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“JOINT INTEGRATED POLICY FOR LOW-CARBON ECONOMY IN CROSS-BORDER REGION”

Ref. No.CB006.1.11.165



CLUSTER RENEWABLE ENERGY SOURCES BULGARIA
The Sustainable Energy Cluster of Bulgaria
Linking energy producers, manufacturers, research and education

AIR QUALITY REPORT

Report from conducted survey on the quality of the ambient air according to Directive 2008/50/EC of the European Parliament from 21 May 2008 on ambient air quality and cleaner air for Europe and Ordinance No 12 from 15 July 2010 of the MOEW and MH

Responsible Organization / Documented by	Cluster “Renewable Energy Sources”
Project:	“Joint Integrated Policy for Low-Carbon Economy in Cross-Border Region”, Ref. No.CB006.1.11.165
Programme:	Interreg-IPA CBC Bulgaria–the former Yugoslav Republic of Macedonia Programme, 1st Call of Proposals
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Blagoevgrad, Bulgaria

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Territorial scope of the survey: The measurements were carried out on the territory of the following municipalities: Blagoevgrad, Simitli, Kresna, Strumyani, Sandanski.

Time period for conducting the survey: The measurements were carried out between 13.03.2017 and 23.03.2017 covering the Winter Season from 10.04.2017 to 20.04.2017 covering the Spring Season from 23.06.2017 to 04.07.2017, covering the Summer Season and 01.11.2017 to 11.11.2017, covering the Autumn Season of 2017.

Methods of Measurement used:

1. Method of sampling and measurement of PM10 levels - CCDEN / TS 16450:2013 BDS "Air quality - Automatic particulate (PM10, PM 2.5)" systems.
2. Method for measuring the levels of nitrogen dioxide and nitrogen oxides - BDS EN 14211: 2012 "Ambient air quality - Standard method for measuring the concentration of nitrogen dioxide and nitrogen monoxide by the chemiluminescence method".
3. Method for measurement of sulfur dioxide levels - BDS EN 14212: 2012 "Ambient air quality - Standard method for measuring the concentration of sulfur dioxide by ultraviolet fluorescence method".
4. Method for the measurement of ozone levels - BDS EN 14625: 2012 "Ambient air quality - a standard method for measuring the concentration of ozone by ultraviolet photometry".
5. Method for the measurement of carbon monoxide levels - BDS EN 14626: 2012 "Ambient air quality - Standard method for measuring the concentration of carbon monoxide by non-dispersive infrared spectroscopy".
6. The Air Quality Monitoring takes into account also standard Meteorological Parameters (Temperature, Relative Humidity, Air Pressure, Wind Speed, Wind Direction);



I. MUNICIPALITY OF BLAGOEVGRAD



1. Geography, Borders and Size

The municipality of Blagoevgrad is located in the northwestern part of the Blagoevgrad region and its area of 620,118 km² ranks it 3rd among the 14 municipalities of the district and 9,61% of the territory of the district. Its boundaries are as follows:

Northwest and North with Kyustendil District - respectively Nevestino Municipality (northwest), Boboshevo Municipality and Rila Municipality (to the north);

To the east, southeast and south - respectively Belitsa Municipality, Razlog Municipality and Simitli Municipality;

To the west - Republic of Macedonia (East Planning Region).

Blagoevgrad municipality is situated in the immediate vicinity of the south-western slopes of the Rila Mountains, along the rivers Struma and Blagoevgradska Bistritsa. Surrounded by mountainous and hollow relief, with an average altitude of 959.8 m. The highest point of the region is at the Peak – Golyam Mechi Vrah (2617 m in Southwest Rila). The territory of the municipality is situated on three heights: - a lowland belt from 0 to 200 m - the Valley of the Struma River; - hilly belt from 200 to 600 m - the Blagoevgrad Valley; - a low mountain



range from 600 to 1000 m - the foothills of the Rila, Pirin and Vlahina Mountains, where some of the villages within the municipality are located.



Geographic Map of Municipality of Blagoevgrad

2. Type of area (Urban, Industrial, Suburban Area)

Blagoevgrad municipality is the largest in population and the third in territory in the Blagoevgrad region (with an area of 621 km²). Most of the municipality (45.6%) is occupied by forests. The settlements and urbanized territories occupy about 6.0% of the municipality's territory - a total of 36 km². The settlement network is formed by 26 settlements, of which one city - Blagoevgrad and 25 villages.

