SETOF Soil Erosion and TOrrential Flood Prevention: Curriculum Development at the Universities of Western Balkan Countries

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WP1

Analysis of soil erosion state and torrential floods in Western Balkan Countries

Lead Organisations of WP1**: UNSCM; UB**

Participating Organisation: UNS; UNI; UBL; UNSA; INSZASUM; BOKU; UNIRC; FRI-BAS

Deliverable 1.1

Title: **Analysis state of soil degradation/soil erosion in WBC**

Participating Organisation: UNSCM; UB; UNS; UNI; UBL; UNSA; INSZASUM; FRI-BAS

Project number: 598403-EPP-1-2018-1-RS-EPPKA2-CBHE-JP (2018 – 2579 / 001 – 001)
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TABLE OF CONTENT

Project number: 598403-EPP-1-2018-1-RS-EPPKA2-CBHE-JP (2018 – 2579 / 001 – 001)

Analysis of Soil Erosion/Land Degradation in Bosnia and Herzegovina

STATUS OF THE SOIL DATA IN THE BOSNIA AND HERZEGOVINA

The major soil types

The soil cover in Bosnia and Herzegovina (BiH) is very heterogeneous (Fig. 1). Terrestrial (automorphic) soils cover 86% of the total BiH surface area, while the hydromorphic soils cover the remaining 14%. The most widespread soil types are: Calcomelanosol (Cambisoil on limestone and dolomites) which covers 21.45%; Dystric Cambisol (acid brown soil) which covers 17.71%, and Calcocambisol (brown soil on limestone) on 17.15% of BiH surfaces. The most widespread hydromorphic soils are Fluvisol and Pseudogley soil type. Composition of humus in agricultural soils is around 50% lower than in soils covered by forest vegetation.

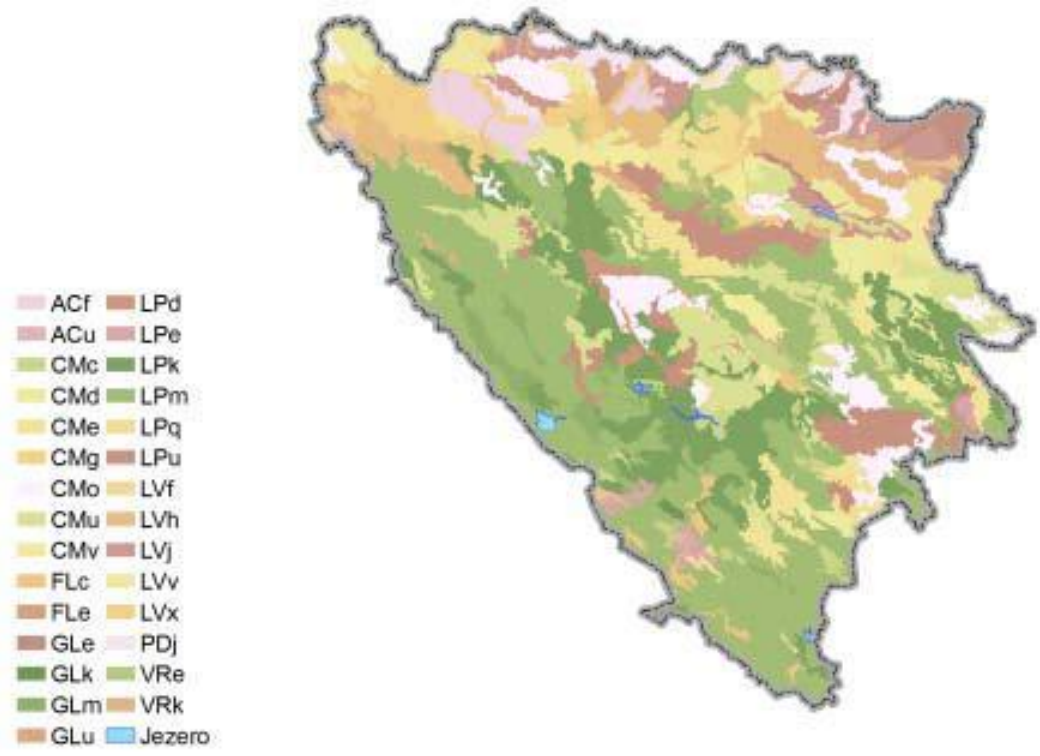

Figure 1. Dominant soil types in BiH according to FAO (Source: SOTER, FAO)

Due to farming and treatment methods applied, the content of humus in agricultural soils shows a tendency toward further decline. Bearing in mind the climatic conditions and relief in BiH, soil

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salinity and soil sodicity are not problem, meaning that these two characteristics of the soil in BiH are not considered as natural constraints.

The main characteristics of soils in BiH are: acid soils cover around one-third of the total land, humus content is low, content of the most important nutrients is low, especially in phosphorus, soils are mainly shallow (deep only at alluvial areas and in the north BiH: Lijevče field, Posavina, Semberija), excess water on about 14% of the territory, inadequate care of soil fertility management and its improvement, water erosion is quite a present problem, particularly on sloping land, which is dominant in BiH. High quality soils account only 15%, moderate quality 22%, while the rest is classified as low quality (32%) and very low quality (30%) soils of the total BiH land resources (see Table 1).

Table 1. Soil capability classes in BiH (AP BiH, 2017)

Soil classes	ha	%
High quality soils of I, II and III class	774,907	15.16
Moderate quality soils of IVa and IVb class	1,126,520	22.03
Low quality soils of V and VI class	1,654,616	32.36
Very low quality soils of VII and VIII class	1,556,857	30.45

Soil degradation

During Land Degradation Neutrality Target Setting Process (LDN TSP) major land degradation drivers in the Republic of Srpska (Kapović Solomun, 2018) and Federation of BiH (Čustović and Ljuša, 2018) are identifies as follows:

- Abandoned agricultural land in rural areas;
- Population migration which leads to increased urbanization (mostly illegal);
- Creation of illegal communal landfills and the occurrence of landslides;
- Weak implementation of existing policy framework and measures to protect the land
- Industrialization and expansion of the area under exploitation of minerals as well as the landfills of mining waste and other materials;
- Forest fires;
- Soil erosion;
- Inadequate agricultural systems;
- Soil pollution;
- Illegal felling;
- Obsolete industrial technologies that lead to land contamination;
- Climate change reflecting in extremes such as droughts and floods.
- Impossibility to maintain up-to-date forestry technologies (selective cuttings, animal usage);
- Over exploitation of biomass in forests with natural renewal.

General trend was decrease of land productivity dynamic related to urban areas and areas with intensive agriculture production, and increase under forest and partially vegetated land. Also, Herzegovina is targeted as “hot spot” due to sensitive and vulnerable ecologic conditions (Kapović Solomun, 2018a). The southern part of the country is covered by a limestone-dolomite substrate, with shallow soils, extensive vegetation or bare land. The whole area is endangered by soil erosion

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which, under such unfavorable natural conditions, can have catastrophic consequences for people's lives. Every year Herzegovina region is affected by large number of forest fires which additionally degrades rare vegetation and already poor soil cover.

Uneven distribution of precipitation during the year, where only 30% fall in the spring-summer period, causes drought, but also excess water during winter in karst fields. Water management in the Herzegovina Karst region is a burning problem. Soils in extreme conditions such as karst require management systems, adapted to environmental, not economic requirements. Restoration of degraded landscapes is conceived as a triple win solution to regain ecological integrity, enhance human well-being in deforested or degraded landscapes and resilience to climate change.

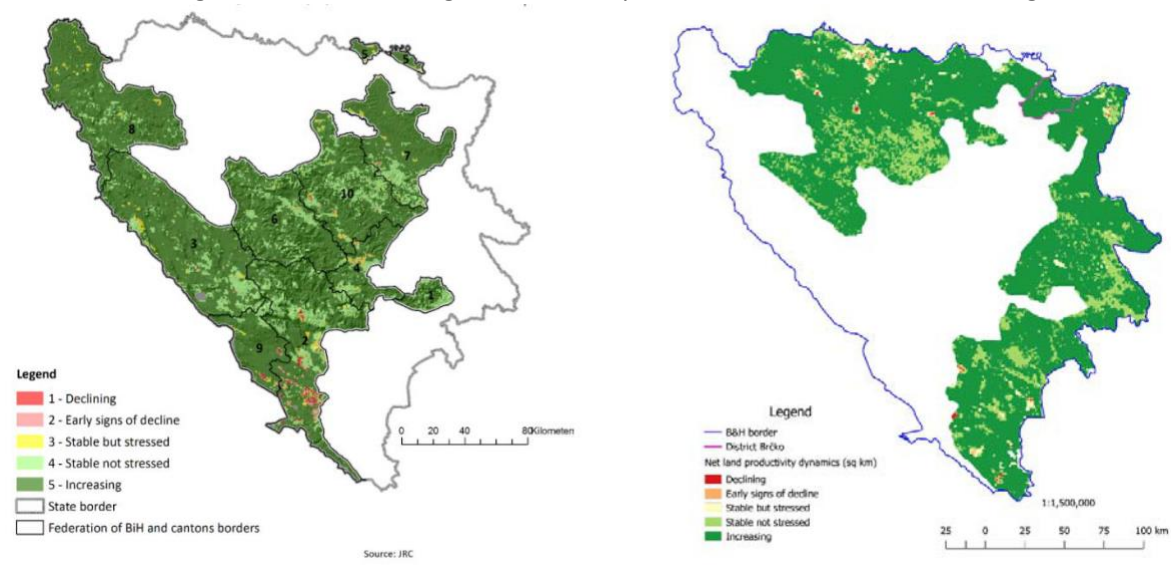

Figure 2. Land productivity Dynamics in the RS and FBiH (source, JRC)

Land cover and changes in land use

At the BiH level an update of the Corine land cover project was done. The creation of a collection of soil quality and pollution monitoring data according to the Lucas System and funded by IPA is in progress. Relevant methodology for collecting data from approximately 1,000 points (and eventually expanded to 10,000 points of monitoring, if funding is made available) is expected in the near future.

Table 2. Land use structure in BiH, 2012 (AP BiH, 2017)

Structure of land use	BiH	FBiH	RS	DB
Ploughed fields and gardens	1,004,931.0	396,182.0	582,270.0	26,479.0
Orchards	99,389.6	43,978.0	52,191.6	3,220.0
Vineyards	5,603.5	5,090.0	513.5	0.0
Meadows	460,166.3	275,516.0	183,815.3	835.0
Pastures	588,181.0	424,794.0	162,662.0	725.0
Agricultural land – Total	2,158,271.4	1,145,560.0	981,452.4	31,259.0
Forest land	2,795,090.0	1,522,886.0	1,272,204.0	0.0

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In the Republic of Srpska, regular soil quality and pollution monitoring is conducted in the area of Banja Luka, Prijedor, and Čelinac city and BD by the Institute of Agriculture of the Republic of Srpska. Soil monitoring in FBiH is conducted by the Federal Institute for Agropedology in Sarajevo within the program of permanent monitoring of agricultural land proposed by the Institute for Agropedology or the cantonal Ministry of Agriculture, which contains all relevant data on a periodic or continuous monitoring of land.

In FBiH this network has been active for three years already, and it has collected soil pollution and quality monitoring from 260 points throughout FBiH. Currently, there is the creation of the soil pollution cadaster in cooperation with Civil Protection of FBiH. Parameters monitored are: heavy metals, organic pollutants and radioactivity.

A functional system for soil monitoring in RS and FBiH, however, has not yet been established. Reporting systems are in the process of being established in accordance with European Environmental Agency (EEA) indicators and European Environment Information and Observation Network (EIONET) requirements. This essentially represents the unification and complementing the results of the above requirements to have a uniform system of soil quality monitoring according to the EEA and EIONET.

Two fundamental obligations of BiH (both Entities: FBiH and RS, and BD) regarding soil resources arise from the ratification of the United Nations Convention to Combat Desertification (UNCCD) as every member state has to submit an annual and/or biannual report on the status of the UNCCD implementation in BiH, and elaboration of the Action Plan to Combat land Degradation and Mitigate Drought Effects (AP BIH) and the Sustainable Land Management combating the Land Degradation in BIH.

The Republic of Srpska and Federation of BiH does not currently have a system of permanent monitoring of land. That is the reason why the Third Level Classification of the CORINE database 2000 - 2012 and the data related to the mapped changes bigger than 5 ha, are used for the present analysis of the state and losses of land (temporary and permanent). The structure of the total permanent and temporary losses of land, 7,386.25 ha or 88.64% is related to the transition of agricultural surfaces into the class artificial surfaces. The average loss of agricultural land (from 2000 to 2006) was 1,231 ha annually. The decreasing trend for the period 2000 - 2012 clearly points to the conversion of agricultural into artificial surface (8,658.45 ha), abandonment of agricultural land and conversion to forest areas (2,329.47 ha), and water areas (318.70 ha).

Forest land is also used for construction of diverse infrastructural utilities and permanent and temporary losses of this resource are quite frequent. Analysis shows that, from 2000 to 2006, 946.42 ha of forest land was converted into a group category of artificial surfaces, of which broad-leaved forests take up 521.97 ha, and the average annual loss of forest land accounts for 157.74 ha. The biggest changes relate to an increase in the class mineral extraction sites (435.41 ha or 46.10%) and discontinued urban fabric (24.35% or 230.47 ha) and the smallest loss of 7.11 ha is related to the loss caused by construction of a sports recreational surface.

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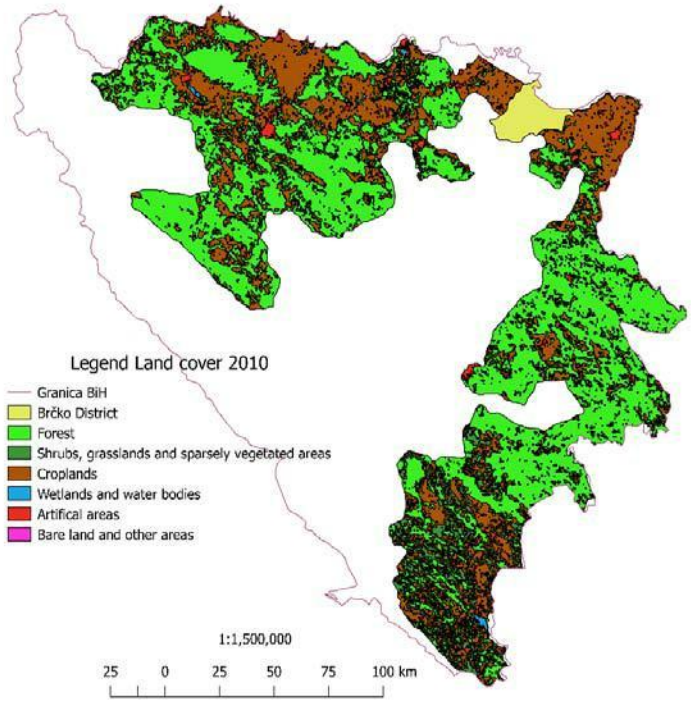
BIH is very rich in forest diversity and it is necessary to carefully include this aspect in forest management planning in order to satisfy the diversity of geography of BiH. Coppice forests with a significant share in private ownership should be specifically addressed in order to bring them back under forest management and define their potential role in not only biodiversity maintenance, but also biomass production. The level of complexity in forest management organizations does currently not support an adaptive forest management in rural areas.

Private forest owners manage around 20% of the forests in BiH, but widely lack capacities and resources to properly manage their forests; additionally, they are not organized into private forest interest associations. Public forest enterprises are currently economically underperforming in the FBiH, but have a strong social role as employers. A higher profitability of public forestry could create additional assets for rural development. Forest infrastructure (i.e. forest roads) and harvesting technology are, however, insufficient to grant efficient forestry operations. Among forest damages, human induced impact is the most prominent. Forest fires are of increasing abundance, and require specific fire management responses.



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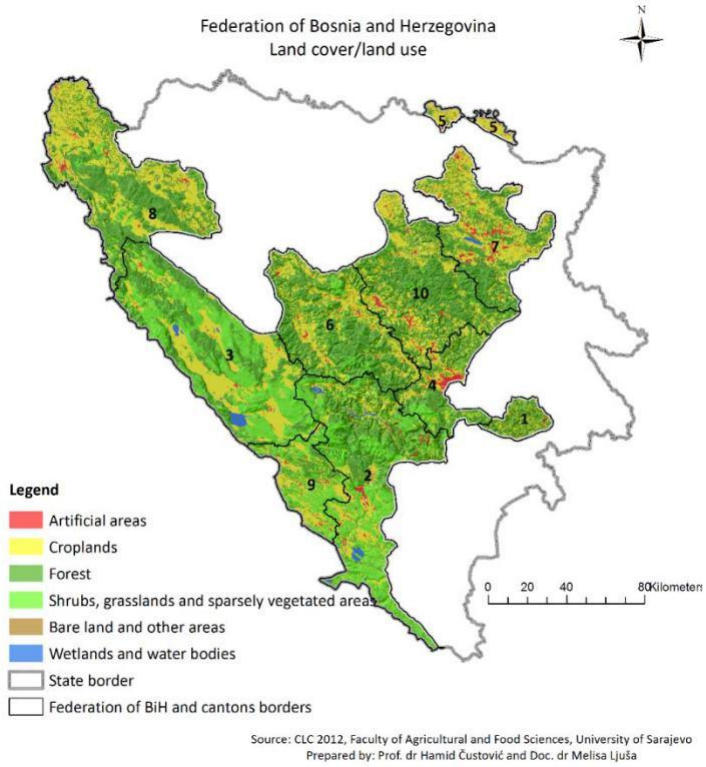

Figure 3. Land cover/use in the Republic of Srpska, 2010 (prepared by prof. dr Marijana Kapović Solomun, source: CLC, 2012); Land cover in FBiH, 2010 (prepared by prof. dr Čustović Hamid, source: CLC, 2012)

Organic carbon content in the soil

A functional system for the analysis of organic carbon and a monitoring network in RS and FBiH has not yet been established. However, according to the map of organic carbon content in top soils in Europe, which have been prepared for use by Joint Research Centre (JRC) of the European Commission, it can be stated that the majority of soil in RS and FBiH fall into two classes: class 2 - 6% organic carbon content in top soils, and; class 1 - 2% organic carbon content in top soils.

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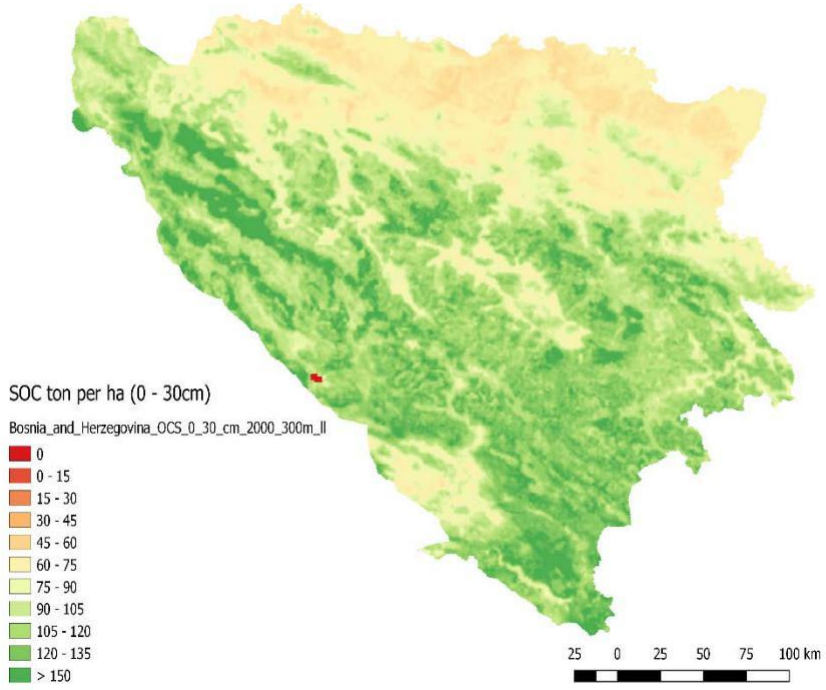

Figure 4. Soil Organic Carbon Content in BiH (Source: ESA, 2000)

Alkalization and salinization

Driving forces for natural soil salinity and alkalinity are climate, rock weathering, ion exchange, and mineral equilibria reactions that ultimately control the chemical composition of soil and water. The major weathering reactions that produce soluble ions are tabled. Where evapotranspiration is greater than precipitation, downward water movement is insufficient to leach solutes out of the soil profile and salts can precipitate. Microbes involved in organic matter mineralization and thus the carbon, nitrogen, and sulfur biogeochemical cycles are also implicated. Seasonal contrast and evaporative concentration during dry periods accelerate short-term oxidation-reduction reactions and local and regional accumulation of carbonate and sulfur minerals. The presence of salts and alkaline conditions, together with the occurrence of drought and seasonal waterlogging, creates some of the most extreme soil environments where only specially adapted organisms are able to survive. Sodic soils are alkaline, rich in sodium carbonates, with an exchange complex dominated by sodium ions. Such sodic soils, when low in other salts, exhibit dispersive behavior, and they are difficult to manage for cropping. These unfavorable processes have a very restricted significance in BiH, according to climate conditions.

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Decline of organic matter and biodiversity

Instead of organic matter the content of humus is determined as an indicator for soil fertility used for the recommendation of ameliorative fertilization or organic food production in BiH. The soil organic matter is approximately about 0.5% in the majority of soils in the RS as well as in the soils of the FBiH. Systematic monitoring of changes in the contents of the soils' organic matter in the territory of BiH has not been established to date. The assumption is that there has been a decrease in the contents of organic matter, which for now cannot be quantified at the entity levels, so this has to be included in soil monitoring in order to have this data available in the future.

Management of contaminated sites

Potentially the largest and the most vulnerable areas are located in the central and north-eastern part of BiH (Tuzla and Zenica Cantons), and on surfaces of all urban agglomerations due to high density of industries, such as mining, etc. In BiH, coal is exploited over the area of 18,000 ha, whereas the area for disposal of waste materials covers almost 6,000 ha. The largest mining areas are in the Municipalities Tuzla, Ugljevik, Gacko, Kakanj, Stanari and Prijedor. Coal mines in BiH are: Banovići, Đurđevik, Kakanj, Zenica, Breza, Bila, Kreka, Sanski Most, Livno, Gračanica, G. Vakuf/Uskoplje, Ugljevik, Miljevina, Gacko and Stanari. There are presently nine metal and non-metal mines: Olovo, Bužim, Vareš, Jajce, Veovača, Čitluk, Posušje, Široki Brijeg and Bosanska Krupa. The "National State of the Environment Report" of BiH dating back to 2012, states that a number of registered waste disposal sites (49 in FBiH, 41 in RS, 1 in BD) were functional in 2010. It was also estimated that around 1,100 illegal ("wild") dumpsites are still in use. Although the negative impact of all forms of contamination on the environment and soils in BIH is known, there have been only a few studies to date. Nevertheless, it is encouraging that, in the territory of FBiH, the Federal Institute for Agropedology established monitoring of contamination levels in soil with heavy metals and organic pollutants. In addition, there is monitoring of heavy metal and organic pollutants contents in the FBiH, whereas in RS and BD there are no such activities but only partial studies. The level of landmine and other residual explosive materials contamination represents a special problem in BiH. Unexploded mines placed in the range of two to five kilometers on both sides of the demarcation line deserve special attention in consideration of this issue. However, data on the number of mines and minefields in BiH are neither reliable nor complete. In the database of the Bosnia and Herzegovina Mine Action Centre (BHMAC) there are 19,000 registered reports on minefields. It is estimated that they represent only around 50 - 60% of their realistic number. According to BHMAC's data, the current size of suspected mine areas is 1,262,82 km^2 or 2.5% relative to the country's total surface area: 938.90 km^2 in FBiH, 298.89 km^2 in RS, and 25.03 km^2 in BD. Given the regular daily demining activities, the landmine contaminated areas are decreasing in size. However, considering the large-scale flooding in May 2014, it is estimated that landmine fields were shifted, but there are no official data yet.

Indicators for assessing the risk of land degradation

There are several indicators for assessing the risk of land degradation. They are described in AP UNCCD BiH:

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- Land Cover Status,
- Water availability per capita,
- Drought,
- Land Use Change,
- Land degradation level,
- Land under Sustainable Land Management,
- Landslides, and
- Contamination.

Also, other indicators adopted trough Land Degradation Neutrality Targett Setting Proces in the Republic of Srpska and Federation of BiH, and important for reporting to the UNCCD Convention are:

- Land cover/Land Use
- Land Productivity Dynamics
- Soil Organic Carbon

Overview of the Forestry/Water/Soil/Natural Resource Management Ongoing projects in the country

A total of 18 projects (medium to high scale) forest/water/soil/natural resources related projects are currently implemented across the country.

