

# Areas with Natural Constraints in South-East Europe: Assessment and Policy Recommendations



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The analysis, conclusions and recommendations in this paper represent the opinion of the authors and are not necessarily representative of the position of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and the Regional Rural Development Standing Working Group in SEE (SWG).

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# LIST OF ABBREVIATIONS

<b>ANC</b>	<b>Areas with Natural Constraints</b>
<b>CAP</b>	<b>Common Agricultural Policy</b>
<b>CIHEAM</b>	<b>International Center for Advanced Mediterranean Agronomic Studies</b>
<b>DG AGRI</b>	<b>Directorate-General for Agriculture and Rural Development</b>
<b>DTM</b>	<b>Digital Terrain Model</b>
<b>EC</b>	<b>European Commission</b>
<b>ESP</b>	<b>Exchangeable Sodium Percentage</b>
<b>EU</b>	<b>European Union</b>
<b>FAO</b>	<b>Food and Agriculture Organisation</b>
<b>GIZ</b>	<b>Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH</b>
<b>IES</b>	<b>Institute for Environment and Sustainability</b>
<b>JRC</b>	<b>Joint Research Center</b>
<b>LAU</b>	<b>Local Administrative Unit</b>
<b>LEIWW</b>	<b>Rural Development through Integrated Forest and Water Resources Management in Southeast Europe</b>
<b>LFAs</b>	<b>Less Favoured Areas</b>
<b>MARS</b>	<b>Monitoring Agricultural Resources</b>
<b>MS</b>	<b>Member State</b>
<b>SAR</b>	<b>Sodium Adsorption Ratio</b>
<b>SEE</b>	<b>Southeast Europe</b>
<b>SWG</b>	<b>Regional Rural Development Standing Working Group in SEE</b>
<b>WB</b>	<b>Western Balkans</b>
<b>WTO</b>	<b>World Trade Organisation</b>

# FOREWORD AND ACKNOWLEDGEMENTS

The region of Southeast Europe is characterised by a great diversity of climatic, soil and geomorphological features, creating conditions for various forms of farming, from the most advanced and intensive ones implemented in the lower fertile valleys, to more traditional forms in the uplands. Pastoralism and small ruminants play a fundamental role in the livelihoods of mountainous communities. Nature has blessed the region with some of the most fertile soils found in Europe, like those in the Pannonia plain, as well as gorgeous mountains covered with forests and pastures and fascinating beaches. Nevertheless, the region also possesses soils with natural constraints ranging from salinity, sodicity, poor drainage and texture conditions, shallowness and stoniness. When such conditions are combined with lower temperatures, especially at higher elevations and dry/arid conditions in lower locations, conditions for farming become cumbersome. The first consequence of these harsh biophysical conditions is land abandonment and increased costs for the farmers of these areas.

The purpose of ANC payments is to provide total or partial compensation to farmers for the natural or specific disadvantages of farming in areas with natural or specific handicaps to ensure that this land remains in agricultural production and to prevent land abandonment. The European Union has paid particular attention to Areas with Natural Constraints (ANC) and its experiences show that the ANC policies have different results in different EU member states, but the general conclusion is that the ANC approach is an instrument for improved targeting of the national agricultural funds and preserving of the population and the agricultural production in the handicapped areas. Furthermore, the ANC policies remain an integral part of the EU's Common Agricultural Policy (CAP) as they tackle important aspects of the integrated rural development strategies in support of the farmers facing these natural hardships.

The ministries of agriculture and rural development from the Western Balkans region, as members of the Regional Rural Development Standing Working Group in the SEE (SWG), have recognised the importance of addressing the ANC issue and its impact on the national and regional agricultural and rural development, and therefore, they requested the development of this study. As the Southeast European countries are increasing efforts towards the EU membership, this publication tries to shed light on what type of data is available in Albania, Bosnia and Herzegovina, Kosovo\*, Macedonia, Montenegro and Serbia, what the identified data and institutional gaps and solutions are and what policies are needed to adopt and implement the EU methodology for mapping and delineation of the ANCs. Moreover, the intention is to merge the national assessments into a regional ANC assessment, as a common platform that will be crucially important for policy and decision making at various levels. The ANC assessment and the preparation of this study was done within the framework of the regional programme "Rural development by integrated forest and water resource management in South-East-Europe (LEIWW)" founded by the German Federal Ministry of Economic Cooperation and Development. The regional programme includes the countries Albania, Bosnia and Herzegovina, Kosovo\*, Macedonia, Montenegro and Serbia and is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the Regional Rural Development Standing Working Group in SEE (SWG).

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On this occasion, GIZ and SWG would like to express their compliments to the Ministries of Agriculture and Rural Development from the SEE region, as well as to all the national, regional and international experts involved in the ANC assessment for their utmost dedication and contribution during the preparation of the ANC assessment report. Special appreciations are also addressed to Prof. Pandi Zdruli from CIHEAM Mediterranean Agronomic Institute of Bari, Italy, and to Prof. Ordan Cukaliev from Ss Cyril and Methodius University of Skopje, Macedonia, for the coordination of the overall assignment and for their extensive technical and scientific support.

Last but not least, a special acknowledgement is addressed to the EC Joint Research Centre, Institute for Environment and Sustainability (IES), Monitoring Agricultural Resources (MARS) Unit, Ispra, Italy, for their scientific and advisory support that was crucial for the development of this study.

On behalf of the SWG Secretariat

**Mr. Boban Ilic**  
Secretary General

On behalf of GIZ LEIWW Programme

**Mr. Benjamin Mohr**  
Team Leader



# A MESSAGE FROM CIHEAM AND BARI INSTITUTE

The International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM) has a history of more than half a century by bringing together thirteen Euro-Mediterranean countries (Albania, Algeria, Egypt, France, Greece, Italy, Lebanon, Morocco, Malta, Portugal, Spain, Tunisia and Turkey). At present only Albania represents the Western Balkans despite the fact that former Yugoslavia was one of the founding members of CIHEAM. Nevertheless, CIHEAM's contacts with the region have always been a crucial part of its activities and hundreds of students from the Balkans have had the chance to study at four institutes of CIHEAM located in Bari (Italy), Montpellier (France), Zaragoza (Spain) and Chania (Greece).

Among the training initiatives, one of the most significant has been BIO 84 – Technical training in organic agriculture to support rural development and food safety in the Balkan area – coordinated by the Mediterranean Agronomic Institute of Bari (CIHEAM-IAMB), financed by the Ministry of Foreign Affairs (MFE) within the framework of Law 84 from 2011, that aimed at the qualification of local experts. Along with BIO 84, CIHEAM-IAMB has an extremely rich training programme offering many courses, both traditional and distance-based, on organic production, land and water resources management, integrated pest management, sustainable rural development. The programme has a territorial connotation strongly tied to the Balkans and the Mediterranean.

There is similarly fruitful collaboration between CIHEAM-IAMB also on the project “Capacity Building: Strengthening the Kosovo MAFRD for the Improvement of Vegetable Production according to EU Standards”, that is part of the actions launched to support the primary Kosovo based sector and directed at introducing EU standards in fruit and vegetable production and at creating a national service that supports the development of organic agriculture. CIHEAM-IAMB, in the role of coordinator, has another important initiative, MOAN (Mediterranean Organic Agriculture Network), a network that comprises partners from 24 countries in the Mediterranean, including the Western Balkans. It is worth mentioning that in 2001, with EC funding, CIHEAM-IAMB conducted and established the Soil Information System for Albania (SIS Albania project) that was the first of this type for the country after decades of isolation.

It is also for these reasons that CIHEAM and its Bari Institute, in particular, have been grateful for the opportunity to provide scientific and technical assistance to the ANC project, a very timely initiative that will help the Western Balkans countries meet the conditions for EU accession. We remain committed to strengthening our collaboration with the region and offer our expertise to these countries towards their EU integration.

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Secretary General of the International Centre for  
Advanced Mediterranean Agronomic Studies (CIHEAM)

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# BACKGROUND INFORMATION, METHODOLOGY APPLIED FOR THE ASSESSMENT AND EXPERTS AND INSTITUTIONS INVOLVED

One of the main objectives of the LEIWW programme is to create preconditions for evidence-based and EU-compliant policy design regarding environmental objectives in rural development and agriculture. In line with this objective, development of evidence-based policy assessments and gap analysis is supported in order to provide policy recommendations in respect to rural development including areas with natural constraints and sustainable management of natural resources in SEE.

The objective of the ANC assignment was to develop methodology for characterising, mapping and delineating areas with natural constraints in the SEE countries and to provide policy recommendations to the SEE states according to EU standards and methodologies.

The major outcome of this assignment is:

- Methodological approach and guidance materials on the characterisation and mapping of the ANC;
- Policy assessment and policy recommendations on the characterisation and mapping of areas with natural constraints in the SEE countries compatible with the EU methodology and standards;
- Policy evaluation, evaluation of the data availability, data gap assessment, provision of institutional setup and assessment of the implications of the ANC approach on regional and national level.

The assessment was done using a so-called “consultancy cascade” approach, which enables all the experts to learn from each other and to exchange on a continuous basis. According to this approach, 3 thematic experts from each country/territory were involved in order to assess and elaborate the national data relevant for the ANC approach. A total of 20 highly qualified experts from the countries/territories from the region have been selected for the development of the assessment. In the same time they represented various institutions including the Ministries of Agriculture, the Ministry of Environment, research and education entities and the civil society sector of the region.

The national experts were supported by regional experts who have extensive international experience in research and assessments in agriculture, areas with natural constraints, funding instruments and environmental concerns in respect to rural development. All national experts and the regional expert were coordinated by the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM), which had the main coordination role of the assignment and was the link with the EU methodologies and standards, as well as with the JRC.

**PART A**

**REGIONAL  
ASPECTS**

# CHAPTER A1

## THE EU METHODOLOGY FOR THE IDENTIFICATION AND DELINEATION OF AREAS WITH NATURAL CONSTRAINTS (ANC)

**Authors: Andrea Hagyo and Jean Michel Terres, European Commission, Joint Research Centre, Institute for Environment and Sustainability (IES), Monitoring Agricultural Resources (MARS) Unit, Ispra, Italy**

Areas with Natural Constraints (before named Less Favoured Areas) in mountain regions or in other areas facing natural or other specific constraints are supported in the European Union by the Common Agricultural Policy budget. The aim of the scheme is to contribute to maintaining the countryside and to maintaining and promoting sustainable farming systems by encouraging continuous use of the agricultural land. In order to ensure the efficiency of such support, payments are intended to compensate farmers for income foregone and additional costs linked to the natural disadvantages of the area concerned.

The aid for the Less Favoured Areas in the European Union (EU) dates back to 1975. Since then, it has undergone several reforms from addressing rural depopulation towards increased focus on maintaining certain agricultural land use and environmental benefits. The current regulation regarding the Areas with Natural Constraints in the programming period 2014-2020 can be found in the Rural Development legal text, in Art. 32 of the EU Regulation 1305/2013.

There are three categories classified as ANC. Each category covers a specific cluster of natural or specific handicaps in Europe in which the continuation of farming is threatened.

1. **Mountain areas** – are those areas characterised by a considerable limitation of the possibilities for agricultural land use and by an appreciable increase in production costs due to:
  - (a) the existence, because of altitude, of very difficult climatic conditions, and therefore substantially shortened growing season;
  - (b) at a lower altitude, the presence over the greater part of the area in question of slopes too steep for the use of machinery or requiring the use of very expensive special equipment, or a combination of these two factors, where the constraints resulting from each taken separately are less acute but the combination of the two gives rise to an equivalent constraint.

Areas north of the 62nd parallel and certain adjacent areas are also considered to be mountain areas and are automatically classified as ANC.

2. **Areas, other than mountain regions, facing significant natural** – are those areas affected by significant natural constraints, notably by low soil productivity or poor climatic conditions. This category applies to areas in which at least 60% of the agricultural area meets at least one of the

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criteria listed in Annex III (or Table A1.1 in this chapter) of the regulation at the threshold values indicated.

3. **Other areas affected by specific constraints** - are areas where it is necessary for land management to be continued in order to conserve or improve the environment, to maintain the countryside, to preserve the tourist potential of the area or to protect the coastline. Their total extent should not exceed 10% of the area of the Member State concerned.

Eligibility is determined at the level of local administrative units or at the level of a clearly delineated local unit which covers a single clear contiguous geographical area with a definable economic and administrative identity.

In the past, the implementation of the measure resulted in regional differences given the number and heterogeneity of criteria used (report on LFA of the European Court of Auditors, 2003). In order to harmonise the delineation, a common framework of biophysical criteria was introduced. They are based on the definition provided by Annex III of EU Regulation 1305/2013 (Table A1.1). For the delineation of areas affected by natural constraints, other than mountain areas, Member States are required to apply them, using the most appropriate available data sets.

The framework for developing the common biophysical criteria was built on objectives given by the Directorate-General for Agriculture and Rural Development (DG AGRI), involving an extensive review of internal and external scientific reports, recommendations from a panel of climate, soil and land evaluation experts, and from the results of technical meetings with MS on their ANC simulations.

To keep the method simple, robust and transparent, a restricted selection of elementary soil, climate and terrain characteristics was made. Those characteristics were included and judged to be the most pertinent for distinguishing land according to its suitability for generic agricultural activity.

The results can be used to effectively delimit the two types of land characteristics for agriculture on condition that reliable base data (observations, measurements or estimates) are available with a sufficient spatial and semantic resolution.

A number of objectives and recommendations for the development of common biophysical criteria were considered:

- **Scientifically clear and understandable methodology:** The application of the criteria should be transparent, straightforward and scientifically clear to enable translation into policy framework.
- **Key soil, climate and terrain characteristics in EU-28:** The criteria should be based on the most pertinent characteristics of land according to its suitability for generic agricultural activity and should be applicable within EU-28 Member States.
- **Natural conditions:** The classification should relate to areas that have severe limitations and natural constraints to agriculture and not to how the land is used, i.e. it does not identify conditions to reach optimal production for each type of crop.
- **Agricultural areas:** The criteria should focus on agricultural areas which include permanent grasslands, permanent crops and arable land. Forest areas are not included.
- **No crop specificity:** The method should not be crop dependent. Suitability was considered for a European conventional, mechanised, farm unit of adapted grain crops or adapted grasses for hay, silage or grazing.

<sup>1</sup> "agricultural area" means any area taken up by arable land, permanent grassland and permanent pasture, or permanent crops

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- Not to change during the programme period: The criteria should not change during the period of the programme. Concerning climate, it should not be based on a particular year, but rather by considering probabilities based on recent time series meteorological data.

The criteria apply for 'natural' conditions. Therefore, areas shall be excluded where the significant natural constraint has been overcome by investments or by, economic activity, or by evidence of normal land productivity, or in which production methods or farming systems have offset the income loss or added costs. This refers to the so-called fine-tuning of the area delineation. It shall be carried out based on objective criteria (Article 32, paragraph 3 of EU Regulation 1305/2013).

## BIOPHYSICAL CRITERIA

The biophysical criteria developed for identifying significant natural constraints to agriculture in Europe are provided in A1.1 below.

Table A1.1. Soil, climate and terrain criteria for classifying land according to its suitability for generic agricultural activity. Threshold values indicate agricultural areas with severe natural handicaps to agriculture.

CRITERION	DEFINITION	THRESHOLD
<b>CLIMATE</b>		
<b>Low temperature</b>	Length of Growing Period LGP (number of days) defined by number of days with daily average temperature >5° C (LGP <sub>t5</sub> ) OR	≤180 days
	Thermal-time sum (degree-days) for Growing Period defined by accumulated daily average temperature >5°	≤1500 degrees
<b>Dryness</b>	Ratio of the annual precipitation (P) to the annual potential evapotranspiration (PET)	P/PET ≤0.5 (dry subhumid areas)
<b>CLIMATE AND SOIL</b>		
<b>Excess Soil Moisture</b>	Number of days above field capacity	≥230 days
<b>SOIL</b>		
<b>Limited soil drainage</b>	Areas which are water logged for significant duration of the year	Wet within 80 cm from the surface for over 6 months, or wet within 40 cm for over 11 months OR
		Poorly or very poorly drained soil OR Gleyic colour pattern within 40 cm from the surface
<b>Unfavourable soil texture and stoniness</b>	Relative abundance of clay, silt, sand, Organic matter (weight %) and Coarse material (volume %) fractions	≥15% of the topsoil is coarse material, including rock outcrop, boulders, OR
		Texture class in half or more (cumulatively) of the 100 cm from the soil surface is sand, loamy sand defined as: Silt%+(2xclay%)≤30% OR
		Topsoil texture class is heavy clay (≥60%) OR
		Organic soil (organic matter≥30%) of at least 40 cm OR
		Topsoil contains 30% or more clay and there are vertic properties within 100cm from the soil surface

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Shallow rooting depth	Depth (cm) from soil surface to coherent hard rock or hard pan	≤30cm
Poor chemical properties	Presence of salts, exchangeable sodium, excessive salinity	Salinity: ≥4 deci-Siemens per meter (dS/M) in topsoil OR
		Sodicity: ≥6 Exchangeable Sodium Percentage (ESP) in half or more (cumulatively) of the 100 cm of soil surface layer OR
		Soil Acidity: ≤5pH (in water) in topsoil
<b>TERRAIN</b>		
Steep slope	Change of elevation with respect to planimetric distance (%)	≥15

These criteria originate from the agricultural “problem-land approach” (FAO, 1990a and Nachtergaele, 2006), whereas the threshold values have been derived from, and justified by, state-of-the-art scientific knowledge and expert consultation. The criteria are based on a selection of elementary soil, climate and terrain characteristics judged to be the most pertinent for distinguishing land according to its suitability for generic agricultural activity in Europe.

In countries or regions for which particular criteria are not relevant, they do not need to be calculated. Some criteria are more absolute than others, and some are easier to overcome. However, each criterion, despite having a particular impact and threshold, does at a certain point present a severe natural handicap for agricultural activities. Hence the delimitation of areas is transparent across the whole of the Community.

The criteria applied here are for ‘natural’ soil and climatic conditions. Therefore, when soil and/or climatic conditions have been improved (e.g. through drainage, irrigation or other techniques), criteria cannot be applied in the same way, as a natural constraint has been overcome. The area delimitation should therefore be ‘fine-tuned’ after this improvement (for further guidance, see Article 32, paragraph 3 of EU Regulation 1305/2013, and Commission Document Fine-tuning in areas facing significant natural and specific constraints, prepared by DG Agriculture and Rural Development (DG AGRI) for the fine-tuning recommendations).

The reasons for choosing the modified “problem-land approach” rather than a more elaborated Land Quality approach for the ANC mapping exercise are its simplicity, robustness, transparency and the objectives pursued, i.e. to identify areas with constraints to agriculture and not to identify all necessary conditions to reach optimal production for each type of crop. The concept of length of growing period (the low temperature criterion) and the probability-based approach for climate-related characteristics have been adopted from the Agro-ecological zoning approach (FAO, 1978, 1996; and Fischer et al., 2002).

## ASSESSMENT OF CRITERIA

Criteria are assessed according to the agronomic law of the minimum (Liebig’s law). As soon as one of the criteria is considered to pass the threshold indicated in Table 1, the corresponding land is judged to have a natural constraint regarding agricultural production. The criteria are not weighted or given a relative importance or priority.

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## CALCULATION OF CLIMATE CRITERIA

Climate criteria are treated in a probabilistic way. In order to account for inter-annual variability of the length of the growing season, temperature accumulation, dryness and excess soil moisture, these characteristics are classified as being natural constraints in a probabilistic approach: i.e. the probability of exceeding the threshold is greater than 20%.

The recommended World Meteorological Organisation (WMO) reference climatic period consists of 30 years, as it is long enough to filter out any inter-annual variation or anomalies. The current climate reference period in use by WMO is from 1 January 1961 to 31 December 1990. ([http://www.wmo.int/pages/themes/climate/climate\\_data\\_and\\_products.php](http://www.wmo.int/pages/themes/climate/climate_data_and_products.php)).

Nevertheless, questions have arisen about the representativeness of a period such as 1961-90 after some years in a non-stationary climate. Moreover, some countries may have more meteorological observation data available in the recent period than 40 years ago. Consequently, and as suggested by the WMO Commission for Climatology, it shall be possible to adapt the reference period to best fit the aim of the application and based on best available meteorological data sets along the following principles:

- The current reference period is from 1 January 1961 to 31 December 1990;
- Updating the reference period is possible following a 'rolling' set of 30 years, updated every 10 years (a period starting on 1 January of a year ending with the digit 1, e.g. 1971, 1981) depending on best available data sets, with the duration of the 'rolling' period being 30 years;

Once, a reference period for meteorological assessment is chosen, it shall be used for the calculation of all climate-related criteria (i.e. Low temperature, Dryness, Excess soil moisture). Time series of daily meteorological data, is required to assess the probability of exceedance. It is strongly advised to use the reference period best suited according to best available meteorological data sets and following the principles above as recommended by the WMO.

In case meteorological observations are unavailable, another possibility is to use data produced by meteorological models (re-analysis data), provided that the horizontal resolution is adequate for the geographical unit under assessment, typically a grid size of 10 x 10 or 20 x 20 km maximum when assessing Local Administrative Units (LAU2) and that the duration of the data series follows the principles above.

## MAPPING OF SOIL CRITERIA

National soil data are less harmonised than climate data, and different classification systems of different properties of the soils are represented in various ways according to national and regional characteristics, needs and purposes of the respective countries. Therefore, it is not possible to provide one single answer on how to derive the soil criteria for all MS.

It is recommended that MS use the most suitable soil and land data available, i.e. with homogeneous coverage, good resolution and a good level of accuracy. The advisable map scale for the assessment of soil criteria is 1:25,000 to 1:50,000. Some MS use the 1:5,000 scale, which is even better for assessing soil constraints at municipality level.

The following soil characteristics are needed for the assessment of constrained agricultural land:

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- Drainage (soil hydromorphic status or frequency and duration of wet periods)
- Stoniness (% volume of stones)
- Texture (% clay and silt) within 100 cm of the soil surface (and clay content (%) in topsoil)
- Soil organic matter content (%) and thickness of organic layers within 100 cm of the soil surface
- Vertic properties within 100 cm of the soil surface
- Rooting depth (cm)
- Salinity [Electrical Conductivity of the extract ( $EC_E$ ) in deci-Siemens per metre (dS/m)]
- Sodicity [Exchangeable Sodium Percentage (ESP)<sup>1</sup> or as SAR (Sodium Adsorption Ratio)<sup>2</sup>]
- pH (value of the hydrogen ion activity as an indicator of soil acidity, measured at 1:5 soil to water ratio)

## SLOPE CALCULATION

Several instruments have been developed over time to determine slope. Topography has been estimated using photogrammetry. In current practice, high-resolution elevation data sets obtained from radar and satellite data are also used. Commonly, MS have elevation data with 10-20 m or finer resolution through their mapping agencies. For a given location, the estimation of the slope will be affected by the resolution of the digital elevation model (DEM). Coarse-resolution DEM will underestimate the real slope. It is, therefore, recommended to use a large-scale DEM (20-m horizontal resolution or higher).

Detailed criteria and thresholds for soil, climate and terrain parameters are given in Table A1.1. Recommendations on the assessment of each criteria are provided in Terres et al., 2016.

## SPATIAL CALCULATION UNIT

Mapping should be carried out at a sufficient level of detail. The available resolution of biophysical data sets varies between and sometimes within countries, as does the size of the administrative unit to be designated. Therefore, it is advisable to ensure that the scales of the soil and climate data are compatible with the scale at which the area will be designated. For example, it is not appropriate to use a small scale soil map (e.g. 1:1,000,000) for characterising soil conditions of administrative units of a few km<sup>2</sup>. Instead soil maps at a scale of 1:25,000 to 1:50,000 are recommended. However, they could be even at larger scale depending on the local conditions of each country.

It is acknowledged that a criterion needs to be assessed only when it is present in the country, i.e. no mapping is needed if the criterion is not a natural constraint (e.g. the criterion on dryness is not expected to be present in northern Member States).

## CONTEXT OUTCOMES AND RECOMMENDATIONS

In 2016 the JRC published the technical report “Updated guidelines for applying common criteria to identify agricultural areas with natural constraints” aiming to provide guidance on the computation and mapping of common biophysical criteria by the EU Member States (MS) for delimiting Areas with Natural Constraints (ANC). These guidelines are intended to help officers in MS administrations, technical institutes and contractors dealing with the computation of the common biophysical criteria for delimitation of ANCs. They describe concepts and provide information on ways to derive the indicators and how they can be aggregated.

However, it should be noted that this is not a detailed description on the exact steps and procedures

<sup>1</sup>  $ESP = \text{exchangeable Na} \times 100 / CEC$  (Na and CEC in meq/100g soil)

<sup>2</sup>  $SAR = Na / \sqrt{\frac{1}{2}(Mg^2 + Ca^2)}$

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

to be followed, as each Member State has different databases and tools and, thus, no single answer can fit all. Furthermore, it is not a compulsory methodology to be followed by MS. Instead, the recommendations must be adapted within each MS to soil, climate and terrain data sets, existing land evaluation methods and/or results from models. Its aim is to make the best use of existing capacities and available information sources in the MS, as well as to share knowledge based on experiences gained during the technical discussions between the MS and Commission services.

The accuracy of applying the criteria to delineate constrained farming areas from other zones is data dependent, both in the semantic and the spatial dimensions. If the semantic resolution of the available observations, measurements or estimates is higher (more classes) or different (class boundaries) than what is requested, a reclassification is necessary. This can imply a certain loss of information and increased uncertainty. Furthermore, it is advisable to ensure that the spatial resolution of the soil, terrain and climate data is compatible with the size of the administrative unit to be designated.

## **WHY IMPLEMENTING THE ANC APPROACH IS RELEVANT AND TIMELY FOR THE WESTERN BALKANS?**

The common biophysical criteria can be used anywhere in Europe to delineate the land areas facing severe natural limitations for agriculture. They provide a simple and comparable system although requiring technical work and administrative efforts to be put in place by all countries.

Adequate data at EU level are not available for an assessment at a detailed spatial scale needed for the ANC delineation. For that reason and in order to avoid inaccurate results, relevant countries' authorities need to perform the work of the application of the common criteria on the basis of sufficiently detailed soil and climate data. The delineation of ANCs is technical work that needs time, expertise and competency on soil, climate, and terrain related issues and on spatial analysis. It may need time and can be costly especially if soil and climate data at sufficient spatial and semantic detail are not available at the country level.

For these reasons and taking into account also the experiences so far, it is highly recommended to analyse data availability and take steps, if needed, to improve them, but simultaneously start the technical work of delineation as well at an early stage when a country decides to include the ANC scheme in its rural development policy.

The DG JRC provides technical guidance to EU Member States during the delineation of ANC in order to insure their consistent delineation throughout the EU. The cooperation starts from the preliminary stages of the assessment to enhance the process and help avoid the risk that some steps or even the whole mapping may have to be redone at a later stage.

The ANC project and the present report is a preliminary and useful step forward towards the implementation of the EU methodology. Since the Western Balkan countries intend to adapt to EU standards, including an ANC delineation in line with the EU methodology in their rural development policies, this report can be the basis for preparing such a process.

# CHAPTER A2

## IMPLICATIONS OF THE ANC EU METHODOLOGY TO THE RESPECTIVE SEE COUNTRIES

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### INTRODUCTION

The ANC methodology applied in the EU reflects the biophysical conditions of its member states (MS). The rule that areas above the 62<sup>nd</sup> parallel are automatically classified as ANC is one of such examples. Other typical characteristics include also the large expansion of natural pastures in countries like Ireland, where this form of land covers almost 80% of the agricultural land. Due to the climatic regime of Northern Europe dominated by heavy rainfall and lower temperatures, wetlands, peats and bogs cover large areas in Finland, Sweden, UK and a few other countries. This is not the case of the Western Balkans.

The peculiarity of climate, soils and terrains in southeastern European countries, including Albania, Bosnia and Herzegovina (B&H), Kosovo\*, Macedonia, Montenegro and Serbia (Fig. A2.1), require that the ANC methodology already applied in the EU may need to be revised but only if underpinned by scientific evidence. Nevertheless, the criteria and thresholds will remain the same. To do so the first step is to have an understanding of the data presently available, their quality check and control and how they could be used to start the ANC delineation process.



Figure A2.1. Map of participating countries in the ANC SEE project (Albania, Bosnia and Herzegovina (B&H), Kosovo\*, Macedonia, Montenegro and Serbia)

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<sup>5</sup> Rural Development through Integrated Forest and Water, Resources Management in Southeast Europe (LEIWW) Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Skopje, Macedonia

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

Table A2.1. Soil, climate and terrain data availability in the SEE countries included in the Areas with Natural Constraints (ANC) project

CRITERION	DEFINITION	THRESHOLD	DATA AVAILABILITY AND PROPOSED SOLUTIONS					
			ALBANIA	B&H	KOSOVO <sup>*</sup>	MACEDONIA	MONTENEGRO	SERBIA
<b>CLIMATE</b>								
Low temperature	Length of Growing Period LGP (number of days) defined by number of days with daily average temperature >5° C (LGP <sub>15</sub> )	≤180 days	Preliminary assessments are available; further elaboration is needed	This is a crucial indicator; careful assessment will be done	Areas may be present; climate data largely missing or stored in Serbia	Preliminary assessments are available; further elaboration is needed	Preliminary assessments are available; further elaboration is needed	Preliminary assessments are available; further elaboration is needed. Climate data available up to 2012
	OR							
	Thermal-time sum (degree-days) for Growing Period defined by accumulated daily average temperature >5°	≤1500 degrees	Same as above	Same as above	Same as above	Same as above	Same as above	Same as above
Dryness	Ratio of the annual precipitation (P) to the annual potential evapotranspiration (PET)	P/PET ≤0.5 (dry sub-humid areas)	Very limited info available. Few areas meeting the criteria may be present	Not relevant	Not relevant	Not relevant, or present in very limited areas	Not relevant, or present in very limited areas	Not relevant, or present in limited areas (Hargreaves method instead of Penman Monteith)
Common agreement for climate data is to use the baseline period 1961-1990								
<b>CLIMATE AND SOIL</b>								
Excess Soil Moisture	Number of days above field capacity	≥230 days	Data exist partially; the number of days may be reduced	Data exist partially; number of days may be reduced	Data largely missing, only expert assessments	Data largely exist, but the total number of days may be reduced	Data largely exist, but the total number of days may be reduced	Data largely exist, but the total number of days may be reduced
<b>SOIL</b>								
Limited soil drainage	Areas which are water logged for significant duration of the year	Wet within 80 cm from the surface for over 6 months, or wet within 40 cm for over 11 months OR Poorly or very poorly drained soil OR Gleyic colour pattern within 40 cm from the surface	Data will be derived from existing soil maps, no field measurements are available	Data will be derived from existing soil maps, no field measurements are available	Only limited info from old soil map of former Yugoslavia	Data from old and recent soil surveys and soil maps	Data will be derived from existing soil maps, no field measurements are available	Data will be derived from existing soil maps, no field measurements are available

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Unfavourable soil texture and stoniness	Relative abundance of clay, silt, sand, Organic matter (weight %) and Coarse material (volume %) fractions	≥15% of the topsoil is coarse material, including rock outcrop, boulders, OR	Soil maps and existing field surveys	Soil maps and existing field surveys	Data largely missing or stored in Serbia	Soil maps and existing field surveys	Soil maps and existing field surveys	Soil maps and existing field surveys, but texture data largely missing	
		Texture class in half or more (cumulatively) of the 100 cm from the soil surface is sand, loamy sand defined as: Silt%+(2xclay%) ≤30% OR	Detailed data available for 240,000 ha of ag. land. The rest from previous surveys	Same as above	Same as above	Same as above	Same as above	Same as above	Same as above
		Topsoil texture class is heavy clay (≥60%) OR	Same as above	Same as above	Same as above	Same as above	Same as above	Same as above	Same as above
		Organic soil (organic matter≥30%) of at least 40 cm OR	Only limited areas are present	Only limited areas are present	Not relevant	Not relevant	Only limited areas are present	Data missing or could be derived from soil maps	
		Topsoil contains 30% or more clay and there are vertic properties within 100cm from the soil surface	Analytical data are available for 240,000 ha; the rest from previous studies	Soil maps and existing field surveys	Data largely missing or stored in Serbia	Soil maps and existing field surveys	Soil maps and existing field surveys	Old soil maps as reference source, but data largely missing	
Shallow rooting depth	Depth (cm) from soil surface to coherent hard rock or hard pan	≤30cm	Soil maps and existing field surveys	Soil maps and old field surveys	Data missing	Soil maps and existing field surveys	Soil maps and existing field surveys	Soil maps and existing field surveys	
Poor chemical properties	Presence of salts, exchangeable sodium, excessive salinity	Salinity: ≥ 4 deci-Siemens per meter (dS/M) in topsoil OR	Info largely available	Not relevant	Not relevant	Information available from soil maps	Not relevant	Data missing, but the problem exists; info could be derived from soil maps	
		Sodicity: ≥ 6 Exchangeable Sodium Percentage (ESP) in half or more (cumulatively) of the 100 cm of soil surface layer OR	Info largely available	Not relevant	Relevant in limited areas	Information available from soil maps	Not relevant	Data missing, but problem exists; info could be derived from soil maps	
		Soil Acidity: ≤5pH (in water) in topsoil	Info largely available	Info from soil maps	Info missing, the only source is from old soil maps	Info from soil maps and recent soil surveys	Info from soil maps and recent soil surveys	Data missing but problem exists; info could be derived from soil maps	

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TERRAIN								
Steep slope	Change of elevation with respects to planimetric distance (%)	≥15	DTM and field surveys	DTM and field surveys	DTM	DTM and field surveys	DTM and field surveys	DTM and field surveys

## FINDINGS, OUTCOMES, CROSS COUNTRY DATA AVAILABILITY AND FUTURE PERSPECTIVES

The detailed information included in Table A2.1 shows the diversity of information available in the participating countries. The most critical one is Kosovo\* where soil and climate data are almost completely missing. In terms of soil information the only source is the Soil Map at a 1:50,000 scale of the former Yugoslavia published in 1974. But, even this one exists only as an image in paper format without any other data, except for the location of the soil profiles studied during the field survey. No profile descriptions or laboratory data are available. In any case, even if these soil data had been available, they would not be fully adequate for ANC delineation as the data were collected more than 50 years ago, hence updates are necessary.

ANC mapping and delineation should foresee substantial funding for new soil surveys and laboratory analyses, not only for Kosovo\*, but also for all other countries, as many of them rely heavily on obsolete soil data.

The situation is more or less the same for climate data too, despite the fact that a number of new meteorological stations are being installed in the participating countries. Nevertheless, their data will not fulfil the ANC requirements for a 30 year baseline climatic period to carry out ANC climatic mapping (i.e. estimation of the growing period, dryness and soil moisture). Then the only remedy for solving the issue of climate data will be to use the baseline period 1961-1990. These data are easier to be collected through various sources, including the archives of the WMO. This is also clearly indicated and agreed upon by the updated EU methodology for ANC delineation. If recent climate data are available as in the case of Serbia, they should be used in the assessment.

The issues of topography and relief characterisation appear to be less problematic as Digital Terrain Models (DTM) and Digital Elevation Models (DEM) with 5 to 20 m resolution are largely available. During the expert discussions and based on the EU methodology, it was agreed that the 20 m resolution for ANC mapping should be used as the most appropriate resolution to identify the diversity of landscapes and their relations with ANC areas.

The best source of land use/land cover data is the CORINE database, freely available at the webpage of the European Environment Agency (EEA). Many ANC countries have already downloaded the CORINE2012 data and this should be the baseline for the identification of the agricultural areas and natural pastures (CORINE code 231) for ANC mapping. Extensive use of national statistics should be made and it should be validated with CORINE data. In the EU the agricultural area includes arable land, permanent grassland and permanent pasture or permanent crops as defined in Article 4 of Regulation (EU) No 1307/2013. The same approach should be also used in the SEE countries.

Additional digital databases in Geographical Information System (GIS) are available at various institutions at country level. They include updated land use maps, topographic maps, administrative divisions and sub-divisions, cadastral maps and many other sets of data. However, this information is often scattered among different governmental agencies and institutions and their access is somehow difficult. Therefore, the involvement of the ANC governmental entities is needed. In particular, the

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Ministries of Agriculture and Environment should take the lead to accelerate the flow of existing digital information to the ANC national teams in charge of ANC mapping and data elaboration.

It is worth mentioning that the project has vast applications and implications in terms of rural development policy, and therefore, its outcomes could be important strategic instruments for other vital sectors of the economy as well, including environmental protection and monitoring. This is another reason for data sharing.

Comparing the EU methodology for ANC delineation with the one to be adopted in the SEE countries, it is recommended that all the assessment criteria remain the same, except for some threshold values that may need to be adjusted. This includes, for instance, the threshold of “230 days above field capacity” that is typical for the areas of Northern Europe under different climatic regimes compared with the SEE region. However, even while keeping the threshold of 230 days unchanged, the criterion of “excess soil moisture” should be replaced by the “limited soil drainage” criteria given in Table A2.1. Another case is the special clayey soil type of the Balkans locally known as “Smonitsa” typical for magnesian soils formed on ultrabasic serpentine rocks. They show poor chemical and physical properties and may qualify as ANC due to high clay content and all other characteristics described under the criteria “Unfavourable soil texture” of Table A2.1.

Another point of discussion in the ANC meetings and workshops has been devoted to the areas with poor drainage conditions or waterlogged for a significant period of time during the year. Obviously the ANC methodology is used to map natural areas characterised by such conditions. But, the history of the SEE countries is in some way different. In all of them during the socialist regime large areas have been reclaimed from swamps to agricultural land through intensive governmentally funded land reclamation projects. However, after the collapse of the socialist regimes, interventions such as dragging and cleaning of drainage canals were abandoned. As a consequence many of these areas experienced severe flooding, excess of soil moisture, including water logging, and a process of swampisation. Therefore, the proposal is to include them in ANC mapping irrespective of the fact that they derive from non-agricultural areas (former swamps) and were transformed in arable lands thanks to human interventions.

## **CROSS-COUNTRY ASSESSMENT OF THE INSTITUTIONAL CAPACITIES FOR DELINEATION AND MANAGEMENT OF ANC AND PROVISION OF RECOMMENDATIONS CONCERNING THE INSTITUTIONAL SETUP**

The project has identified in each participating country/territory three categories of experts as described below:

### **1. Agronomist – Agrometeorologist – Agroenvironmentalist**

The expert should have an advanced degree in agriculture with specific knowledge of the effect of climate on crop growth and yield. The expert should be able to assess the length of the growing period and thermal time sum (Growing degree days – GDD) for different cardinal temperatures over the agricultural areas in the country. The expert should also understand the effect of drought and overmoisture and be able to conduct research on dryness and wetness over agricultural areas in the country and to perform geospatial analyses on soil moisture during the whole year.

### **2. Soil scientist – Pedologist**

The expert should have advanced university degree in soil science with particular knowledge on soil properties that limit crop growth and reduce crop-yielding potential. Particularly the soil scientist should be able to determine the agricultural soils with limited soil drainage, period of presence of excess water in the agricultural soils, unfavourable soil texture and stoniness conditions that affect

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crop growth, rooting depths of the agricultural soils. Also, the expert should be able to delineate agricultural areas in the country in regard to soil chemical properties that limit crop growth and productivity, particularly soil salinity, sodicity, and acidity. The soil expert should have capacity to perform geospatial analyses of soil properties and to map areas with constrains.

### 3. GIS expert

The GIS expert should have an understanding of agriculture and some background in soils, climate, vegetation etc. The GIS expert should be able to perform analyses and modelling of the climate and soils over the agricultural areas in the country. In particular, he/she should support the other experts in the development of models for the determination of areas with natural constraints for agricultural production. The GIS expert should also perform analyses of the terrain and determine agricultural areas with steep slope that are reducing crop productivity according to the methodology provided by other experts. The GIS expert should be able to develop geospatial databases and to present the results of the analyses in WEB GIS format.

A total of 20 highly qualified experts from the countries/territories from the region have been selected. They represent various institutions including the Ministries of Agriculture, the Ministry of Environment, research and education (universities) and private business. However, country capacities are not the same. For instance Serbia, Macedonia, Montenegro and the Republic of Srpska are well advanced in both data availability and GIS software performance and elaboration, Albania and B&H Federation are somewhere in between, while Kosovo\* may be lagging behind both in terms of data availability and elaboration.

The next important aspect in terms of capacity building for ANC mapping is the training of experts. A first tentative training was done at the Kolasin meeting held in Montenegro in September 2016 where the case study of Serbia was shown as an example. Moreover, funding should be foreseen for GIS software acquisition as it is necessary for the spatial delineation of ANCs.

Furthermore, the ANC project has been initiated by and received a warm welcome from the policy makers as meetings were held with few of them in Serbia, the Republic of Srpska, Albania and Kosovo\* meaning that the institutional support exists. The final institutional setup for the establishment of the ANC system and its further updates should be maintained by the Ministries of Agriculture. This should serve not only to display the location of these areas but also to define the rural development policies and the support payment schemes that may be allocated in the future for the farmers operating in those constrained zones.

Besides the provision of policy recommendations, the final outcome of the ANC project in the SEE will also provide technical recommendations for establishment of national web-based GIS systems, with the aim to provide information about the locations of the ANC areas (based on the endorsed national methodology which will be in line with the EU methodology for ANCs).

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# CHAPTER A3

## RECOGNISED SOCIOECONOMIC AND ENVIRONMENTAL NEEDS OF THE REGIONS DEFINED AS ANC

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The Western Balkan countries/territories: Albania (AL), Bosnia and Herzegovina (BiH), Kosovo\* (KS), Macedonia (MK), Montenegro (ME) and Serbia (RS) are typically recognised for their small territory and population (Table A3.1). Altogether the six Western Balkans countries cover about 4.9% of the EU-28 territory and just 3.6% of its population. Serbia is the biggest country covering about 2% compared to the EU-28 territory and about 1.4% of the EU-28 population. All other countries cover an area less than 1%, except for BiH with its 1.15% of the territory compared to EU-28 size. Apart from Albania, until the early 90s all the others were part of the same political system or what is known now as the former Yugoslavia.

Table A3.1. Total area, population and population density in WB countries, compared to EU-28

	AL	BiH	KS*	MK	ME	RS	WB total	EU-28
Population (000 inhabitants)	2,895	3,827	1,805	2,066	622	7,149	18,364	506,881
Share in EU-28 (%)	0.57	0.76	0.36	0.41	0.12	1.41	3.62	100
Average annual population growth 2004-2014 (%)	-0.46	-0.01	-0.68	0.19	0.16	-0.42	-0.42	0.30
Total area (000 km <sup>2</sup> )	28.7	51.2	10.9	25.7	13.8	88.5 <sup>a</sup>	218.8	4,467.8
Share in EU-28 (%)	0.64	1.15	0.24	0.58	0.31	1.98	4.90	100
Population density (inhabitants/km <sup>2</sup> )	101	75	166	80	45	92 <sup>b</sup>	84	113

a and b Including Kosovo\*

Source: Eurostat, 2016 and Bajramovic, et al. (2016) Analysis of the agricultural and rural development policies of the Western Balkan countries. No. JRC101320. Joint Research Centre (Seville site).

There is an evident trend towards reducing population in some Western Balkan countries, particularly in Serbia, Kosovo\* and Albania. Several reports are dealing with the negative trend of population reduction in the region and Palasic (2015) explains that there are several reasons for such decrease but the most important are low fertility rate, migration and the impacts of the war period in the early 90s. Various countries face different problems. Serbia, for instance, had a positive migration balance during and after the war but the decrease of population is related to low fertility rate. The migration problem is widespread in all WB countries and still persists with large parts of population aspiring to migrate abroad. On the other hand, there is also a trend of internal migration. Rural people are moving

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from the marginal areas towards the most developed zones within the countries which beyond doubt most often are located in flat productive areas. It is also for these reasons that the implementation of the ANC policy could remedy, lower and, possibly, reverse these trends.

Although the population trends vary among EU member countries, the EU-28 population as a whole increased with an estimated average growth rate of 0.30% per year in the period 2004-2014. In the Western Balkan countries, overall there is a decrease in the population over the period 2004-2014 with an annual rate of -0.42%; the estimated annual growth rates are positive only in Macedonia and Montenegro.

The data on population density in the year of 2014 presented in Table A3.1 show that the density of population in WB countries is 84 inhabitants/km<sup>2</sup>. That puts the region in the mid-range in terms of EU countries population density (the average being 113 persons per km<sup>2</sup> in 2014). However, the variability of the population density in WB countries is quite large from 45 inhabitants per km<sup>2</sup> in Montenegro to 165 in Kosovo, the latter being even higher than the average population density in the EU-28. The population density in Bosnia and Herzegovina, Macedonia and Serbia is close to the average value for WB countries, while Albania has 101 inhabitants /km<sup>2</sup>.

## THE PATH TOWARDS EU INTEGRATION

The WB countries are at different stages in the EU accession process; Serbia and Montenegro are candidate countries which opened the membership negotiations in January 2016 and waiting for the chapter on agriculture to be opened, Macedonia and Albania have candidate status and wait for the date to start the negotiation process, and Bosnia and Herzegovina and Kosovo\* are potential candidates, promised the prospect of joining when they are ready (EC, 2016). The EU negotiations relate to the conditions of adoption, implementation and enforcement of EU rules by the candidate countries.

According to a recent Joint Research Centre (JRC) report (Bajramovic at al., 2016) the key issues of the accession process in the field of agricultural policy include:

- Implementation of the Instrument for Pre-Accession Assistance in Rural Development (IPARD);
- Harmonisation of the legal framework for the implementation of agricultural policy;
- Institutional capacity building (programming capacity, paying agencies, the Integrated Administrative and Control System (IACS), enforcement of horizontal regulations, etc.);
- Implementation of policy reforms to accommodate the CAP-like policy instruments into agricultural policies (direct payments, rural development and common market organisation).

It should be noted that the ANC delineation and support must be included in the policy support agenda of these countries. It is also important to recognise the close interconnections and interdependence between the socioeconomic and environmental factors and the multi-faceted relationship between agriculture, rural communities and environment in the Western Balkans. This is the best testimony that the region needs an adequate ANC policy rather sooner than later.

## ANALYSES OF SOCIOECONOMIC INDICATORS

The gross domestic product (GDP) of WB countries in 2014 was estimated to range from EUR 5.4 billion in Montenegro to EUR 33.1 billion in Serbia. Data for Kosovo\* are available only for the year 2013 and GDP was estimated to be EUR 5.3 billion (see Table A3.2). There are significant differences in GDP per capita among the Western Balkan countries (Table A3.2 and Figure A3.1); for instance, in 2014, the highest value is in Montenegro with EUR 5.4 thousand/capita, followed by Serbia (EUR 4.6 thousand/capita), Macedonia (EUR 4.1 thousand/capita), Bosnia and Herzegovina (EUR 3.6 thousand/capita), Albania (EUR 3.4 thousand/capita) and finally Kosovo\* (EUR 2.9 thousand/capita in 2013).

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All countries are still lagging far behind the EU-28 value (that is quite heterogeneous among the EU member countries), that is estimated at the average of EUR 27.5 thousand GDP per capita in 2014.

Table A3.2. Gross domestic product (GDP), 2008 – 2014

Country GDP at current market prices (billion EUR)							
	2008	2009	2010	2011	2012	2013	2014
<b>EU-28</b>	12,986.4	12,245.9	12,789.8	13,173.4	13,420.2	13,521.0	13,920.0
Montenegro	3.1	3.0	3.1	3.2	3.1	3.3	5.4
Macedonia	6.8	6.8	7.1	7.5	7.6	8.1	8.5
Albania	8.8	8.7	9.0	9.3	9.6	9.6	10.0
Serbia	33.7	30.7	29.8	33.4	31.7	34.3	33.1
Bosnia and Herzegovina	12.8	12.4	12.7	13.2	13.2	13.7	13.9
Kosovo*	3.9	4.1	4.4	4.8	5.1	5.3	:
GDP per capita at current market prices (EUR)							
	2008	2009	2010	2011	2012	2013	2014
<b>EU-28</b>	26,100	24,500	25,500	26,100	26,600	26,700	27,500
Montenegro	4,908	4,720	5,011	5,211	5,063	5,356	5,436
Macedonia	3,308	3,300	3,459	3,665	3,680	3,930	4,127
Albania	2,986	2,958	3,088	3,191	3,305	3,323	3,440
Serbia	4,586	4,187	4,082	4,619	4,400	4,781	4,635
Bosnia and Herzegovina	3,325	3,234	3,310	3,432	3,430	3,569	3,641
Kosovo*	2,258	2,329	2,480	2,672	2,799	2,935	:

Source: Eurostat, 2016 (online data codes: nama\_10\_gdp, nama\_10\_pc and cpc\_ecnagdp).

The data presented in Table A3.3 shows the trends in real GDP growth. The environment for GDP growth in WB countries was favourable in the period 2004-2008, with its peak being in 2007 in all countries, including the EU-28 average. Following the global financial crisis, there is an evident drop, being the most drastic in Montenegro. In the last five years, the highest growth in real terms is estimated in Kosovo\*, Macedonia, and Albania.

Table A3.3. Real GDP growth in the period 2004–14 (% change compared with the previous year)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2014 (2010=100)
<b>EU-28</b>	2.5	2.0	3.4	3.1	0.5	-4.4	2.1	1.7	-0.5	0.1	1.3	3.0
Montenegro	4.4	4.2	8.6	10.7	6.9	-5.7	2.5	3.2	-2.5	3.3	:	3.9
Macedonia	4.7	4.7	5.1	6.5	5.5	-0.4	3.4	2.3	-0.5	2.7	3.8	8.6
Albania	5.7	5.7	5.4	5.9	7.5	3.4	3.7	2.5	1.4	1.1	2.1	7.0
Serbia	9.0	5.5	4.9	5.9	5.4	-3.1	0.6	1.4	-1.0	2.6	-1.8	1.1
Bosnia and Herzegovina	6.3	3.9	5.7	6.0	5.6	-2.7	0.8	1.0	-1.2	2.5	1.1	3.4
Kosovo*	:	:	3.4	8.3	4.5	3.6	3.3	4.4	2.8	3.4	:	10.6

Source: Eurostat (online data codes: nama\_10\_gdp and cpc\_ecnagdp); Note: Base year for 2014 (2010=100), own calculation for Montenegro, Bosnia and Herzegovina and Kosovo\*.

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

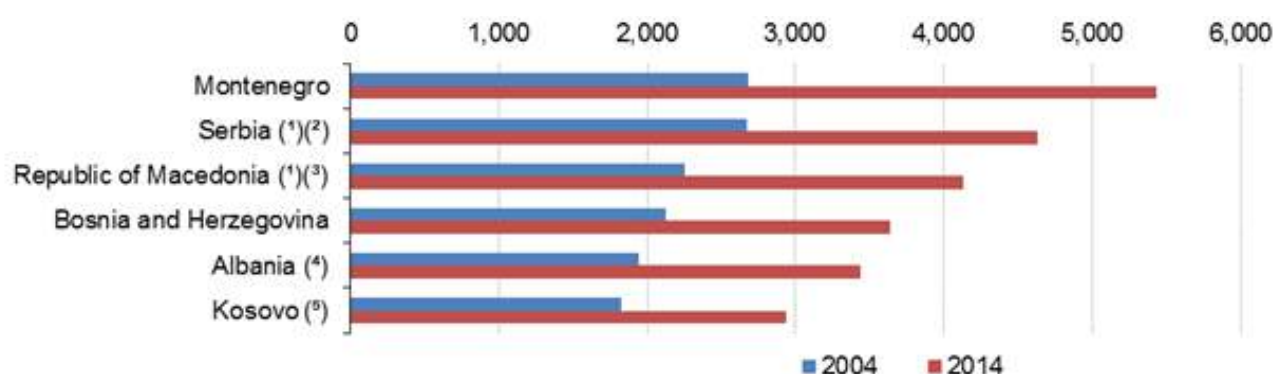


Figure A3.1 GDP per capita, 2004 and 2014

The analysis of the gross value added (GVA) by economic activity presented in Figure A3.2, shows that in the year 2014, the sectors of agriculture, forestry and fishing were still important economic activities in the WB countries, which indicates the development stage of the countries. The share of these sectors in the EU countries is much lower (2% in 2004 down to 1.6% in 2015 - average for the EU-28 countries, Eurostat, 2016), since other industries contribute more significantly to the overall economies. In the WB countries, this share ranges from 7.0% (BiH) to 22.9% (AL) in 2014. Nevertheless, except for Albania, there is a trend of slowly reducing the share of agriculture in GVA in all other countries. If this trend of development of the other sectors other than agriculture continues in the WB countries, most probably the importance of agriculture as one of the most significant economic sectors may be reduced.

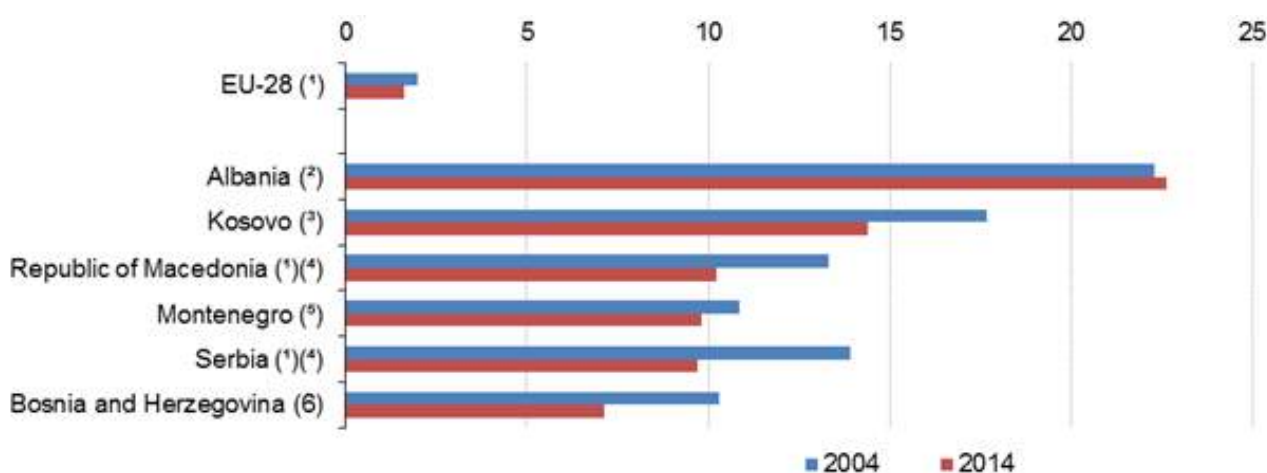


Figure A3.2. Share of gross value added from agriculture, forestry and fishing, 2004 and 2014 (% of the total gross value added)

<sup>1</sup> Based on ESA 2010.

<sup>2</sup> 2004: based on NACE Rev. 1.1. 2014: based on ESA 2010; provisional.

<sup>3</sup> 2013 instead of 2014. 2006 (based on NACE Rev. 1.1) instead of 2004.

<sup>4</sup> 2014: estimate.

<sup>5</sup> 2004: based on NACE Rev. 1.1. 2013 instead of 2014.

<sup>6</sup> 2004: based on NACE Rev. 1.1.

Source: Eurostat (online data codes: nama\_10\_a10 and cpc\_ecnabr1)

Source EUROSTAT, [http://ec.europa.eu/eurostat/statistics-explained/images/6/63/Share\\_of\\_gross\\_value\\_added\\_from\\_agriculture%2C\\_forestry\\_and\\_fishing\\_%28NACE\\_Rev\\_2%29%2C\\_2004\\_and\\_2014\\_%28%25\\_of\\_total\\_gross\\_value\\_added%29\\_CPC15.png](http://ec.europa.eu/eurostat/statistics-explained/images/6/63/Share_of_gross_value_added_from_agriculture%2C_forestry_and_fishing_%28NACE_Rev_2%29%2C_2004_and_2014_%28%25_of_total_gross_value_added%29_CPC15.png)

The share of Utilised Agricultural Area (UAA) as a percentage of the total area (data for the year of 2014) is the highest in Macedonia (49%) and the lowest in Montenegro and Kosovo\* (16.2% and 23.7% respectively). In average 60% of the utilised agricultural area in the EU member countries is

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

accounted for arable land. In the WB countries, this share is only comparable in Serbia with around 65%. Land under permanent crops is least present in all countries, with the exception of Montenegro.

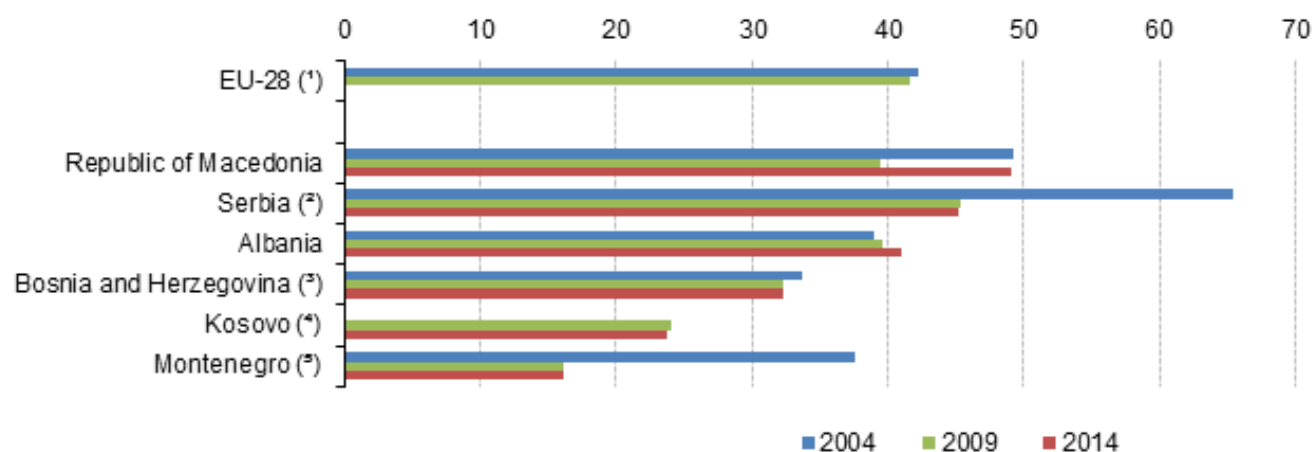


Figure A3.3. Utilised agricultural area, 2004, 2009 and 2014 (% of total area)

<sup>1</sup> 2003 instead of 2004 and 2007 instead of 2009. 2014: not available.

<sup>2</sup> 2009: break in series.

<sup>3</sup> Utilised agricultural area: consists of arable land, kitchen gardens, permanent crops and permanent grassland as cadastral data.

<sup>4</sup> 2004: not available. 2014: provisional.

<sup>5</sup> 2004: provisional. 2013 instead of 2014. 2009: break in series.

Source: Eurostat (online data codes: *appro\_cpp\_luse*, *demo\_r\_d3area* and *cpc\_agmain*)

Source: EUROSTAT, [http://ec.europa.eu/eurostat/statistics-explained/images/e/e6/Utilised\\_agricultural\\_area%2C\\_2004%2C\\_2009\\_and\\_2014\\_%28%25\\_of\\_total\\_area%29\\_CPC15.png](http://ec.europa.eu/eurostat/statistics-explained/images/e/e6/Utilised_agricultural_area%2C_2004%2C_2009_and_2014_%28%25_of_total_area%29_CPC15.png)

The number of agricultural holdings in the WB countries is very high and more importantly farms are very small in size (over 70% of the farms in Kosovo\*, Macedonia and Montenegro have less than 2 hectares of utilised agricultural area). Strong dual farm structure is also present; in addition to the dominant large numbers of small farms, a small number of large farms is also present often derived from the former socialist structures. Table A3.4 presents data on farm structure in WB. The average UAA per holding is from 1.8 ha in Macedonia to 5.4 ha per holding in Serbia, which is much smaller than the average 14.4 ha in the EU-28. The small farm size and often sustainable character make farmers vulnerable to all changes and their economic power is not sufficient to adapt to less favourable conditions for agricultural production. Even more, their adaptive capacity to the coming environmental issues such as climate change is very weak.

Table A3.4. Utilised agricultural area (UAA) and farm structure in WB countries

	AL (2012)	BiH (2010)	KS* (2014)	MK (2013)	ME (2010)	RS (2012)	EU-28 (2010)
UAA (000 ha)	:	:	257.6	315.9	221.3	3,437.4	175,815
Share in EU-28 (%)	:	:	0.1	0.2	0.1	2.0	100.0
Number of agricultural holdings (000)	324.0	:	129.2	170.9	48.9	631.6	12,248
Share in EU-28 (%)	2.6	:	1.1	1.4	0.4	5.2	100.0
UAA per holding (ha)	2.81	2.0a	2.0	1.8	4.5	5.4	14.4
% of holdings with UAA < 2 ha	:	:	80	78	73	48	49

Source: Bajramovic, et al. *Analysis of the agricultural and rural development policies of the Western Balkan countries*. No. JRC101320. Joint Research Centre (Seville site), 2016. (Source: Agricultural Statistics Database, Eurostat; \*Data from FAO study (Volk et al. 2014).: not available

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

Nevertheless, agriculture remains an important employment sector in the region (see Figure A3.4), in particular, in Albania, where its share in total employment in 2014 was 42.7%. The agricultural employment share in the same year for Bosnia and Herzegovina, Macedonia and Serbia is also high, much higher than EU-28 and the figures are 17.1%, 18.0% and 21.1%, respectively. On the contrary, the agricultural employment share in Montenegro and Kosovo\* is much less important covering only 5.7% and 2.6%, respectively. It appears that for these two countries agriculture is not an important employer any more. Probably the social issues usually connected with low living standards and welfare of agricultural workers are important factors in these countries affecting employment prospects in agriculture. Finally, there is a tendency in most countries, except for Macedonia, to reduce their agricultural employment share. One of the reasons might be also related to the modernisation of the agricultural sector and the use of machinery instead of labour force.

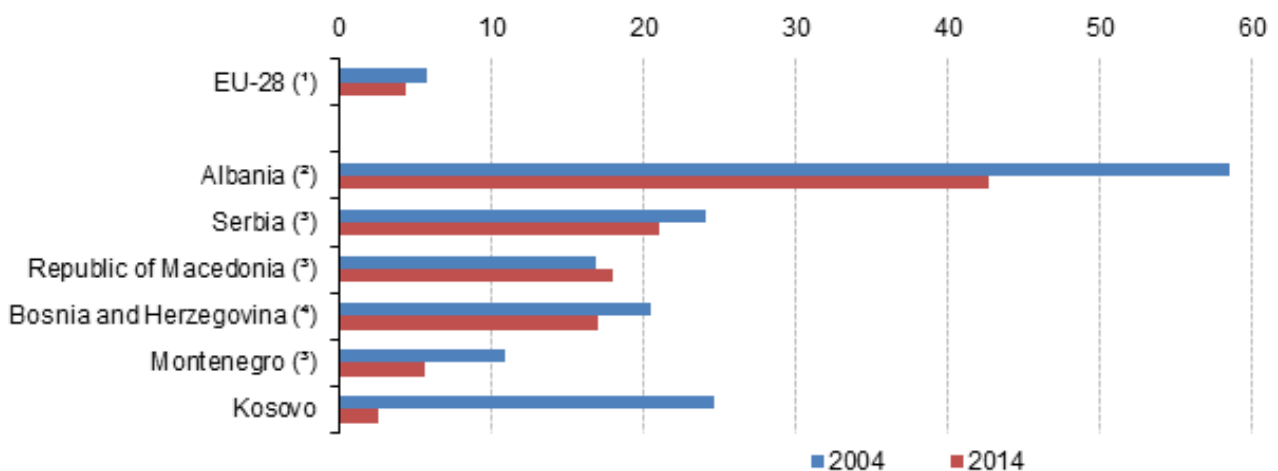


Figure A3.4. Share of employment in agriculture, forestry and fishing (NACE Rev 2), 2004 and 2014 (% of total employment)

<sup>1</sup> 2004: based on NACE Rev. 1.1. Break in series.

<sup>2</sup> 2004: administrative data based on NACE Rev. 1.1. 2014: estimate; the sum of the shares in the analysis of employment by activity does not sum to 100% due to cases where persons have not or cannot be classified in a particular activity. Break in series.

<sup>3</sup> 2004: based on NACE Rev. 1.1. Break in series.

<sup>4</sup> 2006 (based on NACE Rev. 1.1) instead of 2004.

Source: Eurostat (online data codes: lfsa\_egana, lfsa\_egana2 and cpc\_pslm)

Source EUROSTAT, [http://ec.europa.eu/eurostat/statistics-explained/images/3/39/Share\\_of\\_employment\\_in\\_agriculture%2C\\_forestry\\_and\\_fishing\\_%28NACE\\_Rev\\_2%29%2C\\_2004\\_and\\_2014\\_%28%25\\_of\\_total\\_employment%29\\_CPC15.png](http://ec.europa.eu/eurostat/statistics-explained/images/3/39/Share_of_employment_in_agriculture%2C_forestry_and_fishing_%28NACE_Rev_2%29%2C_2004_and_2014_%28%25_of_total_employment%29_CPC15.png)

The term activity rate is related to the percentage of the people aged 20–64 that are in employment or unemployed (in the labour force), with the remainder considered to be economically inactive. The activity rate in the EU-28 for persons aged 20–64 was 76.9% in 2014. The rate for men was considerably higher, at 83.2%, some 12.6 percentage points above the corresponding figure for women (see Figure A3.5).

From the same figure one can see that activity rates in the WB countries were generally much lower than in the EU-28, and this is particularly true for women. The data for 2014 reveal that female activity rates in the enlargement countries peak at 60.7% in Montenegro, while Serbia, Albania and Macedonia also reported that more than half of all women aged 20–64 were either employed or available for work. At the other end of the range, the female activity rate was just slightly less than one quarter in Kosovo\*.

By contrast, male activity rates in some of the enlargement countries were at similar levels to that recorded in the EU-28. In Macedonia for instance, the male activity rate (84.5%) for those aged 20–64 was above (1.3 percentage points higher) than the EU-28 average. By contrast, male activity rates were the lowest in Bosnia and Herzegovina and Kosovo\*, at 72.4% and 71.4% respectively.

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

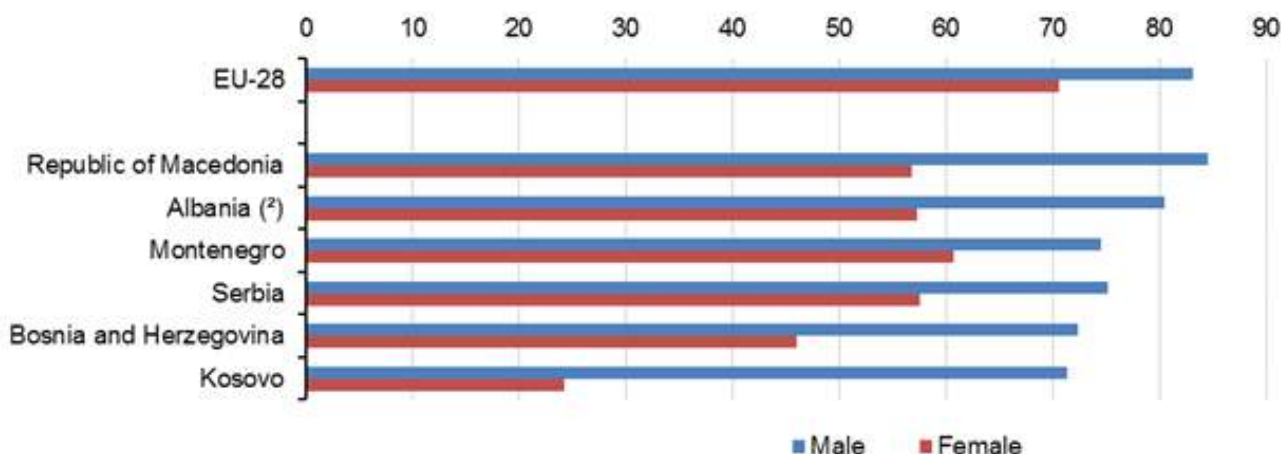


Figure A3.5. Activity rates (persons aged 20–64) by sex in Western Balkan countries, 2014(1)

<sup>1</sup> Ranked on the total activity rate (male and female).

<sup>2</sup> Estimates.

Source: Eurostat (online data codes: lfsi\_act\_a and cpc\_pslm)

Gender inequality may reflect, inter alia, patriarchal family structures, the degree of female empowerment, religious beliefs, other cultural factors, lower pay for women, and difficulties in relation to both access to jobs and career development. A comparison between activity rates for men and women in 2014 across the WB countries showed that the widest gender gaps were recorded in Kosovo\*, where female activity rates were between 46.0 and 47.2 percentage points lower than the corresponding male rates. Two of the enlargement countries reported gender gaps of less than 20 percentage points, namely Serbia (17.6 points) and Montenegro (13.8 points) (Figure A3.6).

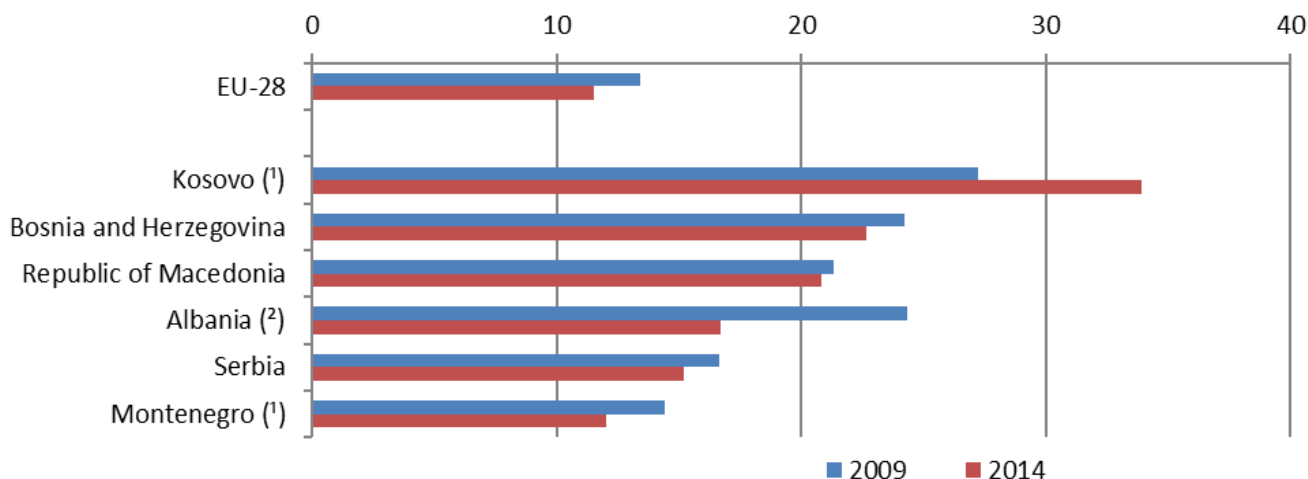


Figure A3.6. Gender gap for employment rates (persons aged 20–64) in WB countries, 2009 and 2014

<sup>1</sup> 2009: persons aged 15–64.

<sup>2</sup> Estimates.

Source: Eurostat (online data codes: lfsi\_emp\_a, cpc\_pslm and cpc\_siemp)

While the largest contractions in economic activity as a result of the global financial and economic crisis were recorded in 2009, it was not uncommon to see unemployment rates continuing to increase in 2010 and beyond. Indeed, the EU-28 annual unemployment rate rose from low 7.0% in 2008 to reach 9.5% in 2010. It was subsequently relatively unchanged in 2011, before increasing again in both 2012 and 2013 to reach 10.8% (see Table A3.5).

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

Table A3.5. Unemployment rates (persons aged 15–74) in WB countries, 2004–2014

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
EU-28 <sup>(1)</sup>	9.2	8.9	8.2	7.1	7.0	8.9	9.5	9.6	10.4	10.8	10.2
Montenegro	27.7	30.3	29.6	19.3	16.8	19.1	19.7	19.7	19.7	19.5	18.0
Republic of Macedonia	37.2	37.3	36.1	34.9	33.8	32.2	32.0	31.4	31.0	29.0	28.0
Albania <sup>(2)</sup>	14.4	14.1	13.8	13.5	13.0	13.8	14.0	14.0	13.4	15.9	17.5
Serbia	18.5	20.8	20.9	18.1	13.6	16.1	19.2	23.0	23.9	22.1	18.9
Bosnia and Herzegovina <sup>(4)</sup>	41.8	43.9	31.2	29.1	23.5	24.1	27.3	27.6	28.2	27.6	27.6
Kosovo* <sup>(5)</sup>	39.7	41.4	44.9	43.6	47.5	45.4	:	:	30.9	30.0	35.3

<sup>1</sup> 2005: break in series.

<sup>2</sup> 2007: break in series (prior to this date administrative data were used as a source).

<sup>3</sup> 2014: break in series. 2013 and 2014: based on 4 weeks criterion and using only active jobs search methods.

<sup>4</sup> 2005: break in series (prior to this date excluding data from Brcko District). 2006: break in series (prior to this date not based on ILO methodology).

Source: Eurostat (online data codes: ifsa\_urgan and cpc\_pslm)

The variation of the unemployment rates in the WB countries was higher in the period following the onset of the financial and economic crisis (2009–14). Unemployment rates fell in Kosovo\*, Macedonia and Montenegro but increased over this period in Serbia, Bosnia and Herzegovina and Albania. The highest unemployment rates in 2014 in the enlargement countries were recorded in Kosovo\*, where just over one third (35.3%) of the labour force were without work; relatively high unemployment rates were also recorded in Macedonia (28.0%) and in Bosnia and Herzegovina (27.6%). Unemployment rates in the remaining WB countries were above the EU-28 average and within the range of 17–19%. Across the WB countries, youth unemployment rates were consistently higher than overall unemployment rates (Table A3.6).

Table A3.6. Unemployment rates in EU-28 and WB countries, total (15–74 years old) and youth (less than 25 years old) for year 2004, 2009 and 2014

	Unemployment rates					
	Total (15–74 years old)			Youth (less than 25 years old)		
	2004	2009	2014	2004	2009	2014
EU-28 <sup>(1)</sup>	9.3	9.0	10.2	19.2	20.3	22.2
Montenegro <sup>(2)</sup>	27.7	19.1	18.0	:	:	35.8
Republic of Macedonia <sup>(3)</sup>	37.2	32.2	28.0	64.8	55.1	53.1
Albania <sup>(4)</sup>	14.4	13.8	17.5	:	27.2	39.0
Serbia <sup>(5)</sup>	18.5	16.1	18.9	48.1	41.6	47.1
Bosnia and Herzegovina <sup>(6)</sup>	41.8	24.1	27.6	62.3	48.7	62.7
Kosovo* <sup>(7)</sup>	39.7	45.4	35.3	66.5	73.0	61.0

<sup>1</sup> 2009: break in series for employment rates.

<sup>2</sup> 2004 and 2009: employment rates are based on persons aged 15–64. Total employment rate: 2005 instead of 2004.

<sup>3</sup> 2004: employment rates are based on persons aged 15–64. Total employment rate: 2006 instead of 2004.

<sup>4</sup> 2004: employment rates are based on persons aged 15–64. 2009: break in series (the source of 2004 data was administrative data).

<sup>5</sup> 2006: break in series for total unemployment rate.

<sup>6</sup> "2006 instead of 2004, except for total unemployment rate. 2006: employment rates are based on persons aged 15–64.

<sup>7</sup> 2004: total unemployment rate, excluding data from Brcko District and not based on ILO methodology."

<sup>7</sup> 2004 and 2009: employment rates are based on persons aged 15–64.

Source: Eurostat (online data codes: ifsa\_ergan, une\_rt\_a, cpc\_pslm and cpc\_siemp)

Similarly as in the EU-28, youth unemployment rates in the WB countries tended to be about twice as high as overall unemployment rates. More than one third of those aged less than 25 years old in the labour force were without work in Montenegro (35.8%) and Albania (39.0%). This share rose to around half of all young people in the labour force in Serbia and Macedonia and the highest youth unemployment rates were recorded in Kosovo\* (61.0%) and in Bosnia and Herzegovina (62.7%).



The average wage in EU-28 was about EUR 1,508 /month in 2015. The wages in WB countries are much lower. Montenegro has the highest monthly wage of about EUR 500, which is approximately 1/3 of the EU-28 average. The average wage in Bosnia and Herzegovina is about EUR 427 /month. All other countries are in the range between EUR 362 and EUR 379/month (Figure A3.7).

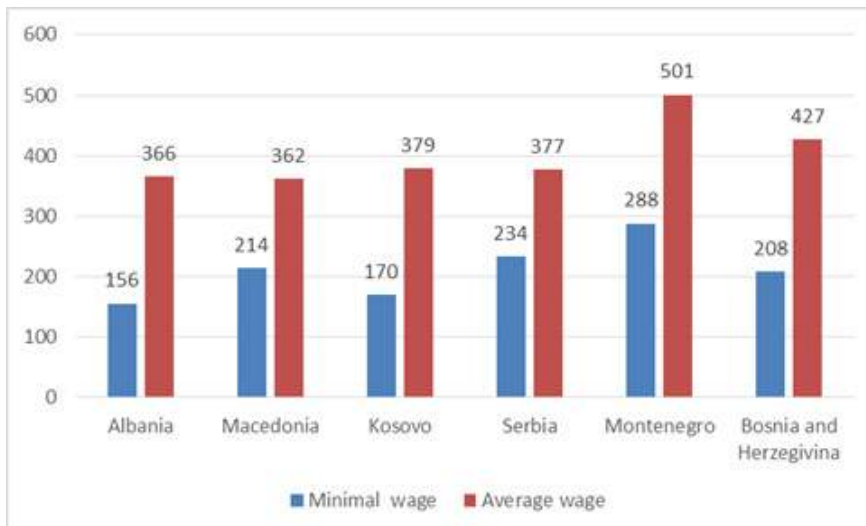


Figure A3.7. Minimal and average wage in WB countries in EUR

Source: EUROSTAT, 2016

The minimal wage presented in Figure A3.7 is given because wages in agriculture and in rural areas are closer to the minimal than to the average wage.

## CONCLUSIONS AND CHALLENGES AHEAD

The overall socioeconomic situation in the WB countries is characterised by low economic power, small GDP compared with the EU-28, lower income level, high unemployment rate, higher than usual inequality in terms of income and gender rights, high emigration and low fertility rate. These countries are small in terms of territory and population as well. The agricultural sector is still an important contributor to the GDP as well as an important employer in the region. The conditions for agricultural production are different in all countries and there is still huge potential for the intensification of the sector.

The ANC areas in the WB are not yet delineated and proclaimed as such and, moreover, there is not a defined policy on how to address them. The farmers that grow their crops in areas with natural constraints are facing higher than usual obstacles and, therefore, have higher production costs and lower economic power compared to other farmers. So it is hard for them to compete successfully. The depopulation of these areas is happening quickly as young people are migrating (both abroad and in internal larger urban centers). To maintain agricultural production and the welfare of the farmers in these areas, special attention is required and ANC policies that look after them must be first drafted and then implemented. The ANC experts' network is ready to start mapping and delineating the ANCs, but to reach this target financial support must be provided.

The areas facing natural constraints are particularly sensitive/susceptible and affected by environmental impacts. There are at least two major environmental issues that have serious impacts on these areas: climate change and land degradation. The agricultural sector of the southwest region is already affected by climate change. Frequent weather extremes (floods, droughts, frost damages, etc.) have been

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more frequent and have already reduced agricultural productivity in recent times in some regions. The farmers performing their agricultural activity in potential ANCs are characterised with lower resilience and adaptive capacities to climate change, particularly due to lower yields and income reported in these farms. Several climate change reports present high vulnerability and lower adaptive capacity of the agricultural sector in the WB countries.

The Western Balkans Climate Resilience Workshop that took place in Vienna 11-12 May, 2016 presented the main findings from recent studies on climate risks in the Western Balkans and corresponding adaptation priorities and needs. Presentations focused on climate impacts on coastal zones (i.e. based on the conclusions and recommendations from Albania's Third National Communication), mountain areas (in the context of UNEP's recent assessment of climate change adaptation in the Western Balkans mountains), and watersheds (with a case study from Bosnia and Herzegovina). They showed that the region has already entered into a new climate normal (e.g., in some places, current temperature records have already reached the level of the projections for 2030. On the other hand, there is a need to prepare to mounting weather extremes, more prevalent heatwaves and droughts as well as floods, with repercussions for natural resources, such as land, water, ecosystems and biodiversity, and sectors, such as agriculture, energy, transport, human health, tourism, and emergency response.

The higher temperatures, reduced precipitation and more frequent extreme events foreseen based on climate projections for the near future may have negative impacts on soil. Soil quality can be expected to get worse in most of the ANC areas. Particularly, increase of soil erosion is foreseen due to more intensive rainfall, but also due to loss of organic matter from soils accelerated by higher temperatures. Moreover, this situation will accelerate land degradation and due to aridity effects in some regions of the Western Balkans the risk of desertification may increase.

However, climate change may bring some benefits for the ANCs, as increased temperatures can increase the growing season. Therefore, the present areas with a short growing period can have a longer season even with sufficient duration and temperature accumulation in the future. Furthermore, the potential of higher elevated areas will increase for growing crops that otherwise will be affected by heat stress on lower elevations (for instance, grapes and fruit trees could be grown on higher elevation than present). Some reports (Sutton et al. 2013 a, b) suggest that alpine zones (areas higher than 600 m a.s.l.) will be the least affected by climate change in Western Balkan and an increase in winter wheat yield is expected there. These climate change effects should be taken into account later on when updating and monitoring the spatial extent of ANCs areas accordingly.

# CHAPTER A4

## CROSS-COUNTRY POLICY ASSESSMENT AND POLICY RECOMMENDATION CONCERNING THE CHARACTERISATION AND MAPPING OF AREAS WITH NATURAL CONSTRAINTS IN SEE

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### INTRODUCTION AND FEEDBACK

The former Less Favourable Areas (LFAs) now called Areas with Natural Constraints (ANCs) have been part of the EU debate for more than 30 years. The main purpose has been and still remains the same: providing social equity for farmers facing severe natural handicaps that include remoteness, unfavourable terrain, land degradation and poor soil conditions. The Directive 75/268, CEC, of 1975 that was aimed at then LFA farmers (from now on ANC farmers), despite emphasising the social component addressed, expressed environmental concerns as well: “...to ensure the continuation of farming, thereby maintaining a minimum population level or conserving the countryside”.

In 2009 the European Commission rephrased the ANC policy as support to “continued agricultural management in areas where the intensification has not occurred because of physical constraints, supports in general the maintenance of valued open landscapes, semi-natural habitats and biodiversity; it can assist in the control of forest fires and contribute to good soil and water management” (CEC, 2009).

Obviously these policies were oriented towards preventing depopulation, especially of the mountainous areas, reducing land abandonment and the negative effects of land degradation. Bogdanov (2014) analyses the changes of the ANC policies and stresses that over the recent decade “the social component has lost its importance, while environmental concerns and maintenance of certain types of agricultural practices have become more relevant”.

During the decades the objectives of the ANC policy have changed indeed. These changes have taken place within a postproductivist transition in EU agriculture, reflecting a “shift in the rationale for investment of public monies in agriculture in recognition of the multifunctional goods farming provides”. The Agenda 2000 reforms of the CAP brought the LFAs under the Rural Development Regulation (1257/1999) and updated its objectives in terms of providing a stronger environmental emphasis. Furthermore, Agenda 2000 introduced new policy instruments relevant for LFA policy, such as the promotion of sustainable

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farming systems and the requirement to meet good farming practice standards as a prerequisite for support and the switch from head age to area payments.

With further changes to CAP (Council Regulation 1698/2005), rural development was brought under a single funding (European Agricultural Fund for Rural Development - EAFRD) and management frame. Support for ANC provided under 2 axes of Pillar Two programme, aimed to *“Improve the environment and countryside through support for land management”*, through: *“measures targeting the sustainable use of agricultural land in mountain areas and in areas with handicaps other than mountain areas”*.

The present ANC scheme supports and promotes the maintenance of appropriate forms of agriculture (sustainable farming systems) as it compensates farmers covering only the additional costs and income foregone related to the natural handicaps including unfavourable terrain, poor climate and soil conditions. It aims at contributing to environmental objectives, i.e. maintaining the countryside, through continued use of agricultural land, (CEC, 2009).

The debates on the effectiveness of the LFA measure as such have been on-going for years, with a permanent perception that an essential and comprehensive reform is needed. Many authors state that it is not only the first pillar of CAP, but also its ANC component that is more inclined towards *richer, core regions and larger farms* (Bogdanov et al., 2014). Shucksmith et al., (2005) assessed the regional territorial impact of the CAP and Rural Development Policy, examining to what extent they are compatible with objectives of territorial cohesion across the EU. They have concluded that LFA (now ANC) payments tend to benefit richer regions, because of different national priorities and co-financing difficulties. Dax and Hovorka (2008) have found no statistically significant relationship between levels of ANC support and indicators of economic cohesion, which implies that ANC support, despite its spatial objective, seems to be only weakly related to social and economic cohesion.

However, the majority of the EU Member States have provided significant support to the ANC scheme that is one of the most important instruments of EU’s RD policy . There has been a demand to adjust the delineation of LFA/ANC to the newest objectives of the scheme in a transparent and common way throughout the EU. Critics (CEC, 2009) of the ANC emphasised that there was a wide range of indicators used by the Member States to delineate ANC and, therefore, transparency and better targeting on the situations most in danger of land abandonment were missing.

In order to address the above concerns, in a first step, the Joint Research Centre (JRC) was tasked to derive a set of common soil and climate criteria which could support a new delimitation of intermediate ANCs. A panel of soil, climate and land evaluation high-level experts was established and its work was co-ordinated by the JRC. As a result of extensive discussions between the Commission departments and Member States and with active involvement of national experts, a common framework of eight biophysical criteria was introduced (Terres et al., 2016). It is based on the definition provided by Annex III of EU Regulation 1305/2013 (Table A1.1). According to experts, the criteria are robust, based on sound science and allow classifying land homogeneously throughout the EU. They provide a simple and comparable system that can be implemented by all Member States in a relatively short period of time. However, the implementation requires analytical work and administrative effort to be put in place.

The delineation of ANC other than mountains, facing significant natural constraints is ongoing at present in the Member States, with the technical support of DG JRC, based on the common criteria. It

<sup>1</sup> In the programming period 2007-2013, at the EU-27 level the allocation of the EAFRD dedicated to the LFA scheme was € 12.6 billion (13.9% of the total Community funding allocation), corresponding to 32% of the resources devoted to the improvement of the environment and the countryside by supporting sustainable land management (Axis 2 of the Rural Development Policy) [http://ec.europa.eu/agriculture/rurdev/lfa/index\\_en.htm](http://ec.europa.eu/agriculture/rurdev/lfa/index_en.htm)

is foreseen to be finalized in 2018. Regardless of critics, changes in policy objectives and methods of implementation, the ANC approach remains one of the most important implementation mechanisms for rural development support.

## HOW TO ADOPT ANC POLICIES IN THE SEE COUNTRIES

The natural, social, economic, and political context in the SEE countries is different from the EU, especially from its western Member States in some degree. The SEE countries come from a period of state controlled economies that have left their marks on the agricultural sector structure. After the 90s, much of this structure has changed rather drastically and the most common characteristic was the abandonment of mountain regions with larger portions of the population moving towards the cities and flat plains. It happened particularly in Albania, Kosovo and all other countries. Tirana had 250,000 people in 1990 and it has around 1 million now. Certainly the wars of the regions had their toll on the population displacement process too. The extensive overpopulation of cities and losses of fertile agricultural lands in the valleys at the expense of urbanisation and abandonment of the mountain regions creates socioeconomic significant disparities between regions within the countries with severe environmental consequences.

The main conclusion in this regard of the FAO (2014) i.e. Volk et al (2014) study is that:

The bulk of the funds from this policy pillar (the first pillar) belongs to the group of measures intended for improving the competitiveness of agriculture, while other two aspects of rural development policy (e.g. the environment and rural economy and population) are given lesser attention.

Funds intended for improving the environment and the countryside are negligible in most countries. The most challenging question from the perspective of balanced territorial development of the Western Balkans is the lack of measures to support less favoured areas (LFA, now ANC). LFAs are strongly represented in all the countries and are, as a rule, facing serious **demographic and social problems (depopulation, rural poverty)**.

### The findings of the ANC project could then be summarized as follows

- Data available for ANC mapping are available, but their access still remains problematic (especially for climate data)
- Involvement of other stakeholders (data owners/holders) is crucially important for the success of the project and the (possible) forthcoming implementation of the ANC payment schemes
- Montenegro will start the implementation of the ANC JRC methodology in 2017 with funding from the World Bank and is expected to be the first country in the region to complete ANC mapping
- Further updates may be needed to adjust the ANC JRC methodology to SEE conditions and account also for the impacts of climate change
- The ANC mapping should be the first step to be completed in each country.
- National, regional and local decision makers should be informed about the ANC outcomes and their impact on humans and natural resources
- Payments to the ANC areas should differ from country to country. However, efforts should be made to harmonise them as much as possible along the trans-border zones to avoid socioeconomic disparities and competition for natural resources
- Existing ANC policies in the region are either totally missing, poorly developed, or in the process of development. Their status is different from county to county (for instance, by 2018 the Republic of Srpska is expected to start implementing ANC policies)

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- Technical assistance to the decision makers from the national ANC experts is crucial for successful implementation of the payments schemes, whenever they may be active
- ANC policies in the SEE region should be compliant with the EU methodology but should respond also to country specifics, within the limits allowed by the EU methodology
- Guidelines for ANC implementation should be developed for each country. They should consider policy, legal recommendations, institutional setup, step by step introduction into the rural development policy, system for support of the implementation and enforcement, and continuous monitoring and evaluation
- As specified in the EU ANC policy, only active farmers operating in ANC areas should be eligible for payments, but they must commit to stay on the farm for at least 5 years after their entrance into the payment scheme

## RECOMMENDATIONS FOR DECISION MAKERS

- Decision makers should facilitate the process of data sharing and flow of information among all stakeholders (developing and implementing the legal and institutional process)
- Support for existing data sets, digitisation and additional soil surveys as well as maintaining and improving the national meteorological service are very important in particular
- The ANC Policy should be part of the national Rural Development Policies
- The new laws under preparation for Agricultural Rural Development should have a special article on ANCs.
- An overall, comprehensive rural development strategy should address all aspects of rural life, including infrastructure, access to the internet, public schools, health facilities, water supply, besides the ANC payment schemes
- Land tenure issues have a strong impact on land management and have to be solved by adjusting and implementing relevant legislation, in compliance with international legal ownership rights
- Decision makers should develop and implement specific plans for different ANC regions and explore all options for income generating activities in ANC areas (other than the agricultural use of land)
- Decision makers should set priorities in implementing payment schemes for ANC areas based on natural and socioeconomic conditions, but areas at high risk of abandonment must have priority
- The design and the use of the ANC payment mechanism should be monitored for its impacts on reducing migration from countryside towards urban areas and land abandonment
- ANC payment schemes should address and promote sustainable farming practices, and biodiversity conservation
- The IPARD funding mechanisms may need to be adjusted to reflect ANC payment schemes (taking into consideration the existing low rate of IPARD funding use)
- ANC mechanism may be observed as a tool for better targeting of the regional rural development mechanisms and cross-border funding schemes
- Stronger collaboration in ANC mapping and harmonised policy implementation is recommended to all participating countries/territories in the ANC project
- Continuous collaboration with JRC is highly recommended
- Governmental support at all levels is needed to support and mitigate problems of the ANC areas

# CHAPTER A5

## EU LEGISLATION ON THE ANC AREA PAYMENT APPROACH AND THEIR IMPLICATIONS FOR THE IPARD FUNDING INSTRUMENTS

Pandi Zdruli<sup>1</sup> and Ordan Cukaliev<sup>2</sup>

### THE EU LEGISLATION ON PAYMENTS FOR ANCS<sup>3</sup>

Direct payments to farmers operating in the EU member countries are made based on support schemes within the framework of the Common Agricultural Policy (CAP), repealing Council Regulation (EC) No 637/2008 and Council Regulation (EC) No 73/2009. In 2013 the EU approved the Regulation 1305/2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD). In 17 December 2013 the European Parliament and the Council approved the regulation (EU) No 1307/2013 “Payment for areas with natural constraints”. Article 48 of the regulation establishes the general rules as follows:

1. Member States may grant a payment to farmers who are entitled under the basic payment scheme or the single area payment scheme referred to in Chapter 1 and whose holdings are fully or partly situated in areas with natural constraints designated by Member States in accordance with Article 32(1) of Regulation (EU) No.1305/2013 (“payment for areas with natural constraints”).
2. Member States may decide to grant the payment for areas with natural constraints to all areas falling within the scope of paragraph 1, or to restrict the payment to some of those areas on the basis of objective and non-discriminatory criteria.
3. Without prejudice to paragraph 2 of this Article, to the application of financial discipline, of reduction of payments in accordance with Article 11 and of linear reduction in accordance with Article 7 of this Regulation, and to the application of Article 63 of Regulation (EU) No.1306/2013, the payment for areas with natural constraints shall be granted annually per eligible hectare situated in the areas for which a Member State has decided to grant a payment in accordance with paragraph 2 of this Article. It shall be paid upon activation of payment entitlements in respect of those hectares held by the farmer concerned or, in Member States applying Article 36 of this Regulation, upon declaration of those eligible hectares by the farmer concerned.
4. The payment for areas with natural constraints, per hectare, shall be calculated by dividing the amount resulting from the application of Article 49 by the number of eligible hectares declared in accordance with Article 33(1) or Article 36(2) which are situated in the areas for which a Member State has decided to grant a payment in accordance with paragraph 2 of this Article. Member States may, on the basis of objective and non-discriminatory criteria, also set a maximum number

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<sup>3</sup> This chapter is greatly based on the EU Regulation 1305/2013 “Support for rural development by the European Agricultural Fund for Rural Development” (EAFRD) and in the European Parliament and the Council approved regulation (EU) No. 1307/2013 “Payment for areas with natural constraints” dated 17 December 2013.

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of hectares per holding for which support under this Chapter can be granted.

5. Member States may apply the payment for areas with natural constraints at regional level under the conditions laid down in this paragraph provided that they identified the regions concerned in accordance with objective and non-discriminatory criteria and, in particular, their natural constraint characteristics, including the severity of the constraints, and their agronomic conditions.

Member States shall divide the national ceiling referred to in Article 49(1) between the regions in accordance with objective and non-discriminatory criteria.

## ARTICLE 49: FINANCIAL PROVISIONS

1. In order to finance the payment for areas with natural constraints, Member States may decide, by 1 August 2014, to use up to 5% of their annual national ceiling set out in Annex II. They shall notify the Commission of any such decision by that date. Member States may, by 1 August 2016, review their decision and amend it with effect from 1 January 2017. They shall notify the Commission of any such decision by 1 August 2016.
2. On the basis of the percentage of the national ceiling to be used by Member States pursuant to paragraph 1, the Commission shall adopt implementing acts fixing the corresponding ceilings for the payment for areas with natural constraints on a yearly basis. Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 71(2).

## THE RATIONALE BEHIND THE ANC MEASURES

Payments in mountain areas or in other areas facing natural or other specific constraints aim at compensating farmers in total or partially for disadvantages to which the agricultural production is exposed due to natural or other specific constraints in their area of activity. Such compensation shall **allow farmers to** *continue to use the agricultural land, maintain of the countryside as well as maintain and promote sustainable farming systems in the areas concerned in order to prevent land abandonment and loss of biodiversity.*

In order to ensure the efficient use of Union funds and equal treatment for farmers across the Union, mountain areas and areas facing natural or other specific constraints should be determined in accordance with objective criteria. These criteria should be clearly quantified and clear evidence for their relevance and persistence should be provided.

As the payment calculation is based on the principle of *income foregone* and *costs incurred compared to agricultural production not suffering from natural or specific constraints*, support to farmers can only be granted in areas where additional costs/income foregone and a clear risk of land abandonment has been identified.

The issue here is that payments to EU farmers should not be in conflict with the World Trade Organisation (WTO) Marrakesh Agreement and it should be clearly indicated that payments are made specifically to farmers in areas with natural constraints as specified below:

1. Eligibility for such payments shall be limited to producers in disadvantaged regions. Each such region must be a clearly designated contiguous geographical area with a definable economic and administrative identity, considered as disadvantaged on the basis of neutral and objective criteria clearly spelt out in law or regulation and indicating that the region's difficulties arise out of more than temporary circumstances.
2. The amount of such payments in any given year shall not be related to, or based on, the type or volume of production (including livestock units) undertaken by the producer in any year after the base period other than to reduce that production.

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3. The amount of such payments in any given year shall not be related to, or based on, the prices, domestic or international, applying to any production undertaken in any year after the base period.
4. Payments shall be available only to producers in eligible regions, but generally available to all producers within such regions.
5. Where related to production factors, payments shall be made at a degressive rate above a threshold level of the factor concerned.
6. The payments shall be limited to the extra costs or loss of income involved in undertaking agricultural production in the prescribed area.

## TYPES OF OPERATION/SUPPORT

Annual payments per hectare of agricultural area.

### AREA-BASED PAYMENT

The regulation foresees minimum and maximum amounts of support. The minimum amount defined shall ensure that the constraint is significant and that the support amount paid justifies the administrative costs linked to the grant. The maximum amounts are different for mountain areas and other areas. Payments can be higher if the calculated amount in a region clearly exceeds the maximum amount and the payment is duly justified, i. e. is needed to avoid land abandonment.

### DIFFERENTIATION OF PAYMENT LEVELS

It is possible to have different levels of payments, expressing a different degree of the constraint and different farming systems. This is particularly the case for mountain areas where different altitudes represent a different impact on agriculture.

### MINIMUM PAYMENT

The sum of income loss and additional cost must be at least **€25 per hectare**. If it is lower, the payment cannot take place (as the administrative burden would be disproportionate to the benefit, as well as any amount lower than €25 is unlikely to make a difference). Nevertheless, this amount indicates the minimum average payment per hectare per year of the beneficiary receiving support. In practice this means that a farmer with two hectares can receive €35 for the first hectare and €15 for the other hectare, as the average payment per this beneficiary is not lower than €25/ha.

### PAYMENT UNDER THE FIRST PILLAR OF CAP

If the farmer benefits from the payment under Article 34 of the direct payments regulation (top-up for farmers in ANC areas), it has to be taken into account in the second pillar payment in order to prevent overcompensation. Naturally, the easiest approach to “taking into account” is deducting the first pillar payment from the second pillar payment in cases where the sum of the first pillar payment and the second pillar payment exceeds the sum of income loss and additional cost. Where, for example, the sum of income loss and additional costs equals €150, the first pillar payment is €15/ha, the second pillar payment is €80/ha, no deduction needs to be made. The deduction is necessary in order to prevent overcompensation in the CAP’s second pillar.

N.B: It has to be borne in mind that if the resulting amount (after the deduction) is lower than €25/ha, no payment can be granted in the second pillar [bearing in mind what is written above as regards the average payment per hectare].

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## PARTIAL COMPENSATION

From the example above, it is also clear that the second pillar payment does not have to cover all additional costs and income losses. Member State may justify a partial compensation, however, always bearing in mind the risk of land abandonment. The justification for a partial compensation should, therefore, provide reasons for the threshold selected (e.g. 80% of the sum of income loss and additional costs) as well as a conclusion that even at this reduced level, the land in question will not be abandoned. Inevitably, this conclusion should be based on a sound analysis. Annex I of the Rural Development Regulation gives the maximum for the payment. That is **€450/ha in mountain areas and €250/ha in the other two categories**. These amounts can be increased in exceptional cases and the justification must be provided in the rural development programmes. Such justification should be documented by the (certified) calculation of income loss and additional cost and it should also be demonstrated that the area is at a genuine risk of land abandonment.

## DEGRESSIVITY AT HOLDING LEVEL PAYMENTS

The payment shall be degressive above a threshold level of area per holding, unless the payment is fixed at €25/ha already from the beginning, in order to be compliant with the WTO requirements. In all cases where the starting level of payment exceeds €25/ha, degressivity must be applied (Point 13 e) of Annex II of the WTO Agreement for Agriculture). The most logical example which is already used by a number of Member States, is that 100% of the payment is granted on the first 0 - X hectares in the holding, 80% of the payment is granted on the next X - Y hectares, 50% is granted on Y - Z hectares and no payment is granted on the remainder of the holding's area. The payment must not go under €25/ha.

As regards the thresholds (X, Y and Z – or more or fewer), they should be set by Member States and their choice should be justified and backed by evidence. The threshold should be set in a way that overcompensation is prevented. To take an example of a steep slope which requires a special tractor – the additional costs will consist of i) the difference of retail price between a standard tractor and this special tractor, recalculated per hectare, ii) the difference in fuel consumption per hectare, iii) the difference in labour costs per hectare. It is clear that point 2 (and most likely point 3 as well) remains constant. However, point 1 needs to be properly reflected upon as the additional costs will be considerably different if this special tractor is used on 2 hectares or on 50 hectares.

Derogation to degressivity: Degressivity is applied at the level of a natural person, legal person or group of natural or legal persons. However, in some cases, even if a farmer belongs to an organisation (legal person), or a group of natural or legal persons (meaning that degressivity would normally be applied at the level of this organisation and not at the level of the individual farmer), it is possible to apply degressivity at the level of the individual farmer. However, this is possible only if the national law provides for the individual farmers to assume rights and obligations comparable to those of individual farmers who have the status of head of holding. These obligations and rights are normally spelt out in their economic, social and tax status. This also requires that these farmers have contributed to strengthening the agricultural structures of the legal persons or groups concerned. If all these conditions are fulfilled, degressivity may be applied at the level of individual farmer.

## BENEFICIARIES

Article 4 of the Regulation (EU) No 1307/2013 defines farmers as:

*“farmer” means a natural or legal person, or a group of natural or legal persons, regardless of the legal status granted to such group and its members by national law, whose holding is situated within the territorial scope of the Treaties, as defined in Article 52 TEU in conjunction with Articles 349 and 355 TFEU, and who exercises an agricultural activity*

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Instead, the term “Active farmer” is very well described in Article 9 of Regulation (EU) No 1307/2013 and practically refers to those “natural or legal persons, or to groups of natural or legal persons, whose agricultural areas are mainly areas naturally kept in a state suitable for grazing or cultivation” and their main activity is related to farming.

## ELIGIBLE COST AND CONDITIONS

**Eligible costs:** The payment reflects the sum of the income loss and the additional cost due to the constraint, as required by the commitments of the European Union in the WTO. The quantification should be made in comparison to the non-constrained area. Those Member States which are delimited as constrained on their entire territory may use estimating studies instead or they can use a larger (homogenous) region as a reference. In order to improve the verifiability of these calculations, they must be certified by a body independent of the authorities and the certificate needs to be provided with the rural development programme (Article 62 of the Rural Development Regulation).

**Eligibility conditions:** It is obvious that only areas which are part of the delimitation can benefit from payment.

In the programming period 2007-2013, about 56% of agricultural areas in EU27 has been identified as constrained but only about a half of the delimited area received some payment (related to constraints). This was because Member States often applied eligibility criteria by which they e.g. exclude certain types of areas and/or beneficiaries.

From a WTO perspective, in order to ensure Green Box compliance of this measure, it is necessary to respect point 13 of Annex 2 of the WTO Agreement for Agriculture. Point d) stipulates that “payments shall be available only to producers in eligible regions, but generally available to all producers within such regions”. However, point f) stipulates that “the payments shall be limited to the extra costs or loss of income involved in undertaking agricultural production in the prescribed area.” This means that once an area is delimited as constrained, the Member State has to pay the additional cost and income loss to all farmers within the delimited area.

On the one hand, the Member State has to pay to all producers within a delimited region. On the other hand, overcompensation must be avoided. In order to avoid overcompensation the Member State may apply Article 31(1) of the Regulation 1305/2013, which allows differentiating the premium according to farming systems, as different farming systems can record different results in calculations of additional costs and income foregone. However, Article 31(1) provides for such a possibility only in duly justified cases. Therefore, Member States may set a specific minimum payment at a level below which they consider that the farming system(s) incurring lower additional costs and income foregone than this amount do not face significant natural constraints. Thus, no support is paid to farms operating such farming system(s).

The primary way to exclude from support farming systems for which no significant additional costs/income losses are identified is the fine-tuning exercise, as referred in Article 32(3) of the Regulation 1305/2013. If the majority of the agricultural area within a delimited area falls under this category, the whole area has to be excluded from the delimitation in the fine-tuning process. The application of farming system as additional criterion for identifying risks of overcompensation and thus allowing the exclusion of farming system incurring losses under a certain threshold, applies only when the specific farming system is not predominant in the area concerned, and, therefore, it is not possible to exclude the whole area in the fine-tuning process. The exclusion concerns always an entire farm; it is not possible to exclude only a certain farming system from ANC- support within a farm practicing several systems. Furthermore, it is not possible to apply farming system as an exclusion criterion in order to exclude, e.g. arable farms on the basis of not having livestock. The exclusion must be related only to the threshold of calculated income losses.

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According to paragraph 138 of Annex 2 to the WTO Agreement on Agriculture, which sets the rules for Green Box compatibility of payments under regional assistance programs, the amount of such payments in any given year shall not be related to, or based on, the type or volume of production (including livestock units) undertaken by the producer in any year after the base period [except to reduce that production, which is not the case for the EU's regional assistance programs]. Whatever additional eligibility criterion is chosen by the Member State, in order to allow the measure to be notified as falling under the Green Box, the conditions of Annex 2 to the WTO Agreement on Agriculture must be respected. Therefore, the use of criteria that may be seen as linked to production, such as livestock density, must be approached with special caution and the preference would be to use other indicators in order to determine whether farming takes place.

However, in order to comply with the requirement of Article 31(2) of the Regulation 1305/2013 to “undertake to pursue farming activity” it may occur that the Member State considers grazing-based activity requirement necessary in order to determine whether farming takes place, thus ensuring the maintenance of permanent grassland. In this case, the Member State may set minimum activity requirements such as grazing livestock (in the form of low livestock density requirement).

In summary, the ANC specific areas eligible for payments should meet the following conditions:

- at least 60% of the agricultural area meets at least two of the criteria listed in Table A2.1 each within a margin of not more than 20% of the threshold value indicated, or
- at least 60% of the agricultural area is composed of areas meeting at least one of the criteria listed in Table A2.1 at the threshold value indicated, and areas meeting at least two of the criteria listed in Table A2.1 each within a margin of not more than 20% of the threshold value indicated.

Compliance with the eligibility conditions (Article 32 (2), (3), (4)) shall be ensured at LAU2 level or at the level of a clearly delineated local unit which covers a single clear contiguous geographical area with a definable economic and administrative identity. When delimiting areas concerned by this subparagraph, Member States shall undertake a fine-tuning exercise as described in Article 32(3).

## CO-FINANCING RATE(S)

This measure is among the measures which contribute to the compliance with the requirement stipulated in Article 59(6) of Regulation 1305/2013 and which requires that at least 30% of the total EAFRD contribution to the rural development programme shall be reserved for measures contributing to climate change mitigation and adaptation as well as to environmental issues.

Furthermore, this measure can also benefit from a higher co-financing rate (75%) as it contributes to the objectives of environment and climate change mitigation and adaptation (Article 59(4)(b) of the RD Regulation). In case of less developed regions, in the outermost regions and in the smaller Aegean islands, this co-financing rate can be even higher (85% of the eligible public expenditure) as stipulated in Article 59(3) (a).

## WHAT IS NEW IN COMPARISON WITH THE PERIOD 2007-2013

The areas facing natural or other specific constraints, in the past referred to as “*Less-Favoured Areas (LFAs)*”, are subject to changes in delimitation and other requirements in comparison to the programming period 2007-2013. The three categories of these payments “*mountain areas*”, “*areas affected by significant natural handicaps*” and “*areas affected by specific handicaps*” remain also during the period 2014-2020. The novelties introduced in the Rural Development Regulation for the period 2014-2020 result from a long debate and policy process between the Commission and the Member States. Apart from the political will of the co-legislators to change the policy, some of the adaptations have also become inevitable due to the commitments of the European Union in the World Trade Organisation (WTO).

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In 2003, the European Court of Auditors concluded that the delimitation of the intermediate less-favoured areas could involve unequal treatment because it was based on some 140 national criteria, all very different from each other. However, the revision of the system was delayed due to several factors. Finally, in 2011, the Commission communicated to the Member States eight biophysical criteria as a way of delimitation of intermediate areas. This delimitation is credible, transparent, objective and comparable across all Member States. The method is based on scientific evidence and has been elaborated by the European Commission's Joint Research Centre (see chapter A1).

## MAXIMUM AND MINIMUM COMPENSATIONS

Now, in the period 2014-2020, the maximum amount of payment has been increased from €250 to €450 per hectare in mountain areas and from €150 to €250 per hectare in areas of other natural or specific constraints. These amounts can be increased in case of specific circumstances, and have to be justified in the Rural Development Programme. The minimum amount of €25 per hectare remains the same during the new period 2014-2020, too.

## ACTIVE FARMER CONCEPT

In the period 2014-2020, the beneficiaries must comply with the definition of “active farmer”, as defined in Article 9 of Regulation (EU) No 1307/2013. The active farmer provisions under the Pillar II start being applicable from the moment they are applicable under the first pillar (1 January 2015), as provided in Regulation (EU) No 1307/2013. Member State may, however, anticipate the definition of the “active farmer” term in order to bring it in place from the beginning of the period.

## PAYMENTS UNDER THE FIRST PILLAR

The new period 2014-2020 brings along also a possibility for an additional income support to farmers in constrained areas in the form of a decoupled area-based payment as a complement to the basic payment under Pillar I. This is a voluntary payment (up to 5% of annual national ceiling) for farmers in areas facing natural constraints, as delimited in the Rural Development Regulation covering all three categories of constrained areas. However, Member States may decide to restrict this payment to some of these areas on the basis of objective and non-discriminatory criteria. Member States may also apply the payment at regional level, provided that they identified the regions concerned in accordance with objective and non-discriminatory criteria and, in particular, their natural constraint characteristics, and their agronomic conditions.

The new payment for farms in areas with natural constraints in Pillar I should not be a duplication of the scheme in rural development. The main purpose of the new Pillar I scheme for areas with natural constraints is to allow Member States to achieve a more equitable distribution of income throughout their agricultural area by targeting a part of income support to farmers whose farming activity and the income derived from it is permanently limited by natural constraints.

The support scheme is optional in both pillars. The interaction between the pillars is secured by the condition that any payment for natural constraints received in the first pillar is taken into account in the payment in the second pillar.

## FOCUS ON SPECIFIC ISSUES

### Delimitation of mountain areas

Very few changes can be expected for the mountain areas as the delimitation criteria will remain the same. However, Member State may proceed to a revision of the delimitation in cases where e.g. better data are available. In practice, this means that a commune can be added (or excluded) to the existing delimitation as long as evidence shows that the commune meets the criteria (of shorter growing

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period and/or slope). In case a Member State decide to change the parameters of the delimitation for mountain areas, new negotiations may commence. However, any new approach by Member States could only be based on an intention to come to a more efficient use of funds. This would mean that either new data on shorter growing period and/or steep slopes would be presented or that a Member State would decide to apply stricter criteria compared to the past.

### **Delimitation of areas with natural constraints other than mountain areas**

Unlike in the previous programming periods, Member States do not have to “build a case” for delimiting these areas. The criteria for the delimitation are clearly spelt out in Chapter A1. As the delimitation of these areas can be costly, Member States have the possibility to use technical assistance to finance the related works. This possibility is also extended to the period 2014-2020.

The delimitation gives theoretical access to payment for constraints in both pillars of the CAP (this payment is optional in both pillars). There is no other mechanism of adding areas and there is no possibility of homogenisation (including areas which have not been delimited but are surrounded by areas which are affected by constraints). Difference shall be made between the areas that are staying in the delimited areas of areas with natural constraints other than mountain areas, and those areas that will be phased out. The “phasing out” areas will no longer be subject to payments following the new delimitation criteria, or the fine-tuning exercise concluding that the natural constraints have been overcome.

The Member States shall apply the new delimitation in 2018 at the latest. In the “phasing out” areas the payments shall be degressive from the moment of completion of the new delimitation. The degressive payment shall not exceed 80% of the average payment fixed in the Rural Development Programme for the period 2007-2013. The payments in “phasing out” areas shall end in 2020 at the latest when the granted premia shall not exceed 20% of the abovementioned calculated amount. The Regulation also foresees the mechanism of fine-tuning, i.e. excluding areas where a constraint has been documented but has been overcome. A guidance document has been prepared and discussed with experts from the Member States. The fine-tuning approach should be a part of the Rural Development Programme and it will be scrutinized by the Commission services.

As regards the choice of administrative unit, the Regulation is compliant with the WTO Marrakesh Agreement, i.e. the delimitation must be based on an administrative unit with a definable economic and administrative identity. These are ideally LAU2s, or other units fulfilling the definition. The delimitation cannot be based on farms, plots, and other units, such as national parks, valleys, etc. If the delimitation is based on other units than LAU2, Member States should provide evidence, based on a legal analysis that the chosen administrative unit complies with the requirement of the Regulation.

### **Delimitation of areas facing specific constraints**

The extent of this category is limited by a maximum 10% of the entire territory of the Member State in question. It is irrelevant whether the Member State in question uses a single RDP or regional RDPs, the 10% is always calculated from the entire territory of the respective Member State. Overseas territories should be included in the reference value as long as they administratively belong to the Member State (this should be verified by both Member State and the responsible geographical desk). Finally, the reference value is the entire territory of the Member State, including cities, rivers, etc., it is not 10% of the agricultural area. Obviously, the delimitation of areas with constraints is limited to agricultural areas. Therefore, a Member State with the total territory of 1 million square kilometres, which includes 200,000 square kilometres of agricultural area, can delimit up to 100,000 square kilometres of agricultural area in this category, i.e. a half of its total agricultural areas. The Member States where the entire territory has been considered as an area facing specific handicap under regulations 1698/2005 and 1257/1999 may continue to be defined as an area facing specific handicap

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(the entire territory).

The Regulation stipulates that this category of areas with constraints shall comprise farming areas where the natural production conditions are similar. The delimitation of these areas is left up to Member States as, by definition, the constraints will be specific. The delimitation of these areas must be, however, based on clear criteria which lay ground to a quantification of income loss and/or additional cost, resulting from the constraint (which will have been certified as foreseen in Article 69). It should also be reminded that socioeconomic criteria, such as low population density, distance to market, average age of farmers, etc. do not meet the conditions of Article 33(4).

### Combination of criteria in areas facing specific constraints

The Rural Development Regulation envisages a possibility for applying “cumulative” criteria in defining the areas facing specific constraints. The Commission DG AGRI services together with the Joint Research Centre will provide more detailed guidance on this matter. While experts’ analysis will be provided, Member States may think of various combinations which, indeed, lead to a constraint in combination with each other. There are some combinations which do not meet this requirement – for example, some combinations of texture and drainage will not be acceptable as certain constraints in texture automatically lead to constraints in drainage. Such combination is, therefore, not a combination of two constraints; it is, de facto, one constraint. The chosen combinations should be used throughout the area covered by the RDP in order to secure transparency. Therefore, it is not possible to use different combinations in different areas. The delimitation must be based on administrative units in order to ensure compliance with the WTO Marrakesh Agreement.

### The five year rule: farmer’s obligation

As regards the 5-year obligation to continue farming, the following should be taken into consideration: if the commitments are undertaken in 2014 (under old or new rule’s funds), the beneficiary is exempt from this obligation according to Article 1(2) of Regulation (EU) No 1310/2013. However, only beneficiaries entering the scheme for the very first time in 2014 are exempt from the 5-year rule. In case a beneficiary has received the very first payment before 2014, the fact that the Member State enters into a new legal commitment in relation to the beneficiary (as it is the case given the fact that the measure is implemented every year) in 2014, does not mean that the 5-year period expires earlier. Therefore, the obligation has to continue until the end of the 5-year period. Finally, in 2015, in case of the use of “old” budget (funds for the period 2007-2013), the 5-year requirement has to be applied again, following the provisions of Regulation 1257/1999.

### What could the SEE countries learn from the EU payments schemes?

The descriptions above provide the detailed legislative regulations implemented in the EU to provide payments to farmers in the ANC areas. They show clearly that intensive work is needed to adjust these regulations into the SEE conditions as a simple “copy and paste” procedure could not work. Nevertheless, the first step would be to identify where the ANCs are and then how to apply the financial support schemes. This would require the joint efforts and collaboration of the national biophysical and socioeconomic experts working together to adapt EU legislation to national and regional conditions. It is not going to be an easy task, therefore, further assistance from the EU would be needed. One thing is sure: the ANC project will be able to define with a great level of confidence the location of these areas in six participating countries. It will be then the duty of national decision and policy makers to define the correct amounts of payments to farmers based on each countries’ economic conditions, priorities and rural development strategies.

### IPARD funding instruments and potential links with ANC payment schemes

As its stands in the timing of this publication, IPARD funds are not foreseen to be used for ANC

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payments. Moreover, the existing funding instruments require co-financing from the farmers receiving IPARD support and this may not be the case of ANC farmers already facing natural hardships.

Nevertheless, the **Axis 2 - Preparatory actions for implementation of the agri-environmental measures and Leader** of IPARD include the following measures that have relevance for the ANCs:

- Preparation for implementation of actions relating to environment and the countryside
- Preparation and implementation of local rural development strategies

It is then proposed, that ANC payments may be subject of IPARD negotiations with the Commission if there is political will from the participating countries to align their rural development policies with those already implemented in the EU member states for the ANC areas.

There might also be room for manoeuvring to allocate IPARD funding for ANC payments. For instance, Article 34 (of the document prepared by the DG Agriculture and Rural Development, European Commission since November 2009<sup>1</sup>) dealing with Aid intensities and rate of Community contribution specify that candidate countries may allocate funding under IPARD sources but the public expenditure shall not exceed a ceiling of 50% of the total eligible cost of the investment. However, there are exceptions to the 50% rule for:

- 60% for investments in agricultural holdings in mountain areas;
- 65% for investments in agricultural holdings in mountain areas made by young farmers

Large parts of the mountain areas could qualify as ANCs due to climatic, soil and terrain conditions.

<sup>1</sup> [http://ec.europa.eu/agriculture/enlargement/assistance/documents/sectoral-agreement\\_en.pdf](http://ec.europa.eu/agriculture/enlargement/assistance/documents/sectoral-agreement_en.pdf)



# CHAPTER A6

## SUMMARY OF THE CONSULTATION MEETINGS OF THE ANC REAWG IN THE FRAMEWORK OF THE LEIWW PROGRAMME

Pandi Zdruli<sup>1</sup> and Ordan Cukaliev<sup>2</sup>

### SUMMARY OF THE KICK-OFF MEETING OF THE REAWG ON ANC

The ANC REAWG project funded by the LEIWW Programme of GIZ and SWG was launched in Skopje, Macedonia, on 2 - 3 March 2016. The kick-off meeting was attended by the designated national experts (soil, meteorology, GIS) of Albania, Bosnia and Herzegovina, the Republic of Srpska, Kosovo\*, Macedonia, Montenegro and Serbia. Representatives of the SWG, GIZ, CIHEAM Mediterranean Agronomic Institute of Bari (CIHEAM IAMB), European Commission's Joint Research Centre (EC-JRC) and one high-ranking official from the national government of Montenegro were also present.

The meeting was opened with a presentation made from the JRC representative addressing the issues related to the delineation of Areas with Natural Constraints (ANC) using a common framework of biophysical criteria for all the EU28 Member States in compliance with the implementation of EU regulation 1305/2013. The representative of the CIHEAM IAMB described proposed adjustments that need to be done to the JRC methodology to better respond to soil, climate, land use/land cover, and other geo-morphological characteristics of the SEE countries. All country experts explained the status of data available as well as gaps and shortcomings and possible remedies. At the end, the timeline of activities to be performed, agreement on roles and responsibilities, communication and dissemination was agreed upon. The deadlines are given below:

- Define methodology by March 2016
- First interim meeting to be held in June 2016 (Andrevlje, Serbia)
- 2nd interim meeting to be held in September 2016 (Kolasin, Montenegro)
- National reports must be ready by October 2016
- Policy recommendations should be formulated by February 2017

Thanks to the active collaboration of the national experts, all the above goals have been successfully accomplished well before the deadline as evidenced by this publication, including policy recommendations.

### SUMMARY OF THE FIRST INTERIM MEETING OF THE REAWG ON ANC

The first interim meeting on the REAWG on ANC was held in the period 29 June – 01 July 2016 in Andrevlje, Serbia. The main objective of the meeting was to discuss the overall ANC methodology including the recent developments from the JRC, their application in the EU and its adaptation to

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the SEE countries. Updates in the preparation of the country reports were reported by respective experts emphasising the data needs, gaps, shortcomings, solutions and deliverables foreseen. Other issues included the possibilities for data exchange in bordering areas (soil and climate data) in order to improve the quality of the national data. Detailed discussions were held in three working groups, namely soil, climate and GIS. It was decided that each country must select a case study area to test the ANC methodology and to present the results in the next meeting to be held in September in Kolasin, Montenegro. The Serbian team agreed to make an in-depth assessment of the methodology for the municipality of Aleksinac.

## SUMMARY OF THE SECOND INTERIM MEETING OF THE REAWG ON ANC

The second interim meeting on the REAWG on ANC was held in the period 13 – 15 September 2016 in Kolasin, Montenegro. The 2<sup>nd</sup> interim meeting addressed the following topics:

- Country specific recommendations concerning the institutional setup for data collection, data sharing and data management, as well as designation of national authorities responsible for ANC for all six countries involved in the LEIWW programme
- Final technical assessment and compilation of the country reports (alignment of the country reports, quality control, editing, assurance of consistency and transparency)
- Regional data gap assessment and provision of recommendations
- National policy assessments and recommendations on characterisation and mapping of areas with natural constraints
- Regional policy assessments and recommendations on characterisation and mapping of areas with natural constraints in SEE
- EU objectives in the policy design processes and country specific implications of the area payment approach under the IPARD funding
- Generally recognised socioeconomic and environmental needs of the regions defined as ANC
- Key findings and summary outcomes to be presented at the SWG Agricultural Policy Forum to be held in Tirana 11-14 October 2016
- Ideas for the Project proposal/Concept note for follow-up activities on ANC in SEE under the EU financial mechanisms, FAO, etc.
- Presentation of the Case Study results from Serbia and general presentations from all other countries.

The Kolasin meeting concluded with a list of recommendations for policy/decision makers provided in Chapter 4 of this publication. It was agreed that the ANC network of national experts remain functional. Efforts will be made to explore the possibilities for ANC mapping and delineation. The GIZ representative expressed his appreciation for the work done so far by the whole network

## THE TIMELINE OF THE IN-COUNTRY CONSULTATION MEETINGS AND OUTCOMES

### Objectives and goals:

1. Brief methodological approach preparation in cooperation with the regional experts
2. Outline of the tasks of the national experts
3. Guidance materials on the EU methodology for the identification and delineation of the ANC, including proposal for data standardisation and harmonisation
4. Methodological framework support to address country specific characteristics
5. On the job training, capacity building and technical backstopping

## Serbia, Bosnia & Herzegovina, Macedonia, 15 - 22 May 2016

### Serbia

The meeting in Serbia was held in Belgrade, first at the office of Dr. Zoran Knezevic, former director of the Agricultural Land Directorate at the Ministry of Agriculture and Environmental Protection. Attending were Prof. Zdruli, Prof. Cukaliev and Dr. Dragana Vidojevic. Dr. Knezevic was briefed on the goals and objectives of the ANC SEE project and the methodology to be applied. He was very supportive and emphasised the fact that his Ministry was looking forward to the outcomes of the project in order to re-orient their rural development policies and establish priorities for providing subsidies and financial support to farmers. He did emphasise also that at this point in time Serbia has limited financial resources to be allocated for the ANC payment areas. Nevertheless, he pointed out that the project is timely and very much welcomed by the Ministry. Finally, Dr. Knezevic promised to provide his support and that of the Ministry he represents for the collection of all data needed to delineate and define the ANCs in Serbia.



From the left: Jovica Vasin, Dragana Vidojevic, Ordan Cukaliev, Nenad Markovic and Pandi Zdruli meeting at the Environmental Protection Agency

Then the meeting continued at the premises of the Environmental Protection Agency. The outcomes showed that much of the data needed for Serbia (soil, climate up to the year 2014, and GIS) are available. A few concerns were raised for missing specific characteristics such as **soil texture** that is not available for the whole country. Another concern was raised about the **number of days at field capacity** (230) that is required for areas with poor **drainage conditions**. The 230 days threshold is a feature typical for Northern European countries but not for the Balkans. Thus, the proposal is to bring that number down to 180 days, subject to agreement with the JRC and the EC. Otherwise, "Excess Soil Moisture" will be defined by either one of the three groups of criteria, namely: "wet within 80 cm (from the surface) for over 6 months", or "wet within 40cm for over 11 months", or "classified as poorly drained" (soils are commonly wet for considerable periods - ground water table commonly within 40cm from the surface), or "classified as very poorly drained" (wet at shallow depths for long periods - ground water table is commonly within 15cm from the surface), or "soil has *Gleyic colour pattern* within 40cm from the surface".

Another good source of available free information is the digital elevation model from the Shuttle Radar Topography Mission (SRTM), adjusted to 1 arc second (about 30m resolution). This may be good for

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slope calculation but will have a coarse resolution for modelling of the weather data, hence a better resolution elevation model will be used.

In the end, it was decided to select a case study i.e. a municipality that most probably has ANC's within its territory so that a preliminary assessment could be done using the existing JRC methodology.

## Bosnia & Herzegovina

### The Federation BiH

The meeting was held in Sarajevo at the Federal Institute of Agropedology in the presence of Dr. Esad Bukalo, director of the institute (soil expert), Dr. Nedžad Voljevića (meteorology expert) and Dr. Damir Behžulović (GIS expert). Dr. Behžulović informed about the availability of soil and GIS data, while Dr. Voljevića explained the status of climate data that is available for the period 1961-1991. Soil data available are based mostly on a very detailed soil map at a scale of 1:50,000 completed in the late 70s. Latter on (2000-2004) the map was updated and converted to FAO soil classification system through a FAO sponsored project. According to Dr. Behžulović **there are no saline nor sodic soils in B&H** and this makes the assessment easier as far as soil constraints are concerned, but there are **acid soils** that need to be accounted for as ANC's as well as **shallow soils less than 30 cm deep, as well as Stagnosols and Gleysols and heavy clay soils**. The B&H team intend to use two elevation models, one with 20 m resolution for slope and 5m resolution for modelling the weather data in order to get a better resolution.

Another issue in the discussion was related to the areas with **poor drainage conditions**. The ANC methodology requires that such areas should be defined only under natural conditions. The problem is that in B&H, but also in other Balkan countries, like in Albania, for instance, after the collapse of the Socialist system many lowland areas that were previously reclaimed were almost abandoned and the drainage systems were not functional. This created **waterlogging** conditions with stagnating waters on the surface. It is, therefore, suggested that these areas should also be classified as ANC's and again



From the left: Nedžad Voljevića, Ordan Cukaliev, Esad Bukalo, Pandi Zdruli and Damir Behžulović (in the background the Soil Map of Bosnia & Herzegovina completed in 1970)

the threshold number of 230 days may need to be revised and adjusted, otherwise these areas will classify as ANC based on “limited soil drainage” criteria. It was agreed that the inclusion of the **natural grazing pastures** as defined by the CORINE methodology (code 231) within the category of agricultural land is appropriate and reflect well the conditions of farming systems in the Balkans that still rely on small ruminant grazing. Hence, providing assistance to these areas is also a remedy against abandonment and depopulation of the mountainous regions.

## The Republic of Srpska



*Dr. Boris Pasalic, Assistant Minister for Agricultural Extension of the Republic of Srpska*

The meeting was held at the Ministry of Agriculture. Dr. Boris Pasalic, Assistant Minister for Agricultural Extension made a welcome address and emphasised the interest of the Ministry for the ANC project as an important instrument for enhancing rural development policies in the Republic of Srpska that intends to implement ANC legislation by 2018

The meeting was attended also by Dr. Zelko Vasko (rural development expert), Tihomir Predic (soil expert), and Boris Markovic (GIS expert). Dr. Markovic explained the status of developing the GIS shape files for various mapping layers and showed numerous maps, including land use, land cover, soil, administrative units, slope of agricultural land etc. There is full confidence that RS team has all the capacities for performing GIS elaboration and processing.

The issue of soil data deriving from the old soil map at 1:50,000 scale of former Yugoslavia is the main source of data for the Republic of Srpska too. The team has all these associated soil profile descriptions and analytical data relevant from this map. In addition, as informed by Dr. Predic, the Agricultural Institute of the Republic of Srpska has a number of soil reports along with soil laboratory data, as well as land cover/land use studies conducted in the period 2000-2007 under a project funded by the FAO. These and other data in the process of elaboration (i.e. LUCAS project sponsored by JRC Ispra) will be made available to the ANC SEE project. Still there are data gaps and shortcomings such as for soil texture.

Climate data are available in digital format for the period 1961-1991 and will be used for the ANC assessment.



*From the left: Tihomir Predic, Boris Markovic, Pandi Zdruli, Zelko Vasko and Ordan Cukaliev*

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## Macedonia

The meeting took place in Skopje on 26 May 2016 at the premises of the Faculty of Agricultural Sciences and Food at the Ss Cyril and Methodius University attended by Nina Aleksovska (Meteorologist, National Hydrometeorological Service), Dushko Mukaetov, (Soil Scientist, Institute of Agriculture) and Ordan Cukaliev, (Agronomist, Faculty of Agricultural Sciences and Food, Regional expert in ANC project). During the meeting the status and availability of the data required for the development of the ANC was elaborated and the following findings were reported:

**Soil data** are largely available and included in the Macedonia Soil Information System (MASIS) in digital format with the exception of drainage classification and limited information on surface stoniness, salinity and sodicity. The **meteorological data** are monitored and processed by the National Hydro Meteorological Service. The data for the main meteorological stations required for the ANC activity are available in digital format, daily values (average, minimal and maximal daily temperature and rainfall) for a period of more than 30 years. However, data are not available for the public and according to the legislation data are available upon payment. The cost of the daily and monthly values required for the development of the ANC is quite high in the range of EUR 70,000. The data on Evapotranspiration (ET) are not available but there is the possibility for it to be calculated using the Hargreaves or Thornthwhite methodology. The Penman Monteith methodology is feasible only for some stations, therefore, one of the abovementioned temperature based equations could be used preferably in order to have higher resolution. Moreover, the monthly data for the period 1961-1990 and 1971-2000 were delivered by the Hydromet for the purposes of developing the Second National Communication on Climate Change to the UNFCCC. However, these data can be used, but still the permission of the data owner is required.

The Republic of Macedonia is part of the CORINE land cover initiative and 3 sets of land cover data for the whole country are available (CORINE LC 2000, 2006 and 2012) in digital format (shape file) containing information about land cover on three levels in a scale of 1:100,000. These databases are available for public use. In addition there are also other **GIS data** available that will be used for the ANC project as digital elevation models with resolution of 5 m and 20 m.

## Albania, Montenegro, Kosovo\*, 3 - 10 June 2016

### Albania

The meeting was held at the Institute of GeoSciences, Energy, Water and Environment, Department of Climate and Environment. Attending were Prof. Dr. Petrit Zorba, Dr. Ilir Salillari and Ms. Florjana Cela. Prof. Zorba pointed out the availability of the climatic information in Albania and assured that the **monthly average rainfall and temperature data** for 135 meteorological stations and 30 climatological ones in the country will be available for the ANC project. Their number is, however, reduced from 238 stations until 1990. Efforts are under way to strengthen the meteorological survey in Albania with tens of new stations funded by the World Bank, GIZ and the Albanian government. These are important facts assuming that updating and monitoring the ANC project results could be done in the future.

Dr. Salillari informed about the national programme intended to produce soil data at very detailed level (maps at a scale of 1:10,000) based on soil types and land suitability. By the end of 2016, an area of at least 240,000 ha, or *34.4% of the total agricultural land* will be covered by soil profile descriptions and laboratory analytical data for the main soil characteristics, all of which is required for the delineation of the ANCs. The Ministry of Agriculture, Rural Development and Water Management aims to complete this type of soil survey for the whole of Albania within 7 years. In the meantime, the missing soil data will be derived either from other soil surveys or pedo-transfer rules.

Ms. Cela informed about the status of soil and GIS data. Albania is divided into 12 administrative counties (region), each containing several districts. These counties were further divided in 36 units. There are overall 2,980 cadastral zones (villages) in all Albania, formerly known as localities. The

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government introduced a new administrative division that was implemented in 2015 whereby the number of municipalities is 61 in total. The CORINE 2012 land cover will be the baseline for the assessment.

A brief informative meeting was held at the Ministry of Agriculture with the SWG delegate from Albania, Dr. Grigor Gjenci who re-affirmed the interest and the support of the Ministry for the ANC project.



From the left: Prof. Chukaliev, Prof. Zdruli, Dr. Salilari and Prof. Zorba

## Montenegro

The meeting was held at the office of Hydrogis Systems in Podgorica attended by Dr. Knezevic, Dr. Pavicevic and Dr. Djajic. The discussion focused on the final preparation of the country report that was overall considered to be comprehensive and well written.



From left: Dr. Pavicevic, Dr. Knezevic, Dr. Djajic, Prof. Chukaliev and Prof. Zdruli

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Nevertheless, a few issues were raised such as the inclusion of climate domains maps and the digitisation of the soil map 1:50,000 that is still ongoing under the leadership of Dr. Knezevic. From the soil perspective, **stony soils** occupy large areas in Ulcin and some other watersheds. They qualify as ANC. For the purposes of the ANC project, about 1,800 profiles, which have about 4,000 layers or horizons with laboratory data, will be used. This means that given that the total area of Montenegro is about 13,812 km<sup>2</sup>, on average one profile will be available for 7,7 km<sup>2</sup>, which can be considered to be sufficient to fulfil the goals and objectives of the project.

Ms. Pavicevic reported on the availability of meteorological information and raised the concern that dissemination of some of these data may create problems from the administrative perspective. It means that elaborated data that are in the possession of the Institute of Hydrometeorology and Seismology of Montenegro may not be given as raw data to other participating countries or entities. It was clarified that **data will remain the property of the data holders** and the ANC wouldn't require that such data should be distributed to other third parties. Instead, the project requires that countries use these data to define the ANCs. All the data used constitute the scientific background for delineation of the ANC. Ms. Pavicevic agreed to include in the Montenegro report the climatic domains maps.

Dr. Djajic showed the availability of the GIS maps. In addition to the CORINE 2012 data, the Ministry of Sustainable Development and Tourism has a geographic information system in the field of hydrology-water management data with the various layers including different land cover categories. The Law on Territorial Division of Montenegro divides the country into 23 spatial units (LAU1, the municipality of Podgorica, the capital Cetinje and 21 local governments) which contain 1,307 settlements (LAU2). Each municipality is divided into one settlement of urban character, and a number of settlements of rural character. Finally, Montenegro is divided into 796 cadastral municipalities and one of them will be selected as a case study for the implementation of the ANC methodology.

### Kosovo\*

The meeting was held in Prishtina and attended by Afrim Sharku, Idriz Shala and Syle Tahirsylaj. The discussions were focused on the data availability for Kosovo\*. Mr. Sharku raised concerns that **soil data were largely missing and this could be a serious handicap for delineating ANCs**. All that is available in Kosovo\* is an old soil map of 1974 from the former Yugoslavia that is like an image with soil polygons and dots where profiles were sampled, but laboratory analytical data are missing. **This issue is critical and needs to be addressed**. Depending on funding availability, a soil survey must be completed at least in agricultural areas where expectations are that ANCs are present.



From the left: Prof. Tahirsylaj, Prof. Zdruli, Mr. Shala and Mr. Sharku

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According to Prof. Tahirsylaj it is possible to collect climate data, are possible to be collected at least for the period 1961-1991. Regarding GIS data, Idriz Shala informed that they have a number of maps, including the administrative units of Kosovo\* and the CORINE 2012 land cover in digital format.

Another meeting was held with Mr. Bekim Hoxha from the Ministry of Agriculture of Kosovo\*. He confirmed the interest of the Ministry for the ANC project but raised concerns about soil data availability and the need to remedy this situation as soon as possible; for this reason all sources of funding must be explored, including local ones.

## CONCLUSION FROM THE IN-COUNTRY MEETINGS

The meetings with country experts were very useful and fruitful. The first conclusion is that in the ANC SEE project there are the right people qualified and devoted to fulfil their tasks. There is a wealth of soil, climate, and GIS information in the countries. Data availability differs from country to country and these shortcomings need to be better identified and evaluated. Last but not least, all policy and decision makers we met expressed support for the project. The authors of this chapter address a heartfelt thank you to all experts for their time, often on Saturdays and Sundays, and for the wonderful hospitality they showed. We travelled more than 2,000 km and all went smooth without any problem despite crossing country borders and riding in all kinds of roads oftentimes.

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**PART B**

**COUNTRY  
REPORTS**

# CHAPTER B1

## STATUS OF SOIL, CLIMATE AND DIGITAL MAPPING INFORMATION IN ALBANIA

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### B1.1. INTRODUCTION

#### Geographical position

The Republic of Albania is located in Southeast Europe, in the western part of the Balkan peninsula, between the geographical coordinates 39° 16' N latitude and 42° 39' E longitude. The Republic of Albania borders Montenegro to the north, Kosovo\* to the northeast, Macedonia to the east, and Greece to the south and southeast. On the west, Albania is washed by the Adriatic and Ionian seas. The overall length of the border line is 1,094 km, of which 657 km is land-border and 316 km is sea-border. The total area of the country is 28,748 square kilometers and out of this area, only 16.2% is less than 100 m above sea level.

#### Physiographic settings

Albania is distinguished by four main physiographic regions: the Northern Mountain Region, the Central Mountain Region, the Southern Mountain Region and Western Lowland including the surrounding hilly area.

*The Northern Mountainous Region* is typically characterised by the Albanian Alps and very rugged terrains known for the great contrast between high mountains and deep valleys. There are at least 30 mountain peaks reaching as high as 2,500 m above sea level. The highest are Jezerca (2,694 m), Radohima (2,569 m) and Shkëlzeni (2,407 m). The river valleys divide the Alps into four big blocks and a series of mountain ridges. The main valleys are those of Valbona, Shala and Cem. The area possesses exceptional landscapes, many of them almost still in their natural conditions, untouched by humans and with great potential for mountain tourism throughout the year, provided the infrastructure is improved. Agriculture is limited in small areas dominated mostly by pastoral activities of small ruminants and Alpine cattle.

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Figure B1.1. Typical Alpine landscape in the Theth valley, dominated by forests, natural pastures and limited agricultural land, source: <http://www.adventurelink.com/trip/146553/trek-in-the-albanian-alps>



Figure B1.2. Albanian Alps seen from the air looking East, Source: Albinfo - Own work, CC BY-SA 3.0, <https://commons.wikimedia.org/wiki/index.php?curid=7489141>

In the center there is the village of Theth. In the upper corner on the right there is the Valbona valley with Maja Roshit and Kollata to the left. Between the two valleys are the Valbona pass (Qafa e Valbonës) and the Jezerca massif with the Jezerca peak between two clouds. On the left there is the Peja pass (Qafa e Pejës) and the pyramid of Maja Arapit. Behind, in the upper left corner there is the Montenegrinian Ropojana valley and the valley of Plav with parts of Lake Plav. To the left there is the Radohima massif. In the lower part the road to Theth over Terthorja pass (Qafa Terthorjës) can be seen.

*The Central Mountain zone* contains the largest area extending from the Drina River in the north of the country to the Upper Osum and Lower Devoll rivers in the south. In the west the zone is bounded by the hilly regions of the western lowland. The Central Mountain Region is not compact, but divided into some massive mountains like Korab, Lura and Skëndërbeu. These mountains are interrupted by various valleys. Although the mean altitude is less than the Alps, this zone has the highest peak in the country at Korab Mountain (2,751 m a.s.l). The predominant direction of the mountain chain and the main valleys runs from northwest to southeast.

*The Southern Mountain Region* is largely overlooking the Ionian Sea. High mountains dominate this zone that includes also lower valleys and depressions occupying considerable areas. The southern mountain region has a more or less regular relief position with mountain chains and valleys having a northwest-southeast direction. This zone has two large tectonic depressions (the Delvina Plain and Dukat Valley) that in certain areas interrupt the mountains range forming narrow gorges. Much of agriculture is confined inside the valleys and in the surrounding undulating gentle slopes.

*The Western Lowland* and its hilly regions are placed along the Adriatic Sea having a length of about 200 km from the north to the south and on average the area is 50 km wide from the west to the east. Much of the area is almost at sea level, and in some places sea water intrusion is common accelerating soil salinisation. Large areas are completely flat surrounded by few ridges of hills. This lowland plain has been formed by Quaternary alluvial deposits of several rivers flowing into the Adriatic and Ionian seas and is considered as the breadbasket of Albania.



Figure B1.3. Typical landscape of the Western Lowland in the village of Gradishte, in Lushnje (Main agricultural crops include cereals, maize, horticulture, greenhouses and cultivated forages).

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## Geology

The geological formations and structures spread throughout Albania's territory are known as Albanide. They form the central parts of Dinaride - Albanideve range confined with the Adrias (Apulja) plate on the west and with the continental micro-block of Korab – Pelagonian on the east.

The geological formation of Albanide is very complex and complicated, with a variety of sedimentary, magmatic and metamorphic formations. The older formations of Albanide are mainly terrigenous of Ordovician, Silurian and Devonian ages. The most widespread are the formations of Mesozoic era represented by magnetite and sedimentary rocks. These geological formations are spread all over the country. Cenozoic depositing are represented by terrigene (flysch, molasses) and carbonate rocks, such as limestones and dolomites, which are found all over the country, from the south to the mountains of Malësia e Madhe in the north.

In the magmatic formations of Albania their large majority is occupied by ophiolite, which is known for its effusive magmatization form as well as intrusive dating back to the Paleozoic era. Additionally, the vulcanization process during the low and medium Triassic era has formed through magmatization various forms of granitic or granosienitic paracretac rocks. The formation of magnesial soils, rich in Mg and typical for their heavy clay texture, otherwise known as Smonitsa soils, is common in such areas. These soils qualify as ANC.

## Soil classification in Albania

### The National Soil Classification System

Soil Classification in Albania started with the first soil maps dating back to 1930. However, the first Soil Map of Albania at a 1:200,000 scale, was compiled in the late 1950's (Zdruli, 1997) and the soil classification system was adapted from the Russian system. In 1971 and 1980 (using the same soil classification system), two soil surveys at scales of 1:50,000 and 1:10,000 were completed for all the agricultural land of the country. Each district had its own soil map at a 1:50,000 scale, its own soil report, and laboratory analytical data for each parcel of agricultural land. Table 1 shows the legend used to develop the 1958 soil map. The main criteria in soil subdivision were elevation and natural vegetation.

Until 1990, soil fertility was monitored throughout the agricultural land every 4-5 years. Representative soil samples were taken for each 10 ha in the flat areas and for every 3-5 ha in the hilly and mountainous regions. This monitoring system along with a wide range of experimental trials helped establish appropriate soil fertility and plant nutrition management plans. These soil studies provided the first assessment of land resources and especially helped make the appropriate decisions, for instance, on fertilizer use and land reclamation projects.

Table B1.1. Generalized table of Albanian soil classification in 1990 and corresponding agricultural areas<sup>1</sup> for each soil type

Zonal soils	Belts	Type	Soil types	%	'000 Ha
I	Subalpine pasture (1,600-2,700 a. m.s.l.)	LM	mountain meadow	0.5	3.2
II	Beech and pine forest (1,000-1,600 a. m.s.l.)	MP	dark mountain forest	3.0	20.2
		LMP	dark meadow forest	0.6	3.4
III	Oak forest belt (600 – 1,000 a. m.s.l.)	KM	cinnamon mountain	17.7	121.3

<sup>1</sup> Area refers to the total agricultural land of the country in 1989.

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		KL	cinnamon meadow	5.4	37.0
		LK	meadow cinnamon	7.5	51.3
IV	Mediterranean shrubs (0 – 6,000 a. m.s.l.)	HK	gray cinnamon	25.7	176.2
		HKL	gray cinnamon meadow	6.4	50.7
		LHK	meadow gray cinnamon	18.5	127.1
<b>Azonal soils</b>					
	Alluvial	AL	fluviatile soils	11.8	80.9
	Peat	LT	boggy soils	1.4	10.0
	Saline	K	solonchak, solonetz	1.4	9.7
	Primitive soils	P	undeveloped soils	0.1	0.4
<b>TOTAL</b>				<b>100.0</b>	<b>691.4</b>

Source: Zdruli, 1997.

### Converting the national soil classification into international standards

The first efforts to convert the national soil classification system to international well-known systems, such as USDA Soil Taxonomy, FAO – UNESCO soil map of the world and World Reference Base for Soil Resources, otherwise known as WRB, were undertaken by Zdruli (1997, 1998, 2001).

In 1998, for the first time an Albanian soil database was introduced into the Soil Geographic Database of Europe at a scale of 1:1,000,000. This was followed in 2001 by a more detailed soil survey aiming at the creation of a national soil database of the country at a 1:250,000 scale prepared according to WRB 1998 system and another much more detailed soil database for the coastal areas at a scale of 1:50,000 (Figure 4).

The Albanian pedological landscape is very diverse as shown in Figure 4. This great diversity of soil types will be crucial in the process of ANC delineation as far as soil constraints are concerned. For instance, Vertisols, Arenosols, Solonchaks, Gleysols, Histosols (if SOM is more than 30%) and Leptosols could be possible “candidates” provided that analytical laboratory data or field descriptions would be available to meet the ANC criteria.

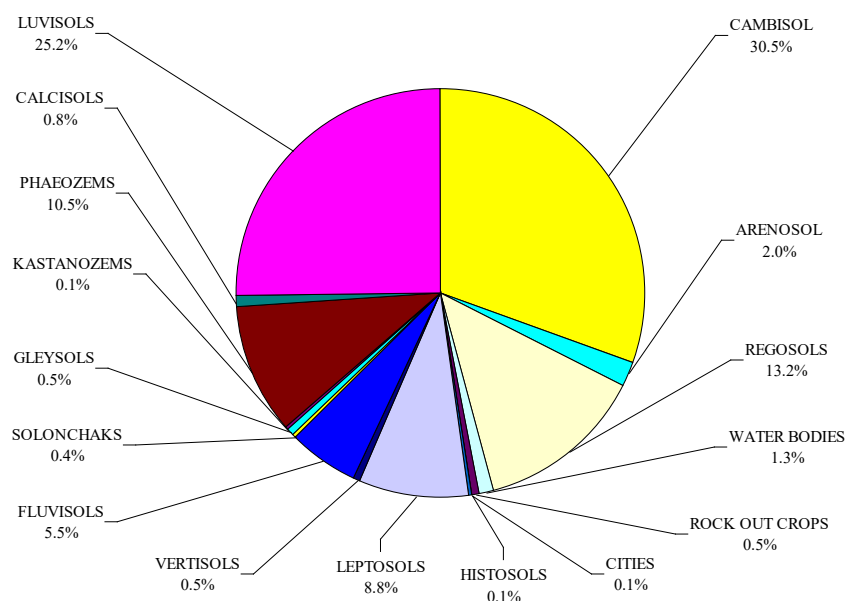


Figure B1.4. Distribution of soils according to the WRB, source: Zdruli, 2001

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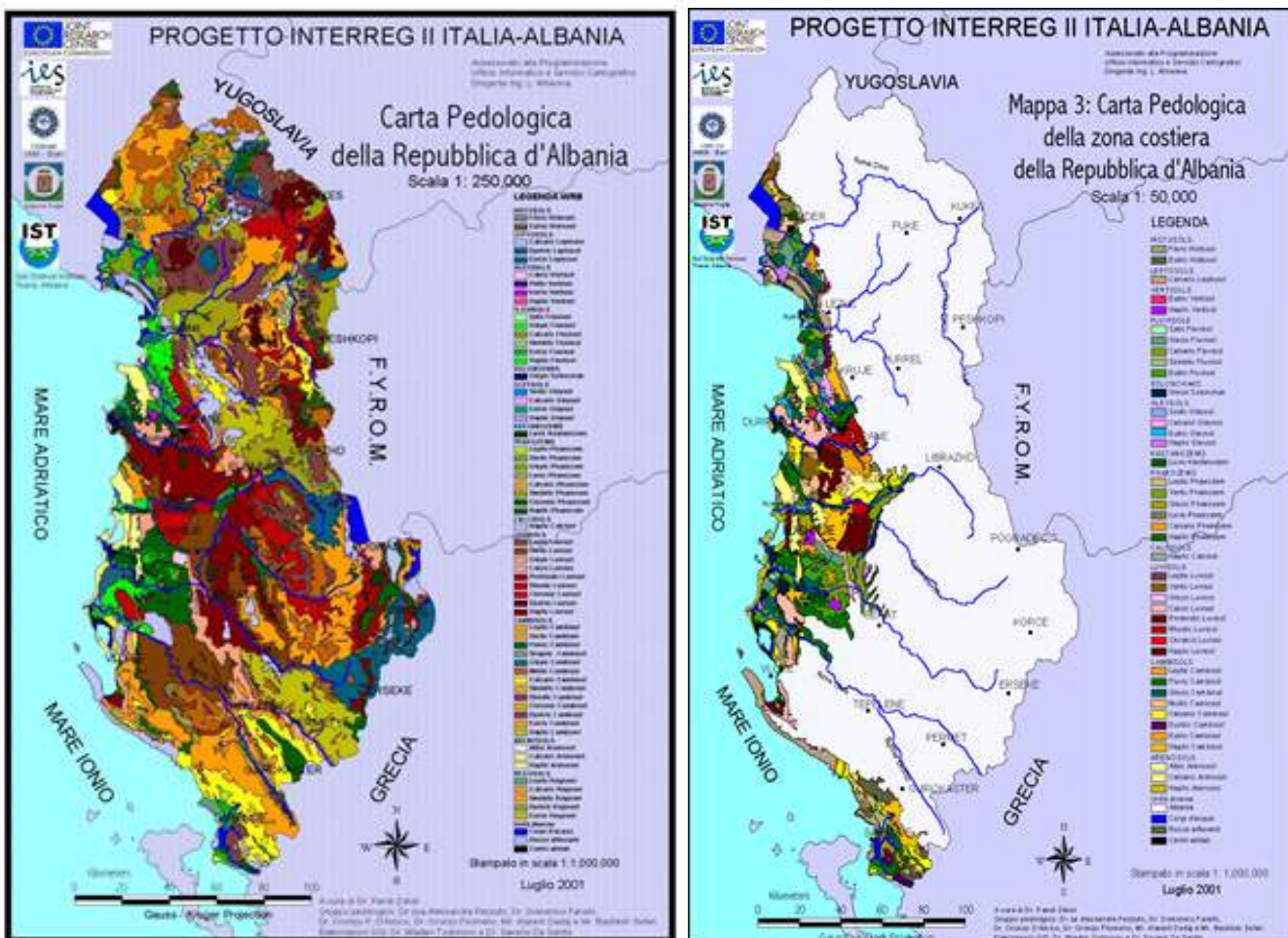
## Vegetation

Albania is considered to be among the countries with the greatest plant diversity as a result of the wide variety of ecological conditions created by combinations of elevation, soil type, rainfall and topography. Vegetation types range from alpine meadows to various types of forest and shrub habitats, up to coastal vegetation. Northern Albania shares flora species groups with Central Europe, while southern Albania has an affinity to Mediterranean group species. Because of the prevalence of a mostly mountainous terrain that reflects significant change in climate and other factors, the vegetation is closely linked to elevation above sea level.

## Relief

About 75% of Albania's relief is mountainous. The variability of formations and the great landscape fragmentation made of mountains, hills, flat plains and valleys interrupt with each other, forming a very diverse mosaic pattern. In addition to the Western Lowland that covers much of the agricultural land of the country, there are other high plateaus formed by tectonics swamps such as the one found in Korça in the southeastern part of the country. Minor extension of similar landforms are present also in Kolonja, Mat, Peshkopi and Kukës. They are characterised by graben type flat bottom valleys and in general have fertile soils. Relief is a major component of the ANC project and will be used to classify ANC areas meeting the criteria of more than 15% slope.

Figure B1.5. Soil map of Albania at a scale of 1:250,000 and 1:50,000 for the coastal area according to WRB



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## Agricultural land

The structure of land use in Albania has remained almost the same for years (between 699,000 ha to 697,046 ha). In 2014, the agricultural land covered 24.3% of the total territory of the country, while the rest (75.7%) which was classified as Non-Agricultural land was divided among forests (36%), natural pastures (15%) and other (24.7%). Nevertheless, currently only about 59% of this area (or 409,000 ha) is cultivated, with the remaining 41% being left fallow due to low soil productivity and terrain constraints (steep slope). In addition, there is the risk that soil degradation of these area may increase, mostly soil erosion due to overgrazing. Although not being cultivated, these areas will qualify as ANCs. Finally, 209,353 ha or 31% of the total agricultural land is irrigated, a figure that is lower than what was the irrigated area until the late 90s.

Table B1.1. Structure of agricultural land by district (in ha)

District	Agricultural land	Non-Agricultural land (forestry, pasture & others fond)
Berat	52,982	126,811
Diber	41,056	207,726
Durres	40,485	35,957
Elbasan	73,445	256,549
Fier	121,914	67,214
Gjirokaster	45,111	243,315
Korce	90,731	280,319
Kukes	25,292	212,056
Lezhe	34,719	130,034
Shkoder	50,174	306,025
Tirane	57,661	108,537
Vlore	63,476	201,866
<b>Total</b>	<b>697,046</b>	<b>217,6409</b>

NB. Note that pasture areas will be included in the ANC area delineation

## Crop production

Cereals and cultivated forage crops (i.e. alfa alfa, *Lat. Medicago sativa*) cover about 85% of agricultural land cultivated with field crops. The trend in cereals over the last ten years (2005 – 2014) has been towards slightly reducing the area under cultivation, but this was compensated by yield increase. Nevertheless, it should be noted that despite recent improvements, yields remain significantly below the biological capacity of cereals. The same trend holds true for the forage crops also.

Table B1.2. Structure of field crops (in 1,000 ha)

No.	Field Crops	2005	2010	2011	2012	2013	2014
1	Cereals	147.7	147.7	143.0	142.1	143.2	147.7
	Wheat	82.4	69.2	73.2	71.2	70.0	69.2
	Maize	48.4	61.2	53.5	53.5	55.0	61.2
	Rye	1.5	1.5	1.3	1.2	1.4	1.5
	Barley	1.5	2.8	2.4	2.5	2.7	2.8
	Oats	13.9	12.9	12.5	13.6	14.1	12.9

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2	Vegetable	32.5	30.6	31.0	30.0	30.0	30.6
3	Potatoes	10.1	9.5	9.3	9.1	9.6	9.5
4	White beans	16.1	14.4	14.6	14.2	14.6	14.4
5	Tobacco	1.5	1.2	1.3	1.7	1.5	1.2
6	Sunflower	1.1	1.5	1.4	0.7	0.7	1.5
7	Soybean	0.4	0.3	0.3	0.3	0.2	0.3
8	Forage	191.0	202.0	204.0	208.9	215.3	204.2

While the surface area covered by field vegetables has been slightly decreasing in recent years, the area under greenhouses has increased by about 66 percent during the period 2005 to 2014, increasing from 650 ha to 1,085 ha, while in 2016 the greenhouse area reached as much as 3,000 ha. This trend was reinforced and encouraged by high profit for farmers, mostly through exports.

One of the most dynamic sectors of Albania’s agriculture include fruit trees, citrus and olive groves that have increased by 110%, 118% and 72% over the period 2004 – 2015 thanks to the recent Governmental support schemes. At the same time the vineyard area has increased by about 29%. These types of land use have still great potential for expansion supported also by suitable climate and soil conditions.

### B1.2. STATUS OF SOIL DATA

All the data collected after 1990 will be made available for the ANC project. Nevertheless, the most consistent soil survey programme was established in 2003 by the Ministry of Agriculture under the

Agricultural land Inventory of Albania Program. This extensive on-going national programme intends to collect soil data and produce very detailed soil maps at a scale of 1:10,000 (Figure 5) based on soil types and land suitability. By the end of 2016 this soil survey will have covered some 240,000 ha (or 34.4%) of the total agricultural land. The Ministry of Agriculture, Rural Development and Water Management aims to complete this soil survey for all the agricultural land in the country over the next 7 years.

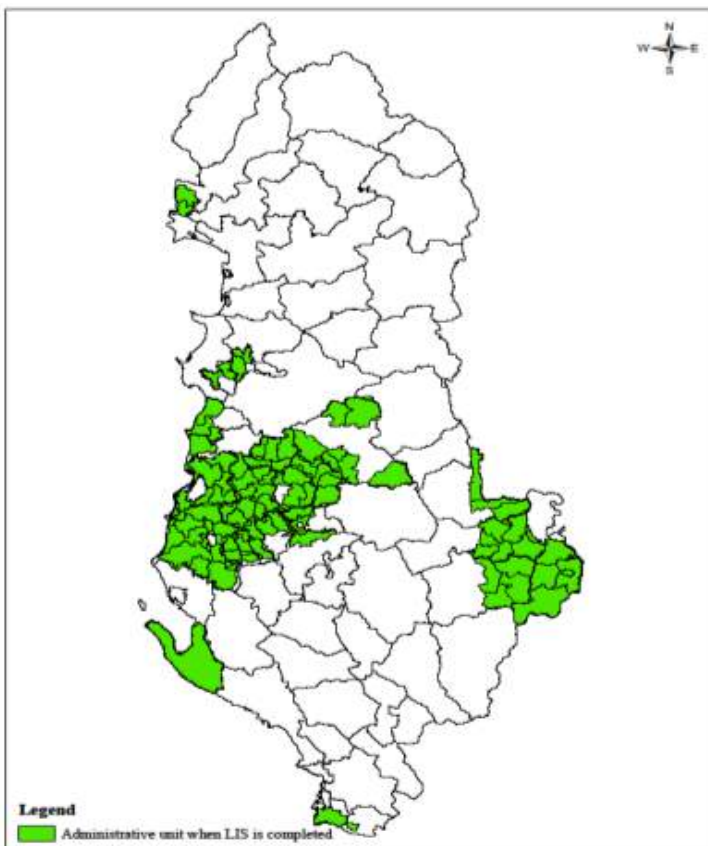
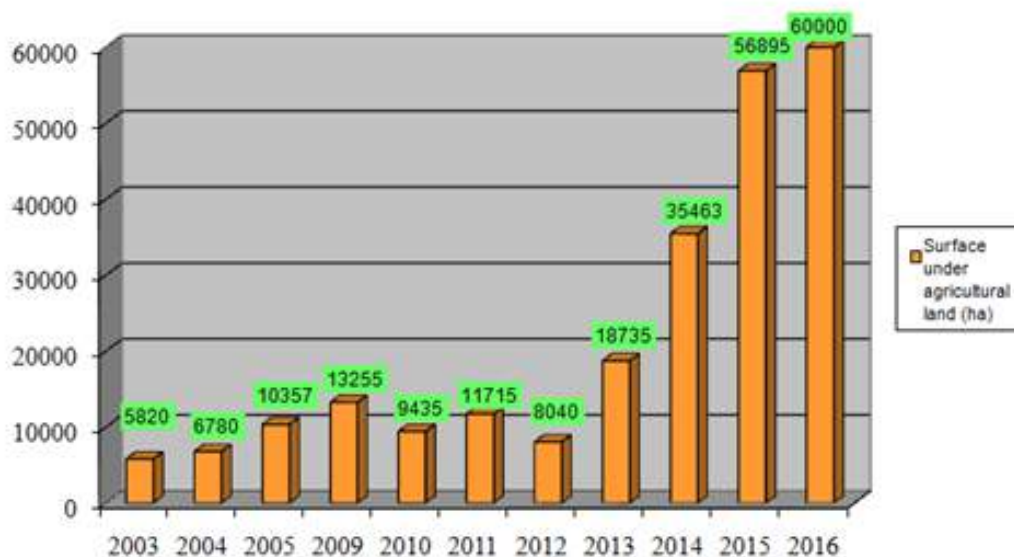


Figure B1.6. Status of soil survey at a scale of 1:10,000

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Graphic B1.1. Agricultural land covered by the national soil survey programme for the 2003-2016 period.

The national focal point for field survey, data collection, validation and GIS processing of soil information is the Centre of Agriculture Technology Transfer (QTTB) based in Fushe Kruje, 10 km north of Tirana.

The GIS database contains a set of soil characteristics including: exchangeable sodium percent (ESP), electrical conductivity (EC), cation exchange capacity (CEC), topsoil fertility (pH, humus or soil organic matter (SOM), available P, exchangeable Ca, K, Mg and Na), topsoil and subsoil structure, slope, flood risk, soil depth, topsoil stoniness, topsoil and subsoil texture, natural drainage, total available water and erosion risk. Based on these data, the Albanian team feels comfortable that the ANCs could be easily defined, at least as far as soil data are concerned.

For other areas that are not covered by the recent soil survey programme, soil data will be derived from previous surveys.

#### Standard methods for soil analyses performed in Albania

##### **Determination of Soil Organic Matter SS 1584/8: 1989**

Organic Matter is the result of the decay process of organic residues. The analytical method is based on oxidation of Carbon of organic matter with  $H_2SO_4$ , and determination titration with chromate indicator, Mohr's methods.

##### **Mechanical analyses SS 1584/14: 1990**

The relative amount of sand, silt, and clay are estimated in moist soil condition by the Stock formula.

##### **Determination of pH SSH 1584/9:1989; SS ISO 10694: 2001, etc.**

The method is based on using a glass and a reference electrode with a pH-meter, on suspension soil/water.

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**Determination of Electrical Conductivity (EC) SS ISO 11265: 2001**

Soluble salt is a measure of conductivity of salt soluble in soil solution water. Soil samples are evaluated for salinity by first determining the electrical conductivity of a soil/water suspension using a conductor meter.

**Determination of exchangeable sodium (Na) SS ISO 13538: 2001**

The method is based on extracting Na cation with oxalate ammonium 1N in a solution with pH =7.4 and measured with Flame Photometer.

**Determination of Cation Exchange Capacity (CEC) SS ISO 13536: 2001**

The method is based on extracting cations Na, K, Ca and Mg with oxalate ammonium solution 1 N at pH= 7.4. Their measurement (Na and K) is made with flame photometer while (Ca and Mg) are assessed with absorber atomic against standart relevant solution.

## B1.3. STATUS OF CLIMATE DATA

### Historical view

The meteorological observations in Albanian started first in 1868 at the port of Dures followed by the city of Shkodra in 1888.

During the First and Second World Wars about 35 meteorological stations were active in the country. After the WW2 the number of stations increased up to 238 measuring different meteorological elements such as rainfall (all 238 stations), temperatures (only 178 of them), etc. After the political change in 1990 and until now, for different reasons, the number of meteorological stations has been reduced to 135 while the number of climatological stations to 30.

The situation has been improving over the recent years since a number of automatic meteorological stations are being installed by a World Bank (WB) project (40 stations) and a few more by other donors (5 by GIZ, 3 by bilateral projects, 4 by universities, 3 by private companies, etc.) in addition to the one station placed at the Tirana Airport. Furthermore, the Albanian government is providing financial support to install 20 new stations to be managed by the Institute of GeoSciences, Energy, Water and Environment (IGEWE). The classical meteorological observations and the newly installed stations operate in conformity with World Meteorological Organisation (WMO) criteria and regulation.

The same criteria are applied to the automatic meteorological stations, too. All the data are collected and are part of the archive that is the only one official resource of meteorological data in Albania hosted by the IGEWE. But all the old data are in hard copy paper format, except for those digitised during the recent years as part of the WB project, which include the period 2001-2011.

Figure B1.7. A historic image of the first meteorological data observed in Dures Meteorological Station



Figure B1.8. Classical meteorological station in Kryevindh

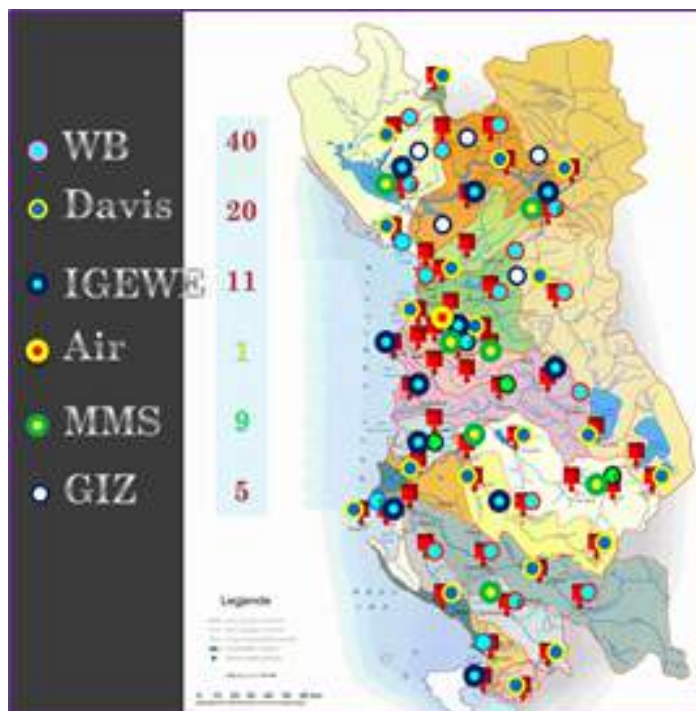


Figure B1.9. Automatic meteorological stations part of the National Meteorological Network of Albania, which is actually operating or in the process of implementation within the framework of different projects

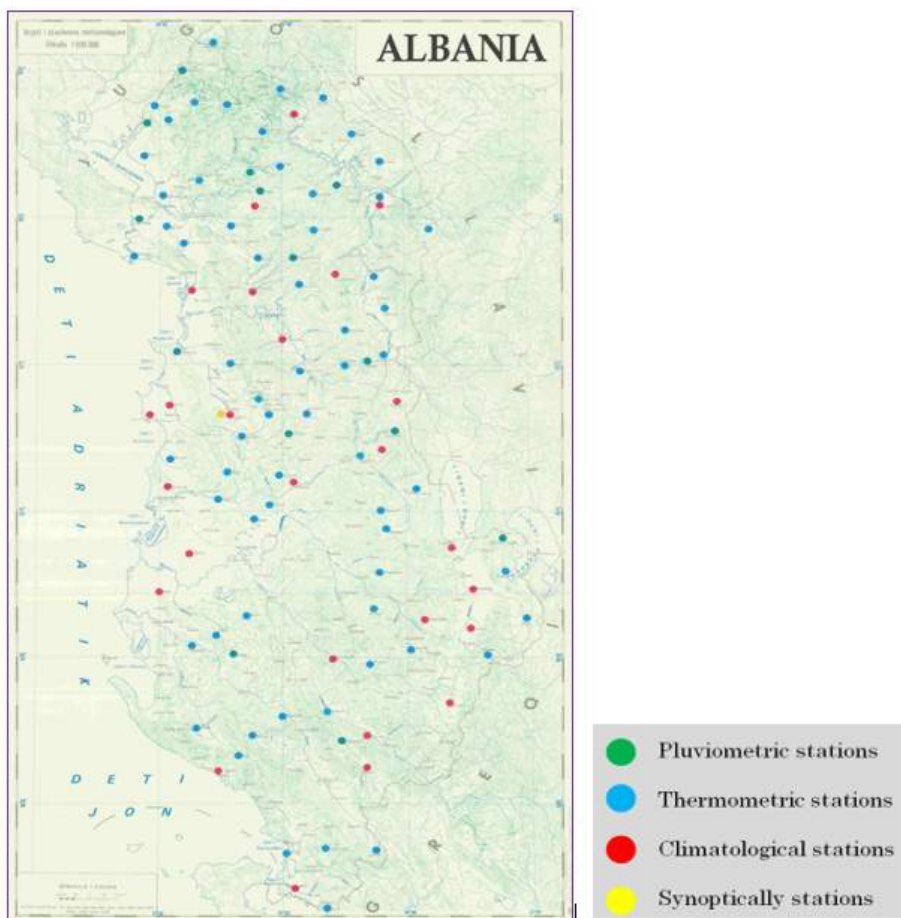


Figure B1.10. National Meteorological Network of Albania actually operating

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The recent information is available via Google map, which includes all types of meteorological stations, both those archived that aren't operating presently but offer a very important historical database and those stations actually operating in a classical way equipped with instruments like thermograph, hygrograph, thermometers, pluviometers, etc., in addition to the automatic stations that provide data online at the following link: <http://www.geo.edu.al>

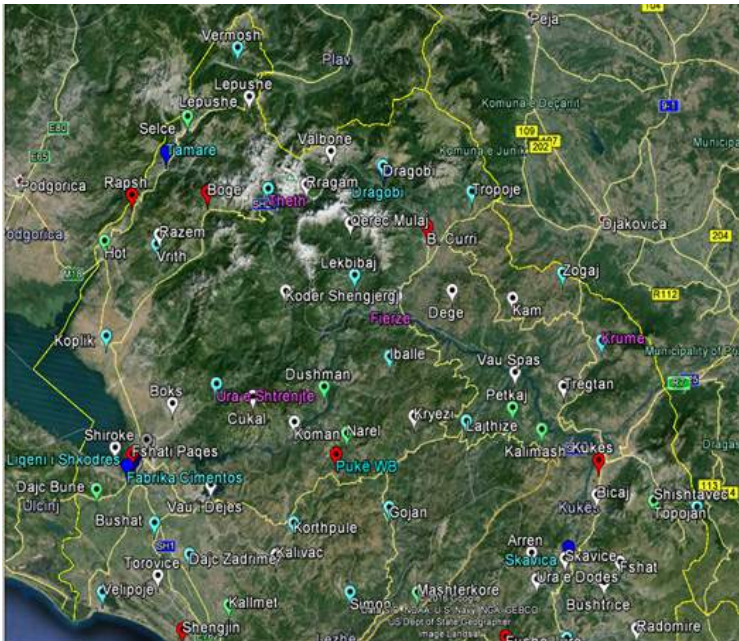


Figure B1.11. The map of all meteorological stations operating in the northern part of Albania



Figure B1.12. Map showing the automatic meteorological stations operating in northern Albania in 2016

Figure B1.12 is very useful for a first delineation of the ANCs in Albania in terms of climate indicators. It depicts the coldest areas in the country located mostly in the Northern Alps and in the northeast bordering Kosovo\* with other scattered areas in the southeast. On the other hand, the driest areas are found in the southeast, typically in the Korca region.

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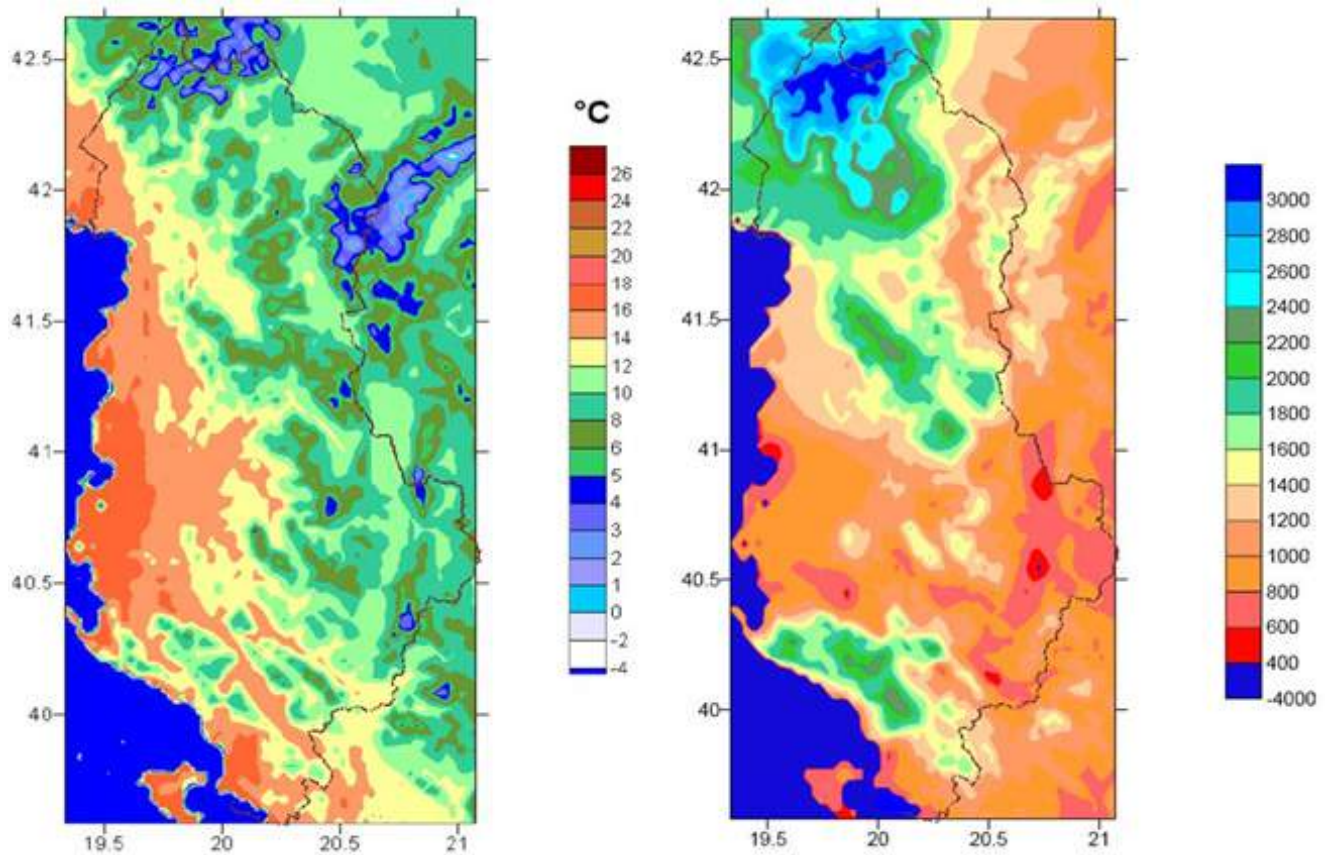


Figure B1.13. Maps showing the national distribution of Average Air Temperature and Average Annual Rainfall (Bruci, 2008)

Nr	Station Name	H <sub>s</sub> (m)	Φ	λ
1	Shupenzë*	480	41°32'	20°25'
2	Fushë Lurë*	1040	41 49	20 13
3	Kukës A (S) *	354	42 02	20 25
4	B .Cumì *	360	42 21	20 24
5	Bogë*	1000	42 24	19 39
6	Rapsh*	600	42 23	19 29
7	Shkodër Q (S)	30	42 04	19 31
8	Shën Koll	6	41 43	19 38
9	Burrel*	309	41 36	20 00
10	Tirana A (S)	89	41 20	19 47
11	Prenjas*	590	41 04	20 32
12	Brataj*	270	40 16	19 40
13	Çorovodë*	410	40 30	20 13
14	Leskovik*	920	40 09	20 36
15	Gjirokastër (S)	193	40 05	20 09
16	Tepelenë*	220	40 18	20 01
1	Shëngjin (m)	10	41 49	19 35
2	Durrës (m)	10	41 18	19 27
3	Vlorë (S) (m)	10	40 28	19 29
4	Sarandë (m)	10	39 52	20 00
1	Pukë* (ag)	810	42 02	19 54
2	Korça (S) *(ag)	899	40 36	20 44
3	Lushnjë (ag)	20	40 57	19 42
4	Elbasan (ag)	100	41 05	20 03

Figure B1.5. Automatic meteorological stations

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

## B1.4. STATUS OF GEOGRAPHICAL INFORMATION SYSTEM (GIS) DATA

### Administrative divisions of Albania

Albania is divided into 12 administrative counties (regions), each containing several districts that are further divided into 36 units. Overall, there are 2,980 cadastral zones (villages) in the country, formerly known as localities. The government introduced a new administrative division that was implemented in 2015 whereby 61 municipalities were established in total.

The municipality is the first level of local government and it consists of several administrative units, while the region is the second level of local government including several municipalities (Figure 12).

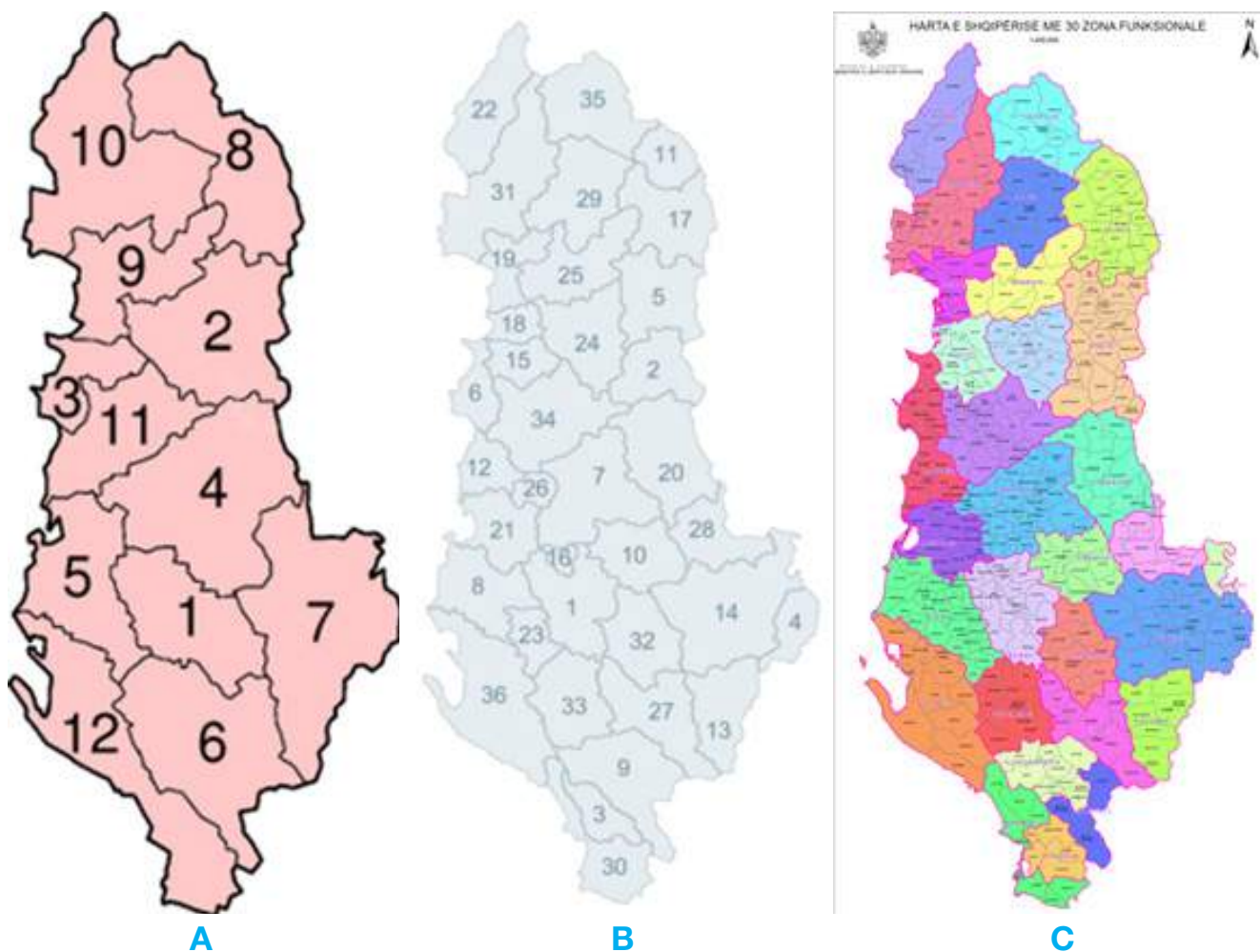


Figure B1.14. Administrative divisions in Albania a) regions, b) municipalities, c) districts

Digital maps for Albania's administrative division are available and contain several layers but this existing information is not easy to access for bureaucratic reasons. The country (AL) is also included in the Nomenclature of Territorial Units for Statistics (NUTS) and the three NUTS levels are defined below:

- NUTS-1: Albania
- NUTS-2: 3 non-administrative regions
- NUTS-3: 12 regions

### GIS data for soil information

Soil data in GIS format were produced from different projects starting with the digitisation of the first soil map of Albania that was done by Zdruli in 1993. As previously mentioned, in the context of the INTERREG II programme a new national soil database at a 1:250,000 scale was created in 2001 by Zdruli for the whole country as well as another one for coastal areas at a scale of 1:50,000. But again, the most important digital soil information is the one collected in the context of the project “Sustainable Management of Agricultural Land” of the Ministry of Agriculture, Rural Development and Water Management that produced very detailed soil data at a scale of 1:10,000 for at least 240,000 ha of agricultural land. This information is available at the QTTB and will be used by the ANC project.

### Land use/cover data

Shape files for land use/cover data were obtained from the database of the European Environment Agency (EEA) for CORINE 2006 and the new database for 2012 (CORINE) will be downloaded soon.



Figure B1.15. CORINE 2006 map for Albania (left) and a physical topographic map (right)

### Digital terrain model

The National Agency for Urbanisation, Legalisation and Integration of Informal Areas and Buildings disposes a digital terrain model at 5m resolution (even though for the ANC project the required resolution will be 20m) that will be requested to be used by the ANC project. The same information is available also at the State Authority for Geospatial Information (ASIG).

The ASIG possesses valuable georeferenced information as below:

- Topographic map 1:10,000 for the western Albanian coastline
- Topographic maps at a scale of 1:25,000
- Orthophoto of Urban Areas at 8 cm/pixel resolution.
- Orthophoto for the entire territory of Albania with 20/35 cm resolution.

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

## B1.5. DATA GAPS, PROBLEMS, AND SOLUTIONS

For soil data the main problem remains with areas surveyed at scales (1:50,000 for the coastal areas and 1:250,000 nationwide). Using the data at these scales could increase the risk of a large number of **soil** units possibly with ANC problems not being represented. It is also for this reason that it is suggested that, considering the conditions of Albania, the best mapping scale for delineating the ANCs must be 1:10,000. Assuming that the ongoing soil survey as a part of Agricultural land Inventory of Albania will continue at the present rate, the remaining unsurveyed agricultural land area of 277,046 ha will be completed in three years. Therefore, some EU funding support will be needed in addition to what is already provided by the Ministry of Agriculture, Rural Development and Water Management through the Sustainable Management of Agricultural Land project.

For the **Climate** data the main problems and gaps lie in converting the paper information into digital format and this could be done by involving students in search of their MS or PhD thesis, given the total lack of staff at IGEWE to do this.

For the **GIS** data the following issues need to be addressed. The new administrative territorial reform has created many changes in the boundaries of municipalities and villages and this is an ongoing process that has been completed up to 80%. Nevertheless, this will not impede the implementation of the ANC project that follows the natural pattern of soil, climate and terrain distribution, therefore the definition of the ANC for each municipality or any other administrative unit will be done once the border issues are resolved. Access to digital data is not always under the auspices of the Ministry of Agriculture but to other governmental agencies that often are reluctant to release digital data in shape format. Hence, administrative support will be needed by the high officials of the Ministry of Agriculture to facilitate this process.

## B1.6. PROVISION OF RECOMMENDATIONS FOR IMPROVED DATA MANAGEMENT IN THE CONTEXT OF THE AREAS WITH NATURAL CONSTRAINTS

In the context of ANC project, the ANC Albania team would like to emphasise the following facts, suggestions and recommendations:

As it was decided at the first kick-off meeting of the project in Skopje in March 2016, the starting point for the ANC project is to establish a time frame period for climate data that can be the same for all the countries and the characteristics are credible and based on the facts and historic developments of the Balkan region.

From a different point of view, the situation coincides also with the climatological norm - the base reference period is 1961-1990, which, fortunately, is a period characterised with less problems and gaps compared to the situation of all the countries after the 90s. This is really a good starting point for updates taking into account the impacts of climate change and/or evaluation of the future of the ANC areas.

In that context, all data referring to the period 1961-1990 are available for Albania, offering data about monthly precipitation, mean air temperature, and respective values for the maximum and minimum temperature. As shown in the maps below (Figure 15), the areas with a growing period of less than 180 days, as required by the ANC project, will be established based on the climatological period 1961-1991.

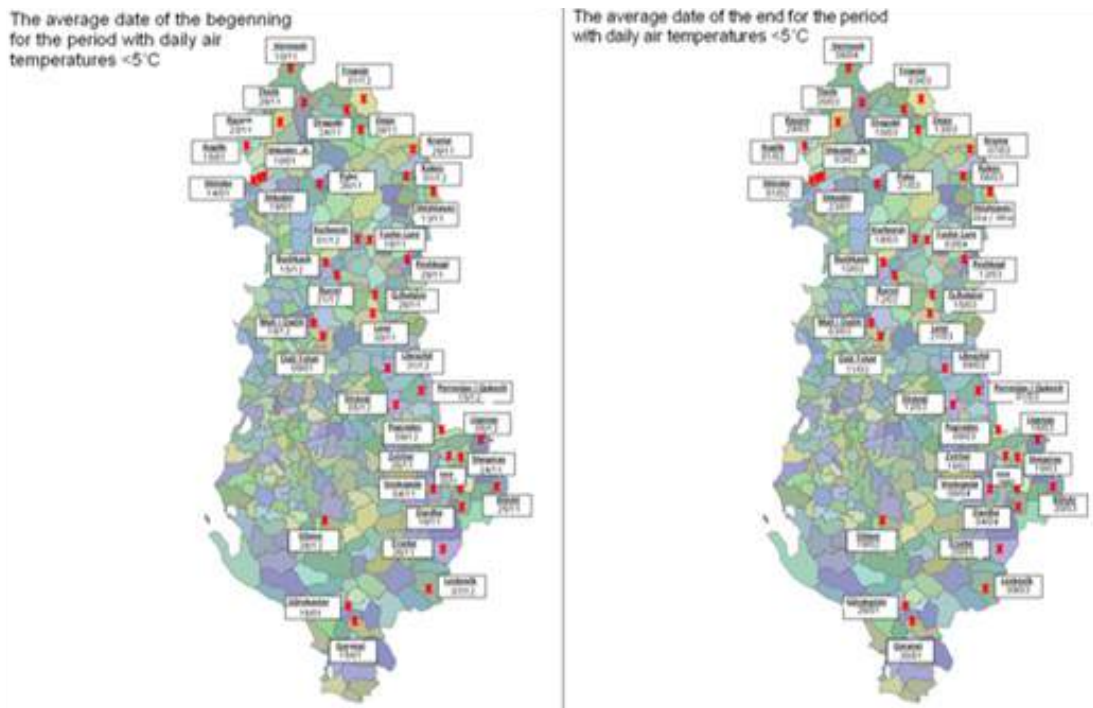


Figure B1.16 Distribution of meteorological stations providing data for air temperature below 5°C

Regarding the data on the aridity index for the period 1961-1990, only some partial observations are done but they are not published or officially documented. Only in recent years, after the installation of the new automatic stations, could data on evaporation and other parameters about aridity be provided.

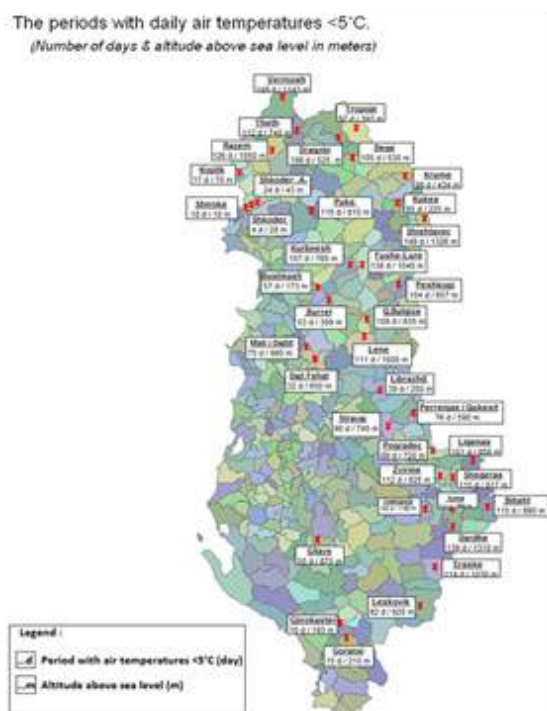


Figure B1.6. Data about the beginning, the end and the duration of the periods with  $T < 5^{\circ}\text{C}$ .

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

Table 1B.3 Data about the beginning, the end and the duration of the periods with  $T < 5^{\circ}\text{C}$ 

Nr	Stations	Date of beginning	Date of end	Period duration with $T < 5^{\circ}\text{C}$	Level above sea (in m)
1	Bilisht	25.XI	20.III	115	890
2	Burrel	21.XII	12.II	53	309
3	Bushkash	15.XII	10.II	57	173
4	DajtFshat	09.I	11.II	32	650
5	Dardhë	16.XI	04.IV	139	1310
6	Degë	28.XI	13.III	105	530
7	Dragobi	24.XI	10.III	106	525
8	Ersekë	26.XI	20.III	114	1030
9	FushëLurë	16.XI	03.IV	138	1040
10	Gjirokastër	16.I	26.I	10	193
11	Gllavë	26.XII	19.II	55	875
12	Goranxi	15.I	30.I	15	210
13	Koplik	15.I	01.II	17	70
14	Korçë	23.XI	14.III	111	899
15	Krumë	29.XI	07.III	98	434
16	Kukës	01.XII	06.III	95	225
17	Kurbnesh	01.XII	18.III	107	760
18	Lenë	30.XI	21.III	111	1000
19	Leskovik	07.XII	09.III	92	920
20	Librazhd	31.XII	08.II	39	250
21	Liqenas	05.XII	16.III	101	858
22	Mali iDajtit	18.XII	03.III	75	980
23	Prrenjasi Q.	15.XII	01.III	76	590
24	Peshkopi	28.XI	12.III	104	657
25	Pogradec	09.XII	08.III	89	720
26	Pukë	26.XI	21.III	115	810
27	Q.Bulqizë	26.XI	15.III	109	635
28	Razem	23.XI	29.III	126	1050
29	Sheqeras	24.XI	19.III	115	817
30	Shirokë	14.I	01.II	18	10
31	Shishtavec	13.XI	10.IV	148	1326
32	Shkodër	19.I	23.I	4	28
33	Shkodër A	10.I	03.II	24	43
34	Stravaj	05.XII	12.III	90	745
35	Theth	28.XI	20.III	112	740
36	Tropojë	01.XII	03.III	92	393
37	Vermosh	10.XI	08.IV	149	1143
38	Voskopoje	04.XI	06.IV	153	1180
39	Zvirine	26.XI	18.III	112	825

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## **B1.7. ANALYSES OF THE NATIONAL CAPACITIES FOR DATA MANAGEMENT AND PROVISION OF RECOMMENDATIONS FOR IMPROVED INSTITUTIONAL SETUP WITH REGARD TO THE ANC**

The Ministry of Agriculture, Rural Development and Water Administration (MARDWA) has the mission of conceiving and implementing the overall national policy on issues of agriculture, rural development, water management and legislative reform in this sector. One of the key elements of the constitutional and legal obligations of the MARDWA is the collection and processing of agricultural information, the sustainable management of agricultural land as well as the efficient use and management of the drainage and irrigation system. The overall sustainable utilisation of natural resources are a high priority for the development of agriculture and rural areas in Albania.

The national focal point for field soil survey, data collection, validation and GIS processing of soil information is the Centre of Agriculture Technology Transfer (ATTC) based in Fushe Kruje, near Tirana. The physical land evaluation system of the agricultural land applied in Albania (Kaleshi et al., 1992) is based on a set of soil fertility and pedological data, taking account of the terrain features, such as slope, as well. The system is a surrogate of the main international land evaluation systems but adjusted to Albania's conditions. All agricultural land in the country is classified into 10 categories, where category I represents the best land for crop cultivation, while category X represents the worst land (MARDWA, 2016).

In 2003 the ATTC of Fushë Krujë initiated a land suitability assessment project based on the FAO approach that divides the agricultural land in four suitable classes (S1-S4) and one inadequate class (N). The implementation of this classification is still in progress in the districts of Elbasan, Korça, Sarandë, Durrës, Tirana, etc. Other institutions relevant to the ANC project are the National Agency for Urbanisation, Legalisation and Integration of Informal Areas and Buildings, which disposes a digital terrain model at 5m resolution, the State Authority for the Geospatial Information (ASIG), which has access to the data regarding the main infrastructure, and the National Agency of Natural Resources, which contains data and digital information on biomass. The National Institute of Statistics (INSTAT) contains the administrative division data based on the new territorial reform that is still not consolidated. Furthermore, the INSTAT, based on the Census of Population and Dwellings, possesses an updated map showing the areas, the density of urban presence through a grid system (INSTAT, 2014).

Albania has the technical and professional capacity to complete the ANC project successfully. There is a wealth of data in the country, but often their release is complicated since they are stored in various institutions. Given the strategic importance of the project, good coordination between them is necessary and the role of the Ministry of Agriculture is fundamental.

## **B1.8. NATIONAL POLICY ASSESSMENTS AND POLICY RECOMMENDATIONS RELEVANT TO THE CHARACTERISATION AND MAPPING OF AREAS WITH NATURAL CONSTRAINTS INCLUDING SOCIOECONOMIC ANALYSES**

The policies for targeting the areas with natural constraints in Albania have been frequently based on different types of interventions. In the past, there was not a clear policy for defining and targeting them. The MARDWA issued its Inter-sectoral Strategy for Agriculture and Rural Development (ISARD) for the period 2014-2020, which is intended to promote sustainable and inclusive growth. ISARD provides support for interventions in three policy areas: (i) rural development policy; (ii) national support schemes for farmers, development of rural infrastructure and ensuring equal opportunities; and (iii) institutional development, implementation and enforcement of the EU regulatory requirements. One of the objectives of ISARD 2014-2020 have been "to support and to develop the appropriate framework

<sup>1</sup> [http://www.instat.gov.al/media/252716/a\\_new\\_urban-rural\\_classification\\_of\\_albanian\\_population.pdf](http://www.instat.gov.al/media/252716/a_new_urban-rural_classification_of_albanian_population.pdf)

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conditions for an efficient, innovative and viable agro-food sector capable to sustain the competitive pressure and meeting the requirements of the EU market through a sustainable utilisation of resources and viable rural areas providing economic activities and employment opportunities, social inclusion and quality of life to rural residents” and more specifically “to increase the viability of the rural economy in disadvantaged mountainous areas”.

There are no separate institutions for addressing the problems in areas with natural constraints. The MADA (Mountain Area Development Agency) is near to its closure and there is no clear approach for finding a substitute for the future of achieving balanced regional development with a focus on vulnerable groups and disadvantaged areas. However, through a GIZ-DANIDA cooperation effort, a 7 million Euro grant scheme and capacity building programme is available for the development of value chains in six rural mountain regions: Shkodër, Kukës, Dibër, Korçë, Berat and Elbasan. It addresses the four most important value chains in these regions, namely small livestock, fruit trees and nuts, medicinal and aromatic plants, and rural tourism (GIZ, 2015).

In addition, the agriculture and rural development programs target the marginalised areas. IPARD II Programme (Instrument of Pre-Accession Assistance for Rural Development) and the National Support Programme are the main mechanisms. The present IPARD II Programme covers the period 2014-2016. Under present provisions, Albania has access to the funds provided under Axis 1 “Raise competitiveness of agriculture agribusiness and forestry” and only for three measures, namely: Measure 101: Investments in agricultural holdings to restructure and to upgrade to Community standards; Measure 103: Investments in the processing and marketing of agricultural and fishery products to restructure those activities and to upgrade them to Community standards and Measure 503: Technical assistance (to the institutional bodies managing the facility), (MARDWA, 2014). In the context of IPARD, a list based on population density is determined in order to define the disadvantaged areas. This list was established for IPARD first document in 2012 and was made public in the first IPARD guideline (MARDWA, 2012).

The national schemes for support of agriculture and rural development were introduced in 2007 with the adoption of the Law on Agriculture and Rural Development. The national measures are programmed annually in the National Action Plan and enforced by a Decree of the Council of Ministers. The measures were established to target also areas with natural constraints through measures for plantation of fruits and nuts, orchards, olives as well as opening of wells and other water irrigation systems.

Another policy framework for targeting these areas has been the Albanian Regional Fund, which aims to allocate investments funds for municipalities to provide basic services and infrastructure to their population. The funds are distributed based on a competitive Grant Scheme. A criterion of selection for marginal areas was the location of the project and the extent to which the project helped regional development (Ministry of Finance, 2016). Another support fund is the Unconditional Fund (Ministry of Finance, 2015) allocated yearly to municipalities. Municipalities with low density, which are assumed to be in mountainous or less favourable areas, are treated differently in the government budget.

Given the fact that Albania is estimated to have some 15,000 ha of saline and sodic soils, 60,000 ha acid soils, about 10,000 magnesian ones, and extensive areas of agricultural land located in slopes higher than 15%, in addition to short growing areas due to severe climatic conditions and, possibly, dry areas meeting the requirements of aridity index, the ANC project is of particular importance for the country. If correctly implemented, the project could reduce the process of abandonment of the mountain regions and provide incentives for their inhabitants. The ANC project will offer the Ministry of Agriculture the necessary instruments to develop and implement support payment schemes for ANC farmers and in the meantime will be used as a monitoring system for the medium and long-term rural development policies and their monitoring.

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence



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# CHAPTER B2

## STATUS OF SOIL, CLIMATE AND DIGITAL MAPPING INFORMATION IN BOSNIA AND HERZEGOVINA

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### REPORT OF THE BOSNIA AND HERZEGOVINA FEDERATION

#### B2.1. INTRODUCTION

The Constitution of Bosnia and Herzegovina (B&H), which was an integral part of the Dayton Agreement in 1995, created a state comprised of two entities: the Federation of Bosnia and Herzegovina (FB&H) and the Republic of Srpska (RS). Under this legal constitution, Bosnia and Herzegovina is a sovereign state with a decentralized political and administrative structure. Consensus building and decision making involves the State Government, the two Entities (the Federation of Bosnia and Herzegovina and the Republic of Srpska) and Brcko District. The Federation of B&H is in turn sub-divided into 10 Cantons. Both entities have a number of municipalities, which are smaller territorial units. Bosnia and Herzegovina has a total surface area of 51,209.2 km<sup>2</sup>, composed of 51,197 km<sup>2</sup> of interior land area and 12.2 km<sup>2</sup> of coastal zone (Source: Agency for Statistics of BiH, [www.bhas.ba](http://www.bhas.ba)).



Figure B2.1. Administrative units in Bosnia and Herzegovina

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\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

Located in the Balkan Peninsula, Bosnia and Herzegovina's territory belongs to both Adriatic and the Black Sea basins or otherwise described as belonging largely to the Danubian and to a lesser extent to the Mediterranean type of climate. Bosnia and Herzegovina has common frontiers with the Republic of Croatia (931 km), the Republic of Serbia (375 km) and the Republic of Montenegro (249 km). To the north, B&H has access to the Sava River, and to the south to the Adriatic Sea (23.5 km of sea borderline).

The land is mainly hilly to mountainous, with an average altitude of 500 meters (from the sea level up to 2,387 m at the highest peak in Maglic Mountain). Of the total land area, 5% is lowlands, 24% hills, 42% mountains, and 29% is in the karst region. Forest lands cover about 2.5 million ha, or 49% of the total land area, which is one of the highest forest coverage areas for a single country in Europe. Nevertheless, the CORINE 2012 land cover data put the forest area at 62.90%. As a general rule, the ANC project will use CORINE data. Bosnia and Herzegovina ranks among the territories with the highest level of biological diversity in Europe. Therefore, forestry in BH is a very important industrial sector, and the sustainable management of forest resources is a significant factor in environmental, climate and biodiversity protection. Nevertheless, forest areas are not subject of study for the ANC project.

There are seven river basins (Una, Vrbas, Bosna, Drina, Sava, Neretva with Trebišnjica and Cetina), of which 75.5% belong to the Black Sea catchment region and 24.3% to the Adriatic Sea catchment. These surface and ground water resources are particularly valuable natural resources. There are also numerous river lakes (on the Pliva and Una rivers) and mountain lakes (in the Dinarides range), as well as thermal and geothermal groundwater resources. Bosnia and Herzegovina is rich in thermal, mineral and thermal-mineral waters.

### The geological characteristics

The geological structure of the territory of B&H has a long geological history. The territory of B&H falls inside the space of the former Tethys geosynclines. The Tethys geosynclines lay between the African plate to the south and Euro-Siberian plate to the north. Throughout the territory of B&H there is a deposition of rocks and sediments ranging from the archaic era until the end of the Tertiary. Some of the oldest sediments established originate from the early Palaeozoic era i.e. the Silurian era. Deposits of the Silurian age are represented in the 'Bosnian Schist Mountains', the group of mountains Vranica - Zec Mountain - Bitovnja. These layers are represented by schist sediments, marbles, dolomites, limestone and clastic rocks, which were impregnated with various igneous rocks. These deposits are also very tectonically fractured and collected. The deposition of Silurian sediments, which further on serve as a basis to all other geological strata and the relief of B&H, has consolidated more than 400 million years ago.

Sedimentation, tectonic and magmatic changing of the Mesozoic deposits lasted in a range of 220 million to 70 million years prior to today's geology. Mesozoic sediments are widespread in the interior, central and outer layers of the Dinarides. Mesozoic sediments in the outer Dinarides are classic carbonate sediments, while the central and inner Dinarides have volcano-sedimentary and flysch sediments. The Triassic sediments spread over the Vrnograc and Bosanski Novi band over western Bosnia, north and northeast Herzegovina and southeast Bosnia. The second broader band goes from Vareš over Olovo, Glasnica and Romanija to Višegrad.

The youngest era in the evolution of Earth's crust is the Cenozoic. It is divided into two major periods: the Tertiary and Quaternary, while the Quaternary is divided into Palaeogene and the Neocene. Deposits are developed on the peripheral north-eastern and northern parts, and on the southern and south-western parts of the country. Igneous rocks are represented in these sedimentations, especially as coal deposits. In addition, beside Neocene limestone and classic deposits, freshwater sediments

are present, of which the largest one is the Sarajevo - Zenica coal basin. The youngest Pliocene and Quaternary deposits are widespread, in almost all basins and valleys. Of particular interest are the Holocene deposits represented by pebbles, sand, loam and clay, and limestone and cave deposits.

### Climate Characteristics

Bosnia and Herzegovina have several conditions that have led to a wide spectrum of climate types: general atmosphere circulation and air mass streaming mount position, its dynamic relief, directions in which its mountain missives stretch, their hydrographical network and the proximity to the Adriatic Sea. The temperate continental climate type is represented mostly in the northern and central parts of B&H, the sub-mountainous and mountainous area (over 1,000 m a.s.l) and the Adriatic (Mediterranean) and modified Adriatic climate type is represented in coastal area of Neum that applies to the Herzegovinian lowlands.

The general climate characteristics of B&H are greatly influenced by the characteristics of the Adriatic Sea, local topography - especially the Dinarides Mountains, which are located along the coast and run from NW to SE parallel to the coast - and atmospheric circulation on a macro scale. Due to these reasons, the climate varies from a temperate continental climate in the northern Pannonia lowlands along the Sava River and in the foothill zone, to an alpine climate in the mountain regions, and a Mediterranean climate in the coastal and lowland areas of the Herzegovina region in the south and southeast.

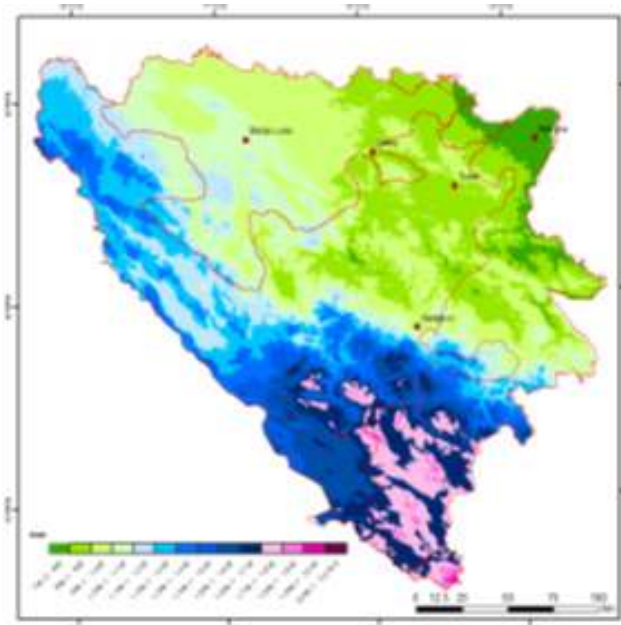


Figure B2.2. Average annual sum of precipitation (mm) for the period 1961-1990

In the lowlands of the northern part of the country, air temperature generally ranges between  $-1$  and  $-2^{\circ}\text{C}$  in January and between  $18$  and  $20^{\circ}\text{C}$  in July. In highlands with the altitude above  $1,000$  m a.s.l, the average temperature ranges from  $-4$  to  $-7^{\circ}\text{C}$  in January to  $9$  to  $14^{\circ}\text{C}$  in July. On the Adriatic coast and in the lowland regions of Herzegovina, air temperature ranges from  $3$  to  $9^{\circ}\text{C}$  in January to  $22$  to  $25^{\circ}\text{C}$  in July. Extremes of  $-41.8^{\circ}\text{C}$  (low) and  $42.2^{\circ}\text{C}$  (high) have also been recorded. The lowland area of northern Bosnia and Herzegovina has a mean annual temperature of between  $10^{\circ}\text{C}$  and  $12^{\circ}\text{C}$ , and in areas above  $400$  m the temperature is below  $10^{\circ}\text{C}$ . Mean annual air temperature in the coastal area ranges between  $12^{\circ}\text{C}$  and  $17^{\circ}\text{C}$ .

Annual precipitation amounts range from  $800$  mm in the north along the Sava River to  $2,000$  mm in the central and southeastern mountainous regions of the country (climate data period 1961 -1990).

In the continental part of B&H belonging to the Danube River catchment area, a major part of annual precipitation occurs in the warmer half of the year, reaching its maximum in June. The central and southern parts of the country with numerous mountains and narrow coastal regions are characterised by a maritime pluviometric regime under the influence of the Mediterranean Sea, so the monthly maximum amounts of precipitation are recorded in late autumn and at the beginning of winter, mostly in November and December.

The duration of sunshine decreases from the coastal area towards the mainland and at higher altitudes. The annual duration of sunshine in the central mountainous area is  $1,700$ - $1,900$  hours, with the lowest insolation ( $1,700$  hours per year) and the cloudiest ( $60$ - $70\%$ ) conditions. Due to frequent fogs during the coldest part of the year, the solar irradiation in the mainland is lower than at the same altitudes in

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the coastal area. In southern regions, there are 1,900-2,300 hours of sunshine (Mostar). In northern Bosnia and Herzegovina, there are 1,800-2,000 hours of sunshine, more in the eastern part than in the western part. Cloudiness declines from the west to the east.

The average annual precipitation in B&H is about 1,250 mm, which, given that the surface area of the country is 51,209 km<sup>2</sup>, amounts to 2,030 m<sup>3</sup>/s. The outflow from the territory of B&H is 1,155 m<sup>3</sup>/s, or 57% of total precipitation. However, these volumes of water are not evenly distributed, either spatially or temporally. For example, the average annual outflow from the Sava River basin, which has a surface area of 38,719 km<sup>2</sup> (75.7%) in B&H, amounts to 722 m<sup>3</sup>/s, or 62.5%, while the outflow from the Adriatic Sea basin, which has a surface area of 12,410 km<sup>2</sup> (24.3%) in B&H, is 433 m<sup>3</sup>/s, or 37.5%. (Source: Initial National Communication of Bosnia and Herzegovina under the United Nations Framework Convention on Climate Change).

### Land Use

The total area of B&H is 5.11 million ha, of which around 50% is agricultural land and around 48% is forest. Total arable land in Bosnia and Herzegovina amounts to about 62%. The ploughland area (or annual crops) amounts to 19.9% of the total land of the country. There are about 0.59 hectares of agricultural land per capita, of which 0.36 ha are fields and gardens.

A land capability (USBR methodology) study conducted in the time of former Yugoslavia established the land quality classes in Bosnia and Herzegovina. The best lands (classes I to III) cover 14.0%, of the territory of B&H, class IV covers 17.9%, class V 16.7%, class VI 31.75% and classes VII and VIII 19.4% (data according to SZS).

Forty-five percent of the agricultural land is hilly (300-700 m a.s.l.), of medium quality and well suited to semi-intensive livestock production. Mountain areas (> 700 m a.s.l.) account for a further 35% of agricultural land but high altitude, steep slopes and lower fertility soils limit the use of this land mostly to livestock grazing during spring and summer. These areas will be the major focus of the ANC project. Less than 20% of agricultural land (half of all arable land) is suited to intensive agriculture, most of it in the lowland river valleys. The land base for agriculture is, thus, very limited in both quantity and quality. Natural water resources are more abundant, with many unpolluted rivers and readily accessible groundwater. Despite this abundance of water only about 10,000 ha (0.1 percent of arable land) was irrigated before the war, an area which could be increased significantly. Finally, it should be noted that individual land holdings are small and fragmented.

Despite the fact that the B&H territory is mainly mountainous, until now little has been done to improve water and soil conditions in the upland areas. Excessive deforestation, inappropriate conversion of grass land to arable land and uncontrolled cultivation of sloping terrain are degrading the land even in the valleys and lowland regions where soils are of good quality. The large sums invested in the protection of flat areas (river course direction, embankments, outfall drains, pumping stations) remain ineffective if soil and water conservation measures, both of an agricultural engineering and technical nature, are not undertaken in the hilly-mountainous uplands. Such measures would contribute to revitalising the mountainous area and would provide better protection for the lowlands as the ANC project envisages.

### Soil Characteristics

The Basic Soil Map (BSM) Project started in 1964 at the scale of 1:50,000 and was implemented by the Agropedology Institute of Sarajevo, which prepared the first manual for field soil investigation. The BSM was developed on pedogenetic principles and lasted from 1966 to 1986. It was the largest pedological project in Bosnia and Herzegovina. The classification of soils was based on genetic-

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evolutionary principles, in which the soil type was the basic unit of the classification system. Mapping units included information on soil type, subtype, variety and even soil formation. Morphological and lithological characteristics were the main criteria for differentiation and 1,176 mapping units have been identified on the soil map of B&H at a scale of 1:50,000. The total number of printed sheets is 116.

There were two periods in the development of the soil map, which differ from each other in inventory criteria, classification and methods. In the first period from 1963 to 1973, the national classification was based on genetic principles. In the second period from 1973 to 1985, a new classification was adopted, which was influenced by international classifications, and this is readily apparent on soil maps made after 1973. In the second stage of mapping, modern methods were used, such as telemetric research using aerial photography at various scales. At first, black and white photography was used, followed by colour photography.

The *flat or lowlands* zone is found in the northern part of B&H and represents the most valuable land resources. There, the degree of development of primary food production is much higher than in the hilly-mountainous areas. The most common types of soil are: Stagnic Podzoluvisols, Fluvisols, Umbric Gleysols and Eutric Gleysols. The “gleytic” criteria will be used during the ANC delineation process.

The *hilly zone* is more heterogeneous than the lowland zone in terms of soil characteristics. A considerable part of this zone has slopes above 13% and the processes of erosion are very marked. Erosion is further exacerbated by inappropriate farming practices, lack of water and when preference is given to row crops (corn and potato) that are unsuitable for these sloping lands or when no soil conservation measures are implemented. The most common types of soil are: Chromic Luvisols, Eutric Cambisols, Leptosols – Rendzic Leptosols and Vertisols.

In the *mountain zone* the erosion processes are present also, although these lands are mostly covered by forests and grasslands. As for sown crops, rye, barley, oats and potato dominate. The most common types of soil are: Dystric Cambisols and Dystric Regosols, which are predominantly present, followed by Leptosols – Rendzic Leptosols and Regosols.

The *Mediterranean zone*, with its warmer climatic conditions, is suitable to grow a wide variety of crops and support intensive farming, as well as traditional arable crops and early vegetables sold in the local markets. Fruit-growing and vine-growing are also well developed here, due to which this region is also called the region of southern crops. The most common soil types are: Lithic Leptosols, Regosols, Leptosols – Rendzic Leptosols, Chromic Cambisols, Fluvisols in the river valleys, Umbric and Eutric Gleysols in the karst fields. In the swamps, Histosols are often present although in limited areas they are environmentally important, especially, for carbon sequestration.

In summary, the main characteristics of soils in Bosnia and Herzegovina are:

- Acid soils occupy more than 1/3 of the territory;
- Soils are generally shallow;
- Erosion is a problem particularly on sloping land.

## Nature and Biodiversity

Bosnia and Herzegovina has a very rich biodiversity characterised by great abundance of genes, species and ecosystems.

A state assessment carried out as part of the National Biodiversity Strategies and Action Plans (NBSAPs) project emphasised the following characteristics of landscapes and biological diversity:

- High level of genetic, species and ecosystem diversity

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- Well-preserved landscape diversity units important on a European and global scale
- Significant degree of change in terms of the distribution and composition of climax ecosystems
- Trend towards loss of biological and landscape diversity, caused by a wide spectrum of anthropogenic factors.

## B2.2. STATUS OF SOIL DATA

The main consistent source of soil data in Bosnia and Herzegovina (B&H) remains the Basic Soil Map at the scale of 1:50,000. The area of B&H was covered by 71 sheets (the whole B&H territory) and 45 other sheets that included surface areas of bordering states. The soil survey methodology was agreed in 1964 and completion of all sheets was done in 1984. The density of profiles was approximately 1/100 ha and the analytical laboratory data for profiles (physical and chemical properties) were included as annexes for each sheet.



During the implementation of the FAO project “Inventory of the Post-War Situation of Land Resources in B&H” all the soil map sheets were scanned and digitised. The same was done for the analytical data (physical and chemical properties) from all annexes of the sampled/studied pedological profiles. After digitisation, the old classification was converted into the official national soil classification system of B&H as well as into the FAO classification.

Figure B2.3. Sheet and annex of Basic Soil Map of B&H

All information is available in GIS format and will be used for the delineation of the ANCs in the country.

The diversity of pedological cover in FB&H is the result of the interaction between the natural soil forming factors comprising the relief, parent material, climate, vegetation and organisms including humans, all interacting over long time periods. Their joint action has led to the formation of some unique mainly autogenous - terrestrial soils, while hydrogenic soils are present to a significantly lower extent.

The ANC project has specific requirements for soil data that include drainage classification, soil depth, soil texture, surface stoniness, soil organic matter (SOM), salinity, sodicity and acidity. The available data at the Federal Institute of Agropedology in Sarajevo are adequate and valid to meet

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these requirements, despite the fact that they refer to more than three decades ago. It is for this reason that, if the ANC project would become operational in 2017, a budget line should be foreseen to update obsolete soil data, at least in those areas that potentially qualify as ANCs. Finally, it should be noted that soil salinity and sodicity are not present in FB&H.

### Drainage classification

Poorly drained or very poorly drained soils or soils saturated with water throughout the profile and much more at deeper layers are found at lower depressions in FB&H. Typical representatives of these soils are the so-called Humofluvisols and Eugley (according to the national soil classification system). They are well-defined in the Basic Soil Map of B&H at a scale of 1:50,000. Inside the Federation of Bosnia and Herzegovina this category covers about 2% of the territory and will be considered as potentially suitable to be classified as ANC.



Figure B2.4. Poorly and very poorly drained areas

### Soil depth

The best approach to meet the requirements of the ANC methodology for this ANC criterion (i.e. less than 30 cm) will be the selection of the Lithosol type from the same soil map mentioned above. Nevertheless, additional soil profile description data will be used, whenever possible to verify the soil depth. Lithosols in B&H cover an extensive area reaching as much as 50%.

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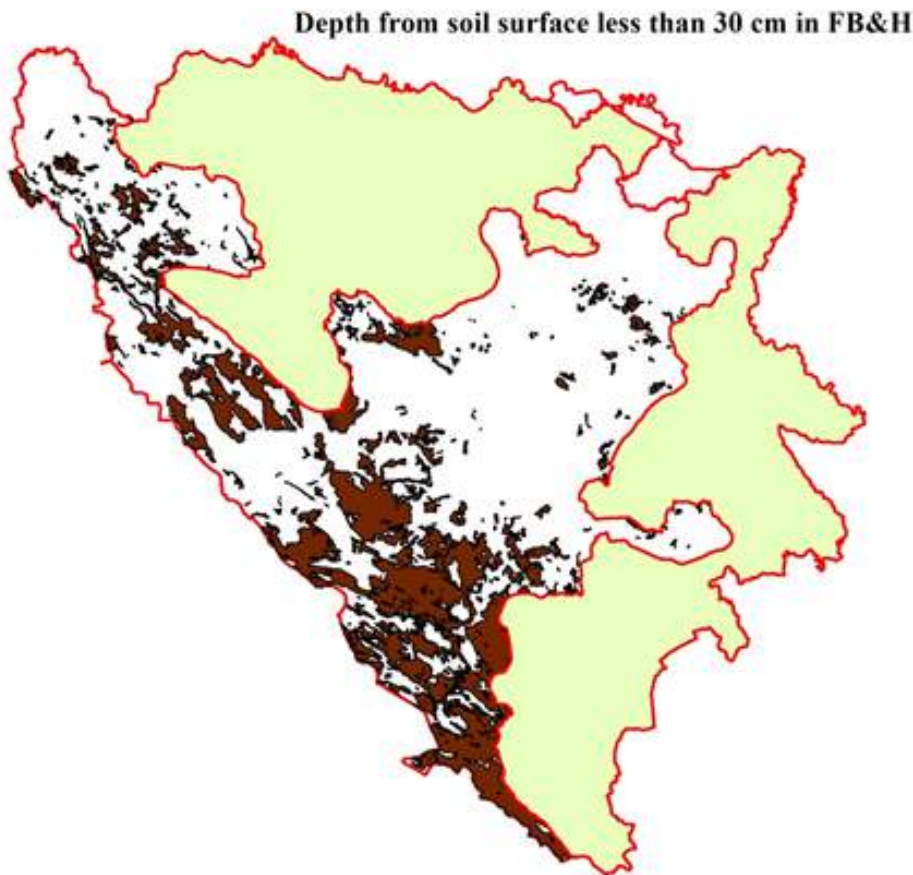


Figure B2.5. Soil depth

### Soil texture

The soil texture refers to the percentage share of certain mineral fractions of sand, silt and clay in the soil, on the basis of which it is possible to define the mechanical properties of soil and its granulometric composition.

The available data for soil texture are as follows:

- Skeleton particle size larger than 2.00 mm,
- Sand particle size from 0.05-2.00 mm,
- Silt particle size from 0.002-0.05 mm,
- Clay particle size less than 0.002 mm.

Based on the American USDA triangle texture class classification, soils are divided into 12 texture classes from sandy soils to clayey soils. Nevertheless, soil texture particle size distribution in B&H and throughout the former Yugoslavia, as shown by the data deriving from the Basic Soil Map of BiH M 1:50,000, used different criteria than those above. The mechanical composition of the soils was made following the Gračanin classification (based on Atteberg criteria for fine grained soils). The Gračanin classification of soil textural elements was as follows: large sand (2.0 to 0.6 mm), medium sand (0.6 to 0.2 mm), and fine sand (0.2 to 0.06 mm), large silt (0.06 to 0.02 mm), medium silt (from 0.02 to 0.006 mm) and fine silt (0.006 to 0.002 mm). All particles less than 0.00 and clay (0.002 mm) are classified as clay. Efforts will be made to convert this type of information into the USDA texture classification as required by the ANC methodology.

**Topsoil contains 30% or more clay and there are vertic properties within 100cm from the soil surface**

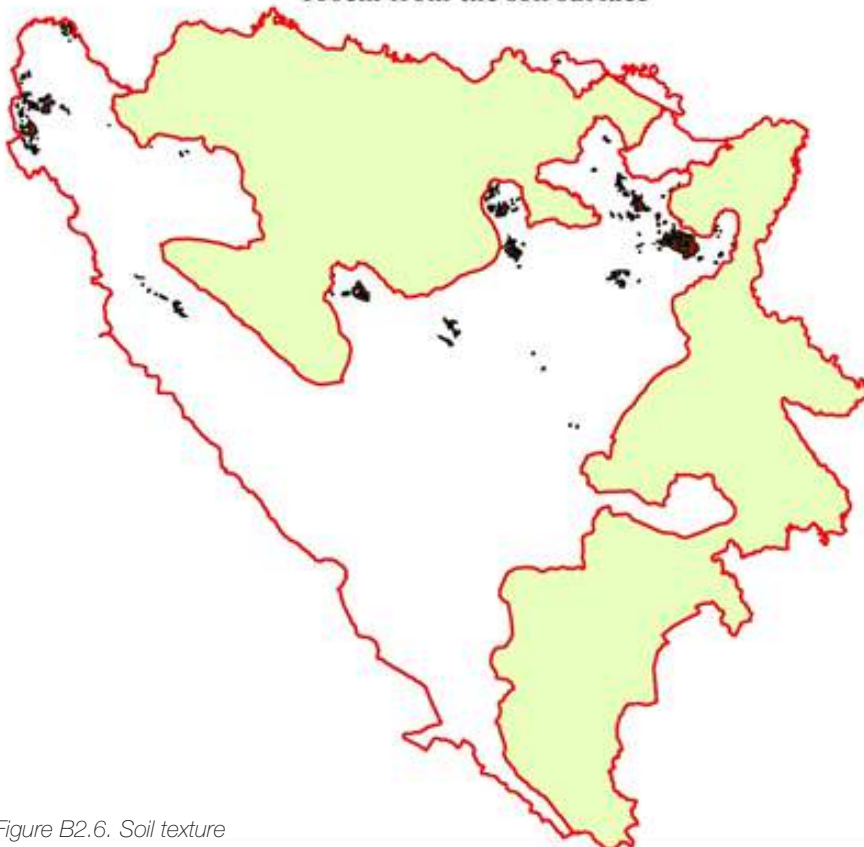


Figure B2.6. Soil texture

**≥15% of the topsoil is coarse material, including rock outcrop, boulders**

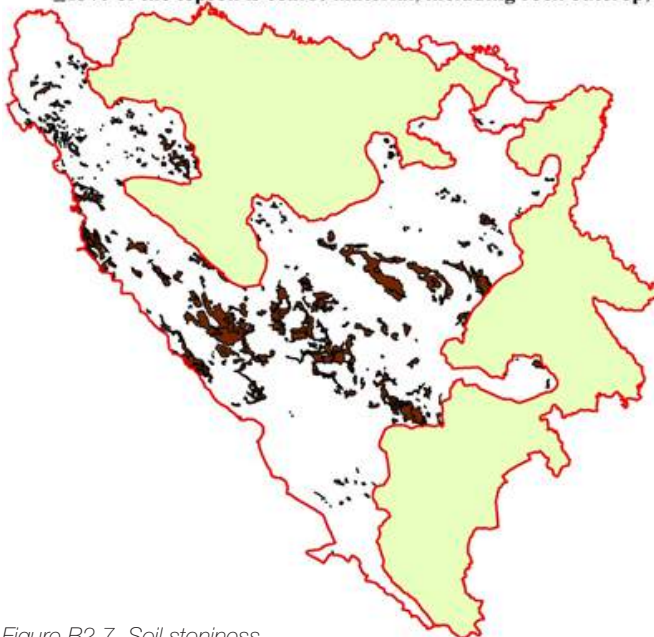


Figure B2.7. Soil stoniness

### Surface stoniness

Surface stoniness is expressed by the percentage of rock outcrops, rocks, stones, boulders, gravel and all particles having a diameter of more than 2 mm. Large areas like this qualifying for ANC are typically found in some mountainous areas above 800/1000 m a.s.l. and geological substrates such as karst (limestone). These properties are associated with certain geological formations, such as limestones and sandbanks, locally classified soil types, such as Calcomelanosol and Calcocambisol, and the like. Based on the Basic Soil Map of BiH M 1:50,000 scale, this category could cover about 10% of the FB&H. It should be noted, however, that the ANC methodology applies only to agricultural land and natural grazing pastures as defined by the CORINE.

Therefore, careful selection will be made before assigning this ANC class in order to avoid other land cover types, such as forests, for instance.

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Figure B2.8. Soil Organic Matter

### Soil Organic Matter

The concept of soil organic matter was almost unknown to many countries of Eastern Europe that were influenced by the Russian school of pedology, which used the term humus instead of SOM or humus horizon instead of mollic horizon. The difference, though, is limited although humus is often more associated with decomposed organic materials. Information about SOM (i.e. humus) was used extensively as an indicator of natural soil fertility as well as in providing fertilizer recommendations. However, the ANC methodology requires information only for the so-called organic soils classified as Histosols that have more than 30% SOM. Their presence in the FB&H is limited at only 0.5%.

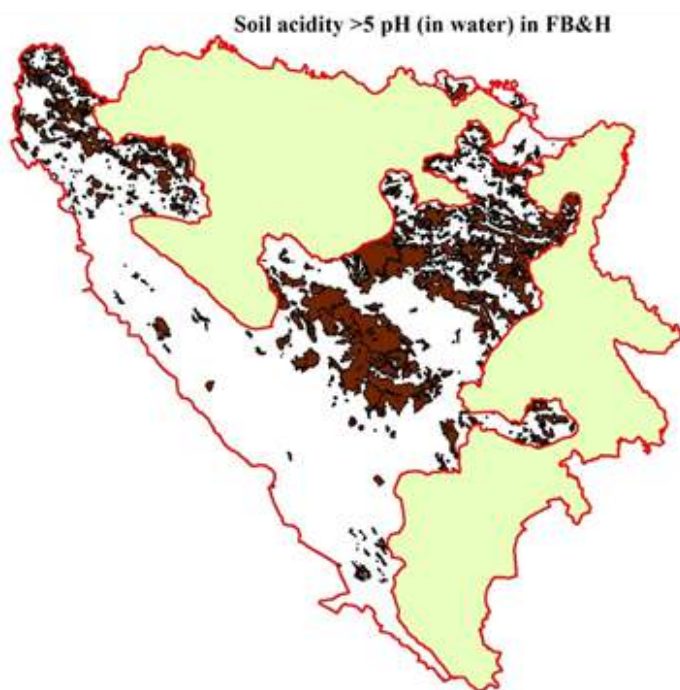


Figure B2.9. Acidity

### Acidity

Preliminary information about soil acidity with a pH in H<sub>2</sub>O of less than 5 can be obtained from the database of Basic Soil Map of BiH M 1: 50.000 as these soils are usually linked to the “dystric” qualifier. Acid soils in the Federation of Bosnia and Herzegovina cover about 23% of the territory. It should be noted that analytical data for all the sampled profiles are crucial and will be used throughout the ANC delineation process.

### Salinity and Sodicity

Such soils are not present in the FB&H and will not be considered in the ANC delineation process.

## B2.3. STATUS OF CLIMATE DATA

The first meteorological observations on the territory of Bosnia and Herzegovina began in the 80s of the 19th century. These were mainly stations used for military purposes, established by the former Austro-Hungarian Empire. Results of meteorological observations were collected and published, so there are a large number of written records about them, as shown in the Figure B2.10. below.

TABLICA 43. — Šrednje mjesečne i srednje godišnje količine

Postaja	Broj godišnj	Razdoblje	Nadmorska visina m	I	II	III	IV	V	VI	VII
Barje Luka	29	1881.—938.	163	64	57	71	103	115	119	8
Bihal	35	1892.—938.	227	73	88	90	123	127	123	9
Bijeljina	35	1890.—938.	94	54	41	54	70	93	92	7
Bjelacina	34	1895.—938.	2067	184	101	203	285	169	147	10
Bjelovar	31	1879.—913.	335	48	48	60	79	92	101	1
Crkvenica	48	1892.—940.	2	91	85	102	101	106	99	
Čakovac	43	1879.—940.	170	50	43	59	83	100	93	
Dronovi	34	1897.—938.	86	50	48	54	74	92	86	
Dubrovaik	27	1882.—913.	18	158	121	118	114	64	69	
Đakovo	41	1894.—936.	111	46	47	56	77	89	91	
Fuline	28	1887.—938.	764	214	209	286	252	212	215	
Gacko	25	1891.—938.	960	140	139	167	139	123	91	
Gospic	32	1904.—940.	565	145	139	154	156	118	112	
Hvar	62	1871.—940.	19	80	62	69	63	45	53	

Figure B2.10. Historical meteorological data recording in Bosnia and Herzegovina

Initial meteorological services in Bosnia and Herzegovina were led by Filip Balif in 1892. He is considered to be the first meteorologist in the country. A better organised approach followed in the late 19th and early 20th century, when the central institution in Sarajevo was formed, whose construction was completed in 1902. The network of those weather stations was quite well distributed, but it quickly began to deteriorate. Consequently, after 1913 very little usable data remain.

After World War II the Yugoslav Government, realizing the importance of meteorology and hydrology to society and the economy as a whole, reached a decision on the unification of these branches into a single Hydrometeorological Institute. In this way the hydrometeorological service was formed represented by the Federal Hydrometeorological Institute and the Hydrometeorological Institutes of the federal republics. One of them was the Republic Hydrometeorological Institute of SRB&H.

During the period from 1945 to 1955, thanks to the establishment of the World Meteorological Organisation (WMO) as a UN agency, in 1950, the number of weather stations in B&H came to a level that meets the spatial distribution of meteorological stations in accordance with the recommendations of the WMO. The best period in the service of Hydrometeorological Institute in B&H is certainly from 1958 to 1991. During this period the network of meteorological stations were at their best and at their peak numbered 600 precipitation stations and 130 weather stations.

After the war period of 1992 - 1995, there was a complete reorganisation of meteorological services and two meteorological institutes were formed, one for each entity. The number of stations was drastically reduced and the data quality is inferior compared to the period before the war.

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The Act of the Federal Government signed in 1997 established the Federal Meteorological Institute, which by an additional act of the Federal Government in 2007 was renamed as the Federal Hydrometeorological Institute. Its activities are carried out in accordance with the standards and recommendations of the World Meteorological Organisation.

The methodology of data processing provided for the purposes of the ANC project is official and approved by the WMO.

The mean daily air temperature is calculated as follows:

$$T_{avg} = \frac{T_{07:00} + T_{14:00} + T_{21:00} * 2}{4}$$

Where:

$T_{07:00}$  - is the air temperature at 07:00

$T_{14:00}$  - is the air temperature at 14:00

$T_{21:00}$  - is the air temperature at 21:00

The mean daily air temperature is calculated as follows:

$$T_{avg} = \frac{T_{07:00} + T_{14:00} + T_{21:00} * 2}{4}$$

Where in this case:

$T_{07:00}$  - is the mean monthly air temperature at 07:00

$T_{14:00}$  - is the mean monthly air temperature at 14:00

$T_{21:00}$  - is the mean monthly air temperature at 21:00

$T_{max}$  and  $T_{min}$  - Maximum and minimum air temperatures are observed at 21:00 ( $T_{max}$ ) and 07:00 ( $T_{min}$ ) local time and mean extreme temperature values for that day.

Precipitation is expressed in millimetres of water residue (mm). The daily amount of precipitation refers to a period of 24 hours, from 07:00 am from the previous day to 07:00 of the current day.

Monthly values of precipitation are obtained by summing the daily amount of precipitation, according to the following formula:

$$R = \sum r$$

Where:

R – is the monthly sum of precipitation

r – is the daily amount of precipitation

For the purposes of the ANC project, the following data for the period 1961 – 1990 will be available:

- Mean monthly air temperature for a minimum of 30 years, daily data, for 17 (seventeen) main meteorological stations, approximately 2% of all possible data have gaps
- Mean monthly air temperature for a minimum of 30 years, monthly data, for 39 (thirty nine) climatological stations, approximately 16% of all possible data have gaps
- Mean monthly precipitation for a minimum of 30 years, daily data, for 17 (seventeen) main meteorological stations, approximately 2% of all possible data have gaps
- Mean monthly precipitation for a minimum of 30 years, daily data for 16 (sixteen) precipitation stations in the basin of the Vrbas river, approximately 10% of all possible data have gaps
- Mean monthly precipitation for a minimum of 30 years, monthly data, for 42 (forty two) climatological stations, including two stations from Brcko District, approximately 22% of all possible data have gaps
- Maximum and minimum air temperature for a minimum of 30 years, needed for calculation of PET, daily data, for 17 main meteorological stations, approximately 2% of all possible data have gaps

**The abovementioned data sets are not homogenized.**

*Tabular review of the available data for ANC project*

Type of data	Period	Values	Number of stations	Type of station	Gaps in percentage (current state)	Data homogenisation
Mean monthly air temperature	1961 - 1990	daily	17	MMS	2%	NO
Mean monthly air temperature	1961 - 1990	monthly	39	CS	16%	NO
Mean monthly precipitations	1961 - 1990	daily	17	MMS	2%	NO
Mean monthly precipitations	1961 - 1990	daily	16	PS	10%	NO
Mean monthly precipitations	1961 - 1990	monthly	42	CS	22%	NO
Maximum air temperature	1961 - 1990	daily	17	MMS	2%	NO
Minimum air temperature	1961 - 1990	daily	17	MMS	2%	NO

**MMS** - main meteorological station

**CS** - climatological station

**PS** - precipitation station

## B2.4. STATUS OF GEOGRAPHICAL INFORMATION SYSTEM (GIS) DATA

Basic topographic data in the Federation of Bosnia and Herzegovina (as well as in most ex-Yugoslav countries) was available on topographic maps at various scales produced by the Military Geodetic Institute based in Belgrade. Gauss Krueger projection (3 degree), (with Bessel - 1841 ellipsoid, and Hermanskogel datum) was used as the State Coordinate System. The territory was divided in a section network with 7°30'x7°30' (1:25,000) for topographic maps and in trigonometric sections for cadastral purposes (22.5x15 km). Transformation parameters for the World Geodetic System (WGS 84) were also calculated, therefore, all data recorded (using GPS) or assumed from other sources can be transferred into the State Coordinate System.

The main consistent source of soil data was derived from the Basic Soil Map of Bosnia and Herzegovina

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at a scale of 1:50,000 and this basic soil information available in GIS format and will be used for the delineation of the ANCs in the country.

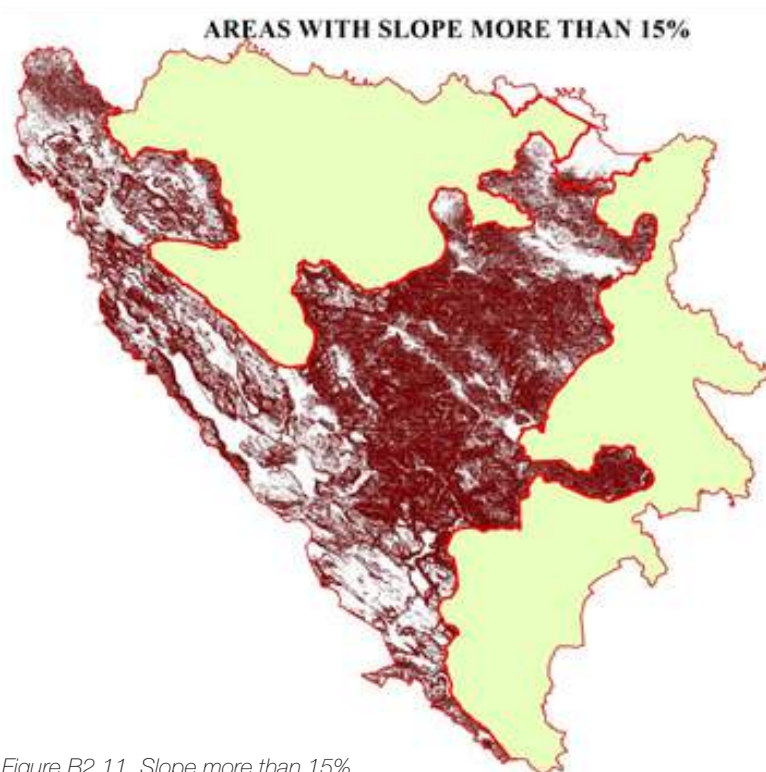


Figure B2.11. Slope more than 15%

### Digital terrain model

During 2012, for the census purposes, Digital Orthophotos (DOF) at a scale of 1:5,000 were produced for the whole territory of B&H, as well as associated Digital Terrain Models (DTM) that are divided in a large number of sheets, but are unpractical to use for large territories. For the purposes of determining the ANC in the Federation of Bosnia and Herzegovina, we suggest DTM with a resolution of 20 m.

### The administrative units at all levels

The General Peace Agreement for Bosnia and Herzegovina, signed in Dayton, USA, on 21 November 1995, established two entities: the Federation of Bosnia and Herzegovina and the Republic of Srpska. Latter on 8 March 2000, the Brcko District was established as another entity of Bosnia and Herzegovina. The Federation of Bosnia and Herzegovina (FB&H), as a one of the two entities in Bosnia and Herzegovina, has its government, jurisdiction and responsibilities. According to the Law on Federal Units (Official gazette No. 9/96) there are ten cantons constituted in FB&H. Names and seats of cantons have been defined by the Constitution of the Cantons. In B&H there is still no diversification on NUTs or LTU regions. In FB&H there is a total of 69 municipalities and there is no lower area partition in other administrative territorial units.

Administrative units	Units in entity Federation of Bosnia and Herzegovina	Units in entity the Republic of Srpska	Brcko District
Bosnia and Herzegovina	1	1	1
Entity of Bosnia and Herzegovina	1	1	-
Cantons borders	10	-	-
Municipality border	69	63	1

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Figure B2.12. Administrative units

### The land cover map for the country (CORINE methodology)

The CORINE 2012 for Bosnia and Herzegovina shows the presence of 33 classes out of a total of 44 included in the CORINE nomenclature. According to this database, it is evident that in B&H the forest vegetation is the dominant land cover occupying 62.90% of the territory. The second category by proportion is the agricultural area covering 34.74%. The rest of the surface area of 2.36% belongs to three categories i) artificial surface (1.57%), ii) water (0.10%), and iii) wet areas (0.69%). Agricultural areas occupy in total an area of 1.779.169, 38 ha (Table B2. 1.).

The agricultural land subdivided in groups of categories such as non-irrigated arable land, irrigated arable land, vineyards, and orchards accounts for only 10.92% (194.301,40 hectares), while the remaining 89.08% (1.584.867,98 ha) is occupied by the following classes: pastures, complex cultivation patterns (CORINE Class 242) and agricultural land with significant areas of natural vegetation (CORINE Class 243).

The category which represents intensive agricultural production covers the largest share of the total agricultural land with 94.71%. This is not irrigated arable land. Nevertheless, it should be noted that a large share of the agricultural land or 40.45% enters within the group of arable parcels, which represent fragmented agricultural land under different crops.

The second most represented (29.49%) is the class of agricultural land with significant natural vegetation, which is also fragmented agricultural land with different crops and between them a mosaic surface covered by natural vegetation is present. Pastures are also a very important class that in the structure of agricultural land account for 19.14%.

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Table B2.1. Level of classification of agricultural areas

Bosnia and Herzegovina				
I. Level of classification - Agricultural areas				
II. Level of classification		III. Level of classification		
2.1.	Arable land	211	Non-irrigated arable land	184.027,35 ha
		212	Irrigated arable land	2.328,22 ha
2.2.	Permanent crops	221	Vineyards	2.491,35 ha
		222	Fruit trees and berry plantations	5.454,48 ha
2.3.	Pastures	231	Pastures	340.598,06 ha
2.4.	Heterogeneous agricultural areas	242	Complex cultivation patterns	719.703,73 ha
		243	Land principally occupied by agriculture, with significant areas of natural vegetation	524.566,19 ha
<b>Total</b>				<b>1.779.169,38 ha</b>
<b>Total FB&amp;H and Brčko District</b>				<b>888.867,53 ha</b>

Agricultural land from CORINA 2000

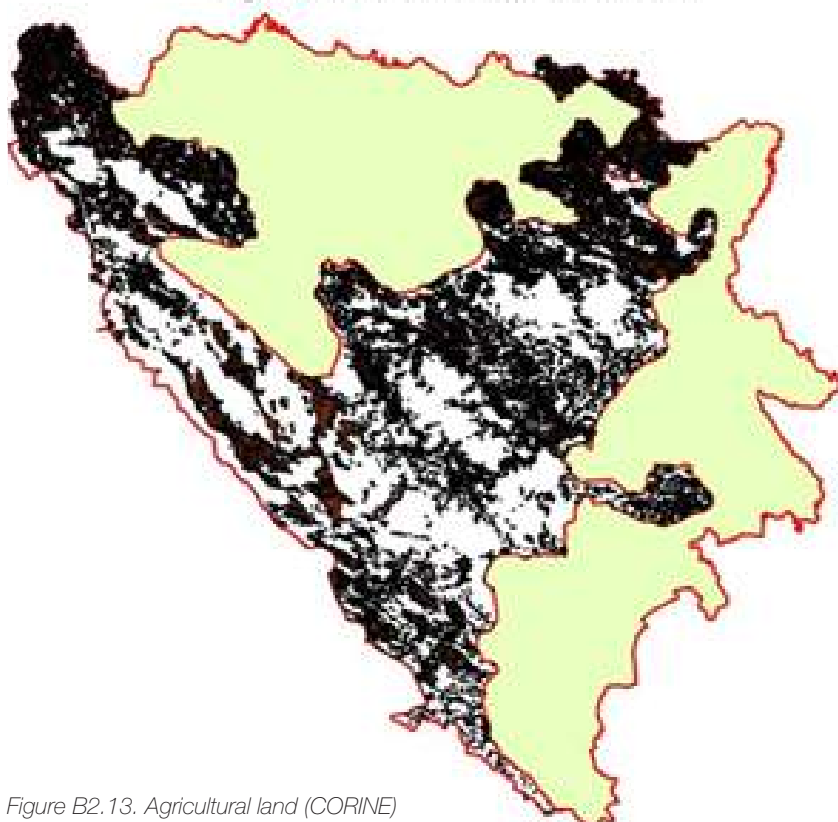


Figure B2.13. Agricultural land (CORINE)

All of the above data will be available to the ANC SEE project.

## **B2.5. DATA GAPS, PROBLEMS, AND SOLUTIONS**

Based on the above, we can conclude that the Federation of Bosnia and Herzegovina has an adequate set of soil data. But, at the moment, the FB&H team does not have in possession the necessary licenses to perform any kind of spatial analyses (Kriging or any kind of interpolation) because of lack of Spatial Analyst or 3D Analyst licenses for ArcMap 10. This software refers to creating maps showing major climatic domains in case when data availability is limited (i.e. monthly or daily temperature and monthly or daily rainfall).

A certain part of the data for the main, climatological and precipitation stations is missing and it is necessary to do an approximation. If everything goes well provided no unexpected and unsolvable problems appear, it is planned to have the report completed by the next meeting in September 2016 (at the latest) or earlier if necessary. In any case, after completing the approximation, the quantity and quality of data provided to the ANC project will significantly improve.

## **B2.6. PROVISION OF RECOMMENDATIONS FOR IMPROVED DATA MANAGEMENT IN THE CONTEXT OF THE AREAS WITH NATURAL CONSTRAINTS**

The ANC team of the Federation of Bosnia and Herzegovina would like to express its willingness to strengthen the scientific and technical cooperation with all the institutions responsible for data management. Since there is a possibility of complete digitisation of daily values for climatological and precipitation stations that are available, which would improve the database for the ANC project, for this purpose we can propose that data entry is performed by students if special funds are available. If this would be possible, the whole digitalisation process could be completed in about four months. Otherwise, as shown by previous experience with other donor funded projects, the staff of the Hydrometeorological Institute would not be available to do this, but the institute would provide working space and hardware information technology support.

## **B2.7. ANALYSES OF THE NATIONAL CAPACITIES FOR DATA MANAGEMENT AND PROVISION OF RECOMMENDATIONS FOR IMPROVED INSTITUTIONAL SETUP WITH REGARD TO THE ANC**

Institutions in the Federation of Bosnia and Herzegovina that have a role in creating and implementing soil and climate data management policies are formally the Federal Institute of Agropedology and the Federal Hydrometeorological Institute BH.

At the federal level, meteorological activities are conducted by the Federal Hydrometeorological Institute, based in Sarajevo. The Institute presently operates 15 major meteorological stations that implement activities in accordance with the WMO recommendations and standards in this area. Regarding possible implementation of the future ANC payments, the Federal Ministry of Agriculture, Water Management and Forestry is the governmental agency responsible.

Depending on the type of station and the number of employees, the observations are carried out at different times, from several observations per day during working hours + observation in climatological terms (07, 14, 21 h) to the observations that are made every hour. These stations automatically collect and store data at each 15 minute interval that are also remotely downloaded via Internet connection. However, the baseline for climatic information for the ANC project will be the period 1961-1991.

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

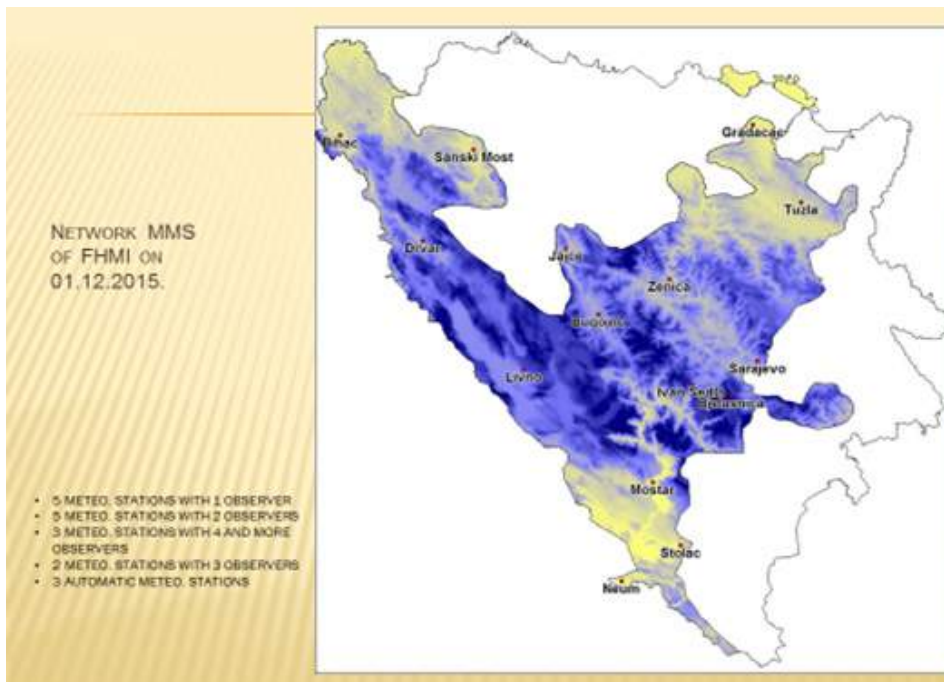


Figure B2.14. MMS Network

At national level, the missing data may be filled through the classical approach, approximation, interpolation. In terms of regional data collection, the recommendation is to promote inter-state cooperation in terms of exchange of information with the locations that are close to the border, in order to complete the missing data.

## B2.8. NATIONAL POLICY ASSESSMENTS AND POLICY RECOMMENDATIONS RELEVANT TO THE CHARACTERISATION AND MAPPING OF AREAS WITH NATURAL CONSTRAINTS INCLUDING SOCIOECONOMIC ANALYSES

Regarding the characterisation and mapping of areas with natural constraints, it can be concluded that the Federation of Bosnia and Herzegovina has the necessary professional and technical institutions that are scientifically qualified to deal with this issue. What is mostly needed is the strengthening of horizontal and vertical cooperation among the ministries and other relevant institutions at all government levels.

Since the institutions which are dealing with meteorology and collecting meteorological data (entity of meteorological institutes) have different databases, it is important to harmonise the methods of data processing. There is no single database at national level and the exchange takes place according to the agreement on cooperation between these institutions. At state level, there is no institution for the issue of meteorology. Most of the activities at national level are implemented through projects. One of the current ones, which is being implemented with the support of UNDP, is the development of interactive climatic atlas of Bosnia and Herzegovina as part of the third national communication on climate change under the UNFCCC (United Nations Framework Convention on Climate Changes).

Regardless of the activities carried out by UNDP, the Federal Hydrometeorological Institute did a draft version of the climate atlas for the Federation of Bosnia and Herzegovina and it is planning to prepare the same for the whole of Bosnia and Herzegovina. It is important to note that FHMZ, for all activities on the development of the atlas, have used their own technical and human capacities, with the use of free software for mapping (SAGA GIS). One of the recommendations for improvement of the characterisation and mapping of areas with natural constraints would be the purchase of licensed

software (GIS) and the improvement of the Climate Database Management System ORACLE - Clidata through the purchase of applications for mapping of meteorological parameters.

### Support payment schemes to farmers

Since July 2010, in the Federation of B&H there has been in force the Act on Financial Support in Agriculture and Rural Development. According to its Article 2, the financial support provided by this Act shall be carried out in accordance with its obligations under the Agreement on Accession to the World Trade Organisation (WTO) and the Agreement on Stabilisation and Association with the European Union. The model of financial support, discussed in Section 5 of this Act, includes a model of rural development. Article 9 of the same Act foresees that farmers in areas with severe economic conditions can in certain positions of some models have the amount of financial support increased up to 35%.

The legislative background for financial support in agriculture and rural development in 2016 is supported by the following laws and regulations:

- The provisions of the Agriculture Act (“Official Gazette of the Federation BiH”, No. 88/07, 04/10, 27/12 and 13/07)
- Law on financial support to agriculture and rural development (“Official Gazette of BiH”, number 42/10).
- Principles of the Mid-term strategy for the development of the agricultural sector in the Federation of Bosnia and Herzegovina 2015-2019
- (Decision of the Parliament of FBiH, number :01,02-24-1-780/15 from 08.06.2015)
- On commitments under the Stabilisation and Association Agreement (SAA) regarding the adjustment of practice in the conduct of agricultural policy under the provisions of the Common Agricultural Policy of EU

According to the report on agriculture in the Federation for the year 2015 of the Federal Ministry of Agriculture, Water and Forestry, the structure of the approved financial support in 2015 looks like that presented in Table B2.2. It could be seen that there are no direct payments the rural development. Instead funding is provided for various sectors of agriculture that indirectly support rural development. In case of ANC payments they could be directed through the item “other kind of financial support” totalling BAM 1,582.708,20 (approx. 800.000 euros).

Table B2.2. Structure of financial support to various agricultural sectors in B&H

Authorised support for 2015	Amount	Participation%
Plant production	10,339,205.97	15.87%
Animal production	53,133,947.44	81.55%
Rural development	0.0	0.0
Other kind of financial support	1,582,708.20	2.43%
Repeated acts of complaints and court verdicts	95,312.00	0.15%
<b>Total:</b>	<b>65,151,173.61</b>	<b>100.00%</b>

The Federal Government is also considering the adoption of the Rural Development Programme for the period 2016-2020, which should ensure the measures necessary for the support and development of rural communities in the Federation, but still this programme does not have a valid legally based document. Until now, the support to rural areas in FBiH has not had clear development goals and adequate accompanying measures. Rural development policy is unsystematic and inconsistent, i.e. it has ad hoc solutions, which is reflected in varying budget support and implementing measures. In this context, in the Federation there were no measures regarding the ANCs. Therefore, officially, no one can expect any budgetary transfer (actions) for ANC at least until 2020.

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

# REFERENCE LIST OF THE DATA USED FOR THE ASSESSMENT OF RELEVANT ANC DATA

Bukalo E.: Possible Use of Pedological Maps for Various Purposes of Land Use. 1997. Faculty of Agriculture, University of Sarajevo

Climate Atlas of the Federation of Bosnia and Herzegovina, Draft Version, 2016

Climatological Stations – Reports for the Period 1961 - 1990

CORINE 2000 Land Cover and Land Use

DTM Digital Terrain Model with 20m resolution

Guide for Observations and Measurements on the Main Meteorological Stations, Belgrade 1974

Initial and Second National Communications of Bosnia and Herzegovina under the United Nations Framework Convention on Climate Change

Key for Reading and Use of the Basic Soil Map of B&H. 1972. Institute of Agropedology, Sarajevo

Main Meteorological Stations – Reports for the Period 1961 - 1990

Meteorological Yearbooks for the Period 1961 – 1990

Official Database of FHMI – CLIDATA (Climate Database Management System)

Official Website of Federal Hydrometeorological Institute

Physical and chemical properties of soils were printed as annexes for every sheet

Precipitation Stations – Reports for the Period 1961 – 1990

Resulovic H., Jovandic P., Dženana Bisic-Hajro. Pedological Manual. 1982. Faculty of Agriculture, University of Sarajevo

Soil Map of B&H at the scale of 1:50,000, 1964-1986

## BOSNIA AND HERZEGOVINA: THE REPORT OF THE REPUBLIC OF SRPSKA

### B2.1.B. INTRODUCTION

The latitude and longitude of the territory of the Republic of Srpska (RS) totalling 24,641 km<sup>2</sup> is included between 42°33'N and 45°17'N and 16°12'E and 19°38'E, respectively, and covers the northern and eastern parts of Bosnia and Herzegovina. The Republic of Srpska belongs to the group of continental areas – it has no access to sea and it is located at the meeting point of two large natural geographic and socioeconomic regional units: Pannonian and Mediterranean.

Complex and interesting natural features characterise the territory resulting from the diversity of geographical units and their geomorphological evolution. In the northern, Peri-Pannonian part, the hilly terrain composed of Cenozoic deposits gradually descends to the flat lands with alluvial plateaus and fluvial terraces. This is the most fertile part of the Republic of Srpska. There are only a few scattered mountains in this area: Kozara, Prosara, Motajica, Vučijak, Ozren and Trebovac, as well as the furthestmost northeastern slopes of Majevisa. Towards the south, the flat lands gradually turn first into the hilly terrain and then into the mountainous region which covers the largest portion of the territory of the republic. The highest mountain peak is Maglić, located at 2,386 metres above sea level, on the mountain also named Maglić.

The longest rivers in the Republic of Srpska are Drina (305 km), Sava (202 km), and Vrbas (117 km). They all drain into the Black Sea. All waters running south of the mountain pass Čemerno, in Eastern Herzegovina, belong to the Adriatic drainage basin (Trebišnjica, Neretva). Other large rivers in the republic are Bosna and Trebišnjica, while the largest lake is Bilećko (on Trebišnjica) with an area of 27 km<sup>2</sup> making it the largest artificial lake in the Balkan Peninsula. On the other hand, the largest natural lake in the republic is Štirinsko (on the mountain Zelengora) with an area of 0.13 km<sup>2</sup>.

Various climatic domains spread throughout the territory of the Republic of Srpska result from natural factors and the rules of air masses general circulation in the region. Consequently, three climate types are recognised:

- 1. Northern Peri-Pannonian region, with its moderate continental climate.** This region's climate is characterised by moderately cold winters and warm summers. Average annual air temperature ranges between 12°C and 19°C.
- 2. Alpine and Pannonian climate,** covers the largest part of the Republic of Srpska. Mountain ranges are characterised by short and cool summers and cold and snowy winters, with high snow cover which persists for a long time. The average annual air temperature is between 5°C and 7°C. Hilly terrain, hollows and valleys are, however, characterised by a somewhat milder climate. The average annual air temperature in the areas with the Alpine and Pannonian climate is approximately 10°C. Winters are moderately cold, with snow, common temperature inversions, and fog. Summers are moderately warm.
- 3. Modified Mediterranean-Adriatic climate.** The southern region of the republic also known as lower Herzegovina, is characterised by the modified Adriatic climate. This region is called Humine, as opposed to the region called Rudine, which covers higher mountainous parts of the karst of Herzegovina with a variant of both the Alpine climate and the climate of Humine. The average annual air temperature is between 14°C and 14.7°C. Trebinje, the warmest city in the Republic of Srpska, is located in this climatic region.

The Soil and Terrain Database (SOTER) developed by FAO/UNEP/ISRIC/IUSS divides the territory of the Republic of Srpska into three parts: the northern part with lowlands and slightly rolling terrains and terraces, hilly - mountainous part and the southern karst part.

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

### The northern part of RS

Areas that occupy this zone are located in the lower reaches of the rivers Una, Sava, Vrbas, Bosna and Drina and comprise the main agricultural area of RS. This area is dominated by hydromorphic soils on flat and gently rolling terrains favourable for agricultural production with the application of specific hydro – amelioration measures. The vegetation period with temperatures above 5°C starts around 6 March, ends on 18 November and lasts on average 253 days. Temperature sum > 5°C is around 3.613°C. The average annual rainfall in this area is about 896 mm. Based on the climate data for the period from 1960 to 1990, it can be concluded that the distribution of precipitation is such that the frequency of drought occurrence is 33% and the duration of the drought is on average 37 days per year, mostly from the beginning of August to the first decade of September. Preliminary assessments indicate that the presence of ANCs in this area will be limited or none.

### The central part of RS

The central part, which is characterised by hilly – mountainous regions, is largely dominated by Dystric Cambisols, soils formed on limestones and dolomites, as well as loessivized soils, delluvial soils of sinkholes and other types of soils, which are in large percentage covered by forests and pastures. This area is characterised by moderate continental climate with the vegetation period with temperatures above 5°C beginning around 21 March and ending around 9 November lasting on average 227 days (with the exception of high mountains, where that period is shorter). The average rainfall is about 1,047 mm. This is the zone of forests and pastures. Expectations are that ANCs will be spread throughout the area due to constraining soil and climate characteristics.

### The southern part of RS

The southern part is dominated by shallow soils on limestone - dolomite substrates with extensive vegetation or without it. This zone is characterised by subtropical winters with lots of rainfall and dry summers. The vegetation period starts around 3 February and ends around 24 December. The average annual rainfall is around 1,577 mm, but with uneven distribution. The greatest amount of precipitation is registered during the winter months. The frequency of droughts is 85%, and its duration is on average 50 days per year. It occurs most commonly in early July and lasts until the beginning of September. From the standpoint of available agricultural land, the area of Herzegovina consists of the following fields: Popovo polje, Trebinjsko polje, Ljubomirsko polje, Ljubinsko polje, Dabarsko polje, Fatničko polje, Bilečko polje, Gatačko polje and Nevesinjsko polje, with a total area of approximately 23,600 ha. The presence of ANC is anticipated to be extensive in this zone too.

## B2.2.B. STATUS OF SOIL DATA

In 2009, the PI Agricultural Institute of the Republic of Srpska prepared a strategic document called “Groundwork for Agricultural Land Protection, Use and Restructuring for the Republic of Srpska as a Component of Land Use Planning Process” (hereinafter referred to as “Groundwork RS”) for the Ministry of Agriculture, Forestry and Water Management of RS. Using the FAO methodology, existing data on land resources and climate were systematically sorted into digital GIS databases, which provided the possibility of a large number of different analyses and combinations depending on the goal set. Groundwork RS made in this way represents a dynamic component of the land use planning process (Fig. B2.2.1).

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence



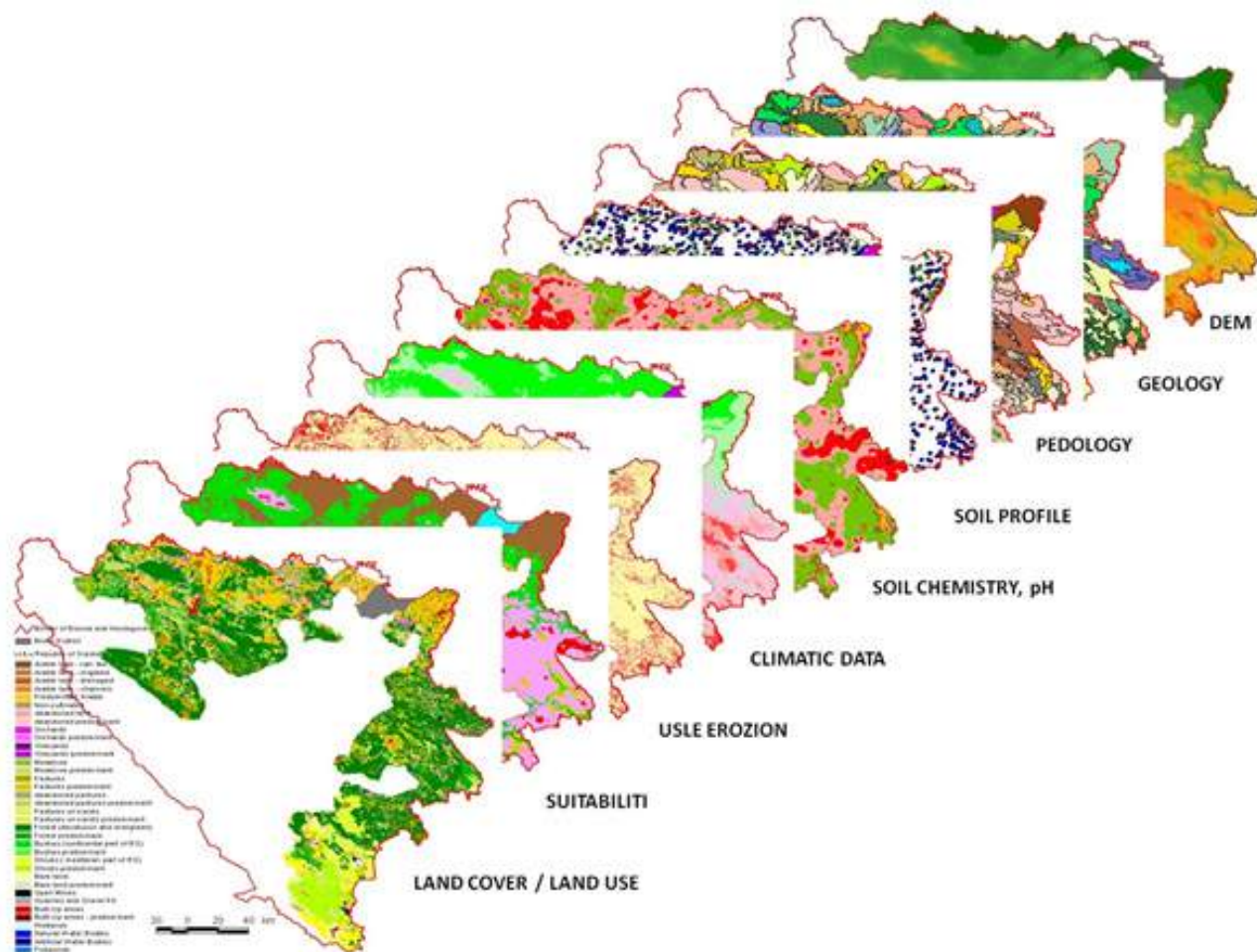


Figure B2.2.1. Basic GIS layers - Groundwork RS 2009

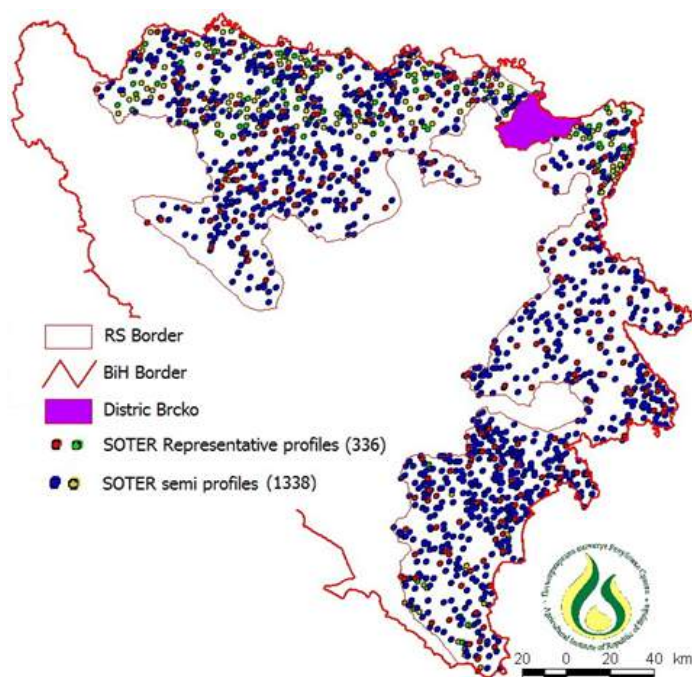


Figure B2.2.2. The spatial distribution of profiles and semi profiles with digital data in the area of the Republic of Srpska (Groundwork RS)

The main source of soil data for Bosnia and Herzegovina, and thus also for the Republic of Srpska, is the Basic Soil Map at a scale of 1:50,000. This map is thoroughly described in the previous sections regarding soil information in the Federation of Bosnia and Herzegovina, therefore the same considerations for soil data and methodological approaches used for their acquisition will not be repeated in the RS part of this report.

The FAO project implemented during the period from 2000 to 2002 created the SOTER database that was based on the data deriving from the Basic Soil Map of B&H. Within the borders of the Republic of Srpska, 283 SOTER units that represent 336 profiles and 1,338 semi profiles were allocated (Fig. B2.2.2).

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

The soil database of the territory of RS contains 336 profiles with data deriving from the main field observations and basic laboratory analyses (numerical and descriptive in the Serbian language) that entered into the GIS-based layer. The following information is included in the database:

1. Profile code,
2. Year and month of profile opening,
3. Altitude,
4. Assessment of erosion,
5. Drainage,
6. Texture code,
7. Acidity (pH/H<sub>2</sub>O, pH 1M KCl),
8. Humus (%),
9. The degree of base saturation (V%),
10. Physiologically active phosphorus and potassium;
11. Soil type according to FAO Classification and the National Classification used on the original Soil Map (1:50,000).

For 1,338 semi profiles, the same data were entered, except the data on the humus content and the degree of base saturation, because these parameters were not measured for semi profiles during the drafting of the Basic Soil Map (there are no such data).

Within the FAO project, the Federal Institute for Agropedology Sarajevo performed the digitisation of the Basic Soil Map at a 1:50,000 scale, but only data on the type of soil according to FAO and the National Classification were entered in polygons.

### Soil data after 2000

In the period between 2000 and 2015, the most important data for the entire territory of the Republic of Srpska were obtained through soil fertility control. Soil fertility control was performed by the PI Agricultural Institute of the Republic of Srpska in the period from 2014 to 2015 for the Ministry of the Republic of Srpska. On that occasion, soil fertility control was performed at 2,586 plots (Fig. 3) at depth of 30 cm. Basic chemical analyses were performed in the samples: reaction (pH in H<sub>2</sub>O, pH 1M KCl), humus (used to calculate also organic C), physiologically active phosphorus and potassium. The samples are stored so that they can be a source of new data as the need arises. Nevertheless, the ANC methodology doesn't require soil fertility information.

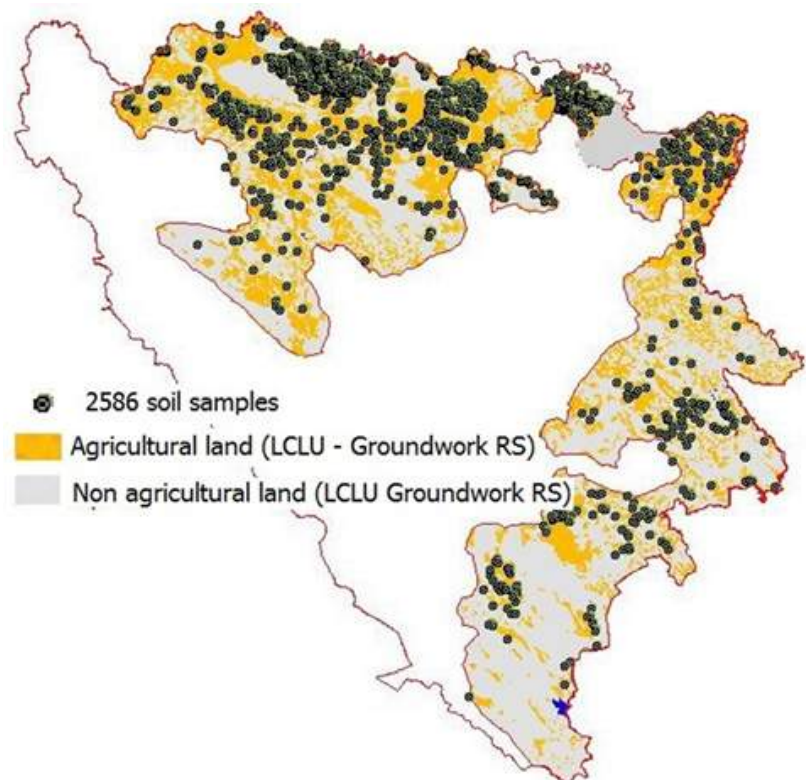


Figure B2.2.3. The distribution of 2,586 soil samples – Soil fertility control, 0 – 30 cm

### B2.3.B. STATUS OF CLIMATE DATA IN THE REPUBLIC OF SRPSKA

Climate data for the territory of the Republic of Srpska are registered and monitored by the Hydrometeorological Institute of RS through a network of meteorological stations spread throughout the territory. Related data required for ANC delimitation will be used for the period 1961-1990 based on data availability as follows:

- a) Temperature data
  - Available mean monthly air temperature for a 30 years reference period and daily data for 18 main meteorological stations in digital format (around 5% of all data are missing). Gaps of missing data are approximated and now there is a continuous 30-year time data series (with one of the programs MASH as part of the project CARPATCLIM).
  - Available mean monthly air temperature for a 30 years reference period and monthly data for 30 climatological stations (partly in digital, partly in hard copy format), approximately 15% of all possible data are gaps (approximation needed, but it can be done with the same MASH program).
- b) Rainfall data
  - Available mean monthly rainfall for a 30 years reference period (1961-1990), daily data for 18 main meteorological stations in digital format (around 5% of all data are missing). Gaps of missing data are approximated and now there is a continuous 30-year time data series (with one of the programs MASH as part of the project CARPATCLIM).
  - Mean monthly rainfall for a minimum of 30 years and monthly data for 30 stations (partly in digital, partly in hard copy format), approximately 15% of all possible data are gaps (approximation needed and it could be done with same the MASH program).
- c) Aridity index data
  - Aridity index is calculated sporadically for certain locations and certain short periods. There are daily data for 18 main meteorological stations (in digital format) according to which PET may be calculated (applying Hargreaves methodology) for a reference period (1961-1990). Approximately 10% of all possible data are gaps (approximation needed).



Figure B2.2.4. The distribution of meteorological stations in the Republic of Srpska with available daily climate data

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

During the implementation of the FAO project “Inventory of the Post-War Situation of Land Resources in B&H”, the PI Agricultural Institute of RS established a climate database for the period 1961-1990. The Agricultural Toolkit (APT4) was used for storing, retrieving and analysing climate data. This research-oriented software package was developed by FAO for AEZ purposes. Seven monthly climate parameters (*precipitation (mm)*, *average temperature (T°C)*, *average max. temperature (T°C)*, *average min. temperature (T°C)*, *relative humidity (%)*, *wind speed (m/s)*, *insulation (h)*) were entered in the climate base for 20 meteorological stations throughout B&H (7 are located in the RS, and 13 are located in FB&H). Data source: Metrological Annual Reviews SFRJ 1960 – 1985 and unpublished data 1986 – 1990 (Federal Metrological Institute, Sarajevo and Hydrometeorological Institute of RS, Banja Luka).



Figure B2.2.5. The distribution of meteorological stations with available daily climate data

APT4 contains part for climate data analysis (CDA) for calculation of potential evapotranspiration (according to Penman-Monteith), water balances, frequency of occurrence of growing periods and statistical analysis.

Table B.2.2.1 Inventory of dry zones in Bosnia and Herzegovina

AEZ INVENTORY OF DRY ZONES IN BOSNIA AND HERZEGOVINA (EXAMPLES - ONLY)																
AEZ DRY PERIOD INVENTORY																
STATION					AVAILABLE SOIL MOISTURE (AWC)											
					50 mm				100mm				150mm			
Name	Code	Alt.	Lat.	Long.	Freq.	Start	End	Duration	Freq.	Start	End	Duration	Freq.	Start	End	Duration
Banja Luka	14542	153	44.47	17.13	95	7.9	9	33	81	8	9	30	59	8.1	9.1	30
Bihac	14002	247	44.49	15.53	92	7.4	8.5	33	58	7.5	8.3	24	33	0	0	0
Bileca	14003	491	42.53	18.27	100	7.4	8.8	42	92	7.6	8.8	36	75	7.9	9	33
Belasnica	14004	2067	43.43	18.16	25	0	0	0	8	0	0	0	0	0	0	0
Bosanska Dub.	14537	100	45.11	16.49	100	8.1	9.1	30	91	8.4	9.2	24	91	8.8	9.4	18
Bugonjo	14006	562	44.04	17.28	100	7.4	8.9	45	75	7.8	9	36	75	8.4	9.3	27
Butmir	14007	503	43.50	18.20	92	7.3	9	51	75	7.6	9.1	45	75	8.5	9.6	33
Doboj	14551	146	44.44	18.06	83	7.5	8.9	42	58	7.5	8.9	42	58	8.1	9	27
Dvrrar	14009	485	44.23	16.24	80	7.6	8.9	39	80	8	9.2	36	80	8.1	9.6	45
Ivan Sedlo	14010	970	43.46	18.02	42	0	0	0	0	0	0	0	0	0	0	0
Jajce	14011	430	44.21	17.16	83	7.3	8.7	42	42	7.6	8.7	33	42	9	9.8	24
Kalinovik	14012	1073	43.31	18.27	100	7.5	9.1	48	78	7.7	9.1	42	56	8.4	9.5	33
Livno	14013	724	43.50	17.01	92	7.5	8.9	42	92	7.8	9.2	42	83	8.1	9.2	33
Mostar	14014	99	43.21	17.48	100	6.9	9.3	72	100	7.1	9.3	66	100	7.4	9.4	60
Sanski Most	14015	158	44.46	16.42	92	7.2	8.8	48	58	7.9	8.7	24	33	8.2	8.8	18
Sarajevo	14016	630	43.52	18.26	92	7.4	8.9	45	75	7.7	9.3	48	75	8.1	9.5	42
Sokolac	14658	872	43.57	18.49	91	8	9.4	42	64	8	9.3	39	55	8.9	10.1	36
Tuzla	14018	305	44.33	18.42	83	7.9	9.2	39	58	7	8.7	51	25	7.5	8.8	39
Zenica	14020	344	44.13	17.54	100	7.3	9.1	54	83	7.6	9.1	45	75	8	9.2	36

Based on the established climate databases and their processing, the following GIS climatic layers have been created:

- Starting of growing period (LGPT5)
- End of growing period (LGPT5e)
- Duration of growing period (LGPT5d)
- Temp. Sum > 5°C (TSum LGPT5)
- Starting of free-frost period (LGPT10)
- End of free-frost period (LGPT10e)
- Duration of free-frost period (LGPT10d)
- Temp. Sum > 10°C (TSum LGPT10)

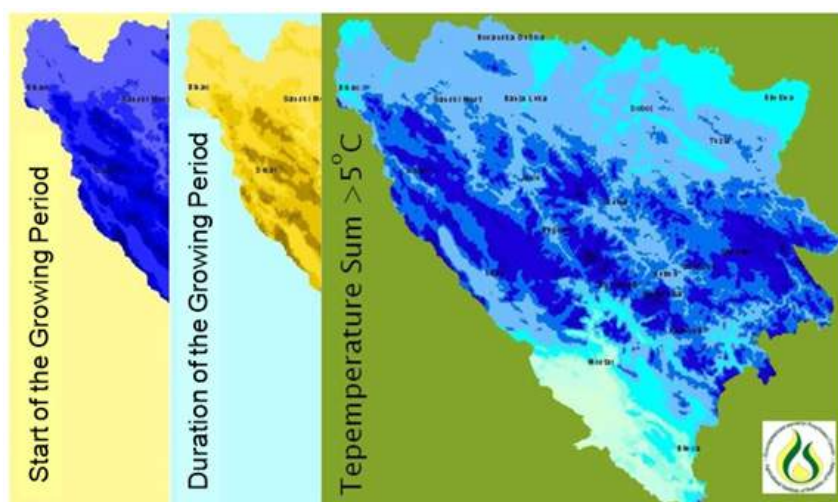


Figure B2.2.6. GIS climatic layers

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

## B2.4.B STATUS OF GEOGRAPHICAL INFORMATION SYSTEM (GIS) DATA

### Basic topography and cadastral data

The basic topographic data in RS\*\* (as well as in most ex Yu countries) was presented on topographic maps produced in the Military Geodetic Institute – Belgrade at various scales. Gauss Krueger projection (3 degree ) (with Bessel - 1841 ellipsoid, and Hermanskogel datum) was used as State Coordinate System. The territory was divided in section network with  $7^{\circ}30' \times 7^{\circ}30'$  (1:25,000 for a topographic map and in trigonometric sections for cadastral purposes (22.5x15 km). The Republic of Srpska is covered with 272 sheets of a 1:25,000 scale map, 85 in 1:50,000, 31 in 1:100,000 and 12 in 1:200,000.

Transformation parameters for WGS 84 were calculated, so all data recorded (GPS) or assumed from other sources can be transferred into the State Coordinate System. Over time, all maps were scanned, calibrated, georeferenced and used with GIS support for various purposes (spatial planning, agriculture, water management, forestry, etc.). Hypsometric layers of the maps were semi automatically digitised and used for DEM production.

Based on the above-mentioned DTM, several digital rasters are prepared for RS (areas above 1,000 m and areas with a 15% slope and above) in the line with the ANC methodology. Data show that the total area above 1,000 m is 507,063 ha, whereof the area of agricultural land is 121,797 ha (less than 10% of agricultural land), and the total area above 15% slope is 1,485,695 ha, whereof the area of agricultural land is 411,597 ha (or 40% of agricultural land) (Fig.B2.2.7).

After the war time, cadastral authorities have started the production of new digital topographic maps in various scales, but this has not been completed yet. Several national and foreign donors are providing funding to prepare satellite and orthophoto images countrywide or at a local scale.

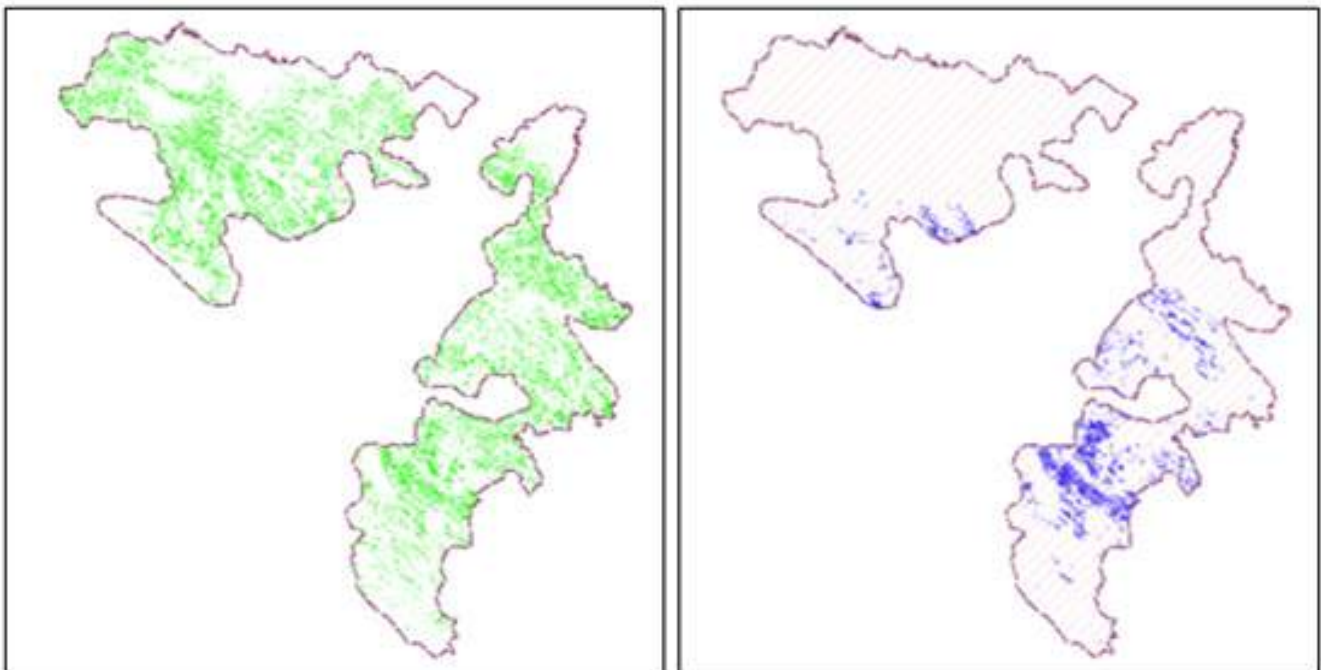


Figure B2.2.7. Map 1. Agricultural land with a slope above 15%;  
Map 2. Agricultural land above 1000 m

\*\* RS is mostly represented in 6.th zone with  $18^{\circ}$  as central meridian

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

Similar to the whole area of B&H, the territory of the Republic of Srpska started the cadastre establishment in XIX century, when Austrian authorities made a complete survey of the country, with a dual system of data collection (cadastre and ownership book). After WW2, a new cadastre based on aerial photogrammetric methodology was prepared for a significant part of the territory, but it is important to say that the priorities in cadastre establishment were made based on the value of the agricultural land, so several municipalities, mostly with significant ANC, are not covered with the new cadastre. At the moment there is a big campaign in establishing a new cadastre for the whole RS (public calls, etc.). The rural area was covered with maps in a scale of 1:2,500 and 1:5,000.

During 2012, for the census purposes, the DOF 1:5,000 was produced for the whole territory of RS (and BiH) as well as associated with DTM. The DTM is divided in a large number of sheets and is impractical to use for large territories, but very useful for planning and designing at middle and large scale. DOF was published in 2013 and is available at request.

It is important to notice that at the moment a hybrid type of GIS is the most present type in RS. There is still no widespread use of the main GIS functions (various analyses, decision support). The system is mostly used for elementary data collection and presentation.

## Geology

Geologic maps are an important set of data in the preparation of soil and other relevant data for ANC. The first geologic maps for BiH were produced by Austrian geologist Katzer at the beginning of the 20th century at a scale of 1:200,000.

RS is covered with 1:100,000 maps (the whole territory) along with relevant explanation books. It is important to mention that surveying was conducted at a scale of 1:25,000 (existing originals) but printed in 1:100,000. Maps were used for the preparation of soil maps in a scale of 1:50,000. Maps are scanned, calibrated, digitised and transferred in GIS and will be made available to the ANC project. After the floods of 2014, this type of maps, combined with the DTM and pluviometric data, were used for the preparation of landslide risk areas. Hydrogeological maps were produced at a scale of 1:200,000 and in detailed scale during the preparation of spatial plans at municipality level in a scale of 1:50,000, or for specific projects in more precise scale.

## Meteorology

The former Yugoslavia in 1969 published the Atlas of Climate for the period 1930 – 1960 with all relevant climate data presented on maps. Climate data for the period 1960 – 1990 were digitised (alphanumeric) for all meteorological stations in B&H/RS, and transferred in spatial models by the institutions in charge of meteorology (at entity level). In addition, through the FAO sponsored project “Inventory of the Post-War Situation of Land Resources in B&H” local consultants collected relevant data, such as the sum of temperature above 5 and 10 C degrees, length of growing period  $T > 5\text{ }^{\circ}\text{C}$  and  $T > 10\text{ }^{\circ}\text{C}$  and other relevant data, that were included in a grid format.

Based on GIS analyses, the total area of RS where the length of growing period  $T > 5\text{ }^{\circ}\text{C}$  is less than 180 days is spread in 612,216 ha and the agricultural area belonging to the ANC criteria is 164,100 ha (approx. 15% of all agricultural land).

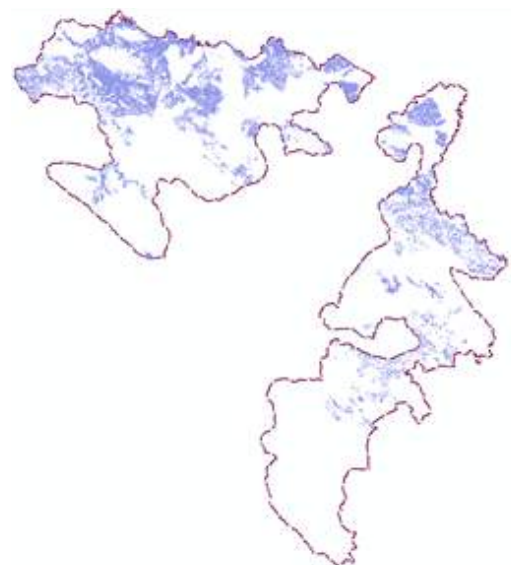


Figure B2.2. 8. Map 5. Distribution of agricultural land in RS with pH < 5

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

## Land use

The most consistent data for (B&H/RS) at present are derived through the Corine Land Cover of 2012 data sets. This type of data is widely used for general spatial planning purposes. As a first step, for the ANC project purposes, the classes with agricultural land were derived from RS Cover (Level 1 – Class 2 and Level 3 - Class 321) as follows:

Table B.2.2.2 Classes of agricultural land

CODE	DESCRIPTION
211	Non-irrigated arable land
221	Vineyards
222	Fruit trees and berry plantations
231	Pastures
242	Complex cultivation patterns
243	Land principally occupied by agriculture, with significant areas of natural vegetation
321	Natural grasslands

In the next step all polygons were aggregated as agricultural land in one feature with an area comprising a total of 1,029,087 ha.

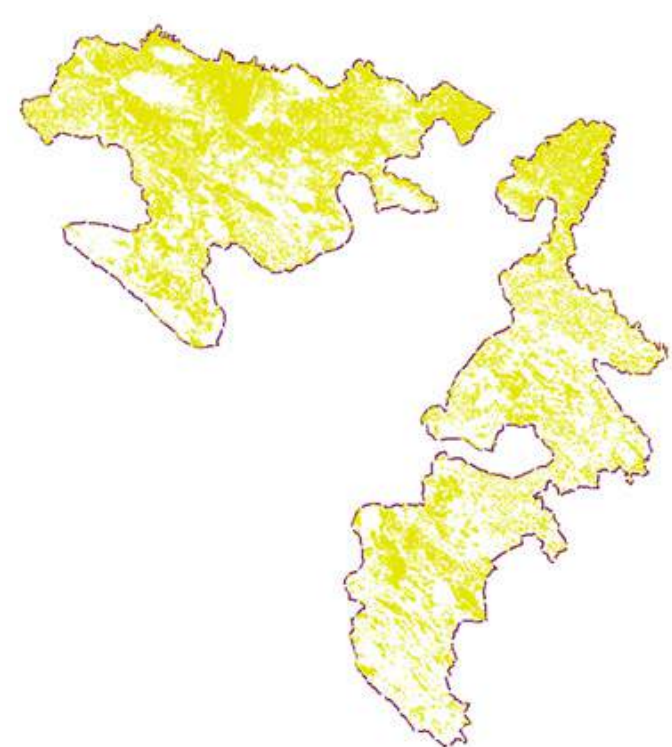


Figure B2.2.9. Map 6. Distribution of agricultural land in RS based on CORINE classification

### Other sources of available data:

2002. – LU/LC map prepared by the FAO project “Inventory of the Post-War Situation of Land Resources in B&H” based on satellite images and FAO methodology.

2009 – LC/LU map prepared by the PI Agricultural Institute of the Republic of Srpska, “Groundwork for Agricultural Land Protection, Use and Restructuring for the Republic of Srpska as the Component of Land Use Planning Process”

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence



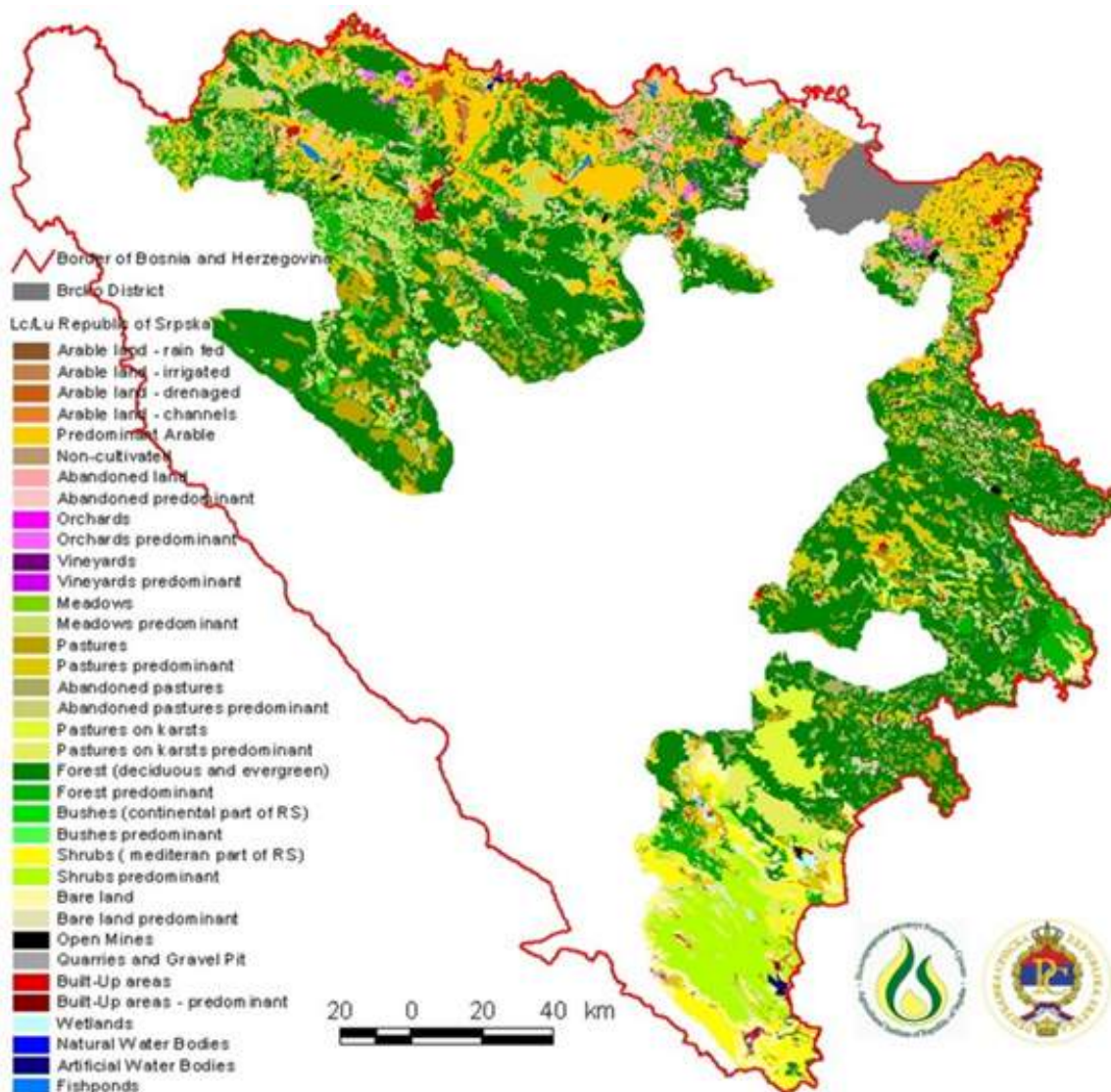


Figure B2.2.10. LC/LU map of Republic of Srpska (Groundwork RS, 2009)

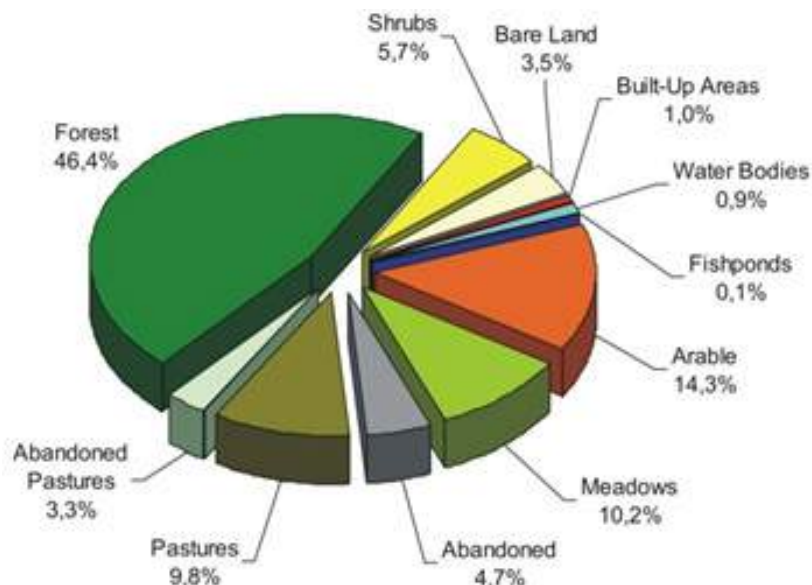


Figure B2.2.11. Structure of LC/LU class in the Republic of Srpska

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Table B.2.2.3. LC/LU Classes by coverage (in ha and in %)

No	LC/LU Classes	Area ha	% of total RS area
1.	Arable land - Rain fed	15651,4	0,6
2.	Arable land - Irrigated	2754,4	0,1
3.	Arable land - Drenaged	5348,9	0,2
4.	Arable land - Channels	2479,2	0,1
5.	Orchards	1051,2	0,04
6.	Vineyards	369,2	0,01
7.	Predominant Arable	312298,5	12,7
8.	Predominant Orchards	12832,3	0,5
9.	Predominant Vineyards	829,0	0,03
<b>TOTAL ARABLE:</b>		<b>353614,2</b>	<b>14,3</b>
10.	Meadows (incl. Natural and Managed)	11329,0	0,5
11.	Predominant Meadows	239709,5	9,7
<b>TOTAL MEADOWS:</b>		<b>251098,9</b>	<b>10,2</b>
12.	Non Cultivated	1243,9	0,05
13.	Abandoned Land	36517,9	1,5
14.	Predominant Abandoned	77602,2	3,2
<b>TOTAL ABANDONED:</b>		<b>115364,0</b>	<b>4,7</b>
15.	Pastures	111244,5	4,5
16.	Predominant Pastures	43647,9	1,8
17.	Pastures on karsts	51462,1	2,1
18.	Predominant Pastures on karsts	36393,0	1,5
<b>TOTAL PASTURES:</b>		<b>242747,6</b>	<b>9,8</b>
19.	Abandoned Pastures (fern and shrubs are predominant due to absence of grazing)	58778,3	2,4
20.	Predominant Abandoned pastures	23261,0	0,9
<b>TOTAL ABANDONED PASTURES:</b>		<b>82039,2</b>	<b>3,3</b>
21.	Forest (deciduous and evergreen)	1011106,6	41,0
22.	Predominant Forest	120627,6	4,9
23.	Bushes (continental part of RS)	11343,6	0,5
24.	Predominant Bushes	1742,3	0,07
<b>TOTAL FOREST:</b>		<b>1144820,1</b>	<b>46,4</b>
25.	Shrubs (Herzegovina - Mediterranean)	58881,0	2,4
26.	Predominant Shrubs	81824,0	3,3
<b>TOTAL SHRUBS:</b>		<b>140705,0</b>	<b>5,7</b>
27.	Bare Land (incl. Sparsely vegetated areas)	73336,2	3,0
28.	Predominant Bare Land	8281,4	0,3
29.	Open Mines	3378,4	0,1
30.	Quarries and Gravel Pit	1481,7	0,06
<b>TOTAL BARE LAND:</b>		<b>86477,7</b>	<b>3,5</b>
31.	Built-Up Areas	22534,6	0,9
32.	Predominant Built-Up Areas	3137,2	0,1
<b>TOTAL BUILT-UP:</b>		<b>25671,8</b>	<b>1,0</b>
33.	Wetlands (incl. permanent and seasonal)	7500,2	0,3
34.	Natural Water Bodies (Rivers and Lakes)	9179,9	0,4
35.	Artificial Water Bodies (incl. Dams, irrigation canals and aquaculture sites)	4492,4	0,2
<b>TOTAL WATER BODIES:</b>		<b>21172,5</b>	<b>0,9</b>
36.	Fishponds	3034,6	0,1
<b>TOTAL FISH-PONDS :</b>		<b>3034,6</b>	<b>0,1</b>

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## Soil data

As thoroughly explained by the FB&H report, the main consistent source of soil data for the RS was produced by the Soil Map of SFRJ at a scale of 1:50,000. B&H was covered with 71 sheet (whole) while 45 sheets belonging to RS. The density of profiles was approximately 1/100 ha and all data were included in appropriate soil reports. After all soil maps were scanned and digitised, a problem occurred with their calibration as these maps were prepared using the topographic basis of the central Paris meridian. In addition, soil maps in the forestry sector were prepared for all state-owned forest land in a scale of 1:25,000.

In the context of the FAO sponsored “Inventory of the Post-War Situation of Land Resources in B&H”, the old soil classification was converted to FAO classification. Finally, data were aggregated for printing purpose at a scale of 1:200,000. After the end of the FAO project, unfortunately, there have been no soil mapping activities ongoing in RS.

The Institute for Agriculture of the Republic of Srpska is permanently engaged in laboratory soil analyses mainly for soil fertility control (approximately 3,000 profile/year), but, unfortunately, all these profiles are not imported in GIS.

For pH criteria of ANC delineation purposes, the project team proposes that the pH map derived from previous maps that show the dominant pH values based on SOTER mapping units should be used. The GIS analysis indicates that 898,112 ha of the total area of the Republic of Srpska has a pH in water less than 5. Using the same approach, agricultural land that matches this threshold covers an area of 414,696 ha (approx. 40%).

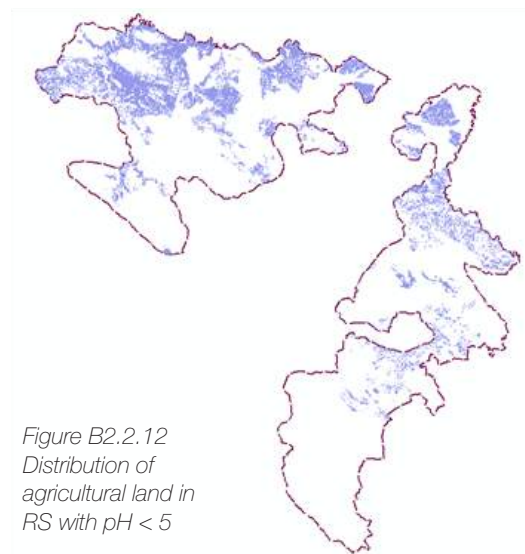


Figure B2.2.12  
Distribution of  
agricultural land in  
RS with pH < 5

## Administrative units

Considering the constitutional organisation of the country with complex jurisdiction on different levels of administration, there is still no diversification on NUTS regions in B&H/RS. The country of B&H is constituted of two entities and the Brčko District. In the RS there are 6 cities and 58 municipalities, with the remark that only the City of Eastern Sarajevo is constituted of several municipalities, therefore, statistically, there are a total of about 63 municipalities. For RS it should be noted that there is no lower area partition in administrative sense. For tax purposes (level of VAT return) there is a 4 level diversification based on the development of the municipalities. The agricultural policy measures (subsidies, concessions, renting, and land use change) are all divided between entities and municipal level.

In cadastral spacing, municipalities are divided in cadastral districts (generally matching settlement borders) and then in cadastral parcels.



Figure B2.2.13. Map 7.  
The Republic of Srpska –  
administrative units

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## B2.5.B DATA GAPS, PROBLEMS, AND SOLUTIONS

Based on the facts presented in this chapter, it can be concluded that RS has a sufficient set of relevant data for the core parameters required by the ANC project.

The main issues are connected with the fact that there are still large sets of data that are not digitised. Therefore, it will be necessary to digitise the profile data deriving from soil maps 1:50,000. There are approximately 20,000 profiles that should be entered into the digitised database after being georeferenced. In addition, there are also other data from different recent research projects that could be used by the ANC project. The RS team will make every effort possible to collect them. Furthermore, it will be necessary to also have reliable hydrogeological maps in GIS for auxiliary analyses to define the water regime in soil as required by the ANC project. Finally, establishing a permanent soil monitoring network would establish the basis for further improvements and updates.

In terms of gaps in climatological data, data for some (shorter) periods are missing and, therefore, approximations have to be done. For instance, the aridity index has never been calculated and it will have to be calculated retroactively on the basis of available data as required by the ANC project.

Basic data on agricultural production as well as the farm register are based on alphanumeric data (old cadastre, etc.), hence establishing LPIS model will be important for all further actions needed to enable sustainable and reliable land policies for rural development. Finally, as already mentioned, the NUTS classification is not adopted yet (due to political issues in the country), therefore, analyses will be made at municipality level.

## B2.6.B PROVISION OF RECOMMENDATIONS FOR IMPROVED DATA MANAGEMENT IN THE CONTEXT OF THE AREAS WITH NATURAL CONSTRAINTS

Data management resources require local, regional and international cooperation through the development and implementation of joint projects, which will bring together and solve issues of data management. All countries should include all scientific, technical and human resources to strengthen the institutions responsible for data management.

Capital investment in research (multidisciplinary and involving more institutions) related to data management, the application of modern methods and techniques in risk assessment are necessary in order to improve data management. Scientific research related to the conservation of soil against any form of degradation, climate change mitigation and the development of information systems in the area of land protection should be the prioritised. The role of government is essential, through the formal education system and improved efficiency and application of the results of scientific research.

## B2.7.B ANALYSES OF THE NATIONAL CAPACITIES FOR DATA MANAGEMENT AND PROVISION OF RECOMMENDATIONS FOR IMPROVED INSTITUTIONAL SETUP WITH REGARD TO THE ANC

Institutions in the Republic of Srpska that are in charge of data management regarding ANC are mostly under the jurisdiction or funded by the Ministry of Agriculture, Forestry and Water management (including the Institute of Hydrometeorology, Institute of Agriculture, the public enterprise for water management, the public forest enterprise, etc.). The Ministry is also the UNCCD focal point for B&H. Other important institutions are the Faculty of Agriculture and the Faculty of Forestry that could assist with data collection relevant to ANC project. The cadastral authorities in RS are in the final phase

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of digitising existing cadastral maps (all maps have been scanned and georeferenced for census purposes). Moreover, the Institute of Hydrometeorology is working on the digitalisation of historical data on temperature and rainfall.

The institutional setup in regard to the ANC project is closely connected with general spatial (land) data management that is underdeveloped in RS although it is legally defined. Unfortunately, spatial data management based on GIS relevant and reliable facts is still not relevant in the decision making context.

## **B2.8.B NATIONAL POLICY ASSESSMENTS AND POLICY RECOMMENDATIONS RELEVANT TO THE CHARACTERISATION AND MAPPING OF AREAS WITH NATURAL CONSTRAINTS INCLUDING SOCIOECONOMIC ANALYSES**

Regarding the characterisation and mapping of areas with natural constraints, it can be concluded that the Republic of Srpska has the appropriate qualified institutions in administrative terms to deal with this issue.

The importance of ANC characterisation is well recognised as a need and priority in RS and is one of its political objectives adopted by its Parliament in the current Strategic plan of agricultural and rural development for the period 2016-2020. The plan requires the identification and mapping of ANCs. This is crucially important for RS legislation and will be necessary to adopt policies and certain rules which will officially establish criteria (preferably identical or largely compatible with those applied in the EU) for delimitation of areas with natural constraints. The final goal will be to introduce differentiated payments and other measures of specific support for these areas.

A core problem that can be emphasised is that all institutions have insufficient staff and equipment for GIS analyses even though much of the data are in different forms. But these institutions do not have official protocols for data exchange and often operate as isolated 'islands'. To accelerate the process of data sharing, political support will be needed to fulfil the ANC project objectives successfully.

Laws and rulebooks that define the establishment of a database for agriculture, forest and water data are adopted and are under jurisdiction of the Ministry of Agriculture, Forestry and Water management, but the system is still not established and operational. WEB GIS data exchange protocols, based on official agreements (i.e. data models) can be defined as a 'light motive'. At the moment the main goal that can be reached is to strengthen the cooperation among all institutions and experts relevant for GIS and other data management. In case ANC data sets are obligatory in the LPIS payment scheme, most of the data and institutional gaps could be overcome.

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# CHAPTER B3

## STATUS OF SOIL, CLIMATE AND DIGITAL MAPPING INFORMATION IN KOSOVO

Sylë Tahirsylaj<sup>1</sup>, Afrim Sharku<sup>2</sup> and Idriz Shala<sup>3</sup>

### B3.1. INTRODUCTION

Kosovo\* has an area of 10,908 km<sup>2</sup> and it is located in Southeast Europe bordering Albania to the southwest, Montenegro to the northwest, Serbia to the northeast and Macedonia to the south.

The territory lies between the geographic latitudes of 41° 51' and 43° 16' and between the longitudes of 19° 59' and 21° 47'. The territory of Kosovo\* is characterised by various altitudes. The lowest point is in the valley of the river Drini i Bardhë, bordering Albania which is only 270 m above sea level (m a.s.l), while the highest point is in the west of Kosovo\*, at Gjeravica mountain having an altitude of 2,656 m. In the hydrological aspect, Kosovo\* is divided into four river basins of Drini i Bardhe, Ibri, Morava e Binçes and Lepenci. These rivers flow into three seas: the Black Sea, the Adriatic and the Aegean Sea.

The climate in the largest part is continental, resulting in hot summers and cold winters, with Mediterranean and continental influence (the average temperature in the country ranges between +30°C in summer and -10°C in winter). However, due to uneven elevations in some parts, there are variations in temperatures and the distribution of precipitation.

According to the statistical yearbook for 2015, Kosovo's\* total residential population in 2013 was 1.820.631 (31 December 2013) with an average population density of 167 inhabitants per km<sup>2</sup>.

Kosovo's\* strategic geographical location and the diversity of natural characteristics, such as geological composition, landscape, climate, hydrology, vegetation and soil types, provide a good basis for economic development.

Agriculture is the main economic activity in the country, with great agrarian density. 2014 Agriculture Census results reveal that the total area of land used for agricultural production was 413,635 hectares. This is 41.8% of the total area of Kosovo\*. On the other hand, the average farm size area is 3.2 ha.

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\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

## B3.2. STATUS OF SOIL DATA

### Historical description of soil surveys

The diversity of Kosovo's\* soils reflects the variety of landscape, geological composition, climate, hydrographic distribution, flora and human action throughout the historical times. In terms of soil quality, the largest part of the territory (56%) is covered with soil of poor quality; another 29% are classified to have average values and only 15% of the country's soils are ranked as good.

The first soil research started in the former Yugoslavia during the '50s that resulted in the preparation of several soil maps of Kosovo\* at a scale of 1: 50,000. Based on these maps and some additional research, the Pedologic Atlas of Kosovo\* IDWR, edited by the Institute "Jaroslav Cerni" of Belgrade, which included 101 systematic mapping units, was prepared in 1974.

Besides the description of soil types, the atlas comprises 3 basic soil data for each of these soil types, such as:

- soil texture,
- soil depth,
- drainage.

All other scientific research made for Kosovo\* soil was systematically based upon this atlas, which shows its great importance in documenting the country's soil resources.

Before the Kosovo\* war of 1999, this atlas was used as a main source for the Agricultural Land Suitability Classification system, where the agricultural land was divided into 8 classes. This system was the basis of the state land taxation system in agriculture and at the same time served as a source of definition of land use.

After the Kosovo\* war, the European Union's IPA Programme for Kosovo\* implemented the project number 2010/230-489 entitled "Further Support to Land Use". In cooperation with the Ministry of Agriculture, Forestry and Rural Development (MAFRD) staff, this project has prepared a new Agricultural Land Suitability Classification, which is still based on the main data deriving from the previous soil atlas containing 101 soil systematic mapping units but provides updates in terms of soil texture, depth and drainage.

Based on this methodology, the Kosovo\* Government, under Administrative Instruction No. 02/2012, prepared and approved the new Agricultural Land Suitability Classification.

All the soil data available in digital georeferenced format or hard copy will be used by the ANC project; nevertheless, these data are limited and not sufficient to complete the delineation of the ANCs in Kosovo\* successfully.

### Maps in digital format

#### Soil Map

In the absence of other adequate sources of soil data, the soil atlas of Kosovo\* IDWR 1974 still serves as a basic source of soil information and land issues in Kosovo\*. As such, this atlas was digitised after the war and was used to prepare digital maps of Kosovo\* keeping the original naming and original borders of the atlas.

Copies of the atlas in a digital format can be found in the database of the Spatial Planning Application for Kosovo\* (SPAK System), prepared by the project: "Implementation and Enforcement of Rural Spatial Planning in Kosovo\*" (EuropeAid/133847/C/SER/XK), managed by the Ministry of Environment and Spatial Planning.

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**Other soil related maps in digital format:**

Map of Elevation  
Map of Soil Erosion Risk  
Map of Environmental Soil Sensitivity  
Map of Integrated Land Suitability  
Map of Agricultural Land Suitability Classification  
Land Use Intensity Plan  
Map of Flood Risk, etc.

All these maps are prepared using the abovementioned 1974 soil map as a basic resource.

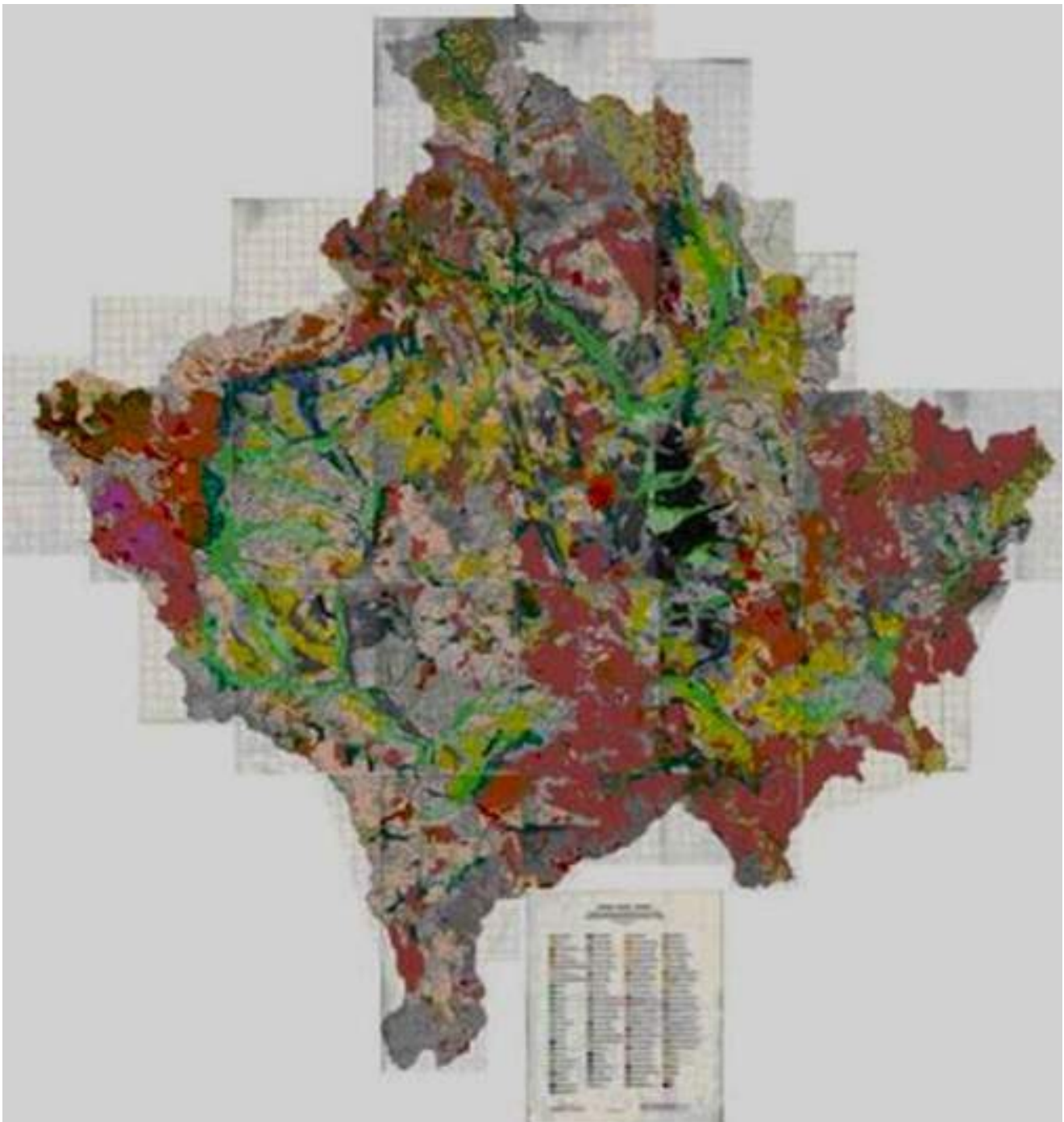


Figure B3.1. Kosovo\* soil map at a scale of 1:50,000

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## Data in digital format

An agriculture census was held in Kosovo\* in 2014. Based on its results, the Statistical Agency of Kosovo\* has prepared a detailed report which provides data for land resources in a digital format. This report can be downloaded at this link: [http://ask.rks-gov.net/publikimet/cat\\_view/9-bujqesia](http://ask.rks-gov.net/publikimet/cat_view/9-bujqesia)

## Soil data needed for the delineation of ANCs

*\*At the best of their availability, these data will be used by the ANC project.*

### Drainage classification (poorly drained or very poorly drained)

The classification of soil drainage is described for the first time in the soil atlas of Kosovo\* IDWR 1974.

Based on this atlas drainage classes are divided into 4 groups:

d_1	poor
d_2	average
d_3	good
d_4	very good

### Soil depth (If equal or less than 30 cm)

The classification of soil depth is described also in the soil atlas of Kosovo IDWR 1974. Depth of soil is measured in open profiles and divided into 4 groups:

D_1	Very shallow (<25 cm)
D_2	Shallow (25-50 cm)
D_3	Average deep (50-80 cm)
D_4	Deep (>80cm)

### Soil Texture

The soil atlas of Kosovo\* IDWR 1974 groups soils in five classes, based on the percentage proportions of sand, silt, and clay:

S	gravel,
P	sand
Pi	sandy-loam
i	loam
G	clay

The determination of the soil texture was done using the international pipette B method (ISO 11277:2009). Apart from this method, a number of Kosovo\* soil laboratories use the Standard Test Method for Particle-Size Analysis of Soils “ASTM D 422” (<http://www.astm.org/Standards/D422>). The ANC soil texture data requirements are related to sandy or clayey soils, hence further subdivision and elaborations will be needed to identify their distribution throughout the agricultural land and natural pastures.

### Surface stoniness

Limited data are available for this ANC soil texture requirement and additional field surveys will be needed for their delineation.

### Soil Organic Matter (if equal or more than 30%)

This ANC soil indicator is related to organic soil or the Histosols, but their extension in Kosovo\* is very limited if none.

### Salinity (if equal or more than 4 dS/m) and Sodicity (if equal or more than 6 ESP)

Both salinity and sodicity are very limited or non-existent in Kosovo\*.

### Acidity (if equal or less than 5 pH in water)

Limited analytical data are available about soil acidity. Preliminary information will be derived from the soil map of 1974 from the “dystric” sub-groups, but additional soil sampling is needed and new

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

laboratory analyses should be performed on these soil samples.

As previously mentioned, the only source of soil data in Kosovo\* is the soil map prepared in 1974 during the time of former Yugoslavia. It should be mentioned, however, that the ANC Kosovo\* team does not have access to these data. The only information available is an image file of the soil map without any other information (i.e. profile descriptions or laboratory analytical data).

In addition, there are some other soil data generated through various international projects that will be collected and validated. Nevertheless, they cover specific areas, such as vineyards and orchards, and not the whole agricultural area or natural pastures that are the subject of investigation of the ANC project.

### B3.3. STATUS OF CLIMATE DATA

The ANC project is very ambitious in regard to climate data. Therefore, to be able to respond to these requirements, all data available in Kosovo will be collected, preferably for as long period as possible. However, based on the documentation gathered from meteorological observations, climatic and meteorological measurements of the Republic of Kosovo\*, it is evident that there is discrepancy between the daily, monthly and annual measurements. This relates to the series of measurements as well as to poor registration of qualitative data regarding these measurements. However, regardless of this situation, every possible effort will be made to collect at least the monthly average rainfall and temperature data at least for the period 1961-1991. In fact, this climatological database will be the standard period for a number of other countries involved in the ANC project.

#### General characteristics of the climate in Kosovo\*

Two types of climate characterise the Republic of Kosovo\*:

- Mediterranean climate which covers the lower watershed area of the river Drini i Bardhe (or White Drini in English) and
- European continental climate.

Based on the climate data dating back to 1922, it should be noted that the territory of the Republic of Kosovo has also a few more microclimatic regions with specific features. These are mainly located in closed valleys of limited extent affected mostly by the influence of maritime Mediterranean climate.

#### The network of meteorological stations

According to historical data, the first meteorological station in Kosovo\* was set near the Albanian border in the village of Vermicë in 1922. In addition to climatological measurements, a hydrometer was also put in the river Drini i Bardhe. Later on in 1925, a set of meteorological, climatological and agro-meteorological stations were spread across the territory.

This network system operated until the Second World War (WW2) with 28 stations and three main meteorological stations, each of them covering on average about 360 km<sup>2</sup>. The intensity of meteorological stations increased notable after the WW2 reaching 126 stations and covering about 87 km<sup>2</sup> per station which is very good from a climatological perspective.

The area covered by climatological measurements for various river basins in Kosovo\* is as follows:

- White Drini basin and river Plava: 1 measurement station in 71 km<sup>2</sup>,
- Ibri basin and Sitnica: 1 measurement station in 96 km<sup>2</sup>,
- Basin of Morava Binçes: 1 measurement station in 78 km<sup>2</sup>,
- Basin of Lepenci: 1 measurement station in 39 km<sup>2</sup>.

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

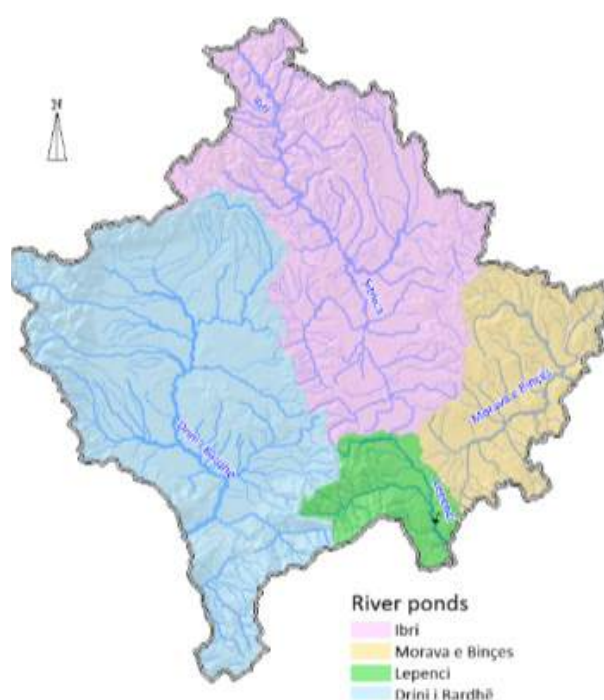


Figure B3.2 River basins in Kosovo\*

After the last war in Kosovo\*, especially during the period from 1989 to 2000, there was a complete break in hydro-meteorological activities at national level. The situation has somehow improved since the year 2000 due to the support of international projects and those funded by the EU. New stations were installed in the same place where the previous stations stood since 1922. This ensured continuity in data collection and reaffirmed the fact that these stations were originally placed in the perfect positions for meteorological, climatological and agro-meteorological measurements.

The distribution of stations for measuring rainfall across the river basins of Kosovo\* is spread according to elevation zones and it appears to have a good coverage with the installation of new stations.

The greatest number of stations is at elevation 650 meters above sea level (66% of total stations), while in the territories over 1,000 meters there are only 12 stations. The preparation and collection of meteorological data is done from one synoptic station in Pristina and three geophysical stations in Peja, while there are also eight simple meteorological stations in: Banjskë, Dragash, Gjakovë, Podujevë, Suharekë, Ferizaj, Mitrovice, Istog and a few other stations measuring rainfall.

### Processed meteorological elements

The period from 1948 to 1978 is considered rich in climate data collection deriving from all the meteorological stations spread throughout the territory. Between 1978 and 2000 (this period includes also the last war in Kosovo\*), climate data collection stopped completely. Since 2001 until the present the situation has improved and the HMIK (Hydrometeorological Institute of Kosovo) database includes a set of meteorological and climatological measurements for stations ranked as first, second, etc. Nevertheless, as previously mentioned, the basic recording period for the delineation of the ANCs in Kosovo\* will be the period 1961-1991. Expectations are, however, that Kosovo\* does not have inside its territory areas that qualify as ANC based on aridity index, but most likely those with a shorter growing period located at higher elevations.

It should be noted that in a few stations, such as Prishtina, Peja and Prizren, since 1925 soil temperature measurements have been made at various depths (2.5, 10, 20, 50 cm up to 1 meter).

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Figure B3.3 Meteorological Stations

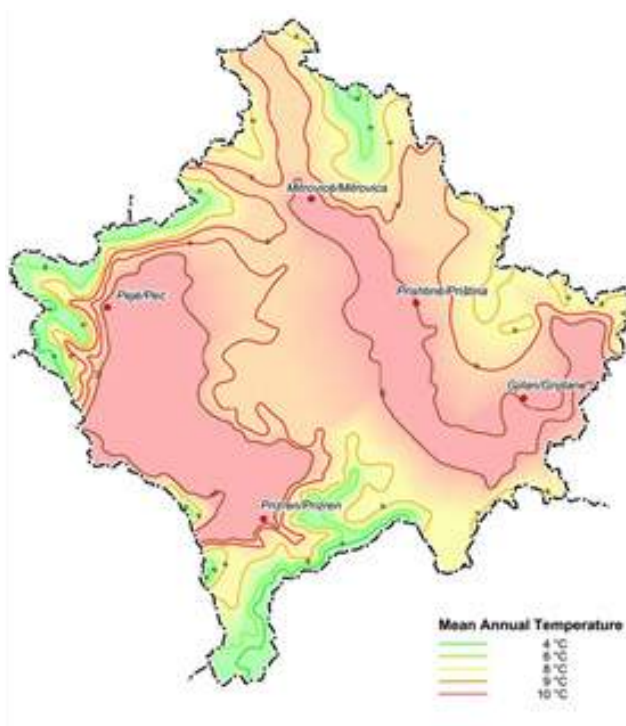


Figure B3.4. Mean annual air temperature

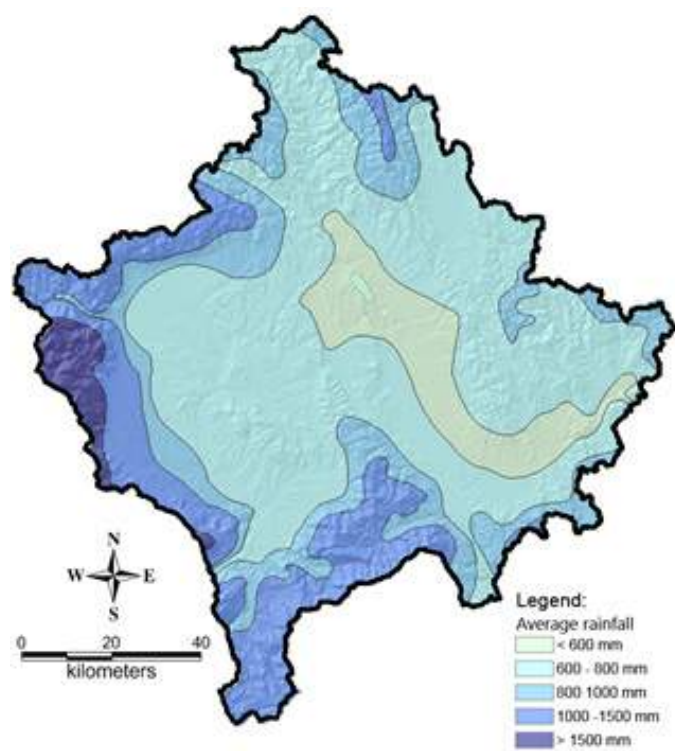


Figure B3.5 Average rainfall distribution in Kosovo\*



Figure B3.6 National Hydrometric Network

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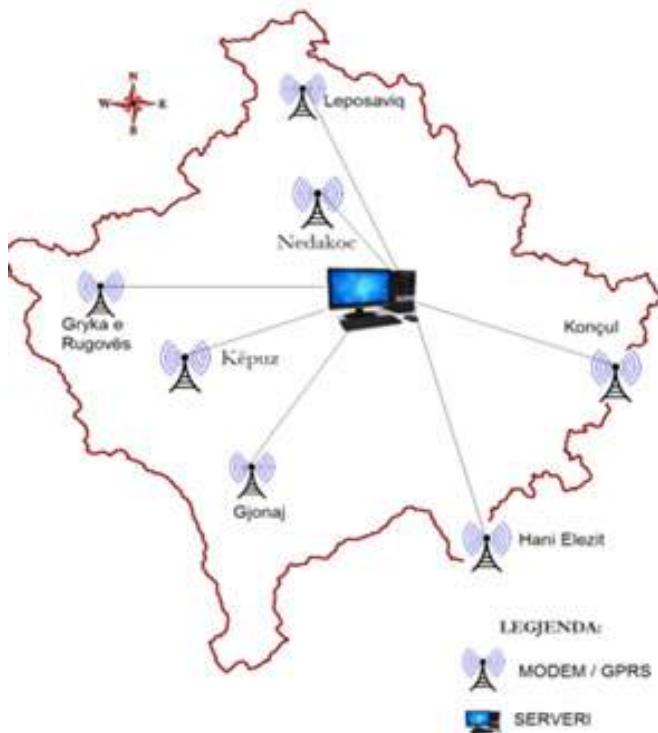


Figure B3.7 Hydrometeorology station with GPRS

### B3.4.STATUS OF GEOGRAPHICAL INFORMATION SYSTEM (GIS) DATA

The territory of Kosovo\* is covered with detailed georeferenced points at the distance of 10 meters. The existing database contains the following relevant attribute points needed to prepare a Digital Terrain Model (DTM) needed for ANC delineation:

Model (DTM) needed for ANC delineation:

- Y coordinates
- X coordinates
- H level



Figure B3.8. Digital elevation map for Kosovo

The DTM of Kosovo\* (Figure B3.8) also includes the Data Format: txt file; Resolution: 10 m, Coverage: the entire territory of the country, Coordinate system: Kosovaref01 and UTM WGS 84 File type: XYZ file Data: 2004. This is a good starting point for ANC delineation regarding the relief requirement or areas with a slope higher than 15%. The owner of these data is the Kosovo\* Cadastral Agency.

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### The administrative divisions in Kosovo

The Nomenclature of Territorial Units for Statistics (NUTS) is a geographical nomenclature dividing the territory of the European Union into regions of three different levels (NUTS 1, 2 and 3, respectively), moving from larger to smaller territorial units. The NUTS is based on the Regulation 1059/2003 on the establishment of a common classification of territorial units for statistics, approved in 2003 and amended in the following years to extend the NUTS system to the new Member States. When a new country joins the EU, its territory is organised in statistical regions corresponding to NUTS. The main purpose of dividing the country into NUTS areas is to establish a common statistical classification of territorial units, in order to enable the collection, compilation and dissemination of harmonised regional statistics in the Community.



Figure B3.9. Map of Kosovo\* – Municipalities

According to the current legal regulation in Kosovo\*, there is no NUTS administrative division. The law on Kosovo's\* Territorial Organisation entered into force on 20 February 2008 and the Assembly of Kosovo\* adopted the law No. 03/L-041 on administrative municipal boundaries, published in the Official Gazette of Kosovo\*, Prishtina Year III, No. 26, dated 02 June 2008. Under this law the territory of Kosovo\* is divided into 38 municipalities and 1,469 settlements (Figure 9). GIS data for all the territorial and administrative division of Kosovo\* are available in ESRI shape file format and will be used by the ANC project.

Since the regional division of Kosovo\* is not yet endorsed by the national legislation, defining its regions in accordance with NUTS classification will be done in compliance with the criteria defined by Regulation (EC) No 1059/2003 of the European Parliament and of the Council dated 26 May 2003. At present, Kosovo's\* territory is divided as given in Figure B3.10.

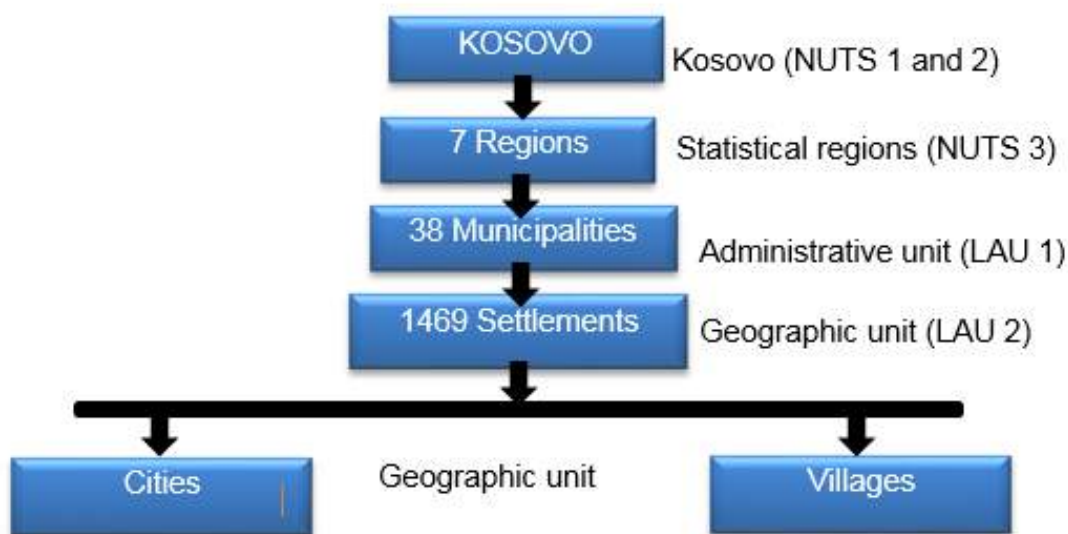


Figure B3.10. Territorial organisation in Kosovo\*

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

The Ministry of Environment and Spatial Planning (MESP) has some data related to land use that were created during the drafting of municipal development plans. But these data are in different GIS formats and the methodologies used to create these data are not totally harmonised with international standards. Nevertheless, these data are fragmentary and not available for the whole territory of Kosovo. The Kosovo\* ANC team will make every effort possible to acquire these data for the benefit of the ANC project.

The Ministry of Agriculture, Forestry and Rural Development (MAFRD) has developed a parcels system called Land Parcel Identification System (LPIS). The LPIS is one of the elements of the Integrated Administration and Control System and is a key tool for the control of agricultural subsidies provided by the Common Agricultural Policy. Moreover, the LPIS is a system which identifies agricultural parcels which are currently arable. The LPIS is based on a GIS application based on web access via the Internet. It contains orthophotos of the entire territory of Kosovo and will be crucial, if not complementary, for the development of the ANC web-based GIS system.

Since at the LIPS additional layers can be added easily, this enables the digitisation of agricultural parcels and assigning of attributes data for each farmer. This enables an electronic application for direct payments for each area, thus, creating a geo-database for all agricultural parcels which are arable in Kosovo\*. It is for these reasons that the Kosovo\* ANC team proposes that the LIPS system should be linked with the forthcoming ANC system in order to facilitate the financial support and subsidies to farmers located in the ANC areas. In 2012 a new GEOBASE was created populated with the data showing agricultural land suitability map, Construction Zoning Plan with all restrictions, Construction Zoning Plan with classed restrictions, Optimised Land use plan, and the Rural Environmental action plan. In some cases there are also spatial data showing specific land use types, such as vineyards and forests.

The latest Agriculture Census in Kosovo\* was conducted in 2014 and Table 1 shows some of its findings. Agricultural holdings in Kosovo\* (agricultural households and legal entities with agricultural activity) own 310,691 hectares of land. On average, a single farm owns 2.4 hectares of land and there are 3,904 farmers (3% of the total) who lease 6,311 ha of agricultural land. Renting land from the others is far more frequent than leasing the land. Almost 15.8% of agricultural holdings rent about 60,032 ha.

For the ANC project objectives, the total utilised agricultural area (UAA) of 413,635.16 ha will be the subject of study and mapping, since this area includes also the surfaces covered by natural pastures as defined by the CORINE 2012 methodology and cartography.

In the structure of land used by agricultural holdings, the largest share (80.8%) is the so-called utilised agricultural area (UAA), which is characterised by productive farming finalised with yields and harvests.

Table B3.1. Agricultural holdings by land ownership, Kosovo\*, 2014

	Number of agricultural holdings	Area (ha)
Total land area	130 662	512 000.29
Land owned	130 439	310 691.05
Land rented from other	20 679	60 032.43
Land leased to others	3 904	6 310.75
Common land	24 808	147 587.56
Utilized agricultural area	129 884	413 635.16
Utilized agricultural area - rented from others	20 605	55 372.08

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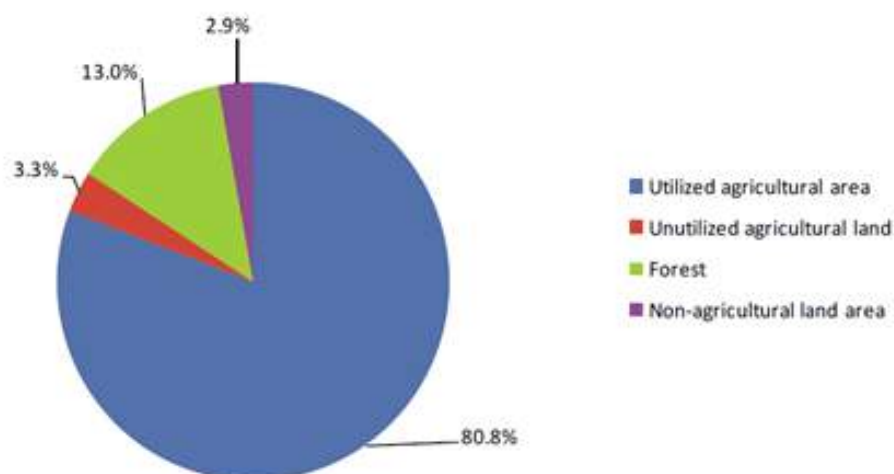


Figure B3.11. Structure of land on agricultural holdings, Kosovo\*, 2014

Table B3.2. Total land use and use of agricultural land on agricultural holdings. Kosovo\*. 2014

	Number of agricultural holdings	Area (ha)
<b>Land area - Total</b>	<b>130 662</b>	<b>512 000.29</b>
<b>Utilized agricultural area</b>	<b>129 884</b>	<b>413 635.16</b>
Arable land	113 231	180 381.11
Kitchen gardens	46 458	1 054.99
Permanent grassland (including common land)	79 761	224 410.83
Permanent crops	24 909	7 788.23
Orchards	19 619	4 390.24
Vineyards	6 242	3 215.26
Nurseries	698	182.73
<b>Unutilized agricultural land</b>	<b>18 317</b>	<b>17 142.35</b>
<b>Fores<sup>1</sup></b>	<b>58 874</b>	<b>66 558.23</b>
<b>Non-agricultural area</b>	<b>125 515</b>	<b>14 664.55</b>

The average size of agricultural holdings in Kosovo\* is 3.2 ha of utilised agricultural land, but the farms with 2-5 ha are most common (23.3%).

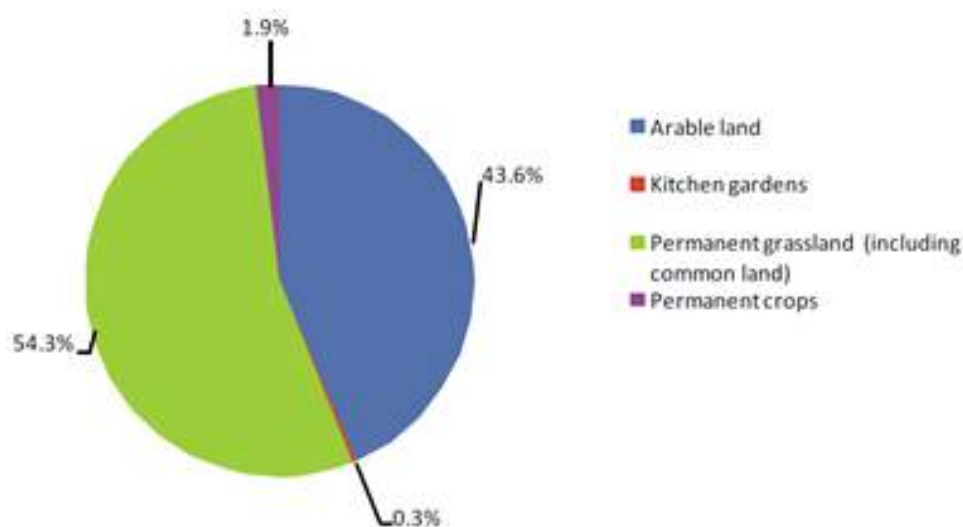


Figure B3.12. Structure of utilised agricultural area (UAA) on agricultural holdings, Kosovo\*, 2014

<sup>1</sup> This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

Within the utilised agricultural land, the largest area belongs to permanent grasslands (54.3%), followed by arable land (43.6%), permanent crops (1.9%) and kitchen gardens (0.3%).

### Land cover information in Kosovo\*

Data on land cover in Kosovo\* are derived from the CORINE 2012 database, which was the basis for the creation of Corine Land Cover (CLC2012, Fig. B3.13) classes. The main purpose of the CLC is to provide an inventory of the land surface for environmental management purposes and rural development. It should be noted that the CLC2012 is designed with special features for the Western Balkan countries with the help of international and local experts, including those from Kosovo\*. The main task of CLC 2012 was to compare and identify changes in land cover between CORINE 2006 and 2012

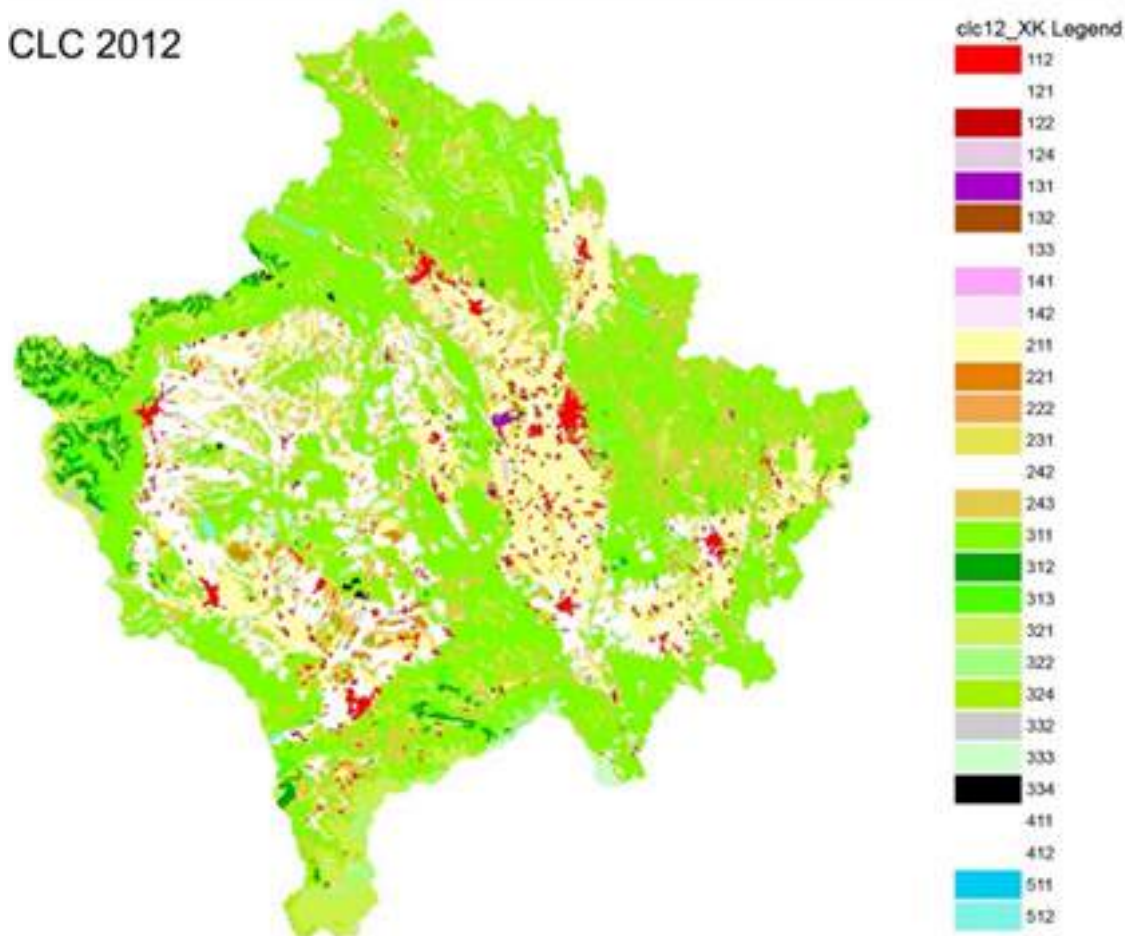


Figure B3.13. CORINE Land cover 2012

From a total of 44 CORINE2012 classes, 28 are identified in Kosovo\*. These are grouped into four main classes. The largest area is dominated by forests and semi-natural areas (about 57%) followed by agricultural lands (around 40%), while artificial lands cover 3.0% of the total territory and the rest (about 0.3%) is classified as water bodies and wetlands.

Ancillary data that could be used by the ANC project include satellite images of 2012, orthophoto of 2004, 2008 and 2012 and various topographic maps. The most common software used are InterChange 3.1, InterCheck, ArcGIS, and MapInfo. As previously mentioned, the owner of these digital data is the Ministry of Environment and Spatial Planning/Kosovo\* Environmental protection Agency. Assistance will be needed to have access to the data for successful completion of the ANC project.

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## B3.5 DATA GAPS, PROBLEMS, AND SOLUTIONS

### Soil data

#### Gaps

- The existing soil data included in the Soil Atlas of former Yugoslavia are very old dating back to soil analyses made during the 50s, 60s and 70s.
- The systematic soil survey was made based on a methodology that is not compliant with existing soil classification systems and not fully appropriate to satisfy the ANC project requirements for soil characteristics. From the time when the study was conducted until the present more than 60 years have passed and since then land uses have changed affecting soil properties.
- The number of the representative profiles at the time of the survey was 1 for 200 ha. This is far too small to satisfy the requirements of the ANC project.
- Despite all the mentioned shortcomings, unfortunately the ANC Kosovo\* team does not have access to soil information, including in the Soil Atlas of the former Yugoslavia.

#### Proposed solutions

Soil information stored in the archives of Serbian institutions should be requested from the Serbian authorities. However, even if this happens, it would be a partial solution to the problem since much of this information is obsolete as it was strongly emphasised in this report. Therefore, the Kosovo\* ANC team proposes that a new soil survey for Kosovo\* should be launched. The details of this survey, such as scale, number of soil profiles to be sampled, laboratory analyses, GIS elaboration and development of the GIS Soil Information System for Kosovo\*, will depend on funding available. Otherwise, the accomplishment of the ANC project in Kosovo\* is in great jeopardy.

### Climate Data

#### Gaps

Climate data in Kosovo\* are scarce and with shortcomings. During the last war in Kosovo\*, every station and institution was completely destroyed and data were lost. From 1998 to 2000 not a single meteorological activity was conducted. The situation improved somehow after 2001 with the installation of three stations in Prishtina, Peja and Ferizaj and in 2004 in Podujevo and Mitrovica for climatological measurements. In 2013, 11 new stations for air quality, as well as 36 hydrometric measurement stations and 38 rainfall stations were installed. Nevertheless, problems of vandalism have often created interruptions in data collection.

In conclusion, Kosovo\* has 17 meteorological stations together with air quality stations which measure meteorological elements every 30 minutes. The facility is at the Institute of Hydrometeorology (IHMK). But data are not free of charge. However, these data are not suitable for the ANC project requirements needing a 30 year period for data elaboration. In that context, the only source is the period 1961-1991. Kosovo\* institutions do not have access to these data that should be available at the Hydro Meteorological Institute of Serbia in Belgrade.

#### Proposed solutions

Climate data should be requested from the Hydro Meteorological Institute of Serbia in Belgrade.

### GIS Data

Close collaboration between the Ministry of Agriculture, Forest and Rural Development and the Ministry of Environment is needed to accelerate the release and exchange of information for land cover 2012 in the right format required by the ANC project. A land use map for Kosovo\* does not exist at the present time, therefore, CORINE2012 remains to be the only reliable source that fulfils well the ANC project requirements for land cover data.

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## **B3.6. PROVISION OF RECOMMENDATIONS FOR IMPROVED DATA MANAGEMENT IN THE CONTEXT OF THE AREAS WITH NATURAL CONSTRAINTS**

### **Soil data**

It is strongly re-emphasised that the MAFRD should urgently start the preparation phase to prepare a new soil map of Kosovo\* based on modern soil classification systems and EU methodologies. If no international funding is available (this is very unlikely), the MAFRD should consider allocating its own proper funding for such activity that will definitely place Kosovo\* at the same level and standards with other neighbouring nations and EU member states.

### **Climate Data**

Every effort should be made to increase the number of meteorological stations throughout Kosovo\* and assure their continuous functioning according to international standards established by the WMO.

### **GIS Data**

There is a wealth of GIS data that needs to be made available to the ANC project but access to this data is a problem. For instance, data from Kosovo\* Cadastral Agency are not free of charge, therefore, the MAFRD should sign a memorandum of understanding with the Agency to facilitate data sharing for the purposes of the ANC project.

## **B3.7. ANALYSES OF THE NATIONAL CAPACITIES FOR DATA MANAGEMENT AND PROVISION OF RECOMMENDATIONS FOR IMPROVED INSTITUTIONAL SETUP WITH REGARD TO THE ANC**

### **Soil issues**

The MAFRD has in its organisational structure the Land Division. However, taking into account the volume of works and problems that Kosovo\* faces, such as: changing of land use destination of agricultural land, fragmentation of plots, lack of knowledge on proper land management, lack of knowledge about optimal land use, lack of appropriate plans for land exploitation, etc., this division is lagging behind in fulfilling its mission. Therefore, the Ministry should strengthen it in terms of human resources (increase of staff and experts on land issues), and also in terms of strengthening the capacities of existing staff.

In terms of defining the ANCs, the Ministry and local authorities should provide support but also become familiar themselves with the ANC methodology since, provided the project becomes reality in the coming years, it will be the staff of the Ministry that will implement ANC results in terms of rural development policies as well as programs, grants and subsidies for ANC farmers.

### **Climate issues**

Institutions in charge of meteorological issues in Kosovo\* include the Ministry of Environment and Physical Planning and its structures (Environmental Protection Agency), the Institute of Agriculture in Peja, the Ministry of Health of Kosovo\* (National Health Institute) and the Statistical Institution of Kosovo\*. National capacities are weak and there is a need to ask for more engagement within their scope and proper coordination of the work at national level with specific focus issues addressed by the ANC project.

### **GIS Data**

Several sets of data are available in GIS format and will be used in the due course of the project. It is worth mentioning that there are trained experts in the country who are familiar with the GIS software,

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therefore, no major constraints would be encountered. The main issue remains free access of data and data sharing hosted between various institutions, both public and private.

### **B3.8. NATIONAL POLICY ASSESSMENTS AND POLICY RECOMMENDATIONS RELEVANT TO THE CHARACTERISATION AND MAPPING OF AREAS WITH NATURAL CONSTRAINTS INCLUDING SOCIOECONOMIC ANALYSES**

#### **Soil, climate and GIS issues and the ANC project**

The ANC project should be better known to Kosovar institutions, including the government, farmer organisations and related NGOs. They all have a stake and it is only through a participatory approach that the project could fulfil its objectives. It is proposed that a national workshop should be organised in Prishtina to explain the objectives, methodology and expected results of the project. Out of this workshop it should be clear what is needed to make the project a reality and what the project will offer to policy makers and farmers alike. Only in this way, could the much needed collaboration between various institutions that possess data be reached, at least for those data that are available inside Kosovo\*. The country needs to heal the wounds of the past and look forward towards EU integration.

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

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\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

# CHAPTER B4

## STATUS OF SOIL, CLIMATE AND DIGITAL MAPPING INFORMATION IN MACEDONIA

Nina Aleksovska<sup>1</sup>, Dusko Mukaetov<sup>2</sup>, Ordan Cukaliev<sup>3</sup> and Aleksandra Martinovska Stojcheska<sup>3</sup>

### B4.1. INTRODUCTION

Macedonia is located in the central part of the Balkan Peninsula. It is a landlocked country having an area of 25,713 km<sup>2</sup>, representing one of the smallest countries in Europe. It is bordered by Serbia and Kosovo\* to the north, Bulgaria to the east, Greece to the south, and Albania to the west.

#### Relief

A wide variety of relief types exists in Macedonia. Great relief forms like mountains, valleys, and gorges are mixed with smaller formations such as paleo-reliefs, abrasive, glacial, and karst types. The territory of Macedonia generally belongs to two regions: a) Rodopian region of ancient mountains and ravines located in the eastern part of the country and b) a region of young (recent) mountains and ravines located in the western and central part.

The average elevation is 829.7 m above sea level, while the mean slope is 15.10 for the 33.56% of the country's territory. The dominant relief forms include hilly-mountainous zone (44.0%), mountainous zone (21.3%) as well as the flat and flat-hilly zone covering approximately 20% of the territory.

#### Geology

The Republic of Macedonia can be divided into four geo-tectonic regions: a) Serbian-Macedonian massif, b) Povardarie area, c) Pelagonia massif and d) Western Macedonia zone. All geo-tectonic zones are characterised by diverse landforms and processes that shape them. Due to numerous different geological formations, which differ even on small distances in their age, mineralogical and petrologic composition, there is high heterogeneity of soil cover.

Although very heterogeneous, geological formations of the mountainous regions differ greatly from those of the lowlands, the mountainous region is generally composed of compact (solid) rocks with eruptive or metamorphic origin. Only a small part of it consists of clastic (loose and weakly connected) sediments, such as flysch morenic sediments, fluvio-glacial material and diluvia breccia.

The valleys are mainly filled with clastic mechanical sediments which are usually loose or weakly

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connected. Only a very small part of the valleys consists of recent compact stones (vulcanite). This lithographic variability in combination with the relief have a strong influence on soil formation and its further resilience or vulnerability to various types of land degradation.

## Soils

Although with very small territory, the Republic of Macedonia has a very diverse soil cover changing spatially over very small distances. In general, soil cover can be divided into four major zones: a) soils of the plains, b) soils of the sloppy terrains, c) soils of the hilly terrains and lake terraces, and d) soils of the mountainous regions.

In the **plains**, *fluviatile soils are the dominant soil type* which as a separate cartographic unit covers 136.343,60 ha (5.45%) of the country territory. The complex of *vertisol+hymic calcaric regosol + leptosol* covers approximately 133.542,20 ha (5.33%). In the dry flat bottom of some valleys there are also salinic soils with about 13.863,22 ha (0.55%).

**Hilly areas and lake terraces** which are spread just above the flat bottom of the lowlands are mainly under cover of the following soil types: *Regosols*, as a separate cartographic unit covers 108.291,60 ha (4.43%) and in complexes with *Hymic Calcaric Regosols*, *Leptosols*, *Molic Leptosols* and *Vertisols* *altogether* covers an additional 100.768,70 ha, (4.03%), *Vertisols*, as a separate cartographic unit, covers about 85.779,23 ha (3.43%). They are likely to be characterised as ANC, provided the clay content criteria are fulfilled. *Renzinas* are estimated at 49.678,59 ha (1.98%). *Chromic Cambisols on saprolite*, cover 96.594,38 ha, (3.86%), while as a complex with *Leptosols*, *Luvissols*, *Hymic calcaric Regosols* and *Vertisols*, they cover 88.016,32 ha (3.52%).

**Sloppy areas** which are formed on deposits of proluvial sediment on the foothills of the mountainous areas and in the valleys are mainly covered by *Fluvisols*, which as a separate cartographic unit covers an area of 181.391.20 ha (7.25%).

The most dominating soil types in the **mountainous regions** are *Leptosols*, with a total area of 378.325,00 ha (14.73%), *Mollic* and *Umbric Leptosols*, which as a separate map unit cover 142.294.80 ha (5.68%), while as a complex with other mountainous soils they cover much of the higher territory. *Leptosols* are good indicators of ANC areas if the soil depth is less than 30 cm. *Calcomelanosols* cover approximately an area of about 238.396,57 ha or 9.52%. *Forest Cambisol* (*Dystric* and *Eutric Cambisols*), as a separate cartographic unit cover a total area of 397.285,20 ha (18.87%), while as a complex with *Mollic* and *Umbric Leptosols*, *Leptosols* and *Regosols* they cover an additional area of 377.249,70 ha (18.07%).

## Land cover

CORINE Land cover is the only available and most relevant source of information in the country. According to CORINE LCU classification – level 1, forests and semi-natural areas cover 60.2% of the whole territory, while agricultural land occupies 36.5%. The land cover data presented in the following map and table are based on CORINE land cover project for 2006.



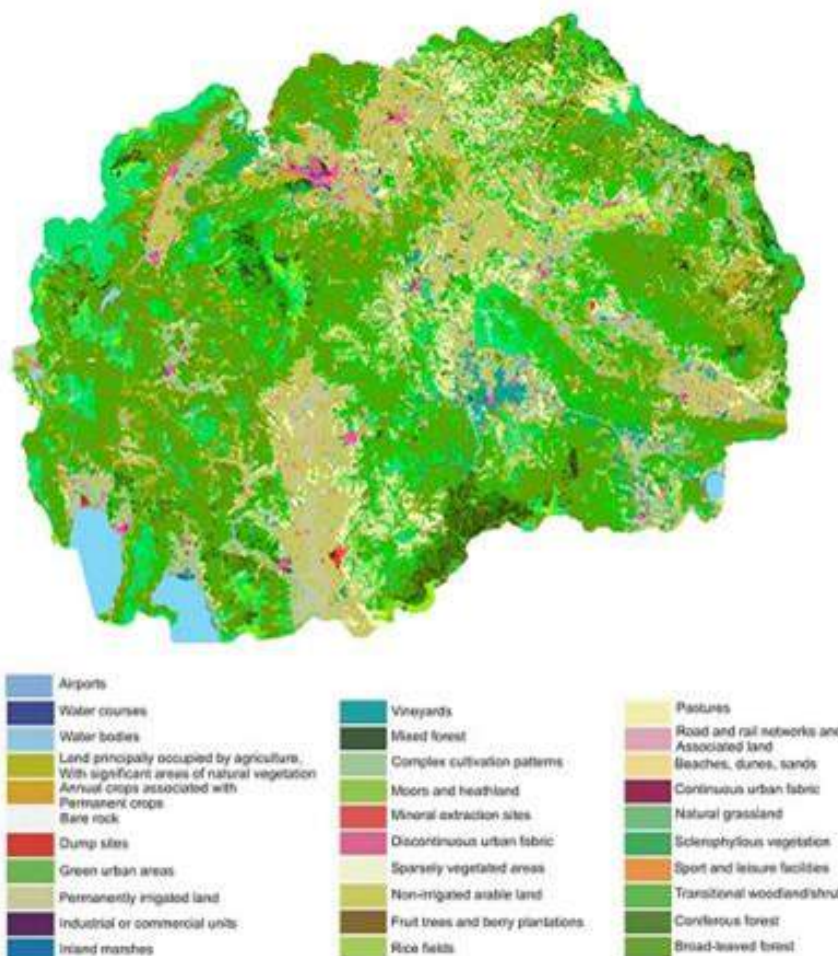


Figure B4.1. Land Cover of Macedonia – CORINE LCU 2006 (level 3)

Table B4.1. Land cover 2006 (according to the CORINE LCU – level 1)

Class	2006 r. (ha)	%
Artificial surfaces	41,480	1.6
Agricultural areas	939,013	36.5
Forest and semi natural areas	1,548,855	60.2
Wetlands	56,444	2.1
Water bodies	2,015	0.08

### Land use

According to the data presented in Table 2 below, out of the total area, almost 85% is productive land, while the rest of 15.07% is under the category of unproductive land. The productive land is split between forest land (38.18%) and agricultural land (43.57%), which is divided into the following two subcategories: pastures (23.65%) and arable land (19.89%). There are several categories within arable land, among which the dominant category is ploughed lands and gardens with 16.13%. For the purposes of the ANC project the area under study will be the agricultural land including all of its sub-divisions.

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

Table B4.2. Land use in the Republic of Macedonia

Land use distribution		
	Area	
	[ha]	[%]
<b>Total land</b>	<b>2,571,300</b>	<b>100</b>
1. Productive land	2,183,766	84.93
1.1. Forest land	981,812	38.18
1.2. Agricultural land	1,120,213	43.57
1.2.1. Pastures	608,176	23.65
1.2.2. Arable land	511,316	19.89
1.2.2.1. Ploughed lands and gardens	414,829	16.13
1.2.2.2. Orchards	14,469	0.56
1.2.2.3. Vineyards	20,695	0.80
1.2.2.4. Natural meadows	61,323	2.38
<b>2. Unproductive land</b>	<b>387,534</b>	<b>15.07</b>
2.1. Waters	81,741	3.18
2.2. Other	305,793	11.89

Source: State statistical office, 2012

Cereal crops are grown on about 41% of the arable land area (wheat, barley, maize, rye, oats and rice). The main industrial crops are sunflower and tobacco, a major export product produced exclusively by small farmers. In the year of 2013, vegetables were produced on a total area of 49,560 ha. The total area for fruit production is about 15.000,00 ha (apples, plums, sour cherries, pears, and peaches). Grape, grown on approximately 22.000,00 ha of which more than 2/3 are used for wine production, and viticulture are one of the most important sectors with wine being a significant export commodity.

In 2007 (Agriculture Census) there were about 192.675,00 agricultural holdings encompassing some 334.226,00 ha of utilised agricultural land with an average size of 1.73 ha showing great farm fragmentation. The average plot size decreases constantly and depending on data sources it varies between 0.12-0.3 ha. Individual farmers own about 81% of the arable land; the remainder is owned or leased by agricultural holdings (or state-owned). The 2007 Agriculture Census reported 192.378,00 private farms and 297 agricultural holdings. The average farm size of private farmers is 1.37 ha of utilised agricultural area and agricultural holdings use in average 235.3 ha of utilised agricultural area. The process of privatisation of state-owned agricultural land started in 2014. Some 196.841,00 ha or about 20% of the agricultural arable land is owned by the state. Most of the pastures are state-owned and are managed by a public enterprise called Macedonian Pastures.

The transfer of the agricultural population into a non-agricultural population and the process of degradation and decrease in the size of farm holdings are considered to be negative trends and should be solved through better agricultural policies.

The number of holdings is relatively evenly distributed among the regions, with 15 thousand being in the Skopje region and 26 thousand being in the southeast region (B4.3). Pelagonia is the region with the largest agricultural area, livestock numbers and agricultural employment. Namely, one-fourth of the total utilised land is in this region, thus resulting in the highest average holding size of 3.2 ha, as opposed to the much smaller farms in the southwest and Polog regions (1.2 ha in average per farm).

Besides arable land, orchards are also the most present in the Pelagonia region, whereas vineyards are typical for Vardar and southeast regions. Given the dominant cereals and fodder production in Pelagonia, the number of livestock is most concentrated there, with the lowest intensity in terms of livestock units per area. Most of the agricultural labour among regions is engaged in Pelagonia, with

relatively low labour intensity (0.6 AWU per hectare of utilised area and 0.8 AWU per livestock unit), and in the southeast region.

Table B4.3. Agricultural sector structure, country level and by regions (2013)

	Republic of Macedonia	Vardar Region	East Region	Southwest Region	Southeast Region	Pelagonia Region	Polog Region	Northeast Region	Skopje Region
Agricultural holdings (thousands)	170.9	20.3	23.8	18.8	25.8	24.9	21.5	20.5	15.3
Total utilised land (thousand ha)	315.9	39.4	42.8	21.7	38.2	79.0	26.3	46.4	22.1
Arable land (thousand ha)	237.6	24.5	28.9	13.1	29.9	65.2	20.2	38.1	17.7
Orchards and nurseries (thousand ha)	17.7	2.8	2.6	2.0	1.8	5.9	0.9	0.8	0.9
Vineyards (thousand ha)	22.7	11.0	2.2	0.7	5.2	0.7	0.1	1.2	1.5
Meadows (thousand ha)	30.1	0.8	7.3	4.0	1.1	6.5	4.6	4.8	1.2
Pastures (thousand ha)	7.8	0.3	1.9	1.9	0.2	0.6	0.5	1.5	0.8
Total utilised land per agricultural holding (ha)	1.8	1.9	1.8	1.2	1.5	3.2	1.2	2.3	1.4
Livestock units (thousand LU)	365.9	30.2	47.4	36.4	54.2	67.8	48.8	45.2	36.0
Livestock units per agricultural holding	2.1	1.5	2.0	1.9	2.1	2.7	2.3	2.2	2.3
Livestock units per ha utilised agricultural area	1.2	0.8	1.1	1.7	1.4	0.9	1.9	1.0	1.6
Total AWU (thousand AWU)	243.7	31.2	27.5	24.3	39.0	50.9	25.5	24.1	21.1
AWU per agricultural holding	1.4	1.5	1.2	1.3	1.5	2.0	1.2	1.2	1.4
AWU per ha utilised area	0.8	0.8	0.6	1.1	1.0	0.6	1.0	0.5	1.0
AWU per livestock unit	0.7	1.0	0.6	0.7	0.7	0.8	0.5	0.5	0.6

Source: SSO, 2014; Notes: LU – livestock unit, AWU – annual working units.

### Socioeconomic indicators of the Macedonian economy and agricultural sector

The gross domestic product (GDP) of Macedonia was estimated at MKD 560 billion for the whole economy or around MKD 270 thousand per capita in 2015 (Table B4.4). Except for the years of 2009 and 2012, there has been a steady GDP annual growth over the last period (more specifically, 6.6% in nominal value and 3.8% in 2015 as the latest year available, compared to 2014). The agricultural sector (together with forestry and fishery) provides around 10% of GDP, with its relative share slowly lessening over the years. Its gross output reached 54.5 billion in 2015.

Crop production is dominant in the agricultural output structure, taking up to three-fourths of the value. Most important crop sub-sectors contributing to the agricultural output value are vegetables (taking up almost half of the crop output value, namely 46% in 2014), followed by cereals and fruits. The relative importance of livestock is decreasing over the years in terms of its share in the total agricultural output. More than half of the animal output comes from milk production (58% in 2014).

Table B4.4. Gross domestic product (GDP) indicators

	2008	2009	2010	2011	2012	2013	2014	2015
Gross Domestic Product, GDP (billion MKD)	414.9	414.6	437.3	464.2	466.7	501.9	525.6	560.1
Growth rate of real GDP (%)	5.5	-0.4	3.4	2.3	-0.5	2.9	3.6	3.8
Total investments (% of GDP)	25.8	24.6	23.1	23.5	23.4	23.7	23.4	23.1
Inflation rate (%)	8.3	-0.8	1.6	3.9	3.3	2.8	-0.3	-0.3
Agriculture, forestry and fishing GDP (billion MKD)	47.5	43.0	44.3	43.4	42.5	50.3	53.1	54.5
Agriculture, forestry and fishing GDP share in national GDP (%)	11.4	10.4	10.1	9.4	9.1	10.0	10.1	9.7
Crops output share in agricultural goods output (%)	69.0	72.4	74.5	75.3	74.9	76.1	76.5	N/A
Livestock output share in agricultural goods output (%)	31.0	27.6	25.5	24.7	25.1	23.9	23.5	N/A

Source: SSO, 2016a; SSO, 2016b

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The latest population census held in 2002 recorded 2,022,547 inhabitants (SSO, 2016b); the population estimation for 2015 was 2,071,278 inhabitants. Macedonia has a population density of around 80 persons per km<sup>2</sup> (Table B4.5), taken as the proportion of permanently settled population per country area (the total surface area of the country being 25,713 km<sup>2</sup>, SSO, 2016), putting it in the mid-range in terms of EU countries population density (the average being 117 persons per km<sup>2</sup> in 2015, Eurostat, 2016).

The natural rate of population growth was 1.3‰ in 2015, its slowdown in the past period resulting from shrinking birth rates and at the same time longer life expectancy.

The net migration has sharply increased over the last years and as such notably influences the population size, from 85 persons in 2008 to reaching 2,860 persons in 2015. Besides directly changing the population size with positive net migration figures resulting into population decreases, migrations also have an indirect effect on the population natural growth, with large share of young people leaving the country (SSO, 2016b). Major demographic challenge is also linked with the aging of the population and the decreases in the birth rates.

The total dependency ratio of population in Macedonia is around 42%, meaning that the dependant part of the population (people who are generally not in the labour force) represents less than half, compared to the productive working part of the population. Life expectancy is higher in the female population, with around 15 years more for those of 65 years of age and older.

The distribution of income is often used to describe inequalities in the society. The Gini coefficient is used as a measure of income distribution, whereas higher numbers correspond to higher inequality in the distribution, and vice versa. In the period from 2010 to 2014, for which data are available, this coefficient is gradually decreasing, with a value of 35.2 in 2014. The number of persons below the at-risk-of-poverty threshold is significant with almost one fourth of the population, but is also slowly decreasing, from 556 thousand in 2010 to 457 in 2014.

Table B4.5. Demographic trends, poverty and inequality indicators

	2008	2009	2010	2011	2012	2013	2014	2015
Estimated population (thousands)	2049	2053	2057	2060	2062	2066	2069	2071
Population growth rate (%)	0.16	0.18	0.21	0.17	0.12	0.14	0.17	0.13
Natural increase rate (‰)	1.9	2.3	2.5	1.6	1.7	1.9	1.9	1.3
Total net international migration (persons)	25	467	652	806	1053	1390	1699	2860
Population density (persons/km <sup>2</sup> )	79.6	79.8	79.9	80.1	80.2	80.3	80.4	80.4
Life expectancy, men (at age 65)	13.6	13.8	13.9	14.0	14.1	14.3	14.4	N/A
Life expectancy, women (at age 65)	15.4	15.7	15.8	16.0	16.0	16.1	16.2	N/A
Dependency ratio (per 100 persons)	42	42	41	41	41	41	42	42
Persons below at-risk-of-poverty threshold (thousands)	N/A	N/A	555.6	551.7	540.1	500.4	457.2	N/A
At-risk-of-poverty rate, %	N/A	N/A	27.0	26.8	26.2	24.2	22.1	N/A
Inequality of income distribution, Gini coefficient	N/A	N/A	40.8	38.5	38.8	37.0	35.2	N/A

Source: SSO, 2015b; SSO, 2016b.

Unemployment has been a setback even before the transition and Macedonia's independence, but has worsened especially during the mid-2000s, when it reached over 37%. The unemployment rates have since been decreasing; though still remain significant with 26.1% in 2015 (Table B4.6). The highest occurrence of unemployment is among the young population, where the trend is also gradually decreasing, but, nevertheless, still almost half of the youth remains unemployed. In terms of rural versus urban population, the unemployment is somewhat higher in the latter population. Rural population takes up around 44% of the total working age population.

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The net average wages have gradually increased in nominal terms over the last years, the most significant raise being in 2009. The wages differ significantly between the national average and the agricultural sector average; in 2015, the average net wage per employee was MKD 21.9 thousand, and in the agricultural sector the net wages were about 28% lower.

Table B4.6. Employment indicators and average net wages

	2008	2009	2010	2011	2012	2013	2014	2015
Total employment rate (aged 20-64)	46.3	47.9	48.1	48.4	48.2	50.3	51.3	51.9
Unemployment rate (aged 15-74)	33.8	32.2	32.0	31.4	31.0	29.0	28.0	26.1
Unemployment rate (aged 15-24)	56.4	55.1	53.7	55.3	53.9	51.9	53.1	47.3
Unemployment rate (25-74)	30.5	29	29.3	28.5	28.2	26.3	25.2	23.8
Unemployment rate in active urban working age population (%)	36.2	32.5	31.6	32.1	30.8	30.6	29.2	26.8
Unemployment rate in active rural working age population (%)	30.3	31.7	32.6	30.3	31.4	26.7	26.5	25.2
Rural population in total working age population (%)	42.7	42.3	42.5	42.3	42.8	42.8	44.2	44.1
Average net wage per employee (MKD thousand)	16.1	20.0	20.6	20.8	20.9	21.1	21.4	21.9
Average net wage per employee in agricultural sector (MKD thousand)	11.7	14.3	14.3	14.8	15.6	15.6	15.8	15.8

Source: SSO, 2016b.

One-third of the country population lives in the capital Skopje region (29.7 in 2013, see Table B4.7). The regional disparity of GDP varies markedly across the 6 regions. The contribution of Skopje region to the country's GDP is the most significant given that almost 43% are generated there; the northeast region on the other hand has the lowest share in the country's GDP, with only 5.3%. Most of the value in agriculture is generated in the southeast region (29%), where vegetable production dominates, followed by the Pelagonia and Vardar regions (with 20% and 14%, respectively). The regional unemployment rates generally correspond to the population distribution, namely being highest in Skopje and Polog region, but more pronounced in the northeast region.

Table B4.7. Regional population and GDP statistics (2013)

	Republic of Macedonia	Vardar Region	East Region	Southwest Region	Southeast Region	Pelagonia Region	Polog Region	Northeast Region	Skopje Region
Estimated population (thousands)	2066	153	178	220	173	232	318	176	614
Estimated population (%)	100	7.4	8.6	10.7	8.4	11.2	15.4	8.5	29.7
Gross Domestic Product (MKD billion)	501.9	41.3	40.4	39.4	46.2	56.5	37.7	26.6	213.7
Agriculture, forestry and fishing GDP (MKD billion)	50.3	7.1	4.4	2.2	14.6	9.9	5.9	2.6	3.6
Unemployment rate (thousands)	277.2	22.7	17.9	37.5	18.5	27.1	40.3	34.0	79.0
Unemployment rate (%)	100	8.2	6.5	13.5	6.7	9.8	14.6	12.3	28.5

Source: SSO, 2015a; SSO, 2016b.

### Dominant types of land degradation

There are several major factors which have the crucial influence on soil formation processes. Changing even one of them and coupled with human activities, e.g. agriculture, industry, solid waste management, and destruction of natural vegetation, could influence the appearance of different land degradation processes and their intensity. Certain soil types have different sensitivity to various types of degradation which is related to their location and land use, but in terms of human-induced and

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human accelerated degradation processes, all soil types are vulnerable to soil degradation. If a soil type has formed on sediments rich in salts, they will be naturally at risk of the process of salinisation, but if they are irrigated with low quality water, salinisation is unavoidable even when there is no natural risk of salinisation.

**Soil organic matter (SOM)** is an important ‘building block’ for soil structure and for the formation of stable aggregates. Other benefits are related to the improvement of infiltration rates and the increase in water storage capacity. The soils under intensive agricultural production on sloppy terrains with heavy texture and shallow soil profile are the most vulnerable to erosion. Any decrease of SOM in these soils, especially in *Lithosols* (shallow soil profile) and *Vertisols* (heavy textured soils), can cause serious damage on their production capability. Nevertheless, for the ANC project purposes, only *Histosols* (organic soils with more than 30% SOM) are subject of investigation.

**Salinisation** is the process that leads to an excessive increase of water-soluble salts in the soil. The accumulated salts include sodium, potassium, magnesium and calcium chloride, sulphate, carbonate and bicarbonate. There are no recent field investigations in Macedonia regarding the soils under threat of salinisation. Former soil survey activities showed that the process is concentrated in the lowest parts of the valleys, with very intensive hydromorphic processes, where ground salty water reaches the upper parts of soil profiles and in some cases its surface. This phenomenon, coupled with hot and dry climate, causes high evaporation and accumulation of salts into the plough horizon of agricultural soils. This is the case of several valleys, like: Strumicko valley, Pelagonija, Ovce Pole valley, Skopsko valley, etc. They will most likely classify as ANCs.

**Soil sealing and soil compaction** are other types of land degradation affecting soil resources in Macedonia but they are not subject of the ANC study as they are human-induced processes and naturally occurring ones.

**Erosion** is the most dominant process causing soil degradation and is caused by several factors including accelerated erosion by human activities (Table B4.8). The natural factors include uneven relief, steep slopes, high intensity rainfalls, land cover, soil erodibility, etc., while socioeconomic factors are related to inappropriate human activities in agriculture and grazing, forest management, inappropriate construction activities, etc.

Table B4.8. Erosion distribution in RM (by Gavrilovic methodology)

Degradation category (erosion processes)		Area (km <sup>2</sup> )	Percent (%)	Erosion intensity (m <sup>3</sup> km <sup>2</sup> y <sup>-1</sup> )
I	extremely high	698	2.77	> 3,000
II	high	1,832	7.38	1,500 – 3,000
III	medium	6,893	27.78	1,000 – 1,500
IV	low	7,936	31.98	500 – 1,000
V	very low	7,463	30.09	70 – 500

About 40,000 ha of irrigated land is subject to erosion, with an annual average soil loss of about 300,000 m<sup>3</sup>. A significant part of these deposits, about 3\*10<sup>6</sup> m<sup>3</sup> y<sup>-1</sup>, is not carried through the downstream sections of the rivers to exit the state territory, but are deposited in natural lakes and reservoirs.

### Climate characteristics in the Republic of Macedonia

Several factors with different spheres of influence: circulating, solar, physical-geographical and

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anthropogenic, t. e. local influence, affect the climate of the Republic of Macedonia. The first three types of factors were considered as primary factors, while the fourth factor was considered as a factor of secondary importance. However, over the last hundred years (more exactly the last twenty years) the influence of this component can be seen more and more and it is becoming one of the dominant climate factors under the influence of fossil fuels and physical-chemical components in the composition and structure of the atmosphere.

Although the Republic of Macedonia is a relatively small country, its territory is covered by different types of climate: from continental, changed continental, sub-Mediterranean (changed maritime) to mountainous climate with various subtypes. At various parts of the territory the influences of the Mediterranean and the continental climate overlap, with a different spectrum of influences. To determine and delimit the different types of climate is not an easy task. Climate determination and valorisation is hampered by the insufficient number of investigations in this field by different authors as well as the insufficient number of meteorological-climatological information, especially in mountainous regions, and also because of the lack of a complex strategy for monitoring the components of the climatic system.

Based on the experiences of the climatic classifications and adequate access to data, the territory of the Republic of Macedonia is divided into the following homogeneous climatic regions and sub-regions:

1. Region with sub-Mediterranean climate (50 - 150 m)
2. Region with moderate-continental-sub-Mediterranean climate (150-300m)
3. Region with hot continental climate (600 - 900 m)
4. Region with cold continental climate (900 – 1,100 m)
5. Region with sub-forest-continental-mountainous climate (1,100-1,300 m)
6. Region with forest-continental mountainous climate (1,300 – 1,650 m)
7. Region with sub-alpine mountainous climate (1,650 – 2,250 m)
8. Region with alpine mountainous climate ( $h^s > 2,250$  m)

Spatial arrangements of climatic regions are represented in Figure B4.2.

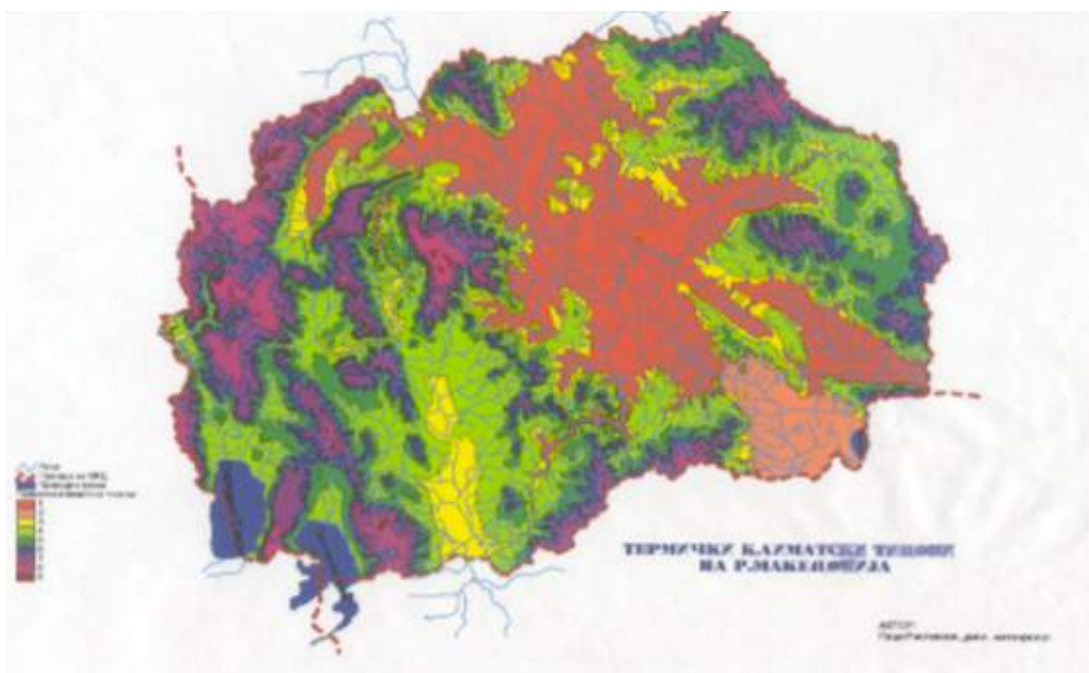


Figure B4.2. Thermic climatic types of the Republic of Macedonia

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### *1. Region with sub-Mediterranean climate*

The characteristics of sub-Mediterranean climate in Macedonia can be found in the areas of Gevgelija-Valandovo region at 50 to 150 m height above sea level. This is the hottest area in the country. The average annual air temperature is between 12 to 14°C with the highest monthly average air temperature during July, which is between 24 and 25°C, and the lowest air temperature above 3.0°C. Precipitation appears the most frequently during the autumn period of the year (especially in November when an average monthly precipitation of 90 mm occurs), while the driest period is in July or August (which is typical of the greater part of the territory of Macedonia), with an average monthly sum of precipitation of 30 mm.

### *2. Region with moderate-continental-sub-Mediterranean climate*

The territory of this region, which is characterised by a combined continental and sub-Mediterranean climate, covers the following parts of the country: central parts along the river Vardar and ravines along the inflow of the rivers Pcinja, Bregalnica and Crna Reka, and the river Vardar, that is Stip, Veles, Kocani, as well as Strumica and Radovis regions. This climatic region covers the area at 150 to 300 m height above sea level. The average air temperatures are between 12 and 13°C with maximum values in July (with air temperatures between 22°C and 24°C). The lowest average values of air temperature appear in January (between 0.0°C and 2.0°C). The average annual precipitation in this climatic region varies between 460 mm to 500 mm in the central regions and between 500 and 600 mm in the other regions.

### *3. Region with hot continental climate*

This region is a mountainous region at a height of up to about 900 m above sea level. The hot continental climate dominates throughout with defined combinations of Mediterranean impact, in the domain of pluviometric regime at some ravines in the northern part of Macedonia. Climatic conditions are significantly more different than thermic conditions as well as pluviometric ones. Average annual air temperatures are in the limits between 10°C and 11°C. The average annual sum of precipitation is in the limits between 530 mm and about 900 mm. The greatest quantities of precipitation appear at mountainous massifs in the western part of the country from 600 mm to 800 mm, while in the eastern parts they are significantly lower. In this climatic region, the number of summer days is between 70 to 110 days, while tropic days are between 10 and 35 days.

### *4. Region with cold continental climate*

This region covers the lowest parts of mountainous at the height of 900 to 1,100 m. It is characterised by transitional characteristics of climate, between continental and mountainous regions. The climate is wetter than the previous region, with an average quantity of precipitation of about 800 mm, while the average annual air temperature is about 9.0°C. The average air temperature in January is about 0.5°C, while the average one in July is about 19°C. The annual maximum of precipitation in the western parts of Macedonia, as well as in the region of Valandovo-Gevgelija appears in November, while in the northern-eastern parts the maximum appears in May, which is typical of the continental pluviometric regime.

### *5. Region with sub-forest-continental-mountainous climate*

This climatic region appears at 1,100 to 1,300 m a.s.l. The influence of continental and maritime climate is combined in it. The average annual air temperature is slightly lower than in the previous region and is about 8.0°C. The average annual sum of precipitation is about 900 mm. The most precipitated period of the year in this region (in the western parts of Macedonia) is in November (more exactly at winded sides of the mountainous massifs), while in the northeast the most precipitated period is in May, as is typical of the continental pluviometric regime.

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#### 6. Region with forest-continental mountainous climate

The region with forest-continental mountainous climate is at the height of 1,300 to 1,650 m a.s.l. The average annual air temperature is about 6.5°C, while the average annual sum of precipitation is about 1,050 mm and it is the wettest climatic belt in Macedonia. The areas with the greatest quantities of precipitation are located in this belt, especially at the winded sides of mountainous massifs.

#### 7. Region with sub-alpine mountainous climate

This region is at the height of 1,650 m to 2,250 m a.s.l. The average annual air temperature is about 5.0°C, while the quantity of precipitation decreases according to the height and is under 1,000 mm. This is a different view of precipitation changes depending on elevation above sea level, according to which at the greater heights above sea level the precipitation greater than 1,200 mm annually appear (statement which was based upon the gradients and without use of results from the measurements performed at Solunska Glava at height above sea level of  $h^s = 2540$  m).

#### 8. Region with alpine mountainous climate

This region is located at the height of up to 2,250 m above sea level, where the average annual temperature is under 0.0°C. The average temperature of the hottest month is under 10.0°C (at Solunska Glava 8.0°C), the average annual sum of precipitation is 867 mm (Solunska Glava). The greatest quantities of precipitation appear in May with the average sum of precipitation being 65 mm. The lowest air temperature recorded in this climatic region is -29.7°C. The average number of frost days is about 225 days.

Areas located inside the regions 5 to 8 are expected to potentially meet the requirements for being classified as ANCs as far as the growing period is concerned but this has to be verified by the climatic measurements for a period of at least 30 years.

## B4.2. STATUS OF SOIL DATA

Soil surveying has a very long tradition in the country. Within a long-term programme of systematic survey launched back in the 50s, when Macedonia was still part of the former Yugoslavia, the whole territory of the country was mapped in a scale of 1:50,000 based on a common methodology for field soil survey and laboratory analyses adopted by all the former Yugoslav republics. Within this period (1950-1990) of about 5 decades, an exhaustive data set was collected, containing data for the pedo-forming co-variables, pedo-transfer functions and data for the most important chemical, physical and mechanical soil properties.

The soil map at a scale of 1:50,000 of the former Yugoslavia was a landmark achievement and its legacy is still strong in all former republics. It was made thanks to the devotion and hard work of tens of soil scientists who, with great professionalism, delineated the soil mapping units based on soil, climate, relief, geological composition and natural vegetation characteristics. It should be noted that in the initial phases of the national soil survey program, priority was given to the most fertile soils in the valleys under agricultural production, while the mountainous areas were mapped in the latter phases.

At the end of this long-term monitoring program, more than 10,000 soil profiles were excavated and described on the territory of Macedonia, while the collected soil samples (>30,000) were examined in a single laboratory. Considering the long period of preparation of the Soil Map, it must be admitted that some of the initially collected field and laboratory data became outdated over time. For that reason, in the early '90s, a revision of the soil survey was made, during which more than 300 locations were preselected and soil profiles were revised and re-sampled.

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

In the past few years the Ministry of Agriculture, Forestry and Water Economy, started a new monitoring programme of agricultural areas to be used for permanent crops e.g. vineyards and orchard plantations. In addition to this data set, there are quite a number of short-term surveys for different purposes, like studies for particular areas and regions, river basin management plans, implementation of agro-ecological measures, afforestation, etc. It should be noted that, after the finalisation of the soil map project in the mid '90s, no more additional systematic soil surveys or soil monitoring activities have been performed. All the old data deriving from the Soil Map at a 1:50,000 scale were in hard copy and scattered among various institutions and private collections.

Soil scientists of the Institute of Agriculture stated the compilation of the existing material and its evaluation and synchronisation at the beginning of 2008. As a result of this effort, all existing material has been collected and systematised. Activities towards the digitisation of soil data continued with the start of the FAO TCP Project, whose main goal was the Creation of Macedonian Soil Information System (MASIS). In the following two and a half years, the compiled material was digitised, soil maps were prepared and a geo-database encompassing all field and laboratory data for more than 4,500 soil profiles was completed. As a final output of the Project activities, using the modern Soil Digital Mapping approach, thematic maps were developed e.g. soil erosion risk map, soil properties distribution maps, using as input data for soil properties their co-variables too, such as climate data, DEM, geology, vegetation, etc.

The soil geo-database contains methodically organised soil properties divided into soil profile data (soil texture, soil chemical and soil physical properties) and soil location. All graphical and alphanumeric data are properly integrated into a SQL database, enabling an easy use of all stored data. In addition, in order to enable dissemination of all data stored into the MASIS database, a WEB GIS Portal has been established. Thus, MASIS data are available to the broader audience through this portal for particular services offered by the portal. Furthermore, the WEB Portal offers functionalities for browsing, selection and download of soil data. Table B4.9 shows the meta-data of MASIS for soil properties, which are needed for ANC mapping. It should be emphasised that this soil information will be made available to the ANC project.

Table B4.9. Soil properties data available at MASIS to be used for ANC mapping

Soil property	Attributive data			Graphical data		
	No data	Limited	All locations	No data	Shape	Raster
Drainage classification (poorly drained or very poorly drained)	x					
Soil depth (If equal or less than 30 cm)			x			x
Soil Texture (see Table 1)			x			x
Surface stoniness (see Table 1)		x		x		
Soil Organic Matter (if equal or more than 30%)			x			x
Salinity (if equal or more than 4 dS/m)		x			x	
Sodicity (if equal or more than 6 ESP)		x		x		
Acidity (if equal or less than 5 pH in water)			x			x

### B4.3. STATUS OF CLIMATE DATA

The Hydrometeorological Service in the Republic of Macedonia was officially established in 1947 with the “Declaration on the Foundation of the Hydrometeorological Service of the People’s Republic of Macedonia”. In 1978, it became Republic Hydrometeorological Service, a governmental organisation of special importance for carrying out work in meteorology and hydrology. The Law on Hydrometeorological Matters was adopted in 1992 (Official Gazette No.19/92). Since 1991, when the

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Republic of Macedonia became an independent country, the Hydrometeorological Service has been a national authority for meteorology and hydrology and it became member of the World Meteorological Organisation in July 1991. In 2000 the Hydrometeorological Service continued its work as part of, and under the authority of, the Ministry of Agriculture, Forestry and Water Economy.

The first meteorological measurements and observations in the territory of Macedonia were carried out in Skopje (from 1891 to 1899), and in Bitola (from 1986 to 1911). For the needs of the army during the First World War, meteorological measurements were carried out at 3 sites: Bitola, Prilep and Udovo, while precipitation was registered at Strumica, Kocani and Skopje. Besides measurements of the basic meteorological elements (temperature, precipitation, air pressure, wind speed and direction, humidity, insolation, etc.) at stations in Prilep, Bitola and Udovo, certain upper air soundings were carried out as well. A few more organised and continuous meteorological and hydrological measurements were started in 1923, and with an interruption during the Second World War, they lasted until 1947, when the Hydrometeorological Service and a network of meteorological stations were established.

The legal framework for meteorological monitoring is based on the Law on Hydrometeorological Activity (Official Gazette of republic of Macedonia No. 103 of 19.08.2008). This law regulates hydrological and meteorological matters and authorizes (designates) the responsible institution – the Hydrometeorological Service – for fulfilling the tasks of: development and maintenance of hydrological and meteorological observation; research of atmosphere, soil and water resources; and application of hydrology and meteorology. Some duties regarding the development and maintenance of the hydrological and meteorological observation (Article 4) are: establishment and maintenance of meteorological and hydrological station network; meteorological measurements and observations for weather forecasting, climatology, agro-meteorology, aeronautical meteorology; measurements and observations of the air, water and soil quality; processing the registered data; provision of reports and forecasts of weather, hydrological condition and air, water and soil quality.

The Hydrometeorological Service (HMS) represents at the same time the national hydrometeorological information centre. It also carries out international exchange of meteorological and hydrological data and information. The HMS is responsible for coordinating international obligations of the country in the area of meteorology and hydrology.

### **Current status of the meteorological observing system in the Republic of Macedonia**

Pursuant to the Law on Hydrometeorological Activity on the territory of the Republic of Macedonia a unique meteorological observing system is established. The meteorological system in the Republic of Macedonia is an integral part of the global observing system and all activities which are performed in this system are determined in accordance with the regulations and standards of the World Meteorological Organisation.

A state meteorological station network with professional observers is determined and established within the meteorological observing system. This network, according to the current status, includes 19 main meteorological stations and 2 meteorological radar hail suppression centres. Besides this, there is an established network of stations with part-time observers, which consists of 7 climatological stations, 103 precipitation and 24 phenological ones. Over the last years the meteorological observing system in the Republic of Macedonia has also been completed by installing additional automatic meteorological stations (their total number is 14).

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Figure B4.3. Meteorological Network in the Republic of Macedonia

The main meteorological stations and data availability are elaborated and presented in the tables below in order to have a better view on what is available at the moment. The availability of the monthly averages for required parameters is presented in the following Table B4.10.

Table B4.10. Status of monthly data measured at the main meteorological stations

N°	Meteorological station	Latitude	Longitude	Elevation (m)	Temperature (mean, max and min), precipitation, wind speed, cloudiness, relative humidity	Sunshine duration	Remark
1	Berovo	41°43'00"	22°25'00"	827	1961-2015	1961-2015	
2	Bitola	41°03'00"	21°12'00"	586	1961-2015	1961-2015	
3	Gevgelija	41°09'00"	22°23'00"	59	1961-2015	1981-2015	
4	Demir Kapija	41°25'00"	22°21'00"	125	1961-2015	1988-2015	
5	Kriva Palanka	42°12'00"	22°22'00"	691	1961-2015	1961-2015	
6	Lazaropole	41°32'00"	20°04'00"	1332	1961-2015	1961-2015	
7	Mavrovi Anovi	41°42'00"	20°04'00"	1240	1961-2015	1961-2015*	
8	Ohrid	41°07'00"	20°04'00"	760	1961-2015	1961-2015	
9	Popova Shapka	42°01'00"	20°05'00"	1750	1961-2008	1985-2008	
10	Prilep	41°21'00"	21°13'00"	661	1961-2015	1961-2015	
11	Skopje Zajchev Rid	42°01'00"	21°12'00"	301	1981-2015	1981-2015	
12	Skopje Petrovec	41°57'00"	21°13'00"	240	1961-1966 1967-2015	1961-1975	Dislocated in 1967; since 2001 manual measurement has been replaced with AWS
13	Solunska Glava	41°42'00"	21°12'00"	2540	1973-2009	1973-2009	
14	Strumica	41°26'00"	22°23'00"	224	1961-2015	1966-2015	
15	Shtip	41°44'00"	22°21'00"	322	1961-2015	1961-2015	

Legend: Coloured field station works in 2016 (\*) series with missing data

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

The climatological stations are still having problems with quality control. Most of the stations are out of operation (only 7 stations remain in operation). Data availability is presented in the following table:

Table B4.11. Status of monthly (mean temperature and precipitation) data measured at climatological stations

N°	Meteorological station	Latitude	Longitude	Elevation (m)	Period 1961-1990	Period 1971-2000	Period 1981-2010	Period 2010-2015	Remark
1	Amzabegovo	41°49'00"	22°20'00"	250	+	+	+	-	
2	Valandovo	41°19'00"	22°23'00"	100	+	+	+	-	
3	Veles	41°43'00"	21°14'00"	175	+	-	-	-	(1961-1987)
4	Gostivar	41°48'00"	20°05'00"	525	+	-	-	-	
5	Debar	41°31'00"	20°03'00"	675	+	-	+	+	(1961-1982) Debar (1983-1990) Debar-Spilje (2003-2015) Debar new location
6	Delchevo	41°58'00"	22°24'00"	630	+	+	+	+	
7	Kavadarci	41°26'00"	22°20'00"	260	+	-	-	-	
8	Katlanovska Banja	41°54'00"	21°14'00"	240	+	+	-	-	(1963-1990)
9	Kichevo	41°31'00"	20°05'00"	620	+	-	-	-	
10	Kochani	41°55'00"	22°22'00"	345	+	+	+	-	
11	Kratovo	42°05'00"	22°20'00"	640	+	+	+	+	
12	Krushevo	41°22'00"	21°11'00"	1230	+	+	+	+	sunshine duration (1999-2015)
13	Kumanovo	42°08'00"	21°14'00"	338	+	+	+	+	
14	Makedonski Brod	41°31'00"	21°11'00"	545	+	+	-	-	
15	Nov Dojran	41°13'00"	22°24'00"	180	+	+	+	+	sunshine duration (1961-2015)
16	Radovish	41°38'00"	22°22'00"	380	+	+	-	-	
17	Resen	41°05'00"	21°10'00"	881	+	-	-	-	

(+) complete series; (+\*) series with missing data

Legend: Coloured field station works in 2016 (\*) series with missing data

The rainfall stations status is presented in Annex 1 of this report.

The daily data are available only for the main meteorological stations as shown in the following Table B4.12.

Table B4.12. Status of daily data measured at meteorological stations

Network	Digitalized	Quality Control	Homogenized
Main meteorological stations	1961-2015	yes (Excluding Popova Shapka and Solunska Glava)	no
Climatological stations	1991-2015	no	no
Precipitation stations	1991-2015	no	no

The data availability is very restricted due to the fact that according to existing legislation the hydrometeorological services charge for data provided in a digital form (Schedule of the amount of

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reimbursement of actual costs incurred to perform the services of provision of hydrometeorological data and products from the archives of the Hydrometeorological Service, published in the Official Gazette No.33 /09). The following Table B4.13 shows that two periods of monthly averages (1961-1991 and 1971-2000) only for temperatures (mean, maximal and minimal) and precipitations are publicly available. Data availability is also presented in Table B4.13.

Table B4.13. Assessment of the access to the available national data

Network	Data	Period 1961-1990	Period 1971-2000	Period 1981-2010
Main meteorological stations	Monthly	Temperature (mean, max and min), precipitation Available	Temperature (mean, max and min), precipitation Available	On request*
	Daily	On request*	On request*	On request*
Climatological stations	Monthly	On request*	On request*	On request*
	Daily	On request*	On request*	On request*
Precipitation stations	Monthly	On request*	On request*	On request*
	Daily	On request*	On request*	On request*

The price of the meteorological data as defined by the price list is rather high, particularly if daily data is to be used for the ANC project. However, based on the request from governmental institutions, it is possible to get some meteorological data free of charge. The cost associated with obtaining the meteorological data is presented in the following Table B4.14.

Table B4.14. Costs for daily and monthly meteorological data

Data	Cost (without VAT) Macedonian Denars	Cost (without VAT) approx. Euro
Daily data for one meteorological element from one meteorological station for one year	3040	50
Monthly data for one meteorological element or parameter from one meteorological station for a series of 30 years	2560	42
Monthly data for one meteorological element or parameter from one meteorological station for more than 30 years	3680	60

Source: According to the Schedule of the amount of reimbursement of actual costs incurred to perform the services of provision of hydrometeorological data and products from the archives of the Hydrometeorological Service (Official Gazette No.33 /09).

The elaboration of the temperature and precipitation in the country will be presented in the following sections.

### Air temperature in the Republic of Macedonia

Air temperature is one of the most important elements of the weather and climate as it determines the climate type, characterises the heat state of the atmosphere and the temperature regime of the territory. Spatial arrangement of air temperature depends on longitude, latitude and altitude. On the basis of correlation dependences between altitude and mean air temperature for each homogeneous physical-geographical environment, air temperature changes are obtained in dependences of altitude. The average thermic field in the Republic of Macedonia is shown in an annual isothermic chart (Fig. B4.4).

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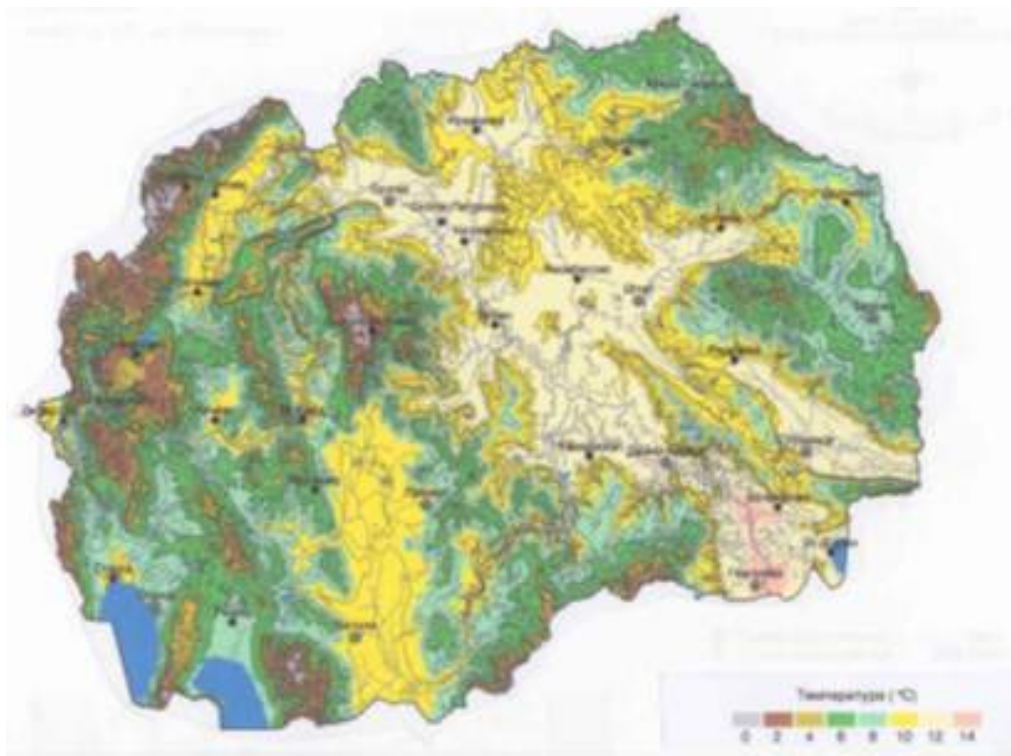


Figure B4.4. Mean annual air temperature in the Republic of Macedonia

The highest values of annual air temperature appear in Gevgelija-Valandovo region, with the mean annual air temperature being greater than 14°C. The influence of the Mediterranean climate is mostly felt in this part of the country. In some years the Mediterranean influence is felt even more deeply in the Balkan Peninsula, especially along the river Vardar, as well as across Strumica ravine.

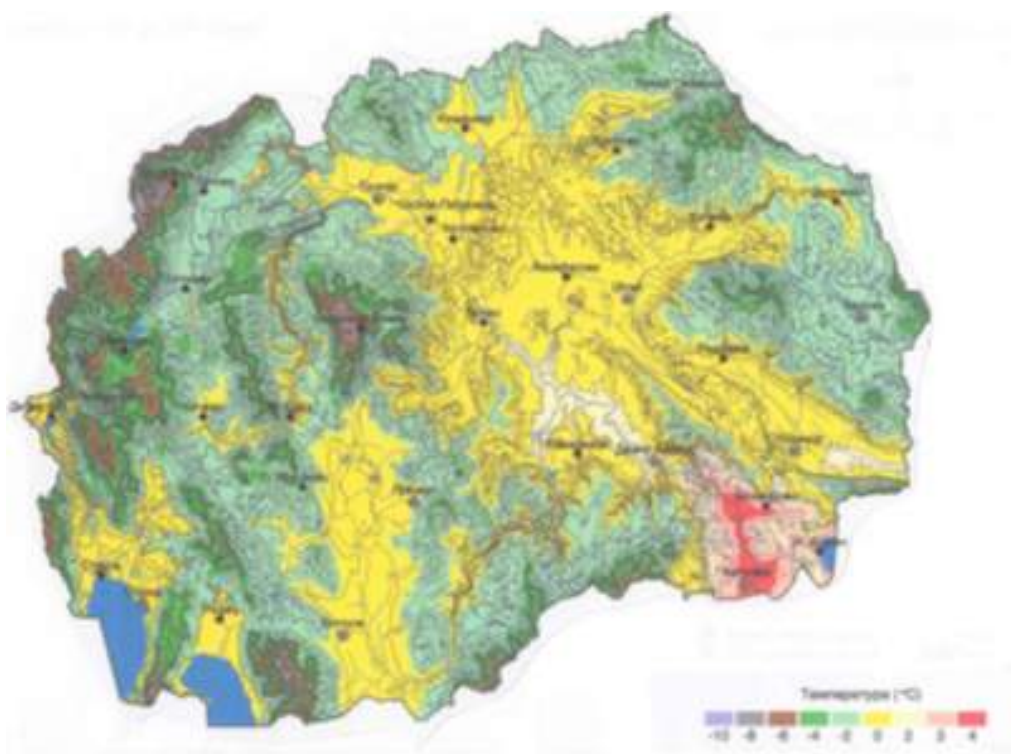


Figure B4.5. Mean air temperature in January in the Republic of Macedonia

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The coldest month in Macedonia is January. The average monthly air temperature in the coldest month is shown in Fig. B4.5. The highest values are recorded in Gevgelija-Valandovo region (greater than 3°C), from 0°C to 2°C along the river Vardar, in Strumica ravine, Pelagonija, Ohrid and Prespa ravine, between 0°C and -2°C in the mountain parts of Krushevo and Lazaropole, from -2°C to -4°C on Popova Sapka and between -6°C and -8°C at the highest parts of the mountain regions (Solunska Glava).

July is in average the warmest month in Macedonia. The average monthly air temperature ranges between 24°C and 25°C in Gevgelija-Valandovo region, from 15°C to 20°C in Berovo and Prespa ravine, Krusevo, Mavrovi Anovi and Lazaropole, from 10°C to 15°C on Popova Sapka and mountain areas, from 8°C to 10°C at the highest parts of the mountains Jakupica, Sar Planina and Baba mountain (Fig. B4.6).

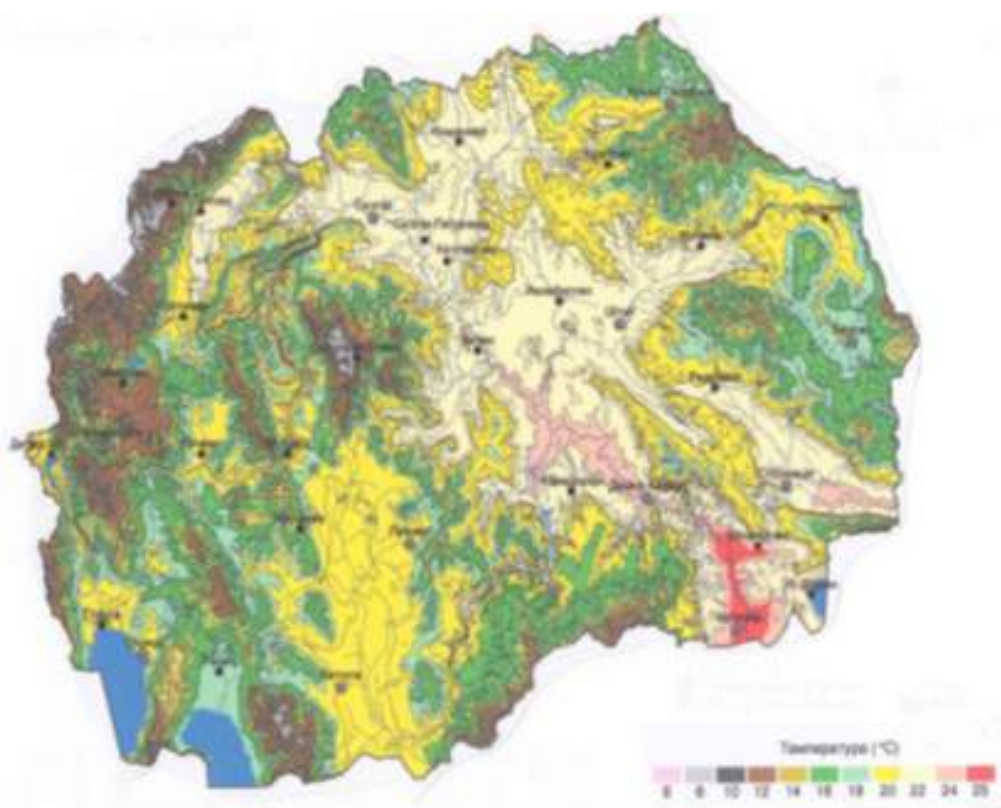


Figure B4.6. Mean air temperature in July in the Republic of Macedonia

### Precipitation in the Republic of Macedonia

The spatial arrangement of precipitation in the Republic of Macedonia is uneven because of the complex orography which influences the pluviometric regime during the months, seasons and years. The unevenness of spatial arrangement of precipitation is the result of the change of altitude, longitude and latitude as well. The orographic conditions in the country and the mountain massifs in its surroundings represent a significant factor in the development of weather and climate. Mountain massifs and their meridional location in the northern part of Macedonia affect the transfer and modification of air masses, which are rich in humidity and transfer towards the central parts of the Balkan Peninsula.

The two basic pluviometric regimes, i.e. the Mediterranean and the continental, overlap on the territory of Macedonia. Between these two specific different pluviometric regimes, two transitional regimes

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are also present: the transitional Mediterranean pluviometric regime and the transitional continental pluviometric regime that can be separated on the basis of prevailing maximum of precipitation during the year.

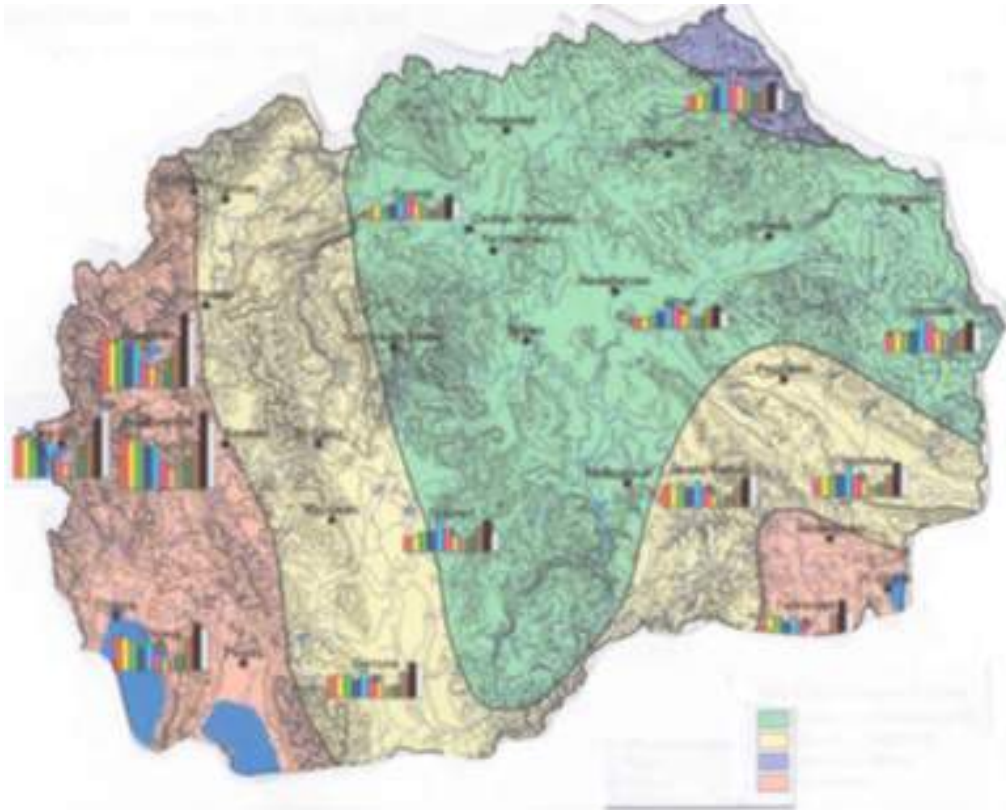


Figure B4.7. Histograms and pluviometric regime (according to Ristevski P. 1986)

In the area of the Mediterranean regime of precipitation, the most precipitative months during the year are November, October and December. In the area with continental climate, the maximum quantities of precipitation occur in May and June.

The most rainy area in the country is the area of mountain massifs in the north, the area of mountains Sar Planina, Bistra and Stogovo, as well as the mountain massifs of Jakupica with its peak Solunska Glava and Baba with its peak Pelister, where the annual sum of precipitation ranges around 1000 mm. The driest areas in the country are Ovce Pole, Tikves and the surroundings of Gradsko, with an annual sum of precipitation of around 400 mm. On the whole territory of Macedonia, the driest months are July or August, and sometimes September.

#### B4.4. STATUS OF GEOGRAPHICAL INFORMATION SYSTEM (GIS) DATA

The creation of digital databases incorporating GIS&RS data is a growing trend in the country and has been developed within many institutions at central and local level, predominantly in the area of environment and agriculture. There are several systems in function, mainly devoted to improved natural resources management and monitoring. The Republic of Macedonia is a part of the CORINE land cover initiative, due to which there are 3 sets of land cover data for the country (CORINE LC 2000, 2006 and 2012) in digital format (shape file) containing information about land cover at three levels at a scale of 1:100,000. These data are available for public use and will be used by the ANC project as well.

Another digital data set has been developed by the Agency for Spatial Planning, containing information

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on the country's infrastructure, climate, hydrology and hydrography as shape and raster files. This data set is not available for public use and some of the stored information in the available copy of this data set is out of date, although most probably there is an updated data set within the Agency. The Agency for Real Estate Cadastre (AREC) develops and maintains the digital land cadastre of the country. There are digital data for the property rights on a parcel level, but the land capability classes are a missing part. For better access and browsing of stored data, the Agency has developed a user-friendly GIS Portal (<http://ossp.katastar.gov.mk/OSSP/>). The GIS Portal offers a wide palate of functionalities for browsing and identification of cadastral numbers, parcels and location in space, with georeferenced aerial photos at high resolution.

In the past few years, within the Land Policy Department of the Ministry of Agriculture, Forestry and Water Economy (MAFWE), the Land Parcel Identification System (LPIS) has been established, for keeping records for the use of the agricultural land in the country. The database contains GIS layers for agricultural parcels boundaries as shape files with the corresponding class of land use. The high resolution colour aerial photos for the whole country taken in 2009 served as a basis for the development of this digital GIS database, which will be renewed every 5-6 years. Land use is further identified by data gathered from the primary agricultural producers applying for subsidies. Validation of the data gathered is performed through field checks by employees in the Ministry and through additional high resolution satellite imagery for particular regions. Data from the LPIS digital database are for internal use of MAFWE and the Paying Agency, but can also be used for other purposes, such as the ANC project, upon request.

Another GIS based digital data set is stored within the Hydrometeorological Service of Macedonia, which contains long-term meteorological measurements and climatological data. Most recently the specialists of this institution started the preparation of maps with GIS modelling for some climate parameters and indices, e.g. temperature, rain, evapotranspiration, wind and SPI (more information is provided in Chapter B.4.3.).

As elaborated in Chapter B.4.2., all relevant data related to soil, like spatial distribution of soil mapping units and complexes, soil property maps, soil risk and soil suitability maps, as well as auxiliary co-variables (e.g. climate, geology, CORINE land cover, DTM etc.) are stored with the geo-database of MASIS, published via its WEB GIS Portal. Within this geo-database there are two DTMs: a) with 5 m. resolution, that has been developed with the elaboration of aerial photos of MAFWE in 2009, and b) with 20 m. resolution, developed by the AREC, on the basis of aerial photos from 2007 taken for the preparation of digital topographic maps in a scale of 1:25,000. The abovementioned terrain models have been corrected and improved by the specialists engaged in the creation of MASIS and are stored in its geo-database. These models can be used in the process of ANC delineation for the identification of areas with slope >15%.

From 2013 the local self-government was organised in a manner that the country's territory is divided into 80 administrative units (municipalities) and the city of Skopje as a separate administrative unit which is divided into 10 municipalities. In addition to these two levels of administrative governmental structure, the Republic of Macedonia was divided in accordance with the Nomenclature of Territorial Units for Statistics (NUTS) in 2005. At the level of NUTS 1 and NUTS 2, the whole country's territory counts as a single region, while at NUTS 3 level, there are 8 statistical regions: Vardar, East, Southwest, Southeast, Pelagonia, Polog, Northeast and Skopje (Figure B4.8).

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Figure B4.8. Position and NUTS3 in the Republic of Macedonia

## B4.5. DATA GAPS, PROBLEMS, AND SOLUTIONS

As already mentioned, in the past two decades, the creation of GIS-based digital databases has become a standard approach for the inventory of natural resources and country's infrastructure. However, there are several problems related to data quality, the use and maintenance of the databases created and the data stored, as pointed out below:

- all digital databases are created within various institutions for different goals,
- there is a serious lack of networking of the created digital databases,
- the quality of stored data in many cases is not sufficient, in terms of consistency, continuity and format,
- data availability in many cases is a significant constraint due to internal procedures and policies of the institutions possessing data.

According to the methodology applied in the EU for defining ANC's, in the case of Macedonia, the existing data sets stored within MASIS can meet most of the specific criteria for delineation of ANC's, especially with regard to soil and terrain data.

The only missing soil parameters are:

- Exact measurements of "poorly or very poorly drained soils" (water logged within a soil profile for a certain period of time). This criterion will be overcome by using the second option, or through identification of gleyic soils out of the existing digital soil map.
- The existing soil database does not contain data for texture classes as indicated in the second criterion "Unfavourable soil texture and stoniness". On the basis of existing data on the content of soil texture fractions, like: clay, silt and sand, the soil texture classes could be calculated by means of map calculation.
- There are no records for soil sodicity into the MASIS database; therefore, the third criterion "poor chemical properties" will be calculated on the basis of delineation of areas under saline soils.

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For all other soil criteria for the delineation of ANCs, the existing soil database contains sufficient soil data in terms of quality, format and resolution. In any case, additional analysis and calculations should be implemented for the identification of ANC areas.

As previously indicated, since the finalisation of the long-term Programme for the Preparation of the Soil Map in the scale of 1:50,000 in the mid '90s, there has been no organised monitoring and systematic survey of soil properties. In terms of monitoring soil resources, the main focus should be put on further enforcement of the newly created Macedonian Soil Information System, especially the development of know-how in the field of Digital Soil Mapping and Earth Observation techniques among staff, as well as maintenance and improvement of technical capacities.

In terms of data collection, the main efforts should be devoted to:

- Further detailing of the existing soil map, especially detailing of soil types spatial distribution and in-depth investigation of soil pedotransfer functions,
- Monitoring of the soil degradation processes with a focus on soil erosion, soil sealing, soil organic matter depletion and soil contamination, particularly if these processes occur with the ANCs,
- Identifying and quantifying of the natural constraints in the most affected areas,
- Designing of measures and implementing conservation activities for combating the negative impacts hampering natural resources,
- Monitoring of the effects of the implemented measures on natural resources,
- Implementing of adaptive measures for mitigation and overcoming the natural constraints in affected areas,
- Improving the resilience of the natural resources, with a main focus on soil and water resources.

*As for the climate data*, the existing data sets that are publicly available provide monthly data for the main meteorological stations for the periods 1961-1991 and 1971–2000, but they are not sufficient and in good quality to produce meteorological maps at good resolution. At least the 7 operating climatological stations should be elaborated in order to increase the number of stations that will be used to get the spatial distribution of temperatures, precipitations and evapotranspiration. Overall, the use of monthly data will be sufficiently accurate for the ANC project activities, because the cost for inquiring and acquisition of daily data is extremely high.

The major problem is to improve public access to the public data collected and processed by the Hydrometeorological Service. Also, due to the lack of resources, the Hydrometeorological Service has been rapidly reducing the network and number of its main climatological stations in the last period. This process should be stopped and, most likely, reversed to strengthen and improve the meteorological network in the country.

#### **B4.6. PROVISION OF RECOMMENDATIONS FOR IMPROVED DATA MANAGEMENT IN THE CONTEXT OF THE AREAS WITH NATURAL CONSTRAINTS**

In order to improve the management of the existing digital data sets related to environmental monitoring and spatial data, it is of crucial importance to develop a concept for integration of the existing data sets, through: networking, harmonisation and alignment. This integration will enable easy access and exchange of data. For these reasons, a Strategy for National Infrastructure of Spatial Data (NISD) was prepared in 2012. The vision of the Strategy is to define the general concepts for integration and harmonisation of the existing geospatial data, following the principles of the INSPIRE Directive.

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The success of the ANC project will also depend on the coordination of authorities responsible for various types of data collection and monitoring. This will enable harmonisation and equalisation in terms of methodology, resolution and format of collected data and will avoid overlapping. The implementation of such a concept will increase the quality of data collected and the services offered and will reduce the cost of the overall process of data collection and ANC delineation. Data availability is of crucial importance, so one of the main issues requiring attention should be to set up clear protocols for data access, level of access, dissemination and use of networked data sets.

#### **B4.7. ANALYSES OF THE NATIONAL CAPACITIES FOR DATA MANAGEMENT AND PROVISION OF RECOMMENDATIONS FOR IMPROVED INSTITUTIONAL SETUP WITH REGARD TO THE ANC**

There are several institutions that have a stake at the ANC project. They have sufficient capacities for monitoring, collection and management of environmental variables and spatial data, among which the most relevant ones are:

**The Ministry of Environment and Physical Planning (MoEPP).** The MoEPP is subdivided into several departments (Department of Environment, Department of Industrial Pollution and Risk Management, Department of Nature, Department of Waters, etc.) among which the most relevant ones with regard to the ANCs are: the Spatial Information System (SIS) and the Macedonian Environmental Information Centre (MEIC).

The MEIC is divided into four units dealing with Air Quality Monitoring, Analysis and Reporting, Cadastre and Modelling and IT Unit. The mission of MEIC is to collect all the information on the environment from self-monitoring of different institutions and other sources to its own monitoring. Furthermore, the MEIC makes available to the public through its electronic information system (via WEB Site of MOEPP) a set of adequate information materials, such as: brochures, reports, etc. The main function of MEIC is to provide relevant, systematised, standardised, and easily accessible information on the state, quality and trends in all segments of environment (water, air, noise, waste).

**The Ministry of Agriculture, Forestry and Water Economy (MAFWE).** MAFWE is also subdivided into several departments and units. In terms of delineation and management of data related to ANCs, the following units have the relevant capacities, resources and data: the Department for Register and Management of Agricultural Land and the Department for Consolidation, Exchange and Identification of Agricultural Land.

Within its LPIS organisational unit, the department for consolidation and identification LPIS possesses the most relevant data, as well as the technical and human capacities related to ANCs. The mission of this unit is to perform periodical controls of land use of agricultural area on a parcel level, by means of RS data (orthophotos) as the main source of identification, to provide validated data of LPIS to the Paying Agency and other governmental and non-governmental bodies, agencies and institutions. The LPIS database, in fact, keeps records on the agricultural land which is actually under cultivation (Picture B4.9). The unit consists of 4 qualified employees for GIS and database administration and 70 employees within the branches of the Ministry for entering field data.

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Figure B4.9. Example of agricultural land identification (source: LPIS-MAFWE)

**The Hydrometeorological Service is an authority within MAFWE** and their scope of activities is described in chapter B4.3.

**The Agency for Real Estate Cadastre (AREC).** AREC is an independent governmental authority governing activities related to the establishment and maintenance of the real estate cadastre, the management of the geodetic-cadastre information system, etc. It should be noted that the National Spatial Data Infrastructure foreseen within the Strategy NISD is established and maintained by the Agency for Real Estate Cadastre. The Agency possesses high level expertise in GIS and RS but its activities are very biased towards real estate and cadastre maintenance and updating. AREC specialists have almost no experience in monitoring and dealing with issues related to natural resources management. Still, the Agency possesses relevant data related to ANC's identification and delineation, e.g. topographic maps, DTM (20 m. resolution), infrastructure, administrative boundaries, etc.

#### **B4.8. NATIONAL POLICY ASSESSMENTS AND POLICY RECOMMENDATIONS RELEVANT TO THE CHARACTERISATION AND MAPPING OF AREAS WITH NATURAL CONSTRAINTS INCLUDING SOCIOECONOMIC ANALYSES**

The national policy for the areas with natural constraints is defined by Articles 76 and 77 of the Law on Agriculture and Rural Development (Official Gazette of Republic of Macedonia No 49/10 from 12.04.2010). Article 76 states that *the policy for encouraging agricultural activity useful for the*

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*environment is implemented through sets of measures, and one of them is: sustainable use of agricultural land through measures to support agricultural activity in areas with limited opportunities. Moreover, Article 77 emphasises the assistance for agricultural activity in areas with limited opportunities as agricultural production is granted to agricultural holdings that operate in such areas in the form of direct payments for support of the income on farms.*

Direct payments are paid to agricultural holdings in the form of annual payments by unit area of cultivated agricultural land and cannot be more than MKD 30,000 (approximately EUR 500) per hectare. The type of activities supported by these measures should be prescribed by the Minister and the implementation procedure should be defined by the Director of the Agency upon receiving a positive opinion of the Ministry of Agriculture, Forestry and Water Economy. This article allows exception of additional payment of 15% of the direct payments for areas with natural constraints.

The programme for direct support to rural development for the year of 2016 (Official Gazette No 6/2016 from 15.01.2016) envisages measure 211 (Assistance for agricultural activity in areas with limited opportunities for agricultural production) that is implemented according to paragraph 8 of Article 77 or as additional financial support amounting to 15% of direct payments per unit area or livestock unit for agricultural holdings in the areas with limited production. The amount of financial support for this measure in the year of 2016 is MKD 35 million (5 million for the year 2016 and 30 million for not realised payments in previous years).

The areas that are eligible for obtaining this support (Assistance for agricultural activity in areas with limited opportunities for agricultural production) are defined in the Decree on the criteria for direct payments, the beneficiaries, the maximum amount and the method for direct payments for 2016 (Official Gazette 2/2016 from 8.1.2016). According to this act, areas elevated above 700 m above sea level are eligible for additional payment of 15%.

The criteria for defining areas with natural constraints can provide much better access to the real constraints and it is very good to have them defined and proclaimed as such based real measurements and verified parameters as required by the ANC methodology.

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# CHAPTER B5

## STATUS OF SOIL, CLIMATE AND DIGITAL MAPPING INFORMATION IN MONTENEGRO

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### B5.1. INTRODUCTION

Montenegro belongs to the countries of Southeast Europe and Western Balkans. Geographic coordinates of the furthest points of the state territory are 43° 32' (Mocevici, Pljevlja) and 41° 52' (Ada, Ulcinj), north latitude, and 18° 26' (Sutorina, Herceg Novi) and 20° 21' (Jablanica, Rozaje), east longitude. On land, it borders Croatia to the west (14 km), Bosnia and Herzegovina to the west/northwest (225 km), Serbia and Kosovo\* to the north and northeast (203 km), and Albania to the east/southeast (172 km). The length of the Adriatic Sea coast in the country amounts to 293 km.

The total surface of the state territory is 13,812 km<sup>2</sup>, while the surface of the territorial sea area is around 2,540 km<sup>2</sup>, although the border between Montenegro and Croatia has not been established definitely yet. Montenegrin borders to neighbouring countries are naturally determined and undisputed, except with Croatia, in the Prevlaka peninsula and the Adriatic Sea.

According to the census of 2003, Montenegro has 620,145 inhabitants, which gives a population density of 44.9 inhabitants per km<sup>2</sup>. In administrative terms, the national territory is divided into 23 political-territorial units – municipalities - that provide local administration. Golubovci and Tuzi have the status of city districts and they are administratively part of the Capital Podgorica (*Figure B5.1. Administrative division of Montenegro*).

### Geological characteristics

The terrain of Montenegro is made up of late Paleozoic, Mesozoic and Cenozoic rocks. As for the hydro-geological characteristics, it is dominated by highly permeable carbonate rocks. Due to the composition of the rocks, precipitation quickly penetrates into the ground feeding both confined and unconfined karst aquifers that discharge into the zones of erosion bases, coastal sea, Skadar Lake and along the edge of the Zeta-Bjelopavlici Plain, the Niksic Field and alongside waterbeds.

The area of Montenegro is composed of rocks of different ages and petrographic composition. The southwestern part of the country is covered mainly with carbonate rocks and occasionally flysch and quaternary sediments are present. Limestones and dolomites of the Triassic, Jurassic and Cretaceous and flysch from the era of Eocene are spread throughout. The northeast area of Montenegro is built of silicate - Paleozoic clastic rocks and Triassic to which they belong as well as volcanic rocks and limestone, which in some mountains originate from the Jurassic and Cretaceous. In the lowest parts of the region, Quaternary sediments are encountered mostly as glaciofluvial layers and less like a lake (Miocene sediments). Much of the central part of Montenegro's flysch extends from Gacko and

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Volujak in Bosnia and Herzegovina (the entity of the Republic of Srpska) to Komovi Mountain and the boundaries with Albania.

Due to its long geological history influenced also by tectonic movements, Montenegro is rich in various types of rocks (igneous, sedimentary, and metamorphic) and many transitional forms. For this reason the geological composition of the country is very heterogeneous, which resulted in a great diversity in land cover, both in terms of typology, as well as physical and chemical characteristics and properties.



Figure B5.1. Administrative division of Montenegro

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## Geographic Characteristics

As a consequence of the long geological evolution of the terrain and changing endogenous and exogenous forces, the relief of Montenegro is highly diversified. The north is dominated by high mountains; the central part is made up of the karst area with major depression/lowland areas, while coastal plains varying in width from a few hundred meters to several kilometres parallel the coast. The coastal zone is separated from the mainland by the mountains of Orjen, Lovcen and Rumija, whose slopes sometimes, as in the case of Boka Kotorska Bay, descend steeply to the coast. The lowest part of the central mainland area consists of the Zeta River and the lower flow of the Morača River valleys, making up the Zeta-Bjelopavlici plain with Skadar Lake - the largest lake in the Balkans. The mountain ranges in the north include 37 peaks with heights above 2,000 m, the highest of which are Bobotov Kuk (Durmitor) and Maja Rozit (Prokletije), with 2,522 m each. The mountain peaks of Montenegro are among those parts of the Balkan Peninsula which were the most ice-eroded during the last glacial period. The deepest canyon in Europe, the Tara River Gorge with a depth of up to 1,300 m, is also located in the northern mountainous region.

Montenegro is mostly a mountainous country with very small low-lying areas directly along the coast, the Skadar Lake basin, some major river valleys (Lim, Tara, Ibar, Cehotina) and karst fields. Of the total land area of Montenegro, only about 5% has a slope of up to 5°, which means that the country is extremely hilly and mountainous, crisscrossed by streams whose valleys alternate their penetration with gorge canyon types. From the sea to the interior of Montenegro, the plain relief occurs in coastal fields (12,000 ha) and the Skadar Lake basin (42,000 ha). They are considered as plains in the true sense. In their environment, on the hillsides, there are certain areas on the terraces, which are scattered around, without significant continuity, depending on the geological structure, rock types and severity of relief forms and slope. The terraced lands in this part of Montenegro are very important for agriculture because they are up to 500 meters above sea level (m a.s.l.) but still under the influence of the Mediterranean climate that allows the cultivation of citrus fruits, early and winter vegetables, ornamental plants and flowers.

Specific areas of flat land (up to 5 degrees) and mild slopes (up to 7 degrees) are the most represented in karst fields and river valleys, where the climatic conditions enable growing continental fruits and a number of field crops occupy the area of 500-1000 m a.s.l. On hilly land, outside the basin and in the form of enclaves in the forest zone, there are also limited arable lands, combined with orchards and meadows.

In the highland zone of 1,000-1,500 m a.s.l. forests and pastures prevail, while arable lands are located at the plateaus, mainly as meadows, while crops are adapted to climatic conditions similar to those of arable lands.

Forests and pastures (mountain type pastures) dominate the area above 1.500 m a.s.l.

## Climate

Besides latitude and altitude, the climate in Montenegro is determined by the presence of large bodies of water (the Adriatic Sea, the Skadar Lake), the sea entering deeply into the land (Boka Bay), moderately high mountainous area near the coast (Orjen, Lovcen, Rumija), Ulcinj field in the far southeast and the mountainous massif of Durmitor, Bjelasica and Prokletije.

Based on the data for the base climate period 1961 – 1990 and according to the classification by Köppen, two types of climate are present in Montenegro: moderately warm C and moderately cold D. The warm climate is present in the lower parts of the country, while the D-type climate can be found in the mountainous inland areas, mainly at altitudes above 1,000 m. The southern part of Montenegro and

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the Zeta-Bjelopavlici plain have Mediterranean climate with long, hot and dry summers and relatively mild and rainy winters. Podgorica is the city with the highest mean monthly temperature in summer, and with the highest average number of tropical days. The climate is significantly more severe in the karst fields, whose lowest parts lie far below the surrounding mountain peaks and are located at a distance of 40-80 km from the Adriatic Sea. Instead, there are also fields that are quite close to the coast (about 20 km) but are separated from the sea by high mountains.

The central and northern parts of Montenegro have some characteristics of mountain climate, but the influence of the Mediterranean Sea is also evident, which is reflected through the precipitation regime and higher mean temperatures in the coldest months. The far north of the country has a continental climate, which is, besides large daily and annual temperature variations, characterised by low annual precipitation evenly distributed throughout the year. In the mountainous areas in the north, summers are relatively cool and humid, and winters are long and harsh, with frequent frosts and low temperatures which rapidly decrease with height. The lowest mean annual temperature is recorded at Zabljak (Tara River basin).

The mean annual cloudiness increases from south to north. The lowest values are recorded at the Montenegrin coast, Zeta-Bjelopavlici Plain and in Niksic area. Cloudiness on the coast ranges from 44% to 47%, in Podgorica it is 48% and in Niksic 50%. The highest mean annual cloudiness is recorded in the mountain areas in the north, on average between 56% and 62%. Observed by months, the lowest cloudiness occurs in the south during the summer months and the highest one in the north during the period November – February.

The duration of the sunny periods on the coast varies from 2,400 to 2,600 hours per year, i.e. from 1,600 to 1,900 hours in the mountains. The Ulcinj region has the longest mean duration of sunshine with 2,557 hours per year. In all areas, the duration of sunshine in July and August is about 4-5 times longer than in the winter months.

On average, the annual number of days with precipitation is about 115-130 on the coast or up to 172 in the north. The rainiest months on average have 13-17, and the driest ones 4-10 rainy days. The number of days with somewhat more abundant daily rainfall (over 10 mm) ranges from 25 (Pljevlja) to 59 (Kolasin). However, the largest number of days with heavy precipitation is recorded in Cetinje – 74 days.

Snow cover is formed at the altitudes above 400 meters. A snow cover deeper than 30 cm can be expected at the altitudes above 600 m, and even deeper than 50 cm at those above 800 m. An average number of days with a snow cover deeper than 50 cm are 76 days in Žabljak, and 10 days in Kolasin.

Annual precipitation is very uneven ranging from about 800 mm in the extreme north to about 5.000 mm in the extreme southwest. On the slopes of Orjen, in the village of Crkvice (940 m above sea level), precipitation may even reach 7.000 mm in record years, which makes it the rainiest place in Europe.

The geographical position and very pronounced orography have caused very diverse climate characteristics, which are quite sharply alternating from Mediterranean to sub-alpine climate. River valleys, basins and plateaus are the most affected from this shift due to the relief, its articulation and the inclination of the terrain. In this regard, 4-5 climate zones can be distinguished in Montenegro.

**The first zone** consists of an area of the Montenegrin coast with a Mediterranean climate, which penetrates partially modified through the valley of Bojana and Skadar Lake, and feels along the valleys of Zeta River, Moraca River, Cijevna River and River Crnojevic. Central air temperatures in January are quite high (6.8 – 8.0°C) and rarely lower than 0°C. In the Skadar Lake basin temperatures are slightly lower (4.2 – 5.1°C), there is more frost and snow, which being in a coastal zone, rapidly melts when it

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falls.

The mean annual temperatures on the coast are 15.5-15.8°C and in the Skadar Lake basin 14.2 – 15.3°C. During the three summer months the maximum temperature could reach as high as 41°C and the heat and dryness of air have negative impacts on the agricultural activities.

Average annual precipitation ranges from 1,400-1,940 mm in coastal areas and in the Zeta-Bjelopavlici plain from 1,650 to 2,560 mm.

**The second zone** consists of a strip of coastal mountains (Rumija, Lovcen and Orijen) and karst surface of Bileca Lake to the border with Albania. This zone, too, is under the impact of the Mediterranean climate, both in terms of temperature and precipitation. Because of this influence coming from Zeta-Bjelopavlici plains and valleys Trebesnjica directly from the Adriatic Sea, the area has a Mediterranean-mountain type of climate. Its main features are hot and dry summers and humid autumn-winter period with moderately severe winters.

**The third zone**, in the surface area of karst (karst fields in Grahovo, Niksic, Cetinje) in the mountains, has lower mean annual temperatures (between 9.5-10.7° C) and exceptionally high precipitation, the average annual precipitation being in the range of 3,140-4,740 mm, but in some years significantly higher, for example in Crkvice site, which is situated in the foothills of Orijen, it could reach up to 7,000 mm, which is the maximum precipitation ever registered in Europe. Snow in this zone is also common, but it does not stay long on the ground because the southern rainy wave rapidly melts it in the mountains.

**The fourth zone**, in the central mountain area of Montenegro, is represented by continental mountainous and sub-alpine climate. The relevant data for Kolasin indicate that the average temperature in January is -1.9 and in February -0.7°C, while in the three summer months it ranges between 13.9 – 15.8°C. In Zabljak the mean annual temperature is 4.7°C, with the coldest months being January (-4.7°C) and February (-3.7°C), but the temperature is below 0°C (negative temperatures) even in December and March. The summer period is characterised by average monthly temperatures of 12.0 – 13.9°C and because of that, Zabljak and plateaus around Durmitor, Sinjajevina, Piva Mountain, Ljubisnja and other high mountains, have an air temperature like the one in the coastal areas and Zeta-Bjelopavlici plains in April.

The absolute maximum temperature in Kolasin is 32.8°C and the lowest is -29.8°C, which is a fluctuation of 62.6°C. On the plateaus, the number of warmer days is significantly lower, which causes smaller temperature fluctuations than in the river valleys, although higher regions have low negative temperatures that cause penetration of cold north wind and snow cover that lasts for long periods. The average annual precipitation in the mountainous areas of Montenegro is quite high, ranging 1,500-2,500 mm. This area represents the transition from modified Mediterranean to continental and mountain climate. The amount of precipitation is higher in places that are closer to, or gravitate to, the Adriatic Sea basin, while decreasing in those draining in the Black Sea basin.

**The fifth zone**, in the northern area of Montenegro, is represented by moderate continental climate, with fairly cold winters and warm summers. Mean annual temperature in Pljevlja is 8.2°C, in Blue 8.5°C, and in Berane and Bijelo Polje 8.8°C. An absolute maximum temperature of 35-37°C and an absolute minimum temperature of -25 to -29°C are registered in the area. The temperatures in January are negative in all places, while Pljevlja and Plav have negative temperatures in December and February. Pljevlja, although lower (784 m) from Plav (909 m), is mostly open to the continental area, and, therefore, has lower negative temperatures, because of the north wind, while fog in the autumn-winter period remains longer than in the valleys Tara, Lim and Ibar.

The summer months are the warmest with average monthly air temperatures of 14.5 to 18.4°C, while

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September is warmer than May, due to the retention of snow on the surrounding mountains. The average annual precipitation ranges from 796 mm in Pljevlja and 780 mm in Savin Field in Bistrica of Bijelo Polje, up to 950 mm in Berane, 1,200 in Plav, 1,345 mm in Mojkovac and 1,467 mm in Gusinje.

In conclusion, it is foreseen that in various areas of Montenegro climatic conditions will meet the requirements of the ANC project as far as temperature and rainfall data are required. Nevertheless, this will be the subject of detailed statistical analyses and investigations when the ANC delineation starts.

## Water resources

There are significant differences in Montenegro in the distribution and abundance of water resources - starting with arid karst areas to those that are rich in both surface and groundwater. Generally speaking, with an average annual runoff of 624 m<sup>3</sup>/s (i.e. the volume of 19.67 billion m<sup>3</sup>), the territory of Montenegro falls among the areas rich in water. An average specific runoff is about 43 litres /s/km<sup>2</sup>. Of the total runoff, about 95% are inland waters, while the remaining 5% are transit waters.

The rivers drain into two basins: the Black Sea, with a total area of 7,260 km<sup>2</sup> (or 52.5% of the territory), and the Adriatic Sea with about 6,560 km<sup>2</sup> (or 47.5%). The major rivers of the Black Sea basin are the Lim (the longest river, 220 km long), the Tara (146 km), the Cehotina (125 km) and the Piva (78 km), while for the Adriatic Sea basin the Morača (99 km), the Zeta (65 km) and the Bojana (40 km) rivers.

Natural lakes are also important water resources, the most significant of which are the Biogradsko (area of 0.23 km<sup>2</sup>), Plav (1.99 km<sup>2</sup>), Black (0.52 km<sup>2</sup>), Sasko (3.6 km<sup>2</sup>) and Skadar Lakes. The surface area of the Skadar Lake, depending on the water level, varies from about 360 to over 500 km<sup>2</sup>, while the volume of the lake ranges from 1.7 to 4.0 km<sup>3</sup>. The total catchment area of Skadar Lake is about 5,500 km<sup>2</sup> (4,470 km<sup>2</sup> in Montenegro and 1,030 km<sup>2</sup> in Albania). Natural lakes are located at elevations ranging from 1,4 m (Sasko Lake) to 1,418 m (Black Lake), and three of them – Biogradsko Lake, Black Lake, and Skadar Lake - are in national parks. The largest artificial reservoir is Piva Lake, with a total water accumulation capacity of 880 x 10<sup>6</sup> m<sup>3</sup>. Other significant accumulations include the lakes of Slano, Krupac and Vrtac (225 x 10<sup>6</sup>m<sup>3</sup>) and the accumulation of Otilovici (18 x 10<sup>6</sup> m<sup>3</sup>).

Wetlands can generally be found in areas around the lakes and to a lesser extent in the coastal area. The most important wetland area is located in the vicinity of Skadar Lake, and is listed as an internationally important area (based on the Ramsar Convention). The data on groundwater are incomplete since the previous surveying was rare and limited in scope. Montenegro is very rich in hydrological terms, because there are numerous surface and underground water streams, natural lakes and artificial reservoirs on its territory (see Figure B5.2.).

From a variety of sources, large and small watercourses, water from the rivers flows in the basin of the Black Sea: Ibar, Lim, Tara, Piva and Cehotina. Specific average discharges (*Fustic and Djuretic, 2000*) in these basins are: in the Ibar and the Cehotina 16-24 l/s/km<sup>2</sup>, in the basin of Lim 27-55 l/s /km<sup>2</sup>, and in the basins of the Tara and Piva 44 l/ s/km<sup>2</sup>. The average specific discharge to the Black Sea basin is 31.6 l/s/km<sup>2</sup>.

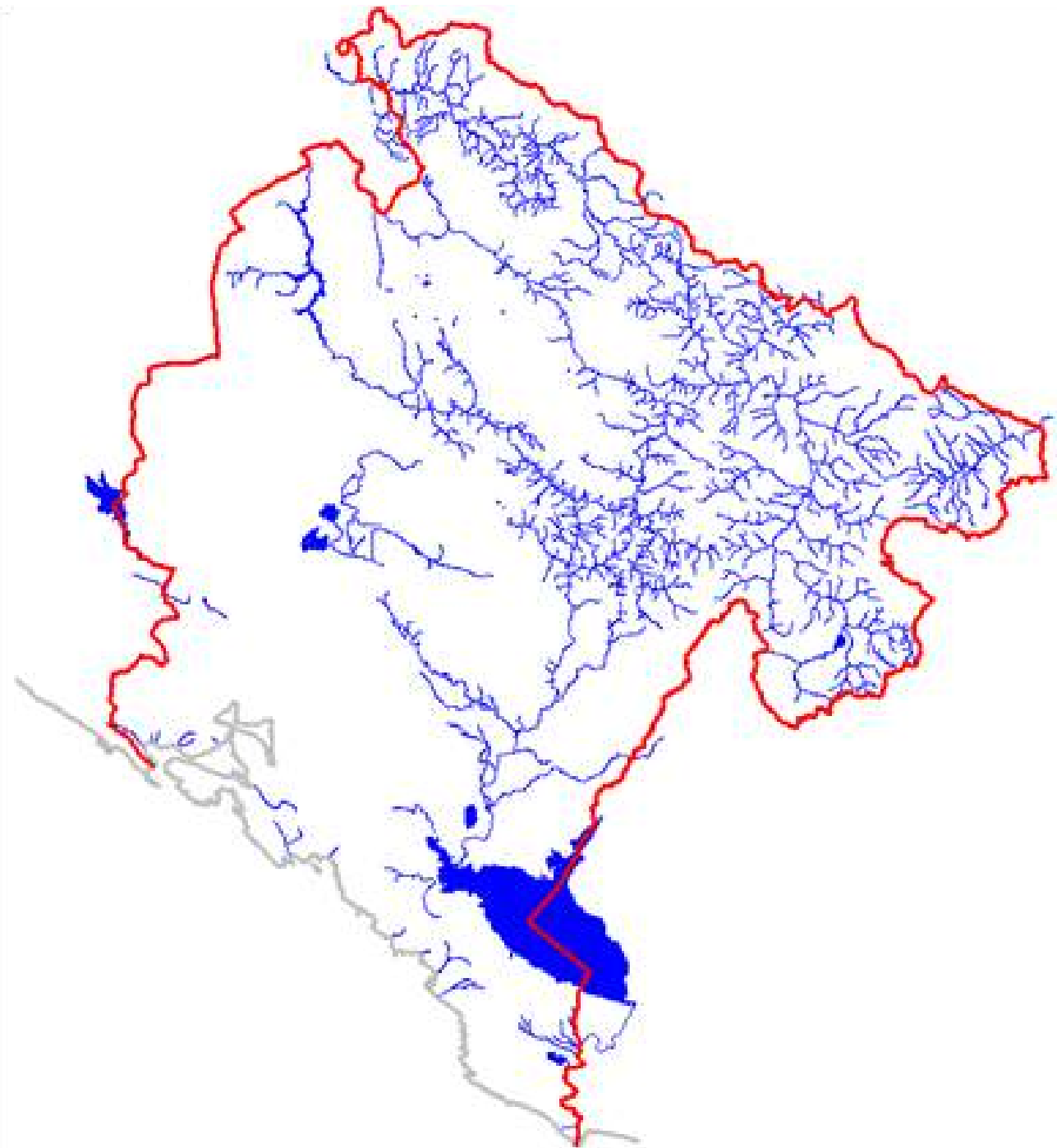


Figure B5.2. Hydrological map of Montenegro

The southern part of Montenegro consists of the Skadar Lake basin and is close to the sea. Moraca River with Zeta River and Cijevna River, as well as the river of Crnojevic and Crmnica River, provide water to Skadar Lake. The specific discharge of Moraca River and Zeta River is around 60 l/s /km<sup>2</sup>.

Bojana River flows out of Skadar Lake, and partly it is a border watercourse along the border with Albania. The mean annual discharge of Bojana River is 665m<sup>3</sup>/s. The area of Boka Kotorska, on the profile of Verige (with an area of 826.5 km<sup>2</sup>), drains 79.5 m<sup>3</sup>/s into the sea, and other coastal watercourses in the areas of the rest of Boka Kotorska drain 11.7 m<sup>3</sup>/s of water into the sea on average per year. From the Trebisnjica catchment, an area of 748 km<sup>2</sup>, the average flow is 38.8 m<sup>3</sup>/s.

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With the specific runoff of 44 l/s/km<sup>2</sup>, Montenegro is one of the richest countries in the world by the quantity of water.

Montenegro has 30 natural lakes; the largest one in the Balkans is Skadar Lake, then Plav Lake, Black Lake and Sasko Lake. All lakes accumulate 4.2 billion m<sup>3</sup> of water, while the artificial lakes, built for the purposes of energy supply and water supply, accumulate over 1 billion m<sup>3</sup> of water.

The karst region of Montenegro covers almost 70% of its territory. Karst is very permeable, which causes the absence of surface watercourses, but also a wealth of groundwater, which appear in the nearby lower ground in the form of strong springs. Groundwaters of Montenegro are of very good quality, which allowed for all municipal water supply in the country, except for Pljevlja and Herceg Novi, to be built by capturing these waters. Surface streams are also of good quality. The quality of spring water gave the birth of and facilitated the fast growth of a new branch of industry: bottling drinking water.

### Land Use

Agricultural land covers an area of about 5,145 km<sup>2</sup> and makes 37% of the total national territory, 6,225 km<sup>2</sup> or 45% is covered by forests, while the settlements, roads, water, rocky areas and other categories occupy 2,442 km<sup>2</sup> or 18% of the territory (data from the Spatial Plan, 2008).

In total, there are 1,307 settlements in the country. The existing and planned land uses are determined through a process of spatial planning. Spatial plans are made on national level (Spatial Plan of Montenegro with the purpose of defining the spatial areas and management plans for the public maritime domains and the national parks as well as the detailed spatial plans and national location studies). On local level, there are in place spatial-urban plans of local self-governments, detailed urban plans, urban designs and local location studies.

Agricultural land, which is an important resource for the development of agriculture, is 0.79 ha per capita. After Northern Ireland (1.36 ha/capita), Montenegro is ahead of all European countries by this indicator.

The National Reference Centre for Montenegro (NRC), was in charge of the CARDS project: CORINE Land Cover mapping in Montenegro: CLC1990, CLC2000 and CLC2006, which conducted the geological survey. Data from the territory of Montenegro were integrated into a European database. Data are available on request to the relevant state institutions and ministries and will be made available to the ANC project, always on request.

The structure of agricultural land shows that there is a large part of it considered to be unfavourable because pastures (323,953 ha) and natural meadows (126,990 ha) have a dominant share (together 87%) of the total agricultural land. Due to high orography, geological composition and other conditions, this land is very extensively used. The depopulation of rural areas of Montenegro has negative impacts and prevents utilisation of pastures and meadows where forests are expanding as they convert to forest land.

The share of arable land, gardens, orchards and vineyards with a total area of 62,154 ha, or 0.095 ha/capita is below the EU average and the average of all neighbouring states. Montenegrin Bureau of Statistics has data on areas of agricultural land by category of use based on regular surveys of crop production statistics from the 2010 Agriculture Census.

The present situation in the area of crop production statistics is characterised by the difference between the data obtained in regular surveys based on a comprehensive cadastre system (Table

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B5.1.) with the data obtained from the 2010 Agriculture Census. In order to harmonise statistics on crop production with EUROSTAT's recommendations, a pilot survey on crop production and autumn sowing on a sample basis was carried out in December 2013. The results of this research will be used for the conversion of time series, which will take place in the future.

Table B5.1. The structure of agricultural land use (2011)

Structure	Surface area (ha)
Agricultural land	515,740
Arable land and gardens	45,748
Orchards	12,007
Vineyards	4,399
Meadows	126,990
Pastures	323,953
Ponds, fishponds, swamps	2,643

Source: MONSTAT - Statistical Yearbook 2012

### Soil characteristics

The heterogeneous pedological cover in Montenegro is the result of interaction between natural soil factors, such as relief, parent material, climate, vegetation, and organisms including humans, and pedogenetic process. Their joint actions formed mainly autogenous - terrestrial soils, while hydrogenic soils are present to a significantly lesser extent. The Soil Atlas, its maps at a scale of 1: 50,000 and the monograph "Soil of Montenegro Mountains" (Fustic and Djuretic, 2000) provide relevant data on the presence of certain types of land, lower systematic units and their distribution.

According to data from these sources, the most common soil type are those formed on carbonate rocks or the Calcomelanosol (national soil classification) covering 660,000 ha, within which Litosols and Regosols are the initial soils. Calcocambisols can be found in lower areas following Calcomelanosol over an area of 30,000 ha and Terra Rossa, which are formed in the coastal area and in the Skadar Lake basin to the height of 500-600 m. The surface area of Terra Rossa is about 84,000 ha. The so-called Rendzina are formed on carbonate regolith of moraine, glacio-fluvial sediment, and scree, covering a surface area of 31,200 ha. Ranker soils, spread in a surface area of 6.830 ha, are found at 1,500 meters above sea level on silicate substrates.

Dystric Cambisols and Brown acid soil occupy 394,820 hectares. They are created on the quartz silicate substrates, which are poor with alkalis, but with leaching due to higher rainfall, soil is further acidified and this contributes to forest litter of conifers and deciduous trees, which slowly decomposes and increases the content of humic acids in the soil. These soils will most likely meet the pH criteria for being classified as ANC.

Eutric Cambisols are found on 118,300 hectares of a similar structure profile as Brown Acid soils. Eutric Cambisols were formed on substrates with the presence of CaCO<sub>3</sub>, but despite that, they tend to be usually acid or moderately acid. On the plains, the substrate diluvial clays as in the case of Bjelopavlici Plain and Ljeskopolje water logging after heavy rainfall is evident above the impermeable illuvial horizon causing the appearance of pseudogley on about 550 ha. These areas are also potentially "suitable" to be classified as ANCs.

Fluvisols occupy 34,250 ha in the river valleys, on the shores of Skadar Lake, Plav Lake and Sasko Lake and in the coastal areas. In the lowest parts of the terrain, Fluvisol exceed the Eugley and Histosol, which could potentially be classified as ANCs.

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Table B5.2. Categories of effective fertility with an estimated area

No:	Categories fertility	Land capability evaluation	Surface area (ha)	%
1.	High fertility	I and II	20,000	1.5
2.	Medium fertility	III and IV	60,000	4.3
3.	Limited fertility	V and VI	350,000	25.3
4.	Low fertility	VII and VIII	640,000	46.2
5.	Infertile	without capability (unclassified)	312,000	22.7
<b>Total</b>			<b>1,382,000</b>	<b>100</b>

The surface of sand-gravel land (3,500 hectares) located in Stoj near Ulcinj and waterbeds are insignificant. Also, the surfaces of technogenic soil and recultivate soil are insignificant. They too could meet the criteria for being classified as ANC.

Based on the Soil Map of former Yugoslavia at a scale of 1:50,000, the most common types of soil in Montenegro are Calcomelanosol (47%) and District Cambisol (28%), followed by Eutric Cambisol (8%), Terra Rossa (6%), Fluvisols (2.4%), Rendzina (2.2%), while other soil types cover the remaining area.

Most of the soils represent in Montenegro have a shallow soil profile (possibly to be classified as ANC) and low contents of nutrients. Of the total area, not considering the infertile lands (rocks, wetlands, lakes, rivers, roads and urban settlements), the soils of Montenegro (Fustic and Djuretic, 2000) are grouped in five categories of effective fertility as shown in Table B5.2.

### Land degradation processes

Multiple pressures on the soil are recorded in Montenegro. When it comes to agricultural land, the sealing process, or the conversion into construction land or land for infrastructure development is common. The country continues to lose extensive areas of agricultural land in line also with what is happening throughout the European Union countries.

Land degradation is also accelerated on a large scale due to the exploitation of sand and gravel, mining, disposal of tailings and construction waste, industrial operations, extraction of clay and similar activities. Other important factors of land degradation include erosion (water, wind) and in-situ damages (physical, chemical and biological).

### Nature and biodiversity

Montenegro belongs to the group of European countries with the richest flora and fauna and highly diverse ecosystems. The country, for example, is considered to be one of the most diverse floristic areas in the Balkan Peninsula, with about 3,250 plant species, whereas the vascular flora species-to-area ratio of 0.837 is the highest in Europe. The total share of protected areas in the national territory is 9.21% and they mainly belong to the five national parks.

## B5.2. STATUS OF SOIL DATA

During the period 1958-1988 a detailed soil map at the scale of 1:50 000 was prepared in Montenegro by the Biotechnical Faculty (former Agriculture Institute). The soil survey involved the study of two thousand profiles. Unfortunately, as in other Former Republics of Yugoslavia, the enormous effort and the work was not properly presented to the wide professional community and land users.

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Pedologic data described the mechanical-physical and chemical properties (MPC properties) of the soil obtained through various laboratory methods. In addition, there was a systematic project in the past, spanning for almost three decades, where several thousand soil profiles were dug throughout Montenegro, and their properties entered in hand-written forms in six notebooks which amount to around 150 double-pages each. Moreover, every profile's location was originally entered on a series of maps, with a 1:50,000 scale.

The pedological map in digital form with the appropriate database can be created with digitisation of data and their positioning. By appropriate polygons (representing mapped soil types) and analytical data, the interpolation and spatial representation of physical and chemical characteristics of the soil can be performed. Thematic maps related to soil texture (coarse sand, fine sand, silt and clay) as well as basic chemical properties of soil (available phosphorus and potassium, soil reaction, organic matter and total carbonates) could be developed. The digitisation of pedological data as shown in Figure B5.4 is in progress.



Figure B5.3. Original pedologic map for soil types in Montenegro

Figure B5.4 Page from the original hand-written notebooks

The processing of the new data sets uncovered some bugs in the parser that, among other things, caused some profiles to be incorrectly georeferenced. Namely, there turned out to be many duplicate profiles in a single section of the map, and these had to be inspected on a case-by-case basis to determine which particular point matches which row of data.

In total, ~7,666 profiles', or ~16,151 profile layers' (every soil profile has 1 or more horizons, corresponding to soil layers) properties were digitised, out of which ~4,986 have MP, and ~6,692 have C properties, while ~ 4,030 have both MP and C properties. ~3,536 profiles or ~6,555 horizons have geographical coordinates.

The data from the book "Zemljišta Crne Gore" were almost entirely georeferenced, in the sense that the authors of the book mentioned the section map where a profile is located, as well as the square inside the section map, which allowed to find the exact coordinates of the profile relatively easily. For the purposes of the preparation of the ANC study, it is not possible to use the number of profiles that was previously mentioned because for many profiles the proper coordinates are missing. For about 3,536, there are also half profiles, which were opened for the purposes of the soil maps.

Nevertheless, half of the information (about 1,800 profiles with about 4,000 layers) can be used by the

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ANC project. Bearing in mind that the area of Montenegro is about 13,812 km<sup>2</sup>, on average, it means that there is one profile for every 7.7 km<sup>2</sup>, which can be considered to be a sufficient volume of data for the ANC project.

The data, which may be available to the full extent for 1,800 profiles, are as follows: the upper depth of the horizon, the lower depth of the horizon, % of skeleton, % of coarse sand, % of fine sand, % of silt, % of clay, % of total sand, % of total clay, hygroscopic moisture, pH in H<sub>2</sub>O, pH in KCl, the content of CaCO<sub>3</sub> (%), content of organic matter (%), available P<sub>2</sub>O<sub>5</sub> (mg/100 g of soil) and available K<sub>2</sub>O (mg/100g of soil). Hydrolytic acidity, sum of base cations, the adsorption capacity of the adsorbed cations, degree of saturation of base cations were not made for all profiles but only for about 47% of the profile (around 850).

The percentage composition of the individual fractions was determined using “Pipette method B”. The chemical soil parameters were determined by methods widely used in the former republics of Yugoslavia (Džamić et al., 1996).

Considering that for the purposes of the ANC study the following data are necessary: drainage classification, soil depth, soil texture, surface stoniness, soil organic matter, salinity, sodicity and acidity, the Montenegrin team confirms that the data at our disposal are adequate and valid. The missing data are those that relate to salinity, sodicity, but bearing in mind the climatic conditions, i.e. high precipitation, soil salinity is not a problem in Montenegro.

The steps to follow would be to increase the number of profiles in the database and connect them with the appropriate coordinates. Due to the lack of financial resources and reduced number of staff at the Centre for Land and Amelioration, no soil survey investigations have been conducted in recent years. For that reason it is necessary to introduce a land monitoring programme. As already emphasised, the Biotechnical Faculty/Department of Soil and Amelioration was in charge of research for the development of the pedological map. Data are available to the relevant state institutions and ministries upon request. The request for data should be addressed to the Dean of the Biotechnical Faculty.

### B5.3. STATUS OF CLIMATE DATA

According to the German climatologist W. Koppen, climatic zones are ranked in three levels: climate, types and subtypes. All the climates, according to the average values of air temperature, are divided into five climates or grades: A, B, C, D and E. B characterises dry climates, and C has moderate warm rainy climates. Types were determined on the basis of the rainfall regime and subtypes according to the values and duration of certain air temperatures (Dubljevic, 2009).

On the basis of the data from 1961-2000, the climatic zones present in Montenegro are as follows:

- C - moderately warm (in lower areas) and
- D - moderately cold (at an altitude of above 1,000 m)

C climate occurs in two types, Cs (Mediterranean type) and Cf (moderately warm and humid climate). In Cs there are two subtypes Csa and Csb, and Cf type is represented in Cfb subtype.

D climate is represented with one type – Df - humid boreal (snow - forest) climate. The Df type is represented in two subtypes, Dfb - at altitudes of up to 1,500 m, and Dfc - at altitudes of above 1,500m.

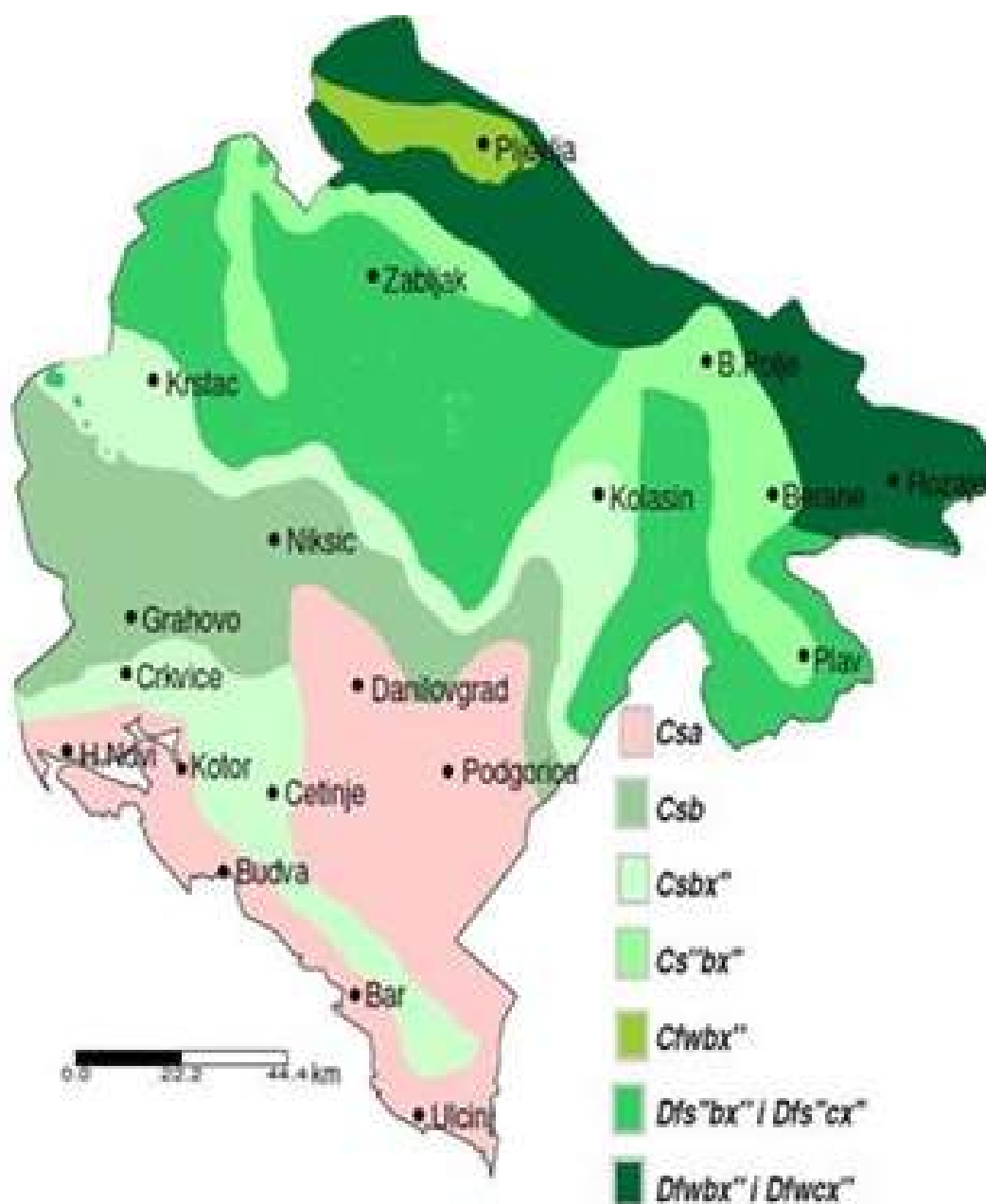


Figure B5.5 Climatic regions of Montenegro according to W. Köppen (Dubljevic, 2009)

### Meteorological networks stations

The first record of the weather on the territory of Montenegro had a descriptive character as encountered in the historical records from the 17th and 18th centuries. These notes are related to the occurrence of droughts and other natural disasters which people remember. Archival documentation indicates that Dr. Petar Miljanic performed the first continuous meteorological observations. He kept a record of the weather in Podgorica from 1 September 1882 to 31 August 1883.

Until 1949, measurements and observations were carried out for certain meteorological elements but with frequent short breaks, and sometimes longer ones. Systematic meteorological measurements and observations began in 1949. Today the territory of Montenegro has a large number of well-equipped meteorological stations according to the standards prescribed by the World Meteorological Organisation (Figure B5.6).

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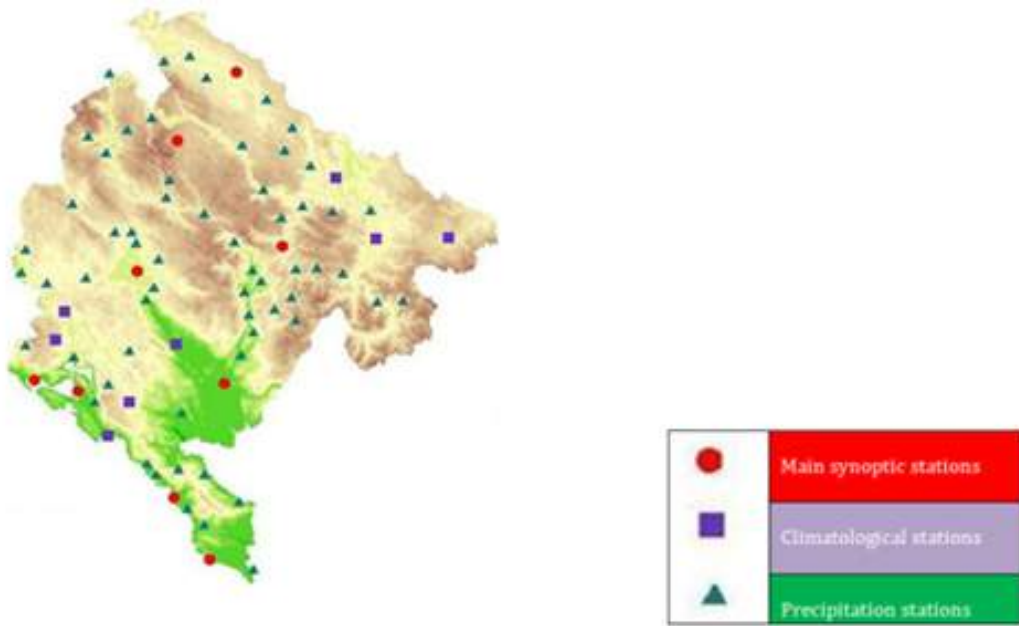


Figure B5.6. Spatial distribution of meteorological stations (Source: IHMS, 2012)

The network of meteorological stations on the territory of Montenegro consists of a basic and supplementary network of meteorological stations as follows:

- 9 main stations
- 2 airport stations (not part of the national meteorological station's network)
- 16 climatological stations (+1 that used to be climatological until 2010 but now has only few measurements)
- 17 precipitation stations and 9 automatic meteorological stations (in operation since 2004).

There are a total of 54 meteorological stations for observation purposes (Figure B5.7).



Figure B5.7. Meteorological network stations of the IHMS (Source: IHMS, 2016)

## Basic network of meteorological stations

The basic network of meteorological stations of the Institute of Hydrometeorology and Seismology of Montenegro consists of 9 main (synoptic), 16 climatological (ordinary) (+1 that used to be climatological until 2010 but now has only few measurements) and 20 precipitation stations (Figure B5.5.7.).

## Data range

On the main meteorological stations and a smaller number of reference climate stations, from which data goes into international exchange, measurements and observations are made every hour and these tasks are performed by a professional (permanent employee) observer.

On a number of climate stations, measurements and observations are carried out 3 times a day at 7, 14, 21 hours (local time), on precipitation stations, measurements and observations are made at 7 hours (local time) for which external observers are engaged on the basis of a fixed term employment contract (Table B5.5.3.).

Table B5.3. Frequency of data measurements according to station's type and meteorological elements

Station type	Time (per day)
Main synoptic	Depending on the element: once at 07:00AM or 09:00PM; three times per day at 07:00AM, 02:00PM, 09:00PM; every hour
Airport	Depending on the element: once at 07:00AM or 09:00PM; three times per day at 07:00AM, 02:00PM, 09:00PM
Climatological	Depending on the element: once at 07:00AM or 09:00PM; three times per day at 07:00AM, 02:00PM, 09:00PM
Precipitation	Once at 07:00 AM
Automatic	Every 10/15 minutes

There are also other weather stations but they are not within the competence of the IHMS. These are stations that are set and maintained by other institutions and economic organisations. They include for instance, aeronautical meteorological stations at airports in City District Golubovci (Capital Podgorica) and Tivat, and climatological stations in the national parks.

## Automatic meteorological network stations

The first research efforts related to automatic measurements in meteorology within the HMS were made from 1996 to 1999. The station METEOMONT, which is largely the result of the work and innovation of employees in the department, was put into experimental work in Podgorica in 1998. The Institute acquired the first automatic weather station in 2000, and since ten years later all weather stations of the first order (Ulcinj, Bar, Herceg Novi, Podgorica, Cetinje, Niksic, Kolasin, Zabljak and Pljevlja) have had automatic measuring equipment (Lambrecht GmbH) from which the data reach the central office in Podgorica through GPRS every 10 minutes.

Similarly, it is possible to collect the data available from the climatological and precipitation stations of the IHMS network and make analysis. Besides the products derived from the climatological database, there is also the Climate Atlas of Montenegro, financed and published by the Montenegrin Academy of Sciences and Arts, 2013.

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## Data access

Access to all data (raw and processed), metadata and products of the IHMS (meteorological, climatological, hydrological, hydrographic, seismological and ecological) is available under certain conditions and rules, in accordance with the Guide for access to information in the possession of the IHMS (published in March 2013).

Requests for data can be submitted via the IHMS webpage or by sending a request for data to the official e-mail address [office@meteo.co.me](mailto:office@meteo.co.me). The request can be downloaded from IHMS webpage: [www.meteo.co.me](http://www.meteo.co.me). After receiving the request, the person in charge of this domain sends a confirmation of receipt of the request to the sender and the information that the request will be processed within the time limit determined by law (within 15 days).

The request received must be recorded in the IHMS archive and then forwarded to the Director, who delegates a person who will process the request and contact the sender in case further information/clarification is needed or will just send the requested information/data.

In conclusion, climate data required for the delineation of ANC in Montenegro are available under the conditions described in the previous paragraphs. The analysis of available climate data for eight climatic parameters for the main meteorological stations (time range of climate parameters, number of months with data availability in CLIDATA database from the beginning of measurement, percentage of daily data availability according to the parameters) has been provided in an annex to this report.

## B5.4. STATUS OF GEOGRAPHICAL INFORMATION SYSTEM (GIS) DATA

### Data of Geographical Information System (GIS) in Montenegro

The Ministry of Sustainable Development and Tourism has the geographical information system for the following layers:

- a. in the field of hydrology-water management data,
- b. in the field of infrastructure with the following layers.

The soil map in GIS format, with a scale of 1: 50,000, falls also under the jurisdiction of the Ministry of Sustainable Development and Tourism and will be made available to the ANC project upon request. All layers are georeferenced in Gauss-Kruger projection of 6 zones.

Most enterprises of local government, dealing with the distribution of drinking water and canalisation and treatment of waste water, use GIS with databases of hydrotechnical infrastructure (water and sewage network). These database tables have been adopted in all enterprises as a standard for the application of GIS in this field.

### The Digital Terrain Model of Montenegro

Real estate management in Montenegro is done using orthophoto images at the scale of 1:10,000 and digital maps in GIS format, at the scale of 1:25,000, covering the whole territory of the country. These maps are georeferenced in the UTM projection. The database of the digital maps in GIS format, at the scale of 1:25,000, contains many layers, even though not all of them are required by the ANC project.

The area of Montenegro is covered with detailed points at the distance of 20 meters and elevation of each meter. The database contains the following points and relevant attributes for developing the DMT (Table B5.5.5):

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- Y coordinate
- X-coordinate
- H level
- ID point

Table B5.4. Data for digital terrain model

AREA	PERIMETER	GSM_	GSM_ID	GSM_COORD Z	POLYGONID	SCALE	ANGLE	Y	X
0	0	0	89815	1349	0	1	0	401360,00	4718740,00
0	0	0	89826	1345	0	1	0	401340,00	4718740,00
0	0	0	89827	1339	0	1	0	401320,00	4718740,00
0	0	0	90380	1336	0	1	0	401360,00	4718720,00
0	0	0	90381	1333	0	1	0	401340,00	4718720,00
0	0	0	90382	1328	0	1	0	401320,00	4718720,00

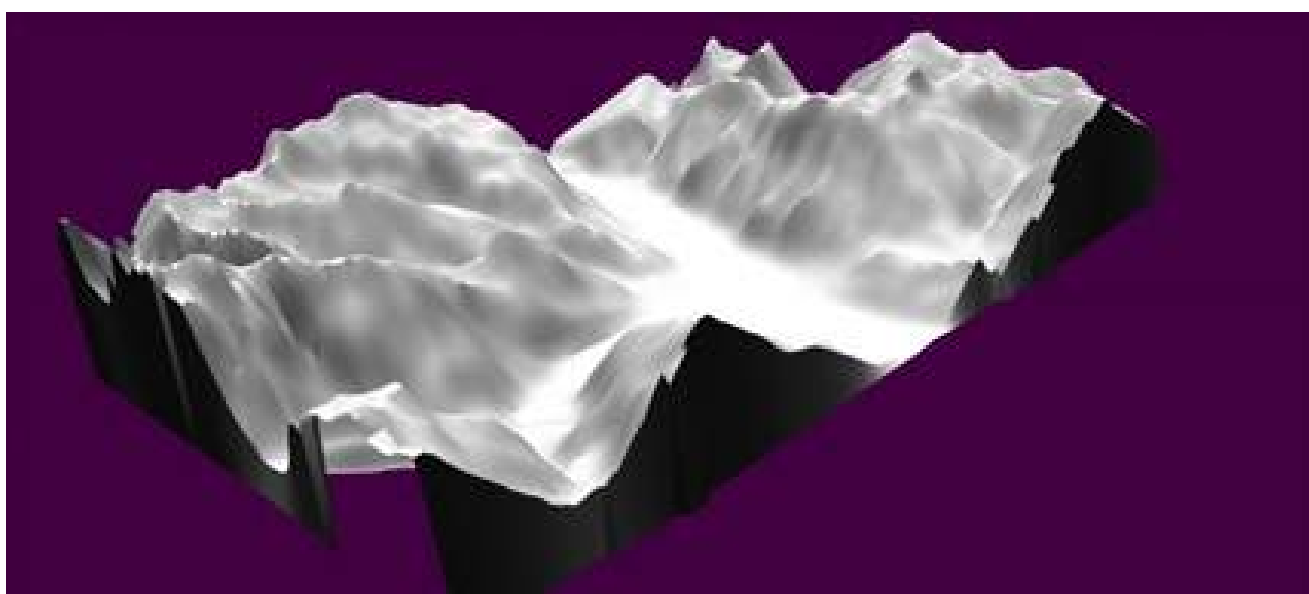


Figure B5.8. Sample of digital terrain model

### The territorial division of Montenegro

The Law on Territorial Division of Montenegro (“Official Gazette of Montenegro”, No. 54 / 2011, 26 / 2012, 27/2013, 62/2013 and 12/2014) defines the territorial organisation of the country. This Law divides the territory into 23 spatial units (LAU1, the municipality of Podgorica, capital Cetinje and 21 local governments) which contain 1,307 settlements (LAU2). Each municipality is divided into one settlement of urban character, and a number of settlements of rural character.

In order to facilitate the real estate cadastre, Montenegro is divided into 796 cadastral municipalities. The boundaries of local governments coincide with the boundaries of cadastral municipalities, which thereby enter into its composition. In order to control administrative competence, the area of local government is divided into local communities. The boundaries of local communities coincide with the boundaries of cadastral municipalities.

The Statistical Office of Montenegro (MONSTAT) is in charge of the process of collecting, processing and publishing demographic, economic, educational, migration, ethno-cultural and social data.

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## **B5.5. DATA GAPS, PROBLEMS, AND SOLUTIONS**

Based on the above information, the Montenegrin team can conclude that Montenegro has adequate sets of historical data for almost all of the relevant climatic parameters required for the successful delineation of ANC areas in the country.

The exception would be only the climatic parameter i.e. wind speed at 10m BRV32, where there are gaps in monitoring and/or data entry from certain climate diaries into the existing climatological database. This lack of information could be overcome if the reference period would be from 1981 onwards since after this period there is a continuous data set for this parameter. Nevertheless, the ANC does not require wind speed data, therefore, this shortcoming would not hinder the implementation of the project.

## **B5.6. PROVISION OF RECOMMENDATIONS FOR IMPROVED DATA MANAGEMENT IN THE CONTEXT OF THE AREAS WITH NATURAL CONSTRAINTS**

A data management resource requires local, regional and international cooperation through the development and implementation of joint projects, which will bring together and solve issues of data management. Montenegro should include all scientific and technical resources and human resources to strengthen the institutions responsible for data management.

Capital investment in research (multidisciplinary and involving more institutions) on data management, the application of modern methods and techniques in risk assessment is necessary in order to improve data management. Scientific research related to the conservation of soil against any form of degradation and climate change mitigation and the development of information systems in the area of land protection should be singled out as a priority. The role of government is essential, through the formal education system and the implementation, improved efficiency and application of the results of scientific research.

Operational and research activities related to the application of meteorological data, forecasts and knowledge in agriculture have become increasingly important. By enhancing a network of observation stations as well as by undertaking agroclimatic research, agrometeorological services in the IHMS and BTF fully contribute to the development of agriculture in Montenegro.

## **B5.7. ANALYSES OF THE NATIONAL CAPACITIES FOR DATA MANAGEMENT AND PROVISION OF RECOMMENDATIONS FOR IMPROVED INSTITUTIONAL SETUP WITH REGARD TO THE ANC**

The Montenegrin institutions that have a role in creating and implementing soil and climate data management policies are formally led by two ministries: the Ministry of Sustainable Development and Tourism (MSDT) and the Ministry of Agriculture and Rural Development. Within the Ministry of Sustainable Development and Tourism there are the Department for Environment, Directorate of Climate Change and the Directorate of Urban Planning that are directly responsible for data management. For many years, these institutions are continually involved in the development of environmental policies. Under the responsibility/coordination of MSDT there are also the following entities: the Agency for Environmental Protection, the Institute of Hydrometeorology and Seismology of Montenegro (IHMS) and the National Council for Sustainable Development and Climate Change, among others.

## **B5.8. NATIONAL POLICY ASSESSMENTS AND POLICY RECOMMENDATIONS RELEVANT TO THE CHARACTERISATION AND MAPPING OF AREAS WITH NATURAL CONSTRAINTS INCLUDING SOCIOECONOMIC ANALYSES**

Regarding the characterisation and mapping of areas with natural constraints, it can be concluded that Montenegro has the institutional capacity supported by well qualified institutions both in professional, scientific, and administrative terms. What is mostly needed is the strengthening of the cooperation among them, their respective ministries and other relevant institutions. Notably, the implementation of the ANC project would require the creation of a unique database including all available information on soils, climate, land use/land cover, terrain in a GIS format. Once this database is finalised the implementation of the ANC should follow and for this technical assistance would be required.

The relevant governmental intuitions and policy makers in Montenegro have great expectations of the ANC project. The final goal would be to develop sustainable rural development policy guidelines that would assist to determine the amount of financial support for farmers that practice agriculture in ANC areas.

Montenegro has recognised the significance of the ANC issue and, with funding provided by the World Bank, it will start the mapping and delineation of the ANCs using the JRC methodology in 2017. Furthermore, by the end of 2016 the Ministry of Agriculture and Rural Development (MARD) is planning to endorse legislation similar to the one developed in Serbia. However, the effects of this legislation will be less visible since most of the Montenegrin territory may be classified as ANC. This could create problems as it will be difficult to harmonise it with the possible national direct payments. Nevertheless, the country will need to enact such legislation sooner than later and this has to be harmonised with CAP rules and guidelines. Finally, the effects of it will be hardly visible or included in the national payment ANC schemes; instead, more is expected to come through the EU support.

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# REFERENCE LIST OF THE DATA USED FOR THE ASSESSMENT OF RELEVANT ANC DATA

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# CHAPTER B6

## STATUS OF SOIL, CLIMATE AND DIGITAL MAPPING INFORMATION IN SERBIA

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### B6.1. INTRODUCTION

#### Geological characteristics

The Republic of Serbia is located in the northwestern part of the Balkan Peninsula, in the southern part of Central and Eastern Europe. It extends in the direction south - north between 41°53' and 46°11' north latitude and in the direction west-east between 18°49' and 23°00' east longitude covering a territory of 88,499 km<sup>2</sup>. Based on its geographic location and natural characteristics, the Republic of Serbia could be considered both as a Central European, Balkan, Pannonian and Danubian country. Its large heterogeneity in geological substrate, climate, vegetation cover and soil fauna has resulted in the formation of a large variety of soil types. Accordingly, the area of Serbia is divided into nine edaphic-climatic regions (Vidojević and Manojlović, 2007). Each region includes several soil types whose combination defines the general characteristics of these regions.

#### Climate

The climate of Serbia can be described as moderate-continental with more or less pronounced local characteristics. The spatial distribution of climate parameters is caused by geographic location, relief and local influence as a result of the combination of relief, the distribution of air pressure on a major scale, terrain exposition, presence of river systems, vegetation, urbanisation, etc. The following geographic determinants featuring important synoptic situations significant for the weather and climate of Serbia should be mentioned: the Alps, the Mediterranean Sea and the Genoa Bay, the Pannonian Plain and the Morava valley, the Carpathian and Rhodope Mountains, as well as hilly-mountainous areas with valleys and highland plains. The prevailing meridional location of river valleys and plains in the northern part of the country make possible the deep southward incursion of cold polar air masses.