According to the requirements of the national and European legislation, the territory of the country is divided into six regions and agglomerations (with a population of more than 250 000 people) for the assessment and management of the ambient air quality (RUUKAV) and their categorization according to the degree of contamination, Fig. I-01. By Order No RD969 / 21.12.2013. of the Minister of Environment and Waters for the designation of the areas for assessment and management of the CAA and the zones where the norms with tolerable deviations have been exceeded, Blagoevgrad Municipality is included in as area for The project is co-funded by EU through the Interreg-IPA CBC Bulgaria–the former Yugoslav Republic of Macedonia Programme



assessment and management of the "Southwest" CA with code BG0005, and is indicated as an area with an level of particulate matter (PM10) indicator and an upper limit of assessment (AOC) for polycyclic aromatic hydrocarbons (PAH) above the average daily value.

II. MUNICIPALITY OF SIMITLI



1. Geography, Borders and Size

The municipality of Simitli is located in the North-Western part of the Blagoevgrad Region and its area of 553,004 km² and is ranked 4th among the 14 municipalities of the Region, which makes up 8.57% of the territory of the Region. Its boundaries are as follows:

Northwest and North - Blagoevgrad Municipality;

To the East - Municipality of Razlog;

To the East - Bansko Municipality;

To the South - Kresna Municipality;

Southwest - Republic of Macedonia.

Number of Settlements – 18;

Number of Inhabitants - 14 283 (2011);

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The territory of Municipality of Simitli represents an extremely interesting mosaic of different types of relief - Valley, low, middle and high Mountain. In the middle of the Municipality, the Struma River runs from north to south and its center forms the small Simitli Valley, which houses the Municipal Center and four more villages. Before the Valley in the Municipality falls the lower (southern) part of the Oranov Gorge, and after it the upper (northern) part of the majestic and picturesque Kresna Gorge. Here in the riverbed is the lowest point of the Municipality - 230 m above sea level. The Western and Eastern parts of the Municipality are mountainous. Its Northeastern part is occupied by the extreme Southwest branch of Southwest Rila, with the highest point 2306 m. The Southeastern quarter is occupied by the North and Northwest parts of the North Pirin, and here is the highest point of the municipality - the Garbetz peak - 2597 m. The entire West and Northwest fall into the Southern branches of Mount Vlahina, with the highest point of Ogreyak Peak (1924 m). To the Southwest, South of the right tributary of the Struma – Sushitska River, are the Northern branches of the Maleshevska Mountain, etc. Krupnitsa Ridge with the Highest Point Ilyov Vrach (Dzhama) 1803 m.



Geographic Map of Municipality of Simitli



III. KRESNA MUNICIPALITY



1. Geography, Borders and Size

The municipality is located in the western part of the Blagoevgrad Region and its area of 344,549 km² ranks 9th among the 14 municipalities of the Region and 5.34% of the territory of the region. Its boundaries are as follows:

- To the North – Simitli Municipality;
- To the Northeast – Razlog Municipality;
- To the East – Bansko Municipality;
- To the South – Strumyani Municipality;
- To the West – Republic of Macedonia.

The municipality has 7 settlements with a total population of 5441 inhabitants (01.02.11)

The territory of Kresna Municipality represents an extremely interesting mosaic of different types of relief - valley, low, middle and high mountain. The larger (Eastern part) is occupied by the Western slopes of the North Pirin, and here is the highest point of the Municipality - Vihren Peak (2914 m). The entire Western half is occupied by the Eastern branches of



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Maleshevska Mountain with a maximum height of 1748 m. Among them, the Northern part of the Sandansko-Petrich Valley is in the Southern part of the Municipality and here in the bed of the Struma River is also the lowest point of the Municipality - 133 m above sea level. The valley of the Struma River, which lies within the Kresna Municipality, covers the valley of the river and the Kresna Plain as part of the Sandanski-Petrich Valley, characterized by a typical transitional Mediterranean climate. Throughout the year, the warm Aegean influence is felt, which invades the river to the Kresna Gorge. The Winter is soft, comes late and is snow-free (average January temperature 2.4° C); Spring begins as early as March; the Summer is dry and hot (average July temperature 24.7 ° C) and in July and August the maximum temperatures reach 40 - 42° C; Autumn is long and warm. The average solar radiation is about 2436 hours / year - one of the highest values for the country. Rainfall averages 700 mm / year. and are predominantly of rain with a high peak in November-December. The winds usually invade the Struma Valley from the South (warm) and the North (colder), with predominantly Southern components. A refreshing effect during the warm half-year has the mountain-valley wind. As the altitude increases in Maleshevska Mountain and especially in Pirin, the Mediterranean influence is gradually diminