of arable land and grassland, the production of grain is mostly represented, and only then the production of vegetables and industrial plants. The total area of grain on the territory of Serbia in 2016 was 595,118 ha with an annual yield of 4.8 t / ha. In the category of permanent plantations, there are mostly orchards and growing of berries.<sup>5</sup>

**Table 2.** Worthiness structure of the productive land in Serbia

Type of worthiness	Površina(km <sup>2</sup> )				Struktura(%)			
	Serbia	Vojvodina	Serbia	KiM	Serbia	Vojvodina	Serbia	KiM
1	11.650	9.688	1.675	287	14,4	51,4	3,2	2,8
2	9.357	3.284	5.481	592	11,6	17,4	10,6	5,8
3	10.522	3.823	5.383	1.316	13,0	20,3	10,5	13,0
4	8.682	355	7.133	1.194	10,8	1,9	13,8	11,8
Total suitable for processing	40.211	17.150	19.672	3.389	49,8	91,0	38,1	33,4
5	11.073	531	9.002	1.540	13,7	2,8	17,4	15,2
6	20.144	889	17.185	2.070	25,0	4,7	33,2	20,4
7	8.069	193	5.232	2.644	10,0	1,0	10,1	26,1
8	1.178	72	604	502	1,5	0,5	1,2	4,9
Total Unsuitable for processing	40.464	1.685	32.023	6.756	50,2	9,0	61,9	66,6
Total productive surface	80.675	18.835	51.695	10.145	100,0	100,0	100,0	100,0
Infertile	7.686	2.671	4.273	742	-	-	-	-
Total	88.361	21.506	55.968	10.887	-	-	-	-

Source: Spatial Plan of the Republic of Serbia 2010-2020 (“Official Gazette of the Republic of Serbia”, No. 88/2010)

### Key Indicators of the State and Land Degradation in the Republic of Serbia

It is understood that the land is, above all, a natural resource that can be renewed by reasonable use. However, despite the higher level of standards and technology in

<sup>5</sup> Statistical Office of the Republic of Serbia, Census 2012, <http://pod2.stat.gov.rs/ObjavljenePublikacije/Popis2012/PP-knjiga1.pdf>.

soil processing, drastic changes in soil because of pollution occurred, primarily due to adynamic degree of urbanization and industrialization. Although land belongs to renewable resources, man is increasingly endangered by the activity of the land fund, where in addition to pollution, a special problem is the permanent destruction of arable land. In addition, land contamination is not an isolated problem concerning one country or region, but rather a global problem that is widespread. Land contamination usually arises from localized sources of pollution, such as industrial facilities, and through diffuse pollution from atmospheric precipitation such as acid rain, the spread of chemicals from farms and the same soil erosion that can reduce nutrient levels. Local land contamination is present in the areas of intensive industrial activity, inadequate landfills, mines, at sites of different incidents. Land is an important natural resource, which is difficult to maintain and regenerate, unlike other natural resources. Land degradation, which involves a set of processes caused by human activity, greatly diminishes the quality of the land. The once-damaged quality of the soil is difficult to regenerate. Large areas of land are degraded by irrational and inadequate use. Land degradation results from loss of nutrients, erosion by water and wind, desertification, shading, chemical pollution, radionuclide waste pollution, mechanical degradation in soil processing, loss of humus, etc. Land loss occurs with poorly planned expansion of urban and suburban settlements, construction of infrastructure and industrial facilities. Degradation may have a mild degree of damage to soil resulting from the inadequate application of agro technical and hydrotechnical measures applied in agricultural production.<sup>6</sup>

European Environment Agency (EEA)<sup>7</sup> follows the indicators that are important for monitoring changes and creating environmental policies. Based on the Corina Land Cover (CLC) database from 2000, 2006 and 2012, the indicator of changes in land use patterns is monitored. This indicator indicates changes in agricultural, forest and another land, such as deforestation, extension of residential areas or tourist facilities, drying of wet habitats, etc. To map changes over time, there are 44 classes of land cover that specifically indicate how decisions made across Europe lead to a change in the landscape's appearance. The results of the CLC database show that in the period from 2000-2012 several changes in the use of land use have been determined, for a total of 1.15% of the total territory. The largest changes were recorded in urban areas in the pasture and mixed agricultural area (37%), arable land and permanent plantations (33%), as well as forests and transitional forest area (28%).