Table 3. Forest resource management projects in the country

Project Title	Project Implementation Start/ End Date
Promotion of sustainable management of forests as support to sustainable development in BiH	2012-2016
Protection of nature and environment from forest fires - Forest Eye	2015-2017
Sustainable Forest and Landscape Management Project – SFLM (GEF)	2014-ongoing
Achieving Biodiversity Conservation through Creation, Effective Management and Spatial Designation of Protected Areas and Capacity Building	2016-ongoing

Table 4. Water Resource Management projects in the country

Project Title	Project Implementation Start/ End Date
ABD Programme for “Drina - Tara” region – funded by ABD grant scheme.	2013-ongoing
The West Balkans Drina River Basin Management (WBDRBM) Project – funded by Global Environment Facility (GEF) and Special Climate Change Fund.	2016- 2020
The Irrigation Development Project (IDP)	2008-ongoing
Facilitation on the Drina River BASIN Nexus Assessment.	2016- ongoing

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Emergency Flood Recovery Project – FERP	2015-
Technology Transfer for Climate Resilient Flood Management in Vrbas River Basin	2016-2020
Drina Flood Protection Project – DFPP	2016-
Irrigation Development Project - IDP	2015-

Table 5. Soil resource management in the country

Project Title	Project Implementation Start/ End Date
Land Use/ Cover Area Frame Survey- LUCAS, JRC.	2015-ongoing
Support to Development of Agricultural Market Information and Land Parcel Identification Systems (LPIS) – WB.	2016
Decision Support for Mainstreaming and Scaling up of Sustainable Land Management (DS-SLM)	2017-2019
Support to the Preparation of Land Consolidation Strategies and the Implementation of Voluntary Land Consolidation Pilot Projects – FAO.	2013-ongoing
Sustainable Forest and Landscape Management Project, WB.	2016-2019
Land Degradation Neutrality Target Setting Process	2016-2018

Soil erosion

Land degradation (LD) and associated soil erosion is an important challenge in Bosnia and Herzegovina (BiH) due to unsustainable land management ongoing for the last 25 years. Unfortunately, significant amounts data (e.g. Map on Soil Erosion of BiH) were destroyed during the Bosnian War (Witmer and O'Loughlin, 2009). Today BiH lacks reliable data and is behind on soil/land related research from the last century. The latest research on soil erosion in BiH dates from 1985, when a Map of Soil Erosion of BiH was developed by Lazarević (1985). Unfortunately, that map has not been updated and moreover, data disappeared during the conflict period in Bosnia (Tošić, 2007; Tošić, 2008). Since 2004 part of soil of the erosion map was reconstructed, but only for the Republic of Srpska territory (Tošić et al., 2012).

Hilly terrain and a relatively huge quantity of precipitation in BiH means that a significant proportion of the BIH territory is exposed to water-induced erosion. This phenomenon is most prevalent in central and southern parts of the country where the annual quantity of precipitation amounts to no less than 2,000 mm. As more than 80% of the BiH territory exists on slopes exceeding 13% water-induced erosion is an increasingly present problem, especially in surfaces that suffered from unplanned exploitation of forests and total deforestation of the terrain. In the northern part of BiH hydromorphic soils are dominant on flat and slightly hilly terrains. In those areas erosion risk is at a much lower level from the point of view of potential erosion, but agricultural production is the basis

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of the intensive development of erosion processes, and on these soils surface erosion happens. In addition, besides water erosion, one should not forget the risks of aeolian erosion in the southern part of the country where shallow soils dominate on limestone/dolomite substrata with extensive vegetation or without and the risk of aeolian erosion is high. There are no official data for BiH as regards areas affected by erosion, and no erosion monitoring system is in place. The current data are of partial character, usually collected at the municipality level through various project activities. Designing an erosion map of SR BiH was completed in 1985. Two copies of the erosion map were then made. During the war (1992 - 1995) both copies were destroyed. The total average amount of sediment, created on the territory of SR BiH per year is 16,518,031 m³, or 323 m³/km². The new Erosion Map of RS was designed in two phases (restructuring of erosion map and innovation of erosion map) during 2011.

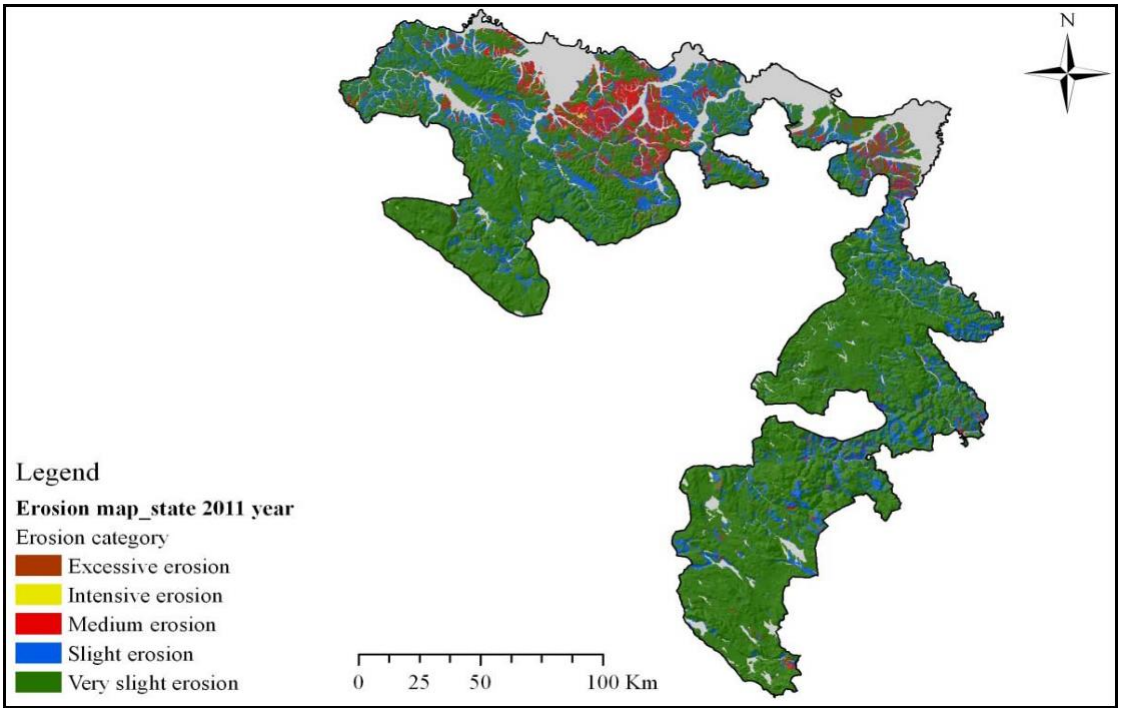

Figure 5. Map of Erosion in the RS, state 2011 (Tošić et al., 2012)

Since the period when mapping of erosion processes in Bosnia and Herzegovina was carried out, some significant changes have occurred in this area due to the anthropogenic influence. The civil war left serious consequences and made important impact on decrease in population and households, population migration, land use structure, but also on gross erosion and sediment yield (Tosic, 2008; Dragicevic et al., 2009; Tošić et al., 2012). Soil erosion map of the Republic of Srpska was created using EPM model. According to 1985 erosion map of the Republic of Srpska 21851.04 km^2 of the total Republic's territory was under different intensity of erosion, while 3277.19 km^2 were manifested as accumulations. According to categories of erosion 1.22 % of the territory was affected by excessive erosion, 1.79 % by intensive erosion, 11.05% by medium erosion, 9.15% by slight erosion, and 76.77% by very slight erosion (Tošić et al., 2011). Presented spatial distribution of erosion intensity is reflection of dominant way of land use, number of population and households

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and role of primary erosion factors in development and intensifying erosion processes. Hence, according to 1985 Map of erosion it is possible to conclude that erosion intensity was increasing from main Dinaride's mountains towards north and decreasing towards south. Considering primary erosion factors, intensity of erosion processes was analogous to the way land was used and emphasized role of geologic-pedological factors in development and intensifying erosion processes. According to 2011 Map of erosion (Fig. 2), 86.95 % of the Republic of Srpska territory was under erosion of different intensity, while on 13.05 % of the territory accumulation was dominant process. According to categories of erosion 0.87 % of the territory wasaffected by excessive erosion, 0.03 % by intensive erosion, 5.22 % by medium erosion, 17.08 % by slight erosion, and 76.77% by with very slight erosion.

However, if we compare land usage on the Republic of Srpska territory according to 1985 and 2011 data, it is noticeable that on 1678.52 km^2 of the Republic's territory in 2011 there was no agricultural production. This fact influenced spatial distribution of soil erosion intensity. In mountainous and hilly areas intensity of erosion was decreased due to migrations but also due to depopulation that was going on long before civil war started. According to 2011 erosion map of the Republic of Srpska, slightest erosion was present in Higher and Lower Herzegovina (Fig 2). This area is very vulnerable to erosion particularly due to ecologic conditions like calcareous and dolomite rocks and karst relief. General tendency of erosion processes development during the last 30 years (1985-2011) is characterized by decreasing erosion processes intensity almost throughout the Republic of Srpska territory. Settling of erosion processes intensity began in the late 1980s as a result of socio-economic changes and increasingly continued by results of warfare in Bosnia and Herzegovina (Tošić et al., 2011; Tošić et al., 2012).

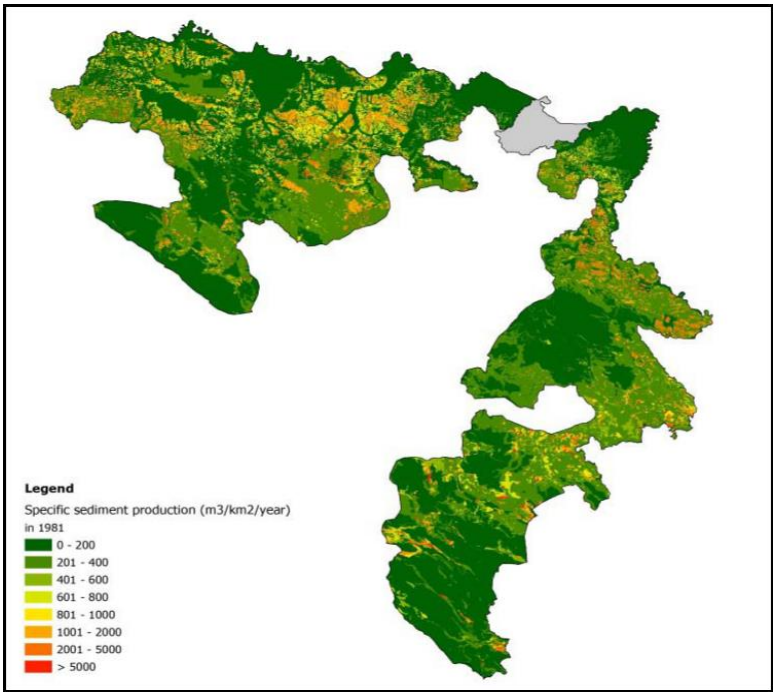

Figure 6.Specific sediment production in 1981 (Tošić et al., 2013)

Project number: 598403-EPP-1-2018-1-RS-EPPKA2-CBHE-JP (2018 – 2579 / 001 – 001)
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The "Strategy for Agricultural Land Management" of FBiH defines that it is necessary to plan and build at least ten measuring stations for soil erosion, but also theoretical methods such as the USLE method to predict the intensity of erosion in the area of FBiH, and making maps of erosion and landslides is necessary.

Institutional set-up concerning soil management, legal and policy Governance

BiH is a sovereign state with parliamentary state organization and decentralized political and administrative structure. It is regulated by the Dayton Agreement and consists of three separate administrative units: the Federation of Bosnia and Herzegovina, Republika Srpska and Brčko District of Bosnia and Herzegovina. FBiH comprises 10 cantons and cantons have municipalities. FBiH has 79 municipalities. While the RS administrative structure includes 62 municipalities. The town Brčko is a special administrative unit, a district. Municipalities and towns with local self-governance are the lowest level of the political and territorial structure of BiH. The towns are (Banja Luka, Doboj, Bijeljina, Pale and Trebinje). The last level of political and territorial distribution in BiH consists of municipalities and towns, where local self-governance is exercised. The following places in BiH have the 'town status': Banja Luka, Bihać, Istočno Sarajevo, Jajce, Mostar, Sarajevo, Zenica, Bijeljina, Doboj, Prijedor and Trebinje.