The lowest temperature ever recorded since the instrumental measurements commenced on the territory of Serbia was -39.5°C in Karajukica Bunari (near Sjenica) on 29 January 1987 and the highest temperature ever measured was 44.9°C in Smederevska Palanka on 24 July 2007. The weather analysis is performed on the basis of the measurements taken at 7am, 2pm and 9pm at the principal meteorological stations (30 stations) for the latest 1981-2010 base period.

The mean annual air temperature across much of Serbia (at 22 principal meteorological stations) ranges between 11°C and 12°C (Figure 1). As a general rule, the annual precipitation quantities increase in average with altitude. The mean annual precipitation sums across Serbia are in the range from 557 mm in Kikinda to 1,018 mm on Zlatibor Mountain (Republic Hydrometeorological Service of Serbia, 2013) (Figure B6. 2).

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\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

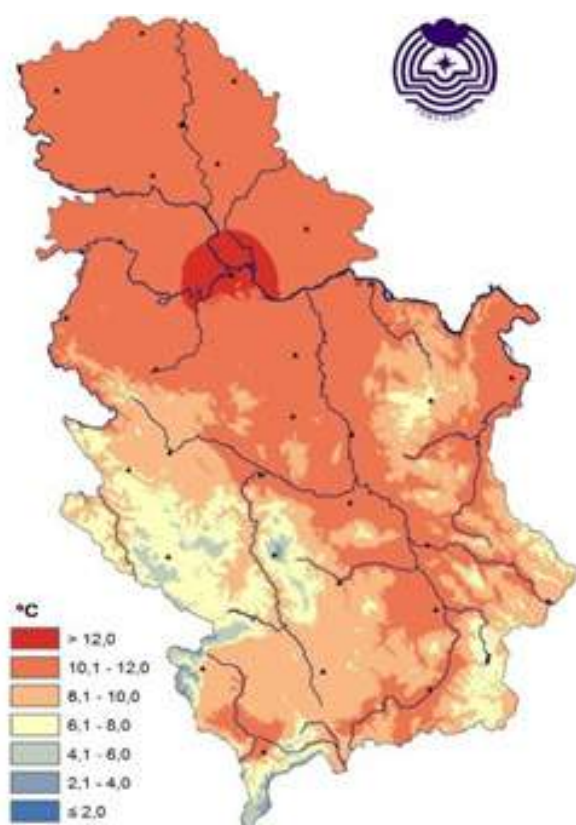


Figure B6.1. Mean annual air temperature for the 1981-2010 base period

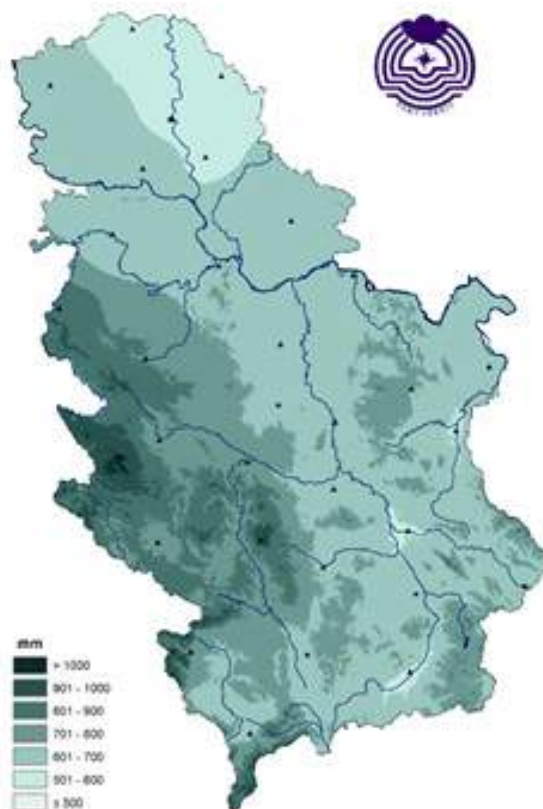


Figure B6.2. Average precipitation totals for the 1981-2010 base period

### Soil classification

Soil classification and cartography in Serbia has passed through different phases of development. The first classification of soils for the Kingdom of Yugoslavia was prepared by Stebut in 1927. Other classifications, based on the genetic principles, were published subsequently (Neugebauer et al., 1963; Filipovski et al., 1964). At a later stage and to facilitate international communication, the national system of soil classification in Yugoslavia was adapted to the international classification valid at that time in Europe (Škorić et al., 1973; 1985). That classification is still accepted and in use in the Republic of Serbia.

### Causes of soil degradation

The occurrence and intensity of soil erosion is one of the major soil degradation processes and a cause of deteriorated soil quality. It is estimated that soil erosion (of various degrees) affects about 80% of the agricultural soil. In the central and hilly-mountainous regions water erosion is predominant, while in the Vojvodina province in the north of Serbia, eolic erosion prevails, affecting approximately 85% of the agricultural soil (Vidojević and Manojlović, 2007). A number of conservation measures have been defined in agriculture as well as a related law aimed at the protection of agricultural land from the harmful effects of erosion (Law on Agricultural Soil, Articles 18, 19 and 20). Soil quality is also affected by uncontrolled and inadequate dumping of waste and by contamination stemming from industrial complexes.

### Land use

Based on the statistical data for 2014, utilised agricultural area covers 3,506,830 ha or 45.2% of the total territory of the country (Statistical Yearbook of the Republic of Serbia, 2015).

Arable land structure monitoring in 2014 shows that the largest share was covered by cereals 1,819,188 ha, which represents about 70% of the total area under arable land. An area of 242,041 ha or 9.3% is fodder crops, an area of 346,524 ha or 13.3% is under industrial crops. Vegetables are cultivated on 52,680 ha or 2% (Figure B6. 3, Table B6. 1).

Table B6.1. Agricultural land – statistical data for 2014 (ha)

Arable land (ha)		Permanent grassland (ha)		Permanent plantations (ha)			
Cereals	1,819,188	Meadows	381,654	Fruit plantations	163,310		
Pulses	7,830			Pastures	331,588	Vineyards	22,150
Potatoes, early and late	51,987					Nurseries	1,531
Sugar beet	64,112					Other permanent plantations	524
Industrial crops	346,524						
Vegetables, melons and strawberries	52,680						
Flowers	343	<b>Total</b>	<b>713,242</b>	<b>Total</b>	<b>187,515</b>		
Fodder crops	242,041						
Other crops on arable land	1,713						
Fallow land	19,655						
<b>Total</b>	<b>2,606,073</b>						

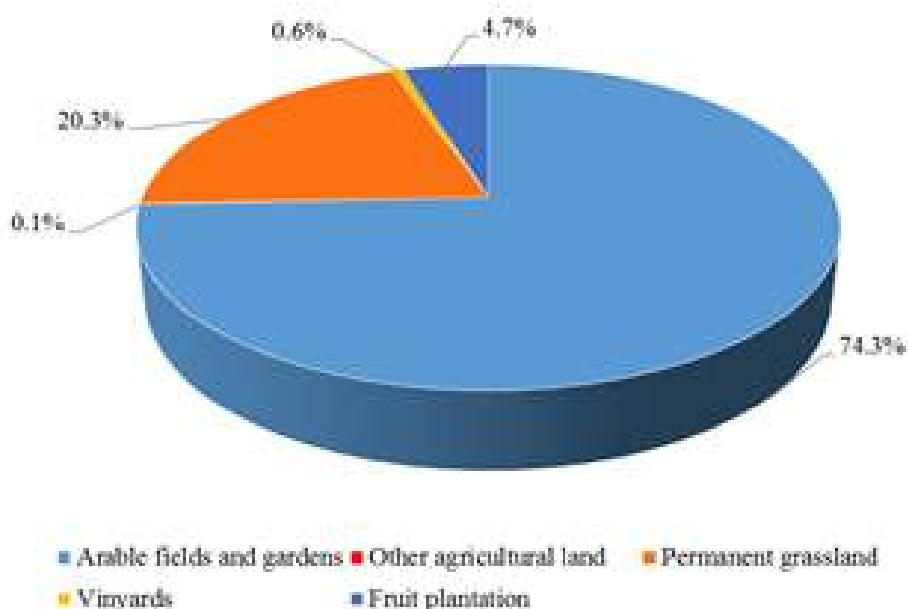


Figure B6.3. Utilised agricultural land (%)

There is a significant difference in land use statistical data and data from Corine Land Cover 2012 database. According to the CORINE Land Cover 2012 database, agricultural areas with natural grasslands dominate in Serbia and spread over 58.24% of the country’s total territory (Figure B6.4, Table B6.2).

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

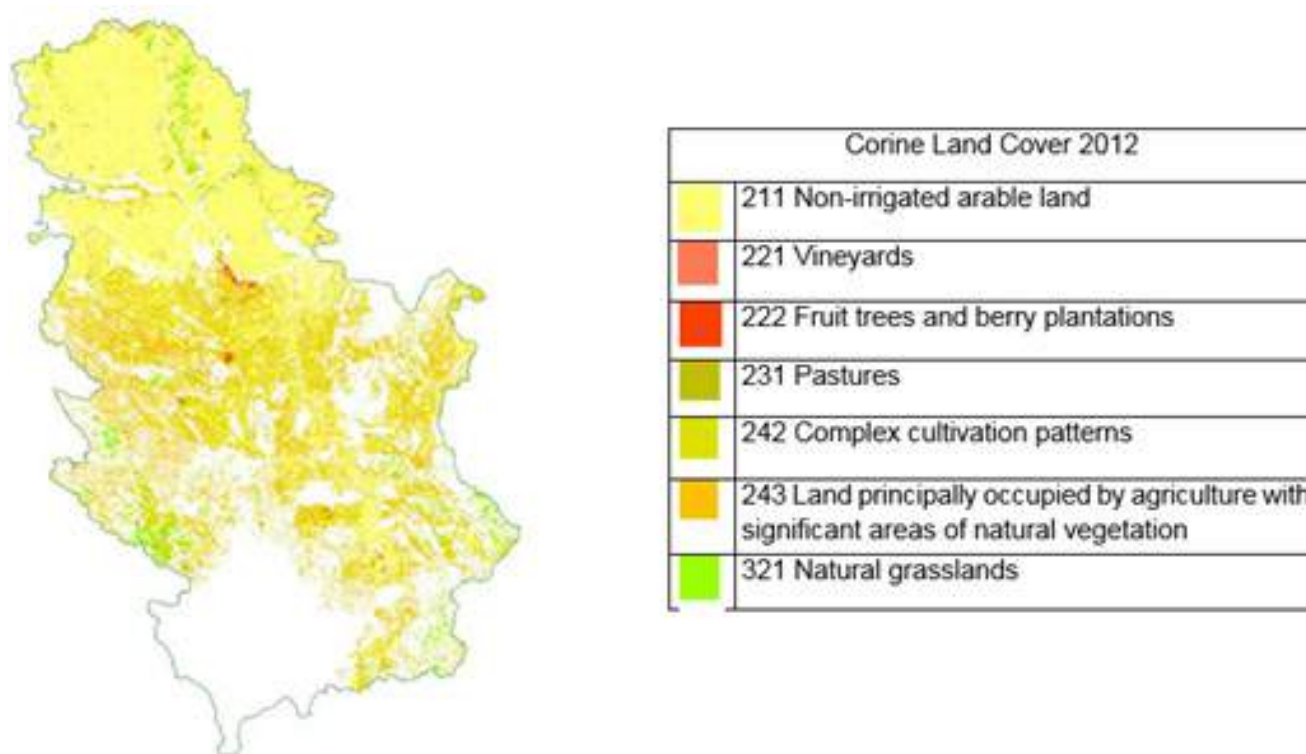


Figure B6.4. Corine Land Cover map for agricultural land and natural grasslands

Table B6.2. Corine Land Cover classes of agricultural land and natural grasslands

Categories/CLC classes	2012	
	ha	%
<b>AGRICULTURAL AREAS</b>		
211 Non-irrigated arable land	2,173,145	28.01
221 Vineyards	10,417	0.13
222 Fruit trees and berry plantations	24,248	0.31
231 Pastures	165,578	2.13
242 Complex cultivation patterns	992,857	12.80
243 Land principally occupied by agriculture with significant areas of natural vegetation	948,246	12.22
Sub-total	4,314,491	
<b>FORESTS AND SEMINATURAL AREAS</b>		
321 Natural grasslands	205,013	2.64
Grand Total	4,519,504	58.24

Altitudinal zonation of agricultural land was calculated using Digital Terrain Model (DTM) (derived from USGS site with a precision of 1 Arc Second) (Table B6. 3).



Table B6.3. Altitudinal zonation of agricultural land and natural grasslands

Altitude	ha	km <sup>2</sup>	%
0-200	2,618,749	26,187	33.75
200-400	920,139	9,201	11.86
400-600	411,141	4,111	5.30
600-800	213,331	2,133	2.75
800-1000	130,756	1,308	1.69
1000-1200	128,567	1,286	1.66
1200-1400	64,024	640	0.83
1400-1600	21,374	214	0.28
1600-1800	9,350	93	0.12
1800-2000	1,931	19	0.02
>2000	143	1	0.00
<b>Total</b>	<b>4,519,503</b>	<b>45,195</b>	<b>58.24</b>

## B6.2. STATUS OF SOIL DATA

Soil characteristics significant for the determination of surfaces defined as Areas with Natural Constraints (ANCs) will be processed using several methodological approaches. The highest significance will be given to the overlapping layers on the digitalised soil map of Serbia and the land use map deriving from the Corine Land Cover.

### Drainage classification

Cartographic units representing soil surface areas which belong to eugley, pseudogley, and specific mapping units belonging to fluvisol soil types will be selected from the Digitalized Soil Map of Serbia.

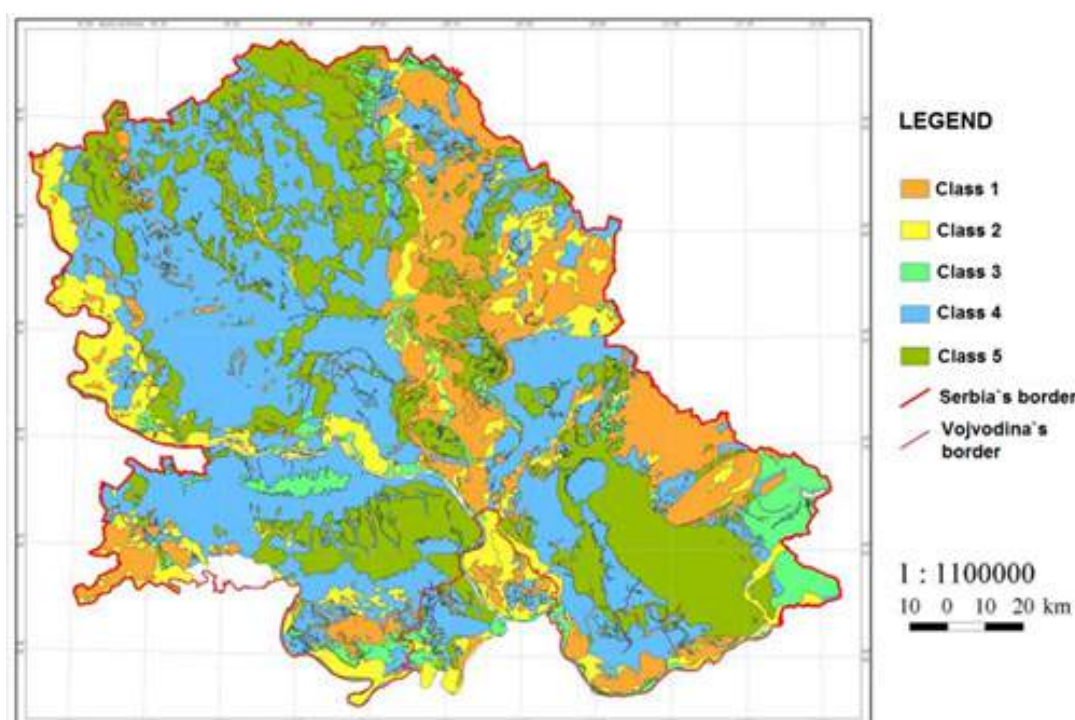


Figure B6.5 Distribution of soils into drainage classes in AP Vojvodina (Northern Serbia)

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

Figure B6. 5 shows the Digitalized Soil Drainage Class map for AP Vojvodina prepared by the Faculty of Agriculture of Novi Sad, Department of Water Management (Benka and Salvai, 2007). However, the Soil Drainage Class Map has not been prepared for the whole territory of the Republic of Serbia. It should be noted that both criteria-based methodologies focusing on drainage (first using the Soil Map and second using the Soil Drainage Class map of AP Vojvodina) do not take into account the EU methodology for the identification and delineation of the ANCs, which requires the same drainage parameter - the number of days with soil moisture content at or above field capacity  $\geq 230$  days using a probability approach (20% in 7 years out of 30). These data are missing for the Republic of Serbia. Moreover, it is proposed that the number of 230 days maybe be revised and lowered to respond to the Balkan region climatic and soil conditions. Otherwise, excess soil moisture will be assessed based on the criterion “limited soil drainage” as given in Table A1.1.

### Soil depth

Analytical data on soil depth for the entire territory of the Republic of Serbia (shown on the Figures B6. 8 and B6. 9) are not available. Cartographic units representing soil surfaces which belong to lithosol soil types, and certain lower level units classified according to national soil classification system as rendzina, Terra Rosa, eutric cambisol and dystric cambisol, will be selected from the Digitalized Soil Map of Serbia.

### Soil mapping in Serbia

Based on two soil maps of the Kingdom of Yugoslavia at the scale of 1:3,500,000 and 1:1,200,000, compiled by Stebut (1926; 1931) between the late 1970s to the mid-1980s, soil mapping in the Republic of Serbia has been intensively conducted resulting in the preparation of the Soil Map of Serbia at the scale of 1:50,000 (Figure B6. 6). Mapping units in the map legend are based on soil classifications established in former Yugoslavia (the last established one is still in use (Škorić et al., 1985)). Such specific cartographic units, i.e. soil types, have similar, or the same diagnostic criteria for classification as required for the delineation of ANCs and this surely will be of great help.

To comply with the WRB classification (IUSS Working Group WRB, 2014), the soil map of Serbia (Škorić et al., 1985) was divided into 15,437 map units. All polygons were divided into eighteen WRB groups. Table B6. 4 shows the areas and proportion of the Reference Soil Groups in the Republic of Serbia according to the WRB classification (Vidojevic et al, 2015) (Figure B6. 7).

According to this soil map, the most extensive groups are Cambisols (27.99%), followed by Chernozems (17.68%), Leptosols (15.9%) and Vertisols (8.32%). Histosols, Anthrosols, Calcisols, Podzols, Phaeozems and Umbrisols are distributed over limited areas in the country, totalling only 3.58%. Unfortunately, the national soil classification does not fully correspond with the criteria of the FAO WRB classification, and their mutual relationship in the majority of cases will be provided in the final report.

Soil maps for the Republic of Serbia without the autonomous province of Vojvodina have been originally prepared by the Institute for Soil Science, based in Belgrade, and by the Institute of Field and Vegetable Crops of Novi Sad for the territory of Autonomous Province of Vojvodina, both as hardcopy maps at the scale of 1:50,000. Both maps were digitised as a polygon vector layer (in former national projection with parameters listed in Table B6. 5) which is now stored at the Environmental Protection Agency in Belgrade and needs to be topologically verified (it hasn't been checked yet for topological errors).

Data from the previous soil studies conducted by the relevant institutions (primarily the Institute of Field and Vegetable Crops in Novi Sad, the Institute for Soil Science in Belgrade, and the Faculties

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of Agriculture in Belgrade and Novi Sad) will be used as the main sources to define the ANCs, for which the specific approach in using the Soil map of Serbia cannot be applied. A combination of both methodologies will be used for some specific soil features.

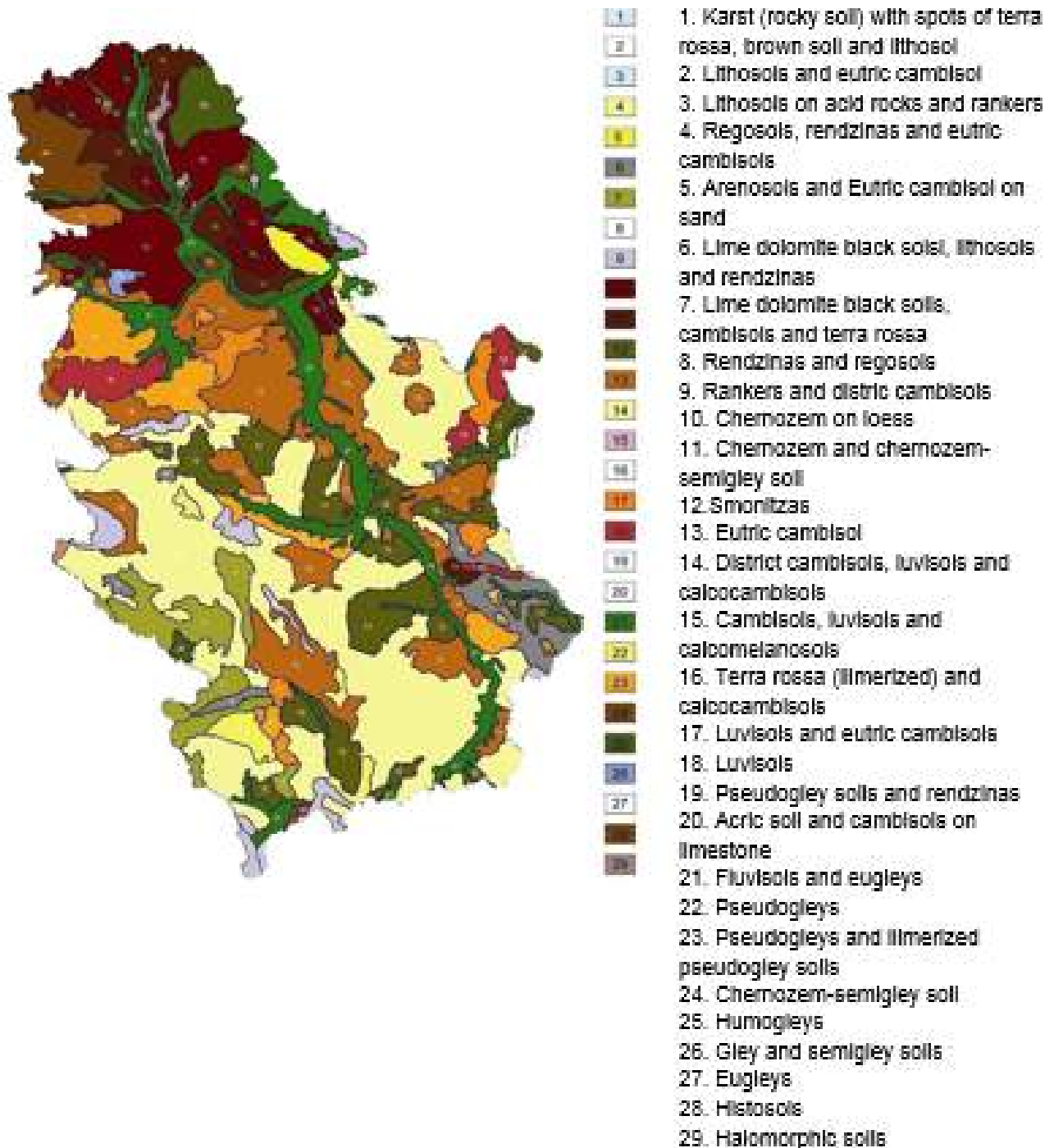


Figure B6.6. Soil map according to the national classification (1:2,000,000)

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

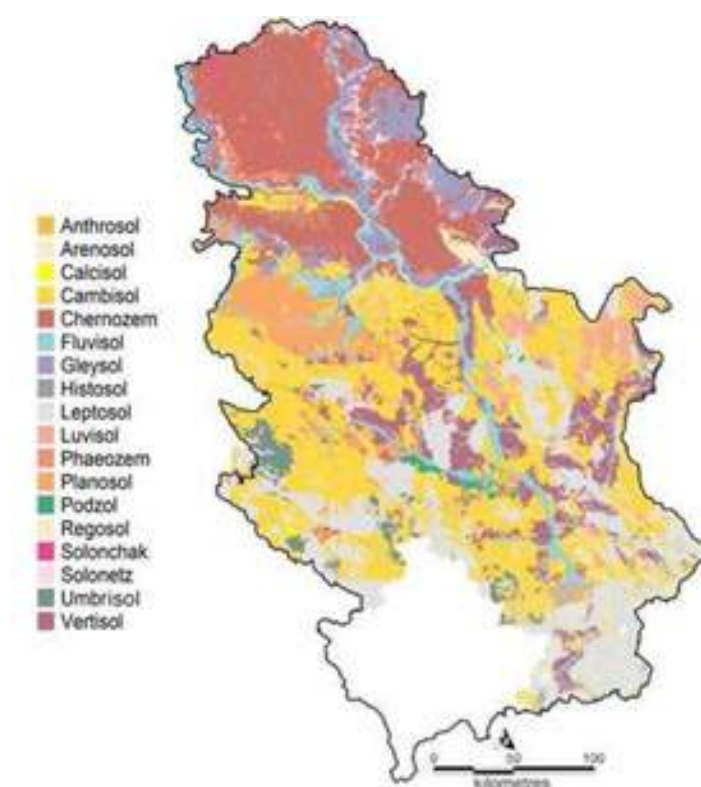


Figure B6.7. Soil map according to the WRB classification

Table B6.4. Soil groups in Republic of Serbia according to the WRB classification

Reference Soil Group Code		Area	
		ha	%
AT	Anthrosol	11,519	0.15
AR	Arenosol	55,836	0.72
CL	Calcisol	27,284	0.35
CM	Cambisol	2,168,581	27.99
CH	Chernozem	1,369,962	17.68
FL	Fluvisol	586,221	7.58
GL	Gleysol	484,545	6.25
HS	Histosol	442	0.01
LP	Leptosol	1,231,952	15.90
LV	Luvisol	219,583	2.83
PH	Phaeozem	72,840	0.94
PL	Planosol	429,472	5.54
PZ	Podzol	34,313	0.44
RG	Regosol	168,689	2.18
SC	Solonchak	25,022	0.32
SN	Solonetz	85,858	1.11
UM	Umbrisol	130,593	1.69
VR	Vertisol	644,689	8.32
<b>Total</b>		<b>7,747,401</b>	<b>100.00</b>

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## Soil database

During the period 2009-2011, a soil database was established which served as the basis for further research. Its objective was to collate all available data and make them available for various purposes. At present, the database includes a total of 1,500 soil profiles collected during the period 1962-2010. The database provides information on a set of data including soil type, organic carbon content, soil bulk density, particle size distribution (clay, silt, sand), land use and altitude.

*Unfavourable soil texture due to high content of coarse material (stone and gravel)*

Analytical data (expressed in weight, not volume %) for the entire territory of the Republic of Serbia (shown on the map in Figure B6. 8) regarding this ANC criteria are not available. Efforts will be made to derive this information from pedotransfer rules using the soil name associated with such characteristics or from expert assessments.

*Unfavourable soil texture when the textural class is sandy and loamy sand ( $Silt\% + (2 \times clay\%) \leq 30\%$ )*

Analytical data on the texture of the soil surface for the entire territory of the Republic of Serbia are not available. This type of information will be derived from the cartographic units classified as arenosol soil type, and at certain lower level units as Regosols and Fluvisols will be selected from the Digitalized Soil Map of Serbia. Further field checks may be done, depending on funding resources.

*Unfavourable soil texture in terms of high clay content  $>60\%$  as well as topsoil texture class of clay, silty clay, sandy clay and vertic properties within 100 cm of the soil surface*

As previously mentioned, these analytical data are not available for the whole territory of Serbia. But, this handicap for the ANC project could be resolved either by identifying the clayey soils from the soil map of Serbia looking at Vertisols (and the locally known Smonitzas) or at soils with vertic properties. Whatever the solution would be, this issue is critical and should be considered. Moreover, the Serbia team propose to lower the clay % value from 60 to 50.

## Surface stoniness

Cartographic units representing soil surfaces which belong to Lithosol soil type, and certain lower level units, such as Regosol, Rendzina, Ranker, Eutric Cambisol, Dystric Cambisol and, Calcocambisol, will be selected from the Digitalized Soil Map of Serbia as potential area to be classified as ANCs.

## Soil organic matter

According to the analysis of the soil map, the soils of Serbia store  $695.31 \times 10^{12}$ g (Tg) of organic carbon at 0-30 cm and  $1142.42 \times 10^{12}$  g (Tg) at 0-100 cm (Vidojevic et al, 2015). The map of soil organic carbon distribution is available to the depths of 0-30 cm. National estimates of the content and spatial distribution of soil organic carbon in topsoil are available for different land use categories.

According to the analysis of 96,011 soil data in 2015 from the State Soil Fertility control program, the average rate of Soil Organic Matter (SOM) expressed as humus content in the top 30 cm of the agricultural soils is 3.4%. Only 4.3% of samples has the rate of soil organic matter beyond 6% (Ministry of Agriculture and Environmental Protection, Directorate for Agricultural Land and Provincial Secretariat for Agriculture, Water Management and Forestry, 2016) (Figure B6. 8). Nevertheless, the ANC methodology, as far as the SOM is considered, does not require data for soils with less than 30% SOM. This information will be derived from the Digitalized Soil Map of Serbia for the soil mapping units classified as Histosols.

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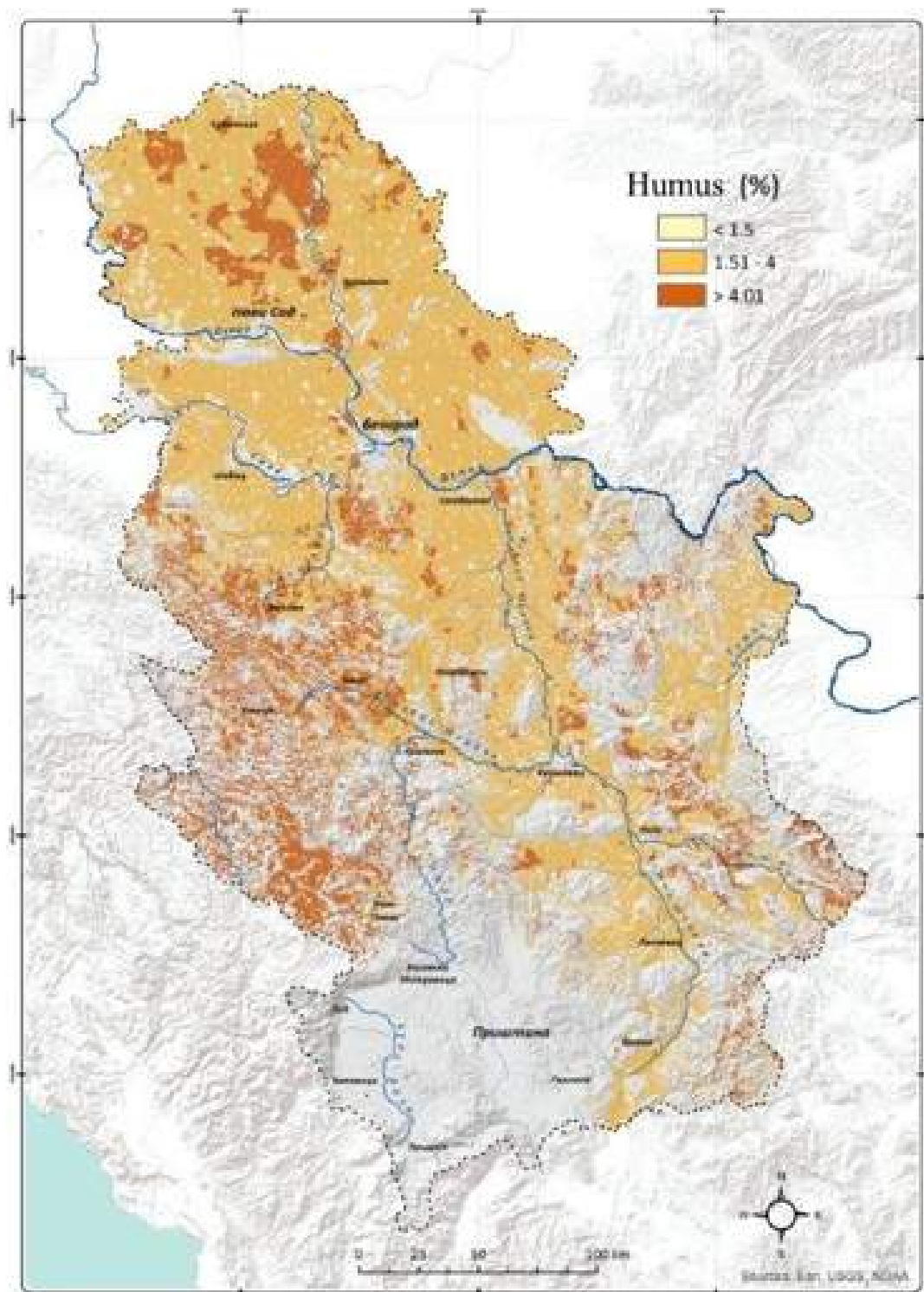


Figure B6.8. Soil organic matter in agricultural soil to the depth of 0-30 cm (%)

### Salinity and sodicity

No analytical data are available either for soil salinity or sodicity but this information will be derived from the soils classified as Solonchaks and Solonetz, and in certain cases by the lower level units, such as saline subtypes mixed with Fluvisols, Eugley, Humogley (Hydromorphic Black soil). This information will be derived from the Digitalized Soil Map of Serbia.

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## Acidity

The starting point for defining the areas with acidity problems will be the cartographic units belonging to Dystric Cambisols that will be selected from the Digitalized Soil Map of Serbia. However, the large majority of this soil type is most frequently found among forest soils (not agricultural), so constructing a map based on the results of analyses in the framework of soil fertility control in the forthcoming period would be a better methodology for the identification and delineation of the ANCs based on acidity.

According to the analysis of 90,515 soil data from the State Soil Fertility control programme conducted in 2015, 6.86% of analysed samples have a  $\text{pH} \leq 5$  (in water). The soil acidity map (pH in water) is being prepared and data processing will take some time before the map is available, following the data quality control and assurance process. However, the soil acidity map (pH in nKCl) is available for the agricultural land for the whole territory of Serbia (Figure B6. 9).

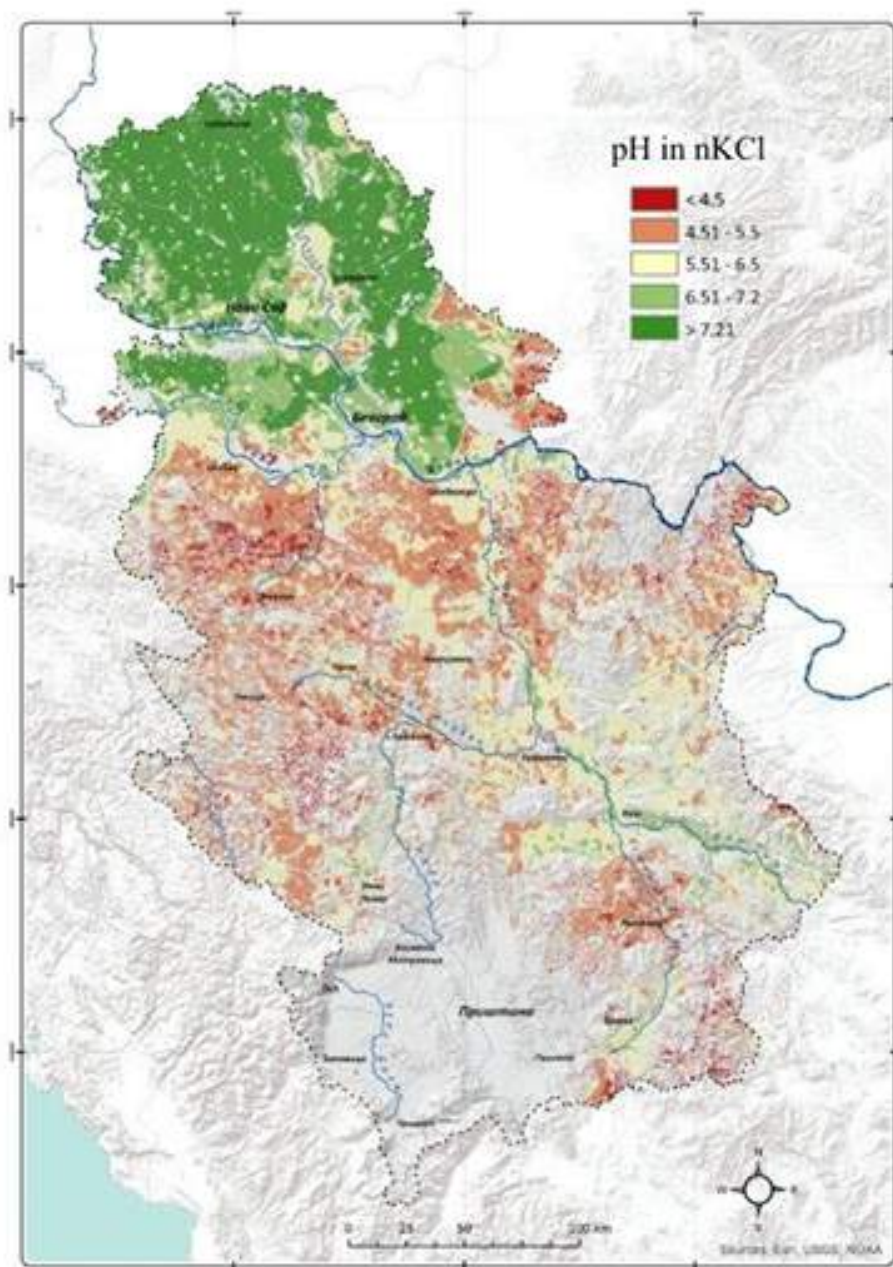


Figure B6.9. pH value in nKCl of agricultural soil to the depths of 0-30 cm

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### B6.3. STATUS OF CLIMATE DATA

Meteorological data are available for the period 1949 – 2014\* in the form of Meteorological Yearbooks downloadable in pdf format from the Republic Hydrometeorological Service of Serbia (RHMZ) ([http://www.hidmet.gov.rs/ciril/meteorologija/klimatologija\\_godisnjaci.php](http://www.hidmet.gov.rs/ciril/meteorologija/klimatologija_godisnjaci.php)) containing the following data:

Monthly values for all meteorological stations

- Air Pressure (mb) (7; 14; 21; average) \*\*
- Air Temperature (0C) (min., max., ampl.; min 5cm; 7-14-21, average) \*\*
- Vapor pressure (mb) (7-14-24; Average) \*\*
- Relative Humidity (%) (7-14-24; Average; min) \*\*
- Wind (m/s) (Average; >6B; <6B) \*\* (7-14-24; Average) for daily values
- Insolation (h) \*\*
- Cloudiness (in 1/10) (7-14-24; Average) \*\*
- Precipitation (mm) (Sum; Max; Day) \*\*
- Snow (cm) \*\*
- Number of Days with
  - Tmin <= -10
  - Tmax <0
  - Tmin <0
  - Tmax >=25
  - Tmax >=30
  - Tmin >=20
  - Cloudiness (<2 and >8)
  - Precipitation >= (0,1; 1; 10)
  - Frequency of directions and mean wind speed (m/s)



Figure B6.10. Spatial positions of the main and minor meteorological stations

Daily values for minimal, maximal and average air temperature and precipitation are obtainable in a digital format upon the request from RHMZ. It is still not clear if the daily values for the meteorological data are obtainable in a digital format from the RHMZ free of charge, since we still haven't received RHMZ's written answer to our written request. If daily data are not available, the monthly data derived from the Meteorological Yearbooks can be used and this meets the requirement of the ANC methodology.

Potential evapotranspiration (PET), needed for the calculation of aridity index (i.e. dryness), is calculated by RHMZ using the Hargreaves method (calculation based on daily max, min and average air temperatures, extra-terrestrial radiation from the sun and duration of the day over the year for a given locality) ([http://www.hidmet.gov.rs/ciril/meteorologija/agro\\_evapotranspiracija.php](http://www.hidmet.gov.rs/ciril/meteorologija/agro_evapotranspiracija.php)), so it can be calculated from the daily data obtained from the RHMZ. However, already calculated values are not obtainable from RHMZ for all stations.

\* Data on the period 1986-1989 is currently not downloadable as well as year 2015

\*\* Daily values also available in Meteorological Yearbooks for this variable for the following stations Beograd, Zlatibor, Novi Sad, Vranje, Loznica, Niš

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence



## B6.4. STATUS OF GEOGRAPHICAL INFORMATION SYSTEM (GIS) DATA

GIS data for the territorial and administrative division of the Republic of Serbia are available in ESRI shape file compatible vector format in former nationally used projection with parameters listed in the Table B6. 5, but can be easily re-projected in WGS 1984 GCS or WGS 1984 UTM Zone 34N, which is the new official projection for the Republic of Serbia.

Table B6.5. Parameters of the formerly used national projection

• <b>Projection:</b>	• <b>Geographic Coordinate System: GCS_Bessel_1841</b>
• <b>Transverse_Mercator</b>	• <b>Angular Unit: Degree (0,017453292519943299)</b>
• <b>False_Easting: 7500000,000000</b>	• <b>Prime Meridian: Greenwich (0,000000000000000000)</b>
• <b>False_Northing: 0,000000</b>	• <b>Datum: D_Bessel_1841</b>
• <b>Central_Meridian: 21,000000</b>	• <b>Spheroid: Bessel_1841</b>
• <b>Scale_Factor: 0,999900</b>	• <b>Semimajor Axis: 6377397,155000000300000000</b>
• <b>Latitude_Of_Origin: 0,000000</b>	• <b>Semiminor Axis: 6356078,962818188600000000</b>
• <b>Linear Unit: Meter (1,000000)</b>	• <b>Inverse Flattening: 299,152812799999990000</b>

The territorial and administrative division of Serbia is as follows (Statistical Office of the Republic of Serbia):

1. NUTS\* 1 – Regions (2 in total)
  - Serbia North
  - Serbia South
2. NUTS 2 – Regions (5 in total)
  - The region of Belgrade
  - Vojvodina (Also administrative Province)
  - The region of Šumadija and Western Serbia
  - The region of Southern and Eastern Serbia
  - Kosovo\*
3. NUTS 3 – Areas (30 in total)
4. Administrative districts (29 in total)
5. Towns/Cities (24 in total)
6. Municipalities/City municipalities (198 in total)
7. Settlements (6158)

Further territorial division in cadastral sense is as follows:

8. Cadastral Municipalities
9. Parcels

Table B6.6. Territorial and administrative division of the Republic of Serbia

	Republic of Serbia					
	Total	Serbia North (NUTS 1)		Serbia South (NUTS 1)		
		Region of Belgrade (NUTS 2)	Vojvodina (NUTS 2)	Region of Šumadija and Western Serbia (NUTS 2)	Region of Southern and Eastern Serbia (NUTS 2)	Kosovo* (NUTS 2)
Areas (NUTS 3)	30	1	7	8	9	5
Administrative districts	29	0	7	8	9	5
Towns / Cities	24	1	6	10	6	1
Municipalities / City municipalities	198	17	46	53	53	29
Settlements	6,158	157	467	2,112	1,973	1,449

\* Serbian Abbreviation NTSJ

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

Please note that the areas (NUTS 3), as territorial divisions, and the administrative districts, as administrative divisions match geographically. All administrative districts (29 in total) + the region of Belgrade, as a NUTS 2 unit, geographically match NUTS 3 units – areas (30 in total) (Figure B6. 11).



Figure B6.11. Territorial and administrative division of the Republic of Serbia (Statistical Office of the Republic of Serbia)

Vector layers for all of the above mentioned levels of the territorial and administrative division of the Republic of Serbia, except the parcels, are already collected. Parcels are not yet completely digitised on a national level and thus not functional (Republic Geodetic Authority). However, the decision on which level of territorial division should be used as a cartographical unit for ANC mapping (cadastral municipalities or municipalities) is yet to be made (Figure B6. 12).

\* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence

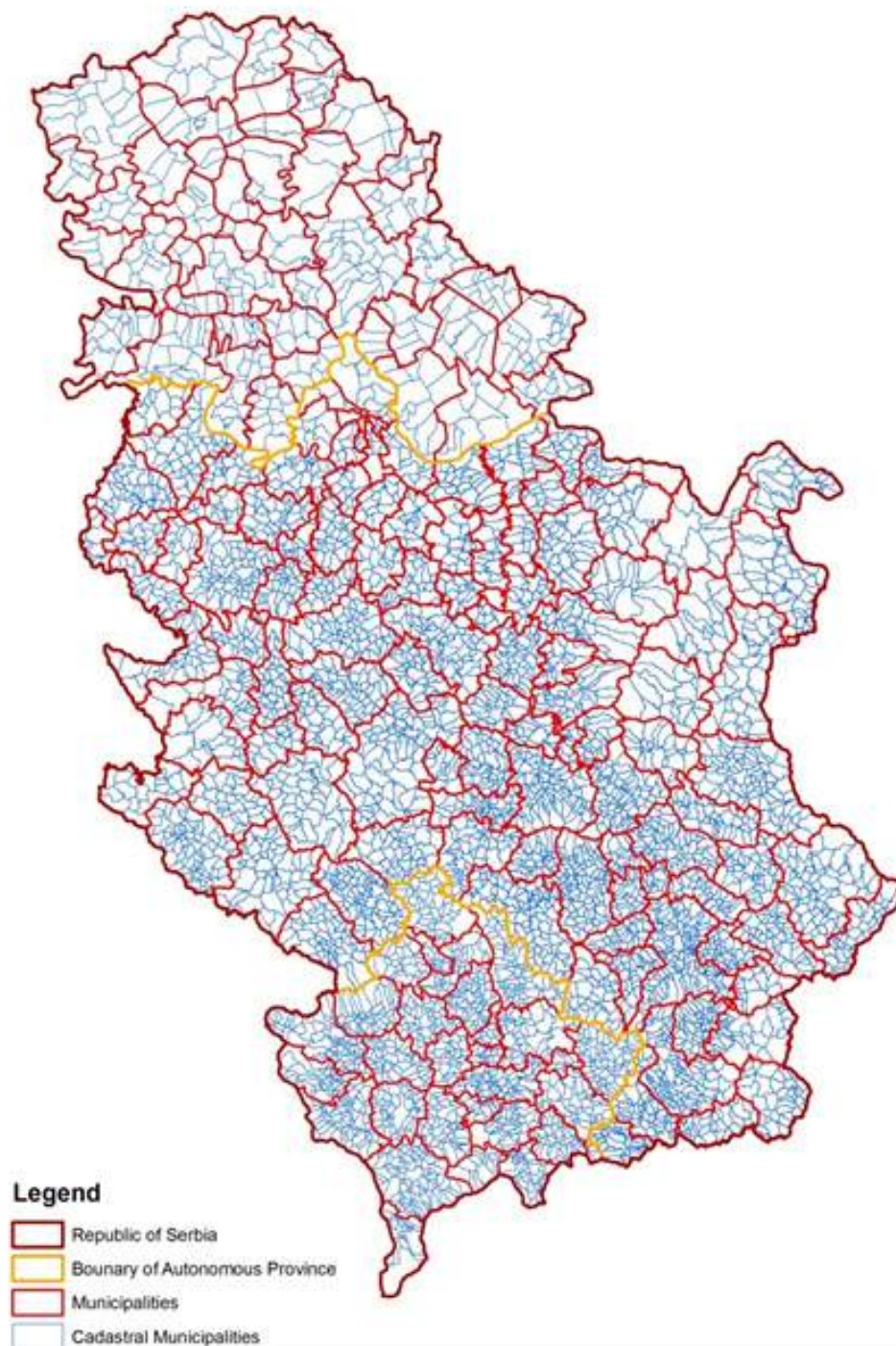


Figure B6.12: Municipalities and cadastral municipalities of the Republic of Serbia

The digital terrain model and the layers of slope and exposition will be derived from the Digital Elevation Model (DEM), which is obtainable in desired resolution and precision (2 m in lowlands and 6-7 m in highlands) from the Military Geographic Institute (VGI). Source data for this DEM (contour lines) are purchased by the Ministry of Agriculture and Environmental Protection of the Republic of Serbia and are, thus, available.

DEM with the precision of 1 Arc SECOND (approximately 20-30 m) is available online from the U.S. Geological Survey site (USGS EarthExplorer) in WGS 1984 GCS projection (Figure B6. 13).

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Land cover map of Serbia is available in CORINE methodology (2012) (ETRS89, LAEA projection). There is also an ongoing project conducted by the Geodetic Office of the RS for the production of a new land cover map. The source of data are ortho-rectified SPOT 5 satellite images with 10 m in resolution, produced in the year of 2011. This project is not yet complete – layers of agricultural land, grasslands, shrubs and bare land are all available for only 66% of the territory.

The land use map of the Republic of Serbia does not exist at the present time and it could be generated after the cadastral parcels are completely digitised and their usage is defined. Nevertheless, this does not restrict the delineation of the ANCs, as the areas of interest for the ANC project can be derived from the CORINE land use/land cover cartography.

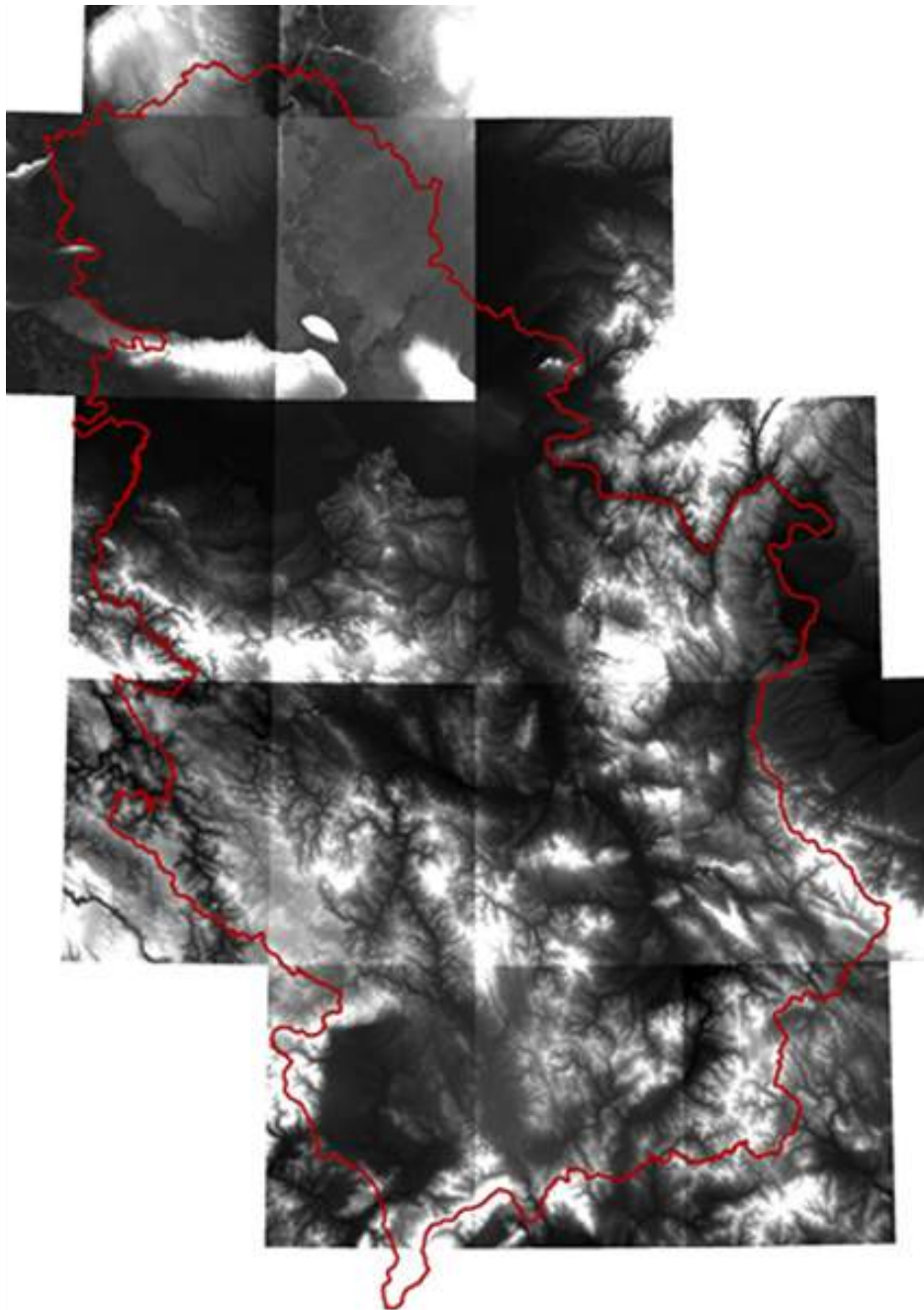


Figure B6. 13. DEM(s) 1 Arc SECOND in precision downloaded from USGS EarthExplorer site

## B6.5. DATA GAPS, PROBLEMS, AND SOLUTIONS

There is a significant difference in land use statistical data and data from Corine Land Cover 2012 database.

Regarding the climate information, if the daily data is not available, the monthly data derived from the Meteorological Yearbooks will be used and this comply well with the ANC methodology. Soil acidity map is yet under construction and data processing may take some time until the map is available, obviously after data has passed the quality control and assurance process. Moreover, the soil map needs topological verification before being used for defining the ANCs.

In practice, Serbia has a limited number of examples of good practice with the mechanisms for horizontal and multi-stakeholder coordination. Efficient horizontal coordination works mostly through personal contacts among civil servants.

## B6.6. PROVISION OF RECOMMENDATIONS FOR IMPROVED DATA MANAGEMENT IN THE CONTEXT OF THE AREAS WITH NATURAL CONSTRAINTS

In our opinion, better cooperation and communication among the national institutions responsible for the production of data needed for the ANC project would certainly be of great importance. Also, exchange of experiences in collecting and managing data between the national teams involved in the project will be of crucial significance for our future work. Therefore, more meetings of the national teams are hereby suggested.

## B6.7. ANALYSES OF THE NATIONAL CAPACITIES FOR DATA MANAGEMENT AND PROVISION OF RECOMMENDATIONS FOR IMPROVED INSTITUTIONAL SETUP WITH REGARD TO THE ANC

Legislative, executive, and judicial powers are mostly exercised within the legally prescribed scope of competence of the national authorities. According to the law, certain competencies are delegated to the autonomous provinces and the local governments.

### Institutional framework

- **The Ministry of Agriculture and Environmental Protection** performs public administration and policy development tasks in agriculture and the food industry, the protection and use of agricultural land, GMOs and the use of plant and animal genetic resources for food and agriculture, and the environment. The Ministry has about 1,580 staff, of which 290 are appointed to work on environmental issues in the Ministry and 71 in the Serbian Environmental Protection Agency..
- **The Sector for Rural Development within the Ministry of Agriculture and Environment Protection** includes the **Department for Rural Development** which, among other things, carries out activities related to the design, promotion, monitoring, evaluation and implementation of rural development programs in order to increase the efficiency, improve the effectiveness of rural development measures and the socioeconomic aspects of life in rural areas.
- **The Directorate for Agrarian Payments**, as part of the Ministry of Agriculture and Environmental Protection, is established by the Law on Agriculture and Rural Development (OGRS, No. 41/09, 10/13). The Directorate performs the activities related to the implementation of the subsidies programme in agriculture, making calls for applications, deciding upon the right to assistance, making payments to the final beneficiary, performing administrative and on-the-spot checks, establishing and keeping accounting records of contractual obligations and payments, implements the international assistance to the agricultural policy in the Republic of

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Serbia, and manages the Farm Register. The establishment of the Directorate has increased the transparency and efficiency of the national subsidies implementation and made the Directorate open to the final beneficiaries in terms of any assistance needed.

Public administration authorities within the Ministry of Agriculture and Environment Protection among others, are: Directorate for Agricultural Land, Republic Directorate for Water, Forestry Directorate and Serbian Environmental Protection Agency (SEPA).

- **The Directorate for Agricultural Land** manages agricultural land (planning, protection, land consolidation and use of state-owned agricultural land), carries out inspections and professional tasks regarding agricultural land, sets up and develops the information system on the agricultural land of the Republic of Serbia.
- **The Directorate for Water** is responsible for the public administration and technical tasks related to water management policy, multipurpose use of water, water supply, water protection measures, the water regime, international cooperation on water and other activities according to the Law on Waters.
- **The Forestry Directorate** is responsible for the public administration and technical tasks related to the policy on forests, forest conservation, use of forests, and wildlife and implementation of measures to protect them.
- **SEPA** performs public administration tasks relating to the development and management of the national information system for environmental protection, monitoring of air and water quality, management of the national laboratory, collection and compilation of environmental data and preparation of reports on the environment. It is also in charge of cooperation with the European Environment Agency and the European Environment Information and Observation Network.
- **The Provincial Secretariat for Agriculture, Water Management and Forestry** performs duties of the Provincial Administration in the field of agriculture, water management, forestry, hunting, cattle breeding, aquaculture, apiculture and veterinary medicine, pertaining to the preparation of acts for the Assembly and the Provincial Government, which stipulates: the adoption of the programme of measures to implement the agricultural policy, the conditions and methods of distribution and use of profits made from the agricultural land use, the establishment of a separate budget where funds generated from the agricultural land use are fed, as well as other activities according to the Law and the Statute.
- **The Republic Hydrometeorological Service (RHMS)** performs public administration activities related to systematic meteorological, climate and hydrological measurements and observations; monitoring, analysis and forecasting of changes in the weather, climate and water; early warning and alerts on the occurrence of extreme meteorological, climatic and hydrological events and transboundary atmospheric transport of radioactive substances; and hydrometeorological support to river navigation. The Ministry of Agriculture and Environmental Protection supervises the work of the Service.
- **The Republic Geodetic Authority** is a specialized organisation carrying out technical and administrative tasks related to state survey, land cadastre, real estate cadastre, utilities cadastre and registration of real estate rights, their maintenance, and updating as well as other assignments defined by law.

All the above institutions have links with the ANC project and it is necessary to increase the capacities of the public administration in order to support the characterisation and mapping of areas with natural constraints. A number of professional and scientific institutions can also provide professional support during the process of characterisation and mapping. They include the Institute of Soil Science in Belgrade, the Institute of Field and Vegetable Crops in Novi Sad, the Faculty of Agriculture in Belgrade and Novi Sad and a few others.

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## B6.8. NATIONAL POLICY ASSESSMENTS AND POLICY RECOMMENDATIONS RELEVANT TO THE CHARACTERISATION AND MAPPING OF AREAS WITH NATURAL CONSTRAINTS INCLUDING SOCIOECONOMIC ANALYSES

### Legal framework

- **The Law on Agriculture and Rural Development (OGRS, No. 41/09, 10/13)** regulates the objectives of agricultural policy and the manner of its implementation, the types of subsidies in agriculture, the conditions for substantiation of the right to incentives, Farm Registry, recording and reporting in agriculture, integrated agricultural information system, control over the implementation of this law. This law establishes the Department of Agricultural Payments, as an administrative body within the Ministry responsible for agriculture and defines its jurisdiction.
- **The Law on Agricultural Land (OGRS, No. 62/06, 65/08-other law, 41/09 and 112/15)** regulates the planning, protection, management and use of agricultural land as well as the inspection of law enforcement.
- **The Law on Incentives in Agriculture and Rural Development (OGRS, No. 10/13, 142/14, 103/15)** regulates the types of incentives, the manners of using these incentives, the register of incentives in agriculture and rural development, as well as the conditions for eligibility for subsidies in agriculture and rural development. Incentives for rural development measures include incentives to support programs relating to the improvement of the rural economy in order to improve the quality of life in rural areas, as well as support for programs relating to sustainable rural development and environmental protection.
- Significant issues addressed by the **Law on Environmental Protection (OGRS, No 135/04, 36/09, 36/09 - another law, 72/09 - another law, 43/11 decision adopted by the Constitutional Court and 14/16)** include the management and protection of natural resources, measures and conditions of environmental protection, environmental programs and plans, industrial accidents, monitoring and information system, reporting, financing of environmental protection, inspection services and fines.
- Horizontal coordination - According to the **Law on State Administration (OGRS, No. 79/05, 101/07, 95/10, 99/14)**, the governmental administration bodies are obliged to cooperate and exchange information in all matters of mutual interest, as well as to establish joint bodies and project groups for the purposes of performing tasks that demand the participation of several bodies. In practice, apart from creating inter-ministerial working groups for the drafting of new laws and regulations, Serbia has a limited number of examples of good practice with the mechanisms for horizontal and multi-stakeholder coordination. Efficient horizontal coordination works mostly through personal contacts among civil servants.
- Within the **Strategy for Agriculture and Rural Development of the Republic of Serbia for the period 2014-2024 (OGRS, No. 85/2014)**, there is a part which includes funds intended to support the areas defined by the criteria of ANC. Considering that the absolute growth of funds has to be mostly directed to environmental issues, it is foreseen that this type of support is one of the key elements of the policy in the forthcoming period. A large part of the territory of the Republic of Serbia consists of areas which are unfavourable for intensive agricultural production. Because of these natural predispositions, they are exposed to degradation, depopulation and high risk of poverty.
- **The National Strategy for Sustainable Development (OGRS, No. 57/2008)** identifies five national priorities: membership in the EU, development of a competitive market economy and balanced economic growth, development of human resources and increased employment, development of infrastructure and balanced regional development and protection and promotion of the environment and rational use of natural resources.
- **The National Strategy for Sustainable Use of Natural Resources and Goods (OGRS, No.**

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**33/2012)** covers mineral resources, renewable energy sources, forests and their resources, protected areas, biodiversity, landscape diversity, fish, water and land resources. For each area, the Strategy describes the existing legal, strategic and institutional framework, sets general and specific policy objectives and states the indicators of achieving their sustainable use.

### The diversity of Serbian rural areas – why Serbia needs the ANC policy

Rural areas in Serbia are highly diverse in terms of natural endowments, economic, social and population characteristics. The diversity of rural Serbia is driven by many factors, whereby of particular importance are the variety of natural resource endowments, cultural and historical heritage, as well as economic, social and demographic patterns (Bogdanov, 2007). Huge development gaps are evident between north and south, urban and rural as well as central and peripheral areas. In general, the Autonomous Province of Vojvodina and the capital city of Belgrade show advanced positions compared to the rest of country, particularly the traditionally underdeveloped south-eastern regions (Jablanički, Pčinjski and Toplički districts), and south-west municipalities (Tutin, Sjenica, Prijepolje).

This pattern applies also to the structural characteristics of agriculture, which show favourable performance of the agricultural structures in the north of the country (Bogdanov et al., 2008). The agricultural sector is sharply characterised by a dual farm structure with significant regional variations in farm size, production and income<sup>1</sup>. Less developed and deprived areas are mostly mountainous and border regions, characterised by relative isolation and inaccessibility, with a traditional economic monostructure based on agricultural production, long-lasting and continuous decline in population, demographic imbalances and rural poverty. The long-term depopulation has had profound consequences on agricultural production, leading to land abandonment, decline of the land area under cultivation and extensive farming systems with a very limited degree of diversified activities. These processes have led to the accelerated growth of rural poverty and widened income gap and social inequality between rural areas.

### Agricultural policy response to rural and regional disparities in Serbia

Over the last two decades agricultural policy has been driven largely by the need to accelerate productivity growth, while the wider public interests, including viability of highland farms and securing public goods, remained of secondary importance. The attitude of agricultural policy towards marginal areas has remained fairly rigid, to the point that programming documents adopted in the early transition years have not anticipated any specific measures and solutions for them<sup>2</sup>.

Attempts to adapt agricultural policy measures to European models of support to ANC (former LFA) in Serbia were initiated in 2006 by introducing incentives to “marginal areas” as the equivalent of ANC policy. The newly introduced measures reflected preferential status given to the farms in marginal areas in terms of higher age limit for beneficiaries of RD support measures, as well as higher co-financing rates (Table B6.7).

The new legal framework for budgetary support to marginal areas was established in 2013 by the adoption of the Regulation on areas with difficult working conditions in agriculture (ADWCA). The criteria used for ADWCA delimitation include: all settlements above 500 m of sea level, villages on the territory of municipalities with less than 100 employees/1,000 inhabitants and villages within nature

<sup>1</sup> The number of hectares of UAA and LSU per employee is much higher in Vojvodina in comparison to all other regions. The ratio between the district with the highest number of UAA per AWU (Srednjobanatski district, Vojvodina – 16.7 ha) and those with the lowest (Jablanički district, South-eastern Serbia – 2.3ha) is 7.3 to 1.0. A similar relation between the districts exists in terms of the number of LSU per AWU, but the differences are less drastic (4.5:1). Such relations cause significant divergence in productivity expressed in standard output levels (SO) per AWU and farm. Regional differences in the amount of the SO per farm and the AWU are very high, indicating that both indicators are more favorable in Vojvodina compared to all other regions (including Belgrade).

<sup>2</sup> Moreover, the dairy premium for upland farmers, as the only measure of support which was supposed to provide privileged position to producers in mountainous areas, was abolished in the mid-2000s after being implemented for three decades.

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parks<sup>1</sup>. The specific needs of producers in areas with natural constraints for agriculture have been recognised by policy makers, but no particular measures have been defined. ***This can be considered one of the biggest agricultural policy failures, given substantial regional disproportions in subsidies allocation.***

Table B6.7. Agricultural policy measures aimed at ANCs

Code	Measure	Description	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
21111	Modernisation of agricultural holdings	Co-financing on-farm investment; 10-20% higher co-financing rate										
21112	Restructuring of permanent crops plantations					+	+	+	+	+	+	+
22111	ANC payments based on output	Higher milk premium	+	+	+	+	+					
		Lower threshold of milk delivered to dairies for ANC farmers										+
22114	Other ANC payments	Grants for voluntary agri-environmental commitments			+							
23210	Business creation and development	Co-financing of projects; 10-20% higher co-financing rate									+	+

+ The measure has been implemented;

Source: Bogdanov's elaboration

The table shows that the set of support measures for marginal areas in Serbia was far from CAP, both in terms of policy objectives and instruments for its implementation<sup>2</sup>. **Chosen measures were aimed at economic, less social objectives, while environmental objectives have not been touched.** Besides, policy support to marginal areas predicted several controversial solutions for implementation mechanisms, which have largely diminished its effects:

- The incentives have not been focused on specific regional problems, meaning that the needs of beneficiaries in certain regions have not been adequately addressed. Though geographical differences were considered, the eligibility criteria for beneficiaries were measure specific, not territorially specific.
- The projected amount of own financial contribution was too high for most farms in undeveloped areas whose financial resources were very modest;
- The age threshold was set at a low level, which limited the number of applications due to the complicated procedures regulating property rights;
- The scoring scale used in project evaluation did not envisage any special advantages for applications from marginal areas. The benefits for users from marginalised regions were reflected only in a higher percentage of state contribution to funding, and an increased age limit for “young farmers” (5-10 years higher than in other areas).

<sup>1</sup> By applying these criteria it was determined that an ADWCA territory makes 40% of Serbian territory, 30% of total population, 29% of agricultural households, and 24% of UAA.

<sup>2</sup> There is no evidence on the amount of agricultural budgetary funds allocated to ANC farmers. Examining the data available, it can be indirectly concluded that the share of ANC regions in the total budgetary support is extremely low.

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Such an approach resulted in a small number of applications from marginal areas, and an uneven distribution of the volume of budgetary support among regions.

Although various national policy documents in Serbia directly or indirectly refer to specific issues of mountainous rural areas and their vulnerability (poverty, social inclusion, environmental fragility, etc.), there are no specific objectives for the agricultural policy related to ANCs and deprived regions. Up to now, farmers in marginal rural areas have not been sufficiently benefiting from rural development policy. Although for the holdings in ANC areas there were higher compensatory allowances, the list of rural development support measures has not been adjusted to the types of production prevalent in such areas and their specific needs.

A significant obstacle to more efficient adaptation of the national ANC support model to the CAP principles are the deficiencies in institutional capacity across the spectrum of the monitoring and evaluation system, the lack of appropriate databases for baseline analysis, as well as of the assessment and analysis of the impacts of previous policies.

ANC policy in any aspect (amount, structure and operationalisation) is one of the major challenges for Serbian agricultural policy reform. Wide diversity of farm types, farming systems and practices in ANC and deprived regions require thoughtfully designed policies and support measures, more focused on the broader public interests and less burdened with economic benefits. Therefore, ignoring specific characteristics of livelihoods and farming practices in ANC and deprived regions in future policy reforms will have outstanding implications for these areas.

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