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6 <http://vssp.edu.rs/wp-content/uploads/2017/03/Prirucnik-Bezbednosno-upravljanje-ljudskim-resursima.pdf>, str.1-55

7 European Environment Agency, <https://www.eea.europa.eu/publications/land-recycling-in-europe>).



**Table 3.** Changes according to the CLC database

SURFACE CHANGES 2000-2012	
Pastures and mixed agricultural areas	37%
Arable land and permanent plantations	33%
Water basins	0,8%
Natural grasslands	0,2%
Forests and transitional forest area	28%
Wetlands	0,3%

Source: EEA, Corina Land Cover (2012)

The use of land in Serbia is accompanied by a number of different problems, such as the fragmentation of the plot, the extent of use, the insufficient introduction of organic matter and degradation processes caused by the action of nature and man. The solution of the problem is in the more intensive use of land, the consolidation of the property, the greater introduction of organic matter and the reduction of degradation processes. Land map in RS is determined on the basis of the Report published by the Environmental Protection Agency,<sup>8</sup> pointing out that the main causes of land destruction are:

1. Erosion
2. Soil contamination
3. Reduction of organic matter
4. Land acquisition by construction
5. Reduction of land biodiversity
6. Salinization
  - **Erosion:** The biggest cause of soil degradation is erosion. According to the National Environmental Program<sup>9</sup> in the territory of Serbia, erosive processes are currently present (even up to 80% of the territory is occupied). The data show that AP Vojvodina in the territory has 85% erosive processes with an average loss of land greater than 0.9 t / ha per year. Due to water erosion  $\frac{1}{4}$  of the land particles are lost.

8 Environmental Protection Agency, [http://www.sepa.gov.rs/index.php?menu=204&id=201&akcija=showXlinked\\_nopagenum](http://www.sepa.gov.rs/index.php?menu=204&id=201&akcija=showXlinked_nopagenum)

9 National Environmental Program (2010), [http://www.zzps.rs/novo/kontent/stranicy/propisi\\_strategije/ Nacionalni\\_program\\_zastite\\_%20zs.pdf](http://www.zzps.rs/novo/kontent/stranicy/propisi_strategije/Nacionalni_program_zastite_%20zs.pdf)

- **Contamination of soil:** When we talk about potential sources and the way of contamination of the soil then this pollution can come through:<sup>10</sup>
- Air pollution, atmosphere - emissions from technological processes, emissions from burning fossil fuels, residential buildings, emissions from exhaust gases of cars, emissions from combustion of biomass, forests, etc. Pollutants in the form of gases, vapours, aerosols or dust reach the surface of the soil by washing with rain, and aerosols and particles directly by sedimentation;
- Pollution from wastewater - wastewater from technological processes, domestic waste water, polluted water due to agricultural activity, etc. Pollutants present in liquid and ground water pollute the land this water gets in contact with;
- Solid waste pollution from the economy, households and agriculture, which is one of the most significant ways of pollution.

Heavy metals, released in the air in the form of rain and gases, reach the Earth. Such a type of soil contamination affects agricultural crops and the quality of the fruit that endangers health food safety. Therefore, in the last few years, special attention has been devoted to testing soil quality and its contamination. The results of previous research have shown that most of the land in Serbia is not contaminated. (Protic et al 2003) In Serbia, copper contamination is present due to anthropogenic activities, most often in the vicinity of mines, vineyards and fruit trees. Heavy metals also contain the concentration of nickel in soils formed on the walls, such as soils in mountainous areas such as Zlatibor, Meljena and Suvobor, near the river Ibar, around Vrnjačka Banja, parts of Eastern and Central Serbia. The average lead content is present in parts of Central Serbia, especially in parts of the Belgrade-Niš highway and along the western Morava stream. Zinc is widespread in sandy, carbonate and highly acidic soils. While the arsenic is characteristic of the land in the vicinity of Valjevo, Čačak, Trstenik and Planina Čemerno. After all, one should not ignore the fact that the environmental and health consequences of NATO bombing in 1999, due to the use of depleted uranium missiles, are unimaginable. Namely, prior to the contamination of a certain part of its territory, Serbia was one of the cleanest green oases of Europe, with great opportunities for healthy food production.

**Land acquisition by construction:** Unlike the land in rural areas, land in upland areas is threatened by the consequences of human behaviour. As an outbreak of land degradation in urbanism environments, pollution of water and air, which is accompanied by dust and exhaust gases, are listed. Also, the problem is the spread of urban centres, the construction of airports, roads, industrial zones, hydroelectric power stations, etc. The results of the survey have shown that about 5,900 ha of agricultural land is lost annually.<sup>11</sup> In some urban areas, land is so burdened that it requires special treatment and monitoring.

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<sup>10</sup> [www.gov.me/files/1247500271.doc](http://www.gov.me/files/1247500271.doc).

<sup>11</sup> Agency for Environmental Protection, Report on the state of land in the RS (2009) [http://www.sepa.gov.rs/download/Stanje\\_zemljista.pdf](http://www.sepa.gov.rs/download/Stanje_zemljista.pdf)

**Reduction of organic matter:** Organic matter greatly contributes to the quality of the soil. Research has shown that anthropogenic activities significantly affect the reduction of organic matter such as inadequate application of organic fertilizers, overtime grazing, natural disasters (droughts, floods, fires). Reducing the content of organic matter, the soil becomes subject to compactization (hardening), which restricts the growth of plant root, While the soil has less ability to retain water in its composition and becomes dependent on irrigation at the same time, such soil becomes vulnerable to the precipitations of swelling of water through the field on mild slopes between depression and higher terrain) and susceptible to erosion.

**Salinization:** Salinization is an excessive accumulation of salt in the soil composition. The largest coverage of saline soil is in AP Vojvodina, with a share of 12%, while 2% of the land in Central Serbia is in the alkaline group.

**Pestel Analysis of the State of Land Resources in Serbia**

Pestel is an acronym derived from the following words: political factors, economic factors, sociological factors, technical and technological factors, legislative factors. It studies the macro environment and is the basis for strategic planning. In order to be able to create an adequate strategy for the protection of land resources in Serbia, we need to collect enough data to analyze the macro environment. PESTEL analysis is certainly the first step in creating a strategy, and through which we can obtain all the necessary information on political, economic, social, technical, technological, environmental and legislative (legal) environment, which are key factors in this analysis. An unstable macro environment can be a significant obstacle to effective action, and the subject analysis can help us to identify all potential threats and chances, as well as the benefits and disadvantages of the state of land resources in Serbia.

**Table 4.** Pestel analysis of the state of land resources in Serbia

Factors	Advantages	Disadvantages
Political	-Partly harmonized national regulations with EU legislation and international conventions -Existence of relevant institutions: the Ministry of Agriculture and Environmental Protection (Environmental Protection Agency, Agricultural Land Administration) and the Provincial Secretariat for Urban Planning, Construction and Environmental Protection	– Incomplete political framework -Lack of specific planning documents –Limited competence of local self-government in decision-making on land resources management – Incomplete restitution process

Factors	Advantages	Disadvantages
Economic	<ul style="list-style-type: none"> <li>– Source of raw materials: water, clay, sand, gravel, minerals and various types of fuel</li> <li>– Development of rural economy</li> <li>–Support to diversification of farm income</li> <li>–Improvement of the state of the infrastructure</li> <li>– Favorable ratio of available area per inhabitant and employed in agriculture</li> <li>– Low labour cost</li> <li>–High competitiveness of crop and vegetable production in the regional market</li> <li>– The competitiveness of some products in the wider international market</li> <li>– The privatization process has been largely completed</li> </ul>	<ul style="list-style-type: none"> <li>–Nondisclosure of funds for implementation of planned provisions.</li> <li>– Negative impacts and consequences of the economic crisis.</li> <li>–Lack of funding for systematic research on quality control and soil fertility</li> <li>–Insufficient budget allocated to address the problem of soil contamination</li> <li>–Dissatisfaction of the local population with material status if expropriation measures are being implemented</li> <li>–Further decline in standards and purchasing power in the country and the environment</li> </ul>
Social	<ul style="list-style-type: none"> <li>–Function of geographical and cultural heritage and physical and cultural environment</li> <li>–Enables/provides space for the construction of facilities - infrastructure</li> <li>– Growing organic production sector</li> </ul>	<ul style="list-style-type: none"> <li>–Different forms of degradation (exploitation of mineral resources, intensive urbanization, industrial processes, traffic, agricultural activity, erosion processes, etc.)</li> <li>– Low level of soil awareness as an important element of the environment</li> <li>–Uncontrolled, unplanned, unlawful and inadequate occupation of (fertile) land (eg landfills, tailings)</li> <li>– Land conversion</li> <li>– Small size of farms and fragmentation of plots</li> <li>– Increasing the area of unused agricultural land</li> <li>–Adverse age and education structure of labour in agriculture</li> <li>– Creating pillars</li> </ul>