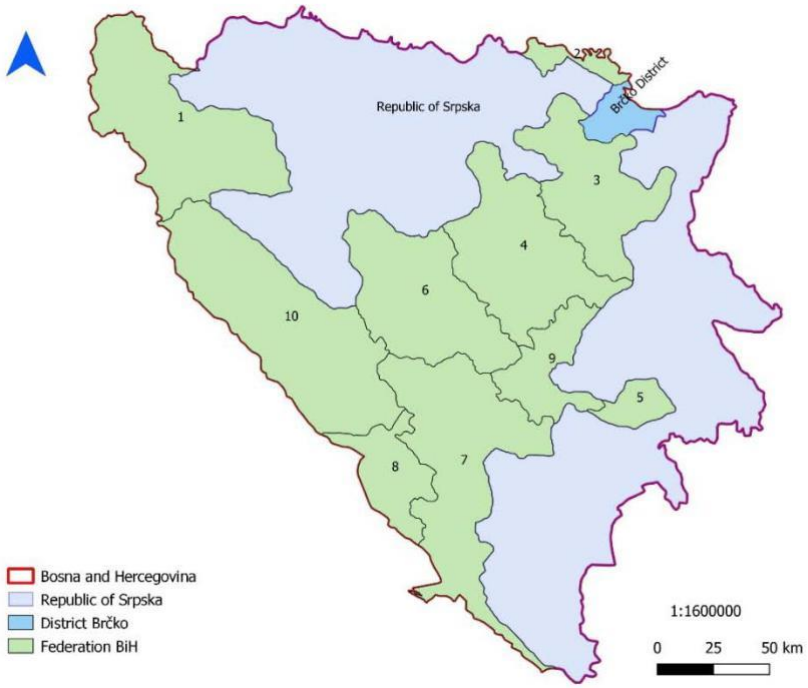

Figure 7. Administrative structure of BiH

Project number: 598403-EPP-1-2018-1-RS-EPPKA2-CBHE-JP (2018 – 2579 / 001 – 001)
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The Sector for Natural Resources, Energy and Environmental Protection within the MoFTER was appointed as a coordination body for land issues for the purpose of common operation at the international level, but only with prior consent of Entity Ministries. The same applies to the Ministry of Civil Affairs which also has some competencies related to the environmental protection, but they are not clearly defined. We should also mention the Inter-Entity Steering Committee for the Environment, responsible for coordination and harmonization of the environmental legislation and policies of relations between the two entities, promotion of ratification of the international conventions and implementation of the EU projects.

Responsible institutions in charge of decision-making and implementation processes with regards to soil at the entity level are:

REPUBLIC OF SRPSKA	
Ministry of Agriculture, Forestry and Water Resources	Organization and implementation of activities related to land use, land management, land policy, protection and exploitation of forest, agricultural and water land. This is the main land related institution in the Republic of Srpska.
Ministry for Spatial Planning,	Construction and Ecology, issuance of measures to mitigate adverse effects of some activities involving land exploitation in a way which may involve a risk of land contamination
Ministry of Industry, Minning and Energy	Impact of industry on the environment, mining activities related to land, legislative framework and policy.
Republic Authority for Inspection Activities	Inspection, administrative and other technical responsibilities pertaining to the inspection control over trade of commodities and services in agriculture, plant protection, fresh water ishery, forestry, hunting industry, energy, mining, geology, oil and gas, pressure containers, water, transport, geodetic affairs, labour, employment, construction, ecology, special planning, urbanism, geodetic affairs, occupational health and safety, sanitary protection, production and sale of drugs, toxic substances and narcotics, protection against ionizing and non-ionizing emissions, social welfare, family welfare, child welfare, ireighting, upbringing, education, living standard of pupils and students and other issues pursuant to the law
Environmental Protection and Energy Eficiency Fund of RS	Fund raising, funding of programmes and projects in the ield of conservation, sustainable use, protection and improvement of the environment, energy eficiency, and use of renewable sources of energy.
FEDERATION OF BIH	
Ministry of Environment and Tourism	Administrative and professional responsibilities related to air, water and soil protection; monitoring and environmental standards; drafting the environmental strategy and policy, tourism development
Ministry of Agriculture, Water	Administrative, professional and other responsibilities in the

Project number: 598403-EPP-1-2018-1-RS-EPPKA2-CBHE-JP (2018 – 2579 / 001 – 001)
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Management and Forestry	ield of agriculture, water management, forestry and veterinary medicine, management of the two river basins (the Adriatic and the Sava River Basin)
Ministry of Spatial Planning	Spatial planning and land use
Federal Inspection Services Authority	Implementation of regulations and control in the field of environmental protection
Environmental Protection Fund of FBiH	Collection and distribution of funds for environmental protection on the territory of FBiH, promotion and funding of preparation, implementation and development of programmes, projects and similar activities related to conservation, sustainable use, protection and improvement of the state of the environment and use of renewable sources of energy
BRČKO DISTRICT	
Department for Urban Planning and Property Affairs	Environmental protection
Department for Agriculture, Forestry and Water Management	Responsibilities related to water management (issuing water licences, water discharge, and lood protection infrastructure)
Inspectorate	Implementation of regulations and controls in the ield of environmental protection

Legal framework

The existing legislation regulating the issues of land and soil, its spatial planning and use is in line with the Entity legislation according to the Constitution of BiH. Entities are mandated for land related matters, namely the ministries and administrative organizations. There is no land or environmental legislation at the national level.

Table 6. Legislative framework in the Federation of BiH

The name of the Law	Oficial Gazette FBiH No.
Law on Agricultural Land	52/09
The Law on Mining	26/10
Law on Changes and Amendments to the Law on Requirements for and Manner of Carrying Out Woodcutting	25/06
Law on Water Resources	70/06
Law on Forestry	20/02
Law on Amendments and Modifications to the Law on Forestry	32/03, 37/04
Law on Concessions	40/02
Law on Amendments to the Law on Concessions	61/06
Law on Waste Management	33/03
Law on Changes and Amendments to the Law on Waste Management	72/09
Law on Air Protection	33/03
Law on Changes and Amendments to the Law on Air Protection	4/10

Project number: 598403-EPP-1-2018-1-RS-EPPKA2-CBHE-JP (2018 – 2579 / 001 – 001)
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Law on Environmental Protection	33/03
Law on Changes and Amendments to the Law on Environmental Protection	38/09
Law on Nature Protection	33/03
Law on the Environmental Protection Fund	33/03
Law on Spatial Planning and Land Use	2/06
Law on Changes and Amendments to the Law on Spatial Planning and Land Use	72/07, 32/08, 4/10, 13/10

Table 7. Legislative framework in the Republic of Srpska

	Official Gazette of the Republic of Srpska No.
Law on Agriculture	7/06, 20/07, 86/07, 71/09
Law on Agricultural land	93/06, 86/07, 14/10, 5/12
Law on Forestry	75/08, 60/13
Law on Water Resources	50/06, 92/09, 121/12
Law on Concessions	25/02
Law on Organic Production	12/13
Law on Mining	59/12
Law on Spatial planning and Construction	55/10
Law of National parks	75/10
Law on Plant Protection Products	52/10
Law on Plant Health Protection	52/09
Law on Environmental Protection	71/12
Law on Nature Protection	20/14
Law on Air protection	124/11
Law on Waste Management	111/13
Law on the Environmental Protection Fund and Financing RS	117/11
Law on Geological Research	51/04
Law on Chemicals	25/09
Law on Tourism	45/17
Law on Mineral Fertilizers	24/12

Table 8. Legislative framework in the Brčko District

Project number: 598403-EPP-1-2018-1-RS-EPPKA2-CBHE-JP (2018 – 2579 / 001 – 001)
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The name of the Law	Oficial Gazette BD No.
Law on Agricultural Land	32/04
The Law on Spatial Planning and Construction	29/08
Law on Environmental Protection	24/04

STRATEGIC FRAMEWORK RELEVANT TO THE SOIL/LAND

Action Program to combat Land Degradation and mitigate the Effects of Drought In Bosnia and Herzegovina (AP)

The Council of Ministers of Bosnia and Herzegovina on 102 Assembly, held on May 05, 2017. (Notification 05-07-1-1236-17/17) officially adopted the *"Action Program to Combat Land Degradation and Mitigate the Effects of Drought in Bosnia and Herzegovina"* (AP). In accordance with the AP, state of land resources and main pressures are identified, strategic and operational targets and priorities to combat land degradation have been analyzed and defined. Although the LDN approach has been adopted and accepted by BiH after the creation of AP, the "land degradation neutrality" concept is not explicitly mentioned in the AP, but it is certainly part of the strategic and operational goals as well as measures needed to improve the condition of land resources. AP is one of the strategic documents for achieving land degradation neutrality and introducing sustainable land management as a way to combat land degradation at the entity level. The goal of AP's and regular reporting is to ensure the long-term commitment of Parties to the requirements of the UNCCD Convention for sustainability in land management, and all further actions within the legal process and legally binding documents at the national level, respectively entity levels in the case of Bosnia and Herzegovina. The task of the UNCCD Convention, including this strategic document, is to recognize the facts and drivers that cause land degradation, and help to establish a system of governance and legislation at the entity levels that will avoid, reduce and reverse land degradation in the future. The strategic goals defined in the AP are focused on stakeholders and partners' participation including decision makers, toward achieving long -term targets and contribution in land degradation decrease in the Republic of Srpska (BiH). The strategic and operational objectives identified in the AP are in line with directions and objectives of the UNCCD Convention, respectively the UNCCD Strategy goals that were actual at the time creation of AP in the BiH. However, last Conference of the Parties (COP 13), adopted new UNCCD Strategic Framework for period 2018-2030 and concomitant decisions that highlight priority activities in the future.

Other documents important/relevant for land resources

- LDN TSP Report for the Republic of Srpska
- LDN TSP Report for the Federation BiH
- LDN TSP Report for the Brčko District
- NEAP BIH for the period 2003 – 2008.
- Solid Waste Management Strategy in BiH, 2000;
- Report on environment state in BiH, 2012;
- BiH Development Strategy, 2011;
- Independent assessment of BiH state capacities in the implementation of multilateral environmental agreements - NCSA, 2012;

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- Climate change Adaptation and low-emission development strategy for Bosnia and Herzegovina, 2013;
- Strategic Plan for Rural Development of Bosnia and Herzegovina 2017.
- The Poverty Reduction Strategy Paper, adopted in 2004
- The Agricultural Development Strategy in Republic of Srpska until 2015.
- The Strategic Plan for Development of Rural Areas and Agriculture in RS 2016 – 2020.
- The Mid-term Development Strategy of Agricultural Sector in FBiH 2015 – 2019.
- The Spatial Plan of Republic of Srpska until 2025.
- The Spatial Plan of FBiH until 2028.
- The Spatial Plan of BD until 2017.
- The Basis for Agricultural Land Protection, Use and Restructuring of RS as the Component of the Land Use Planning Process in 2009.
- The Strategy for Agricultural Land Management of FBiH in 2011.
- Strategy of Forestry development of the Republic of Srpska 2011-2021;
- Integrated Water Management Strategy of the Republic of Srpska 2015-2024;
- Strategic plan for development of agriculture and rural areas of the Republic of Srpska 2016-2020;
- Industry strategy and Policy Development of the Republic of Srpska 2016-2020;
- Strategy for anti-hail development of the Republic of Srpska;
- Program of legislation adjustment of the Republic of Srpska with the legal acquis of the European Union in the field of environmental protection;
- Waste Management Strategy 2017 - 2026;
- Energy Development Strategy of the Republic of Srpska by 2030;
- Action Plan for Sustainable Flood Risk Management of the Danube River Basin with application to sub-basin of Sava River, Republic of Srpska, 2010-2021;
- Action Plan for Implementation of Sustainable Development of Irrigation Areas in the Republic of Srpska, 2008-2017;
- Strategic plan for Rural Development of Republic of Srpska 2009-2015;
- Strategy for Nature protection of the Republic of Srpska, 2011;
- Action Plan for Energy Efficiency of the Republic of Srpska by 2018;
- Municipal waste management plans;
- Spatial plan of the Republic of Srpska by 2025.

IMPLEMENTATION & APPROXIMATION OF EU LEGISLATION

In 2005, both entities, RS and the FBiH, signed a memorandum of understanding and mutual cooperation and support in the development of national systems for environmental monitoring (MoU) with the European Commission. According to this document there is an obligation that the implementation of all activities in this field must be in accordance with Directive no. 1210/90, 933/1999 and 1641/03 and recommendations from the EEA and the EIONET. Depending on the data source, some reports have been made, but there is no statistical consistency in the data provided.
Up to now the EU Thematic Soil Strategy and the topics addressed in the Strategy are not recognized in the current legislation about soil as the natural resource in BiH. Only two pillars of the EU Thematic Soil Strategy, awareness raising and research, are sporadically included in some strategic approach. The EU nitrates directive (Dir. 91/676/EEC) is referred to in some rulebooks about harmful substances for soil.

Project number: 598403-EPP-1-2018-1-RS-EPPKA2-CBHE-JP (2018 – 2579 / 001 – 001)

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