Factors	Advantages	Disadvantages
<p><b>Technical and Technological</b></p>	<ul style="list-style-type: none"> <li>-Some progress in the systematic collection of data on the state of land (preparation of inventories of contaminated sites, publication: Report on the state of land in the Republic of Serbia - SEPA, Program for systematic monitoring of soil quality on the territory of the Republic of Serbia)</li> <li>- Monitoring land use indicators: changes in land use, soil erosion, organic carbon content in soil and management of sealed locally within the National List of Environmental Indicators (SEPA)</li> <li>- The inclusion of Serbia in the creation of the Geochemical Atlas of Europe for agricultural land</li> <li>- Existence of a pollutant cadaster</li> <li>- Benefits for irrigation</li> <li>-Significantly improved technology in some subsectors</li> <li>- A large number of scientific and educational institutions that can be involved in the system of knowledge creation and transfer</li> </ul>	<ul style="list-style-type: none"> <li>-Low level of technical, technological and institutional development</li> <li>-Insufficient technical equipment of institutions (quality of equipment and conditions for research) primarily to obtain analytical data acceptable to EU standards, and are related to different types of soil contamination</li> <li>-Insufficient scope of cooperation with professional institutions in Europe and the world (data exchange, cooperation on projects and staff development)</li> <li>-Lack of systematic monitoring in certain parts of the territory of the Republic of Serbia, and incomplete comparison of results from previous years</li> <li>-Lack of harmonized methods of collecting and analyzing samples, as well as data presentation</li> <li>- Incomplete information for analyzing the situation and the pressure on the land</li> <li>- Uncoordinated and unrelated work of institutions dealing with land survey and those engaged in the exploitation of other natural resources from the land (energy, ore, etc.)</li> <li>-Lack of agricultural infrastructure (field roads, irrigation, drainage, windbreaks)</li> <li>-Unsatisfactory condition of equipment and mechanization</li> </ul>
<p><b>Ecological</b></p>	<ul style="list-style-type: none"> <li>- Basic element and resource</li> <li>- Production of biomass</li> <li>- Conservation of species and genetic biodiversity</li> <li>-Accumulation, filtration and transformation of nutrients and water</li> <li>- Reservoir of biodiversity and carbon</li> <li>- Favorable natural conditions</li> <li>- The ability to produce healthy food</li> <li>- Good quality and structure of agricultural land</li> </ul>	<ul style="list-style-type: none"> <li>- Intentional or accidental introduction of allochthonous invasive species of flora and fauna</li> <li>- Damage caused by the influence of biological agents</li> <li>- natural disasters</li> <li>-Erosion, salinization, loss of nutrients, chemical pollution from bioindustrial sources, mechanical compaction (heavy machinery), locking, loss of fertility, trampling</li> <li>- Trend of loss of agricultural land</li> </ul>

Factors	Advantages	Disadvantages
Legislative	<ul style="list-style-type: none"> <li>–Law on Environmental Protection (Official Gazette of the Republic of Serbia, No. 135/04)</li> <li>–Law on Agricultural Land (Official Gazette of the Republic of Serbia, No. 62/06, 65/08 - other law and 41/09)</li> <li>–Rulebook on permitted quantities of hazardous and harmful substances in soil and irrigation water and methods for their examination (Official Gazette of the Republic of Serbia, No. 23/94)</li> <li>–Rulebook on the National List of Environmental Indicators (Official Gazette of the Republic of Serbia, No. 37/11)</li> <li>–National Strategy for Sustainable Use of Natural Resources and Goods (Official Gazette of the Republic of Serbia, No. 33/12)</li> <li>– National Strategy for Sustainable Development (Official Gazette of RS, No. 55/05)</li> <li>– National Environmental Program</li> <li>– Decree on the program for systematic monitoring of soil quality, indicators for assessing the risk of land degradation and the methodology for the development of remediation programs (Official Gazette of RS, No. 88/10)</li> <li>–Decree determining the criteria for determining the status of a particularly endangered environment, the status of a threatened environment and for determining the priorities for rehabilitation and remediation (Official Gazette of the Republic of Serbia, No. 22/10)</li> </ul>	<ul style="list-style-type: none"> <li>–Incomplete legal regulations in the area of monitoring and protection of land</li> <li>– Lack of strategic documents in the domain of land resources</li> <li>– Non-enforcement of laws</li> <li>– Low or non-existent legal provisions for pollution and inadequate management</li> <li>– Insufficient coverage with inspection services</li> </ul>

Source: (Djordjević, 2016)

As noted, the PASTEL analysis allows us to examine the key factors in the macro environment, that is, those that have an impact on the realistic view of the state of land in the Republic of Serbia. After identifying the key factors, that is, the advantages and disadvantages contained therein, it is possible to create different scenarios, by which it is certain to predict the state of the land in the immediate future, with particular reference to the trends in the key factors of change. Also, each analysis, even this one, serves to create appropriate strategies, that is, documents that will contain all the necessary guidelines and help us achieve the set goals.

### **Measures for soil protection in order to preserve ecological safety**

Serbia, as well as all countries in the world, faces numerous crises related to environmental degradation, caused by various pollutants and other influences, due to irresponsible and inappropriate human activities. Addressing numerous challenges, risks and threats requires general social consensus and comprehensive efforts, and many solutions are taken with a reserve as hard to achieve. Therefore, it is right to ask, what can the institutions and an individual do in the context of security / ecological culture, and specifically contribute to the development and improvement of environmental protection. It is evident that inadequate use of natural resources has led to contamination of soil, water and air, which caused changes in the life of each individual and influenced the decrease in the life span of a modern man. At the same time, soil protection measures cannot be seen in isolation and beyond the context of overall environmental protection measures.

A healthy and safe environment is conditioned by the adoption of numerous and complex solutions in relation to( Bjelajac, 2017):

- Preventing new sources of pollution of the environment;
- Reduction of sources of pollution of the environment;
- Production and storage of chemicals and radioactive materials;
- Environmental impacts from the field of exploitation of ores;
- Increases in the percentage of industrial complexes in urban areas that have sewage networks and sewage treatment plants;
- Commercialization of secondary raw materials and recycling of waste,
- Storage, transport, treatment or safe disposal of medical equipment waste;
- Recovering of polluted and degraded lakes, bars, canals and parts of the river in urban areas;
- Improvement of air and water quality in urban areas;
- Improvement of sewerage in urban and rural areas;
- Efficient and sustainable use of land resources and reduction/loss of agricultural land due to various reasons;
- Improving the efficiency of water resources use and reducing water shortages;
- Increase in forest coverage and forest quality improvement;
- Increase in the quantity and quality of nature reserves;
- Active measures for the protection of rare and endangered plant and animal species;
- Fostering the ability to respond to climate change and reduce greenhouse gas emissions;
- Increasing the efficiency of energy use and encouraging investment in renewable energy sources for the purpose of energy efficiency and energy savings (water, wind, solar thermal, photovoltaic and geothermal sources, wave, tidal and asymmetric energy);

- Creating strong changes in environmental responsibility responses on all instances (industry, businesses, people);
- Strengthening the ability to implement environmental protection laws;
- Developing an ecological industrial economy;
- Increase of investments in the field of environmental protection;
- Accelerating international integration and cooperation in the field of environmental protection;
- Increasing the scope of scientific-technological research, and their applications for development and environmental protection;
- Control of fertility and use of fertilizers, and determination of the content of harmful substances;
- Raising awareness of the importance of land security. The Land Safety Model links sustainable development and land functions into a single system. In this way, the safety of the land becomes the basis and inseparable part of the system and thus affects the ecological safety;
- Prohibitions of disposal of waste material, sludges, etc. on fertile soil;
- Land remediation contaminated with depleted uranium missiles due to the NATO bombing.

It is a flagrant fact that environmental issues are vital for the existence of human beings. In a wider sense, these are issues in the field of security culture, and in the narrower sense, they relate to the field of ecological culture. Solving complex relationships between people, their health and their environment should become an imperative, which through joint efforts will enable effective sustainable development, in the capacity to meet the needs of present generations, while preserving the potential and opportunities for future generations.

### **Conclusion**

Care of the environment is of crucial importance for the existence of a modern man, the sooner the protection of the key elements of our environment is important for human health. The ability to breathe clean air, to provide clean drinking water and healthy food from non-contaminated soils are the basic needs for our well-being. Therefore, the negative environmental impacts on health are the main concern of environmental and health practitioners around the world. With environmental protection and adequate regulation, we can perceive and limit what goes into our atmosphere, groundwater and land. We can ensure that all inhabitants get clean water that does not harm health, that the air we breathe is free of contaminants, that the land in which we grow crops necessary for food products is free from harmful substances. Contaminated soil is a land that, due to harmful substances (on or below it), poses a significant risk to human health. Land can be contaminated in various ways, for example, through industrial activities, waste disposal, etc., including the content of natural substances such as



metals or gases at levels that are harmful. In Serbia, among other things, there are evident negative consequences due to the NATO bombing and use of depleted uranium ammunition, and contaminated land has caused an increase in the number of cancerous diseases. However, it seems that the importance and need to address this problem does not seem to be properly understood. By reviewing the results of previous research, we note that RS has a high-quality land due to favourable climate, vegetation and micro fauna. According to the Statistical Office of the Republic of Serbia (2014), out of the total of 5.06 million hectares of agricultural land, about 65% is used as arable land (more precisely, 3.3 million hectares), out of which 7% per year remains untreated area or coal. It is very important to emphasize the fact that in Serbia 2/3 of crop cultivation can be done 200 days a year. However, despite certain advantages, awareness of environmental protection and the prevention of land degradation remains low compared to the developed countries of Europe. Decision makers, as well as citizens, ignore the fact that land quality significantly affects the agricultural sector and the economic development of the country. In the literature, the results of previous research implied that the land is still insufficiently protected natural resource in which insufficient investments are made in the Republic of Serbia. The “purification” of the land requires great financial investment, and on the other hand, it improves the quality of life of citizens. Based on the analysis of the situation in this domain, despite the seemingly comprehensive legal framework, it is noticeable that one of the problems is incomplete and ineffective legal regulations in the field of environmental protection. Although in the last decade the country is engaged in more active environmental issues in order to meet EU integration requirements, the experts’ opinion is that Serbia is lagging behind in relation to the EU in both normative and realistic terms. Finally, the solution to these complex problems is urgently sought in the promotion of environmental security, which should deal with the connection between environmental and human security issues, which means eliminating negative impacts on human health. Environmental safety tends to cover not only the current environmental degradation problems but also to “illuminate” new threats so that we can create appropriate strategies and pass on to a healthy planet for the next generations.

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## ZAŠTITA ZEMLJIŠTA U REPUBLICI SRBIJI I EKOLOŠKA BEZBEDNOST SA OSVRTOM NA STRATEŠKI I PRAVNI OKVIR

*Željko Bjelajac*<sup>12</sup>, *Marijana Dukić Mijatović*<sup>13</sup>, *Željko Vojinović*<sup>14</sup>

### Rezime

*Opšte je poznato da su ekološke i socioekonomske funkcije zemljišta osnova za socijalno i ekonomsko blagostanje. Uprkos toj činjenici zemljište je još uvek relativno zanemaren prirodni resurs, što se može zaključiti kroz analizu pritisaka na zemljište i nepostojanje sistematskog monitoringa, koji podrazumeva sagledavanja stanja i definisanja programa za njegovu zaštitu. Pri tom, evidentna su nedovoljna izdvajanja za rešavanje ovih složenih problema, što uz nedelotvornost starteškog, institucionalnog i pravnog okvira zaštite zemljišta u Republici Srbiji, naposljetku vodi ka degradiranju ekološke bezbednosti. Imajući u vidu navedeno, ovaj rad potencira nužnost donošenja delotvornih mera za zaštitu zemljišta u cilju očuvanja ekološke bezbednosti, odnosno takav sistem upravljanja životnom sredinom koji će odražavati tendenciju da se eliminišu negativni uticaji u odnosu na životnu sredinu i zdravlje ljudi.*

**Ključne reči:** *zemljište, degradacija zemljišta, zaštita zemljišta, životna sredina, ekološka bezbednost*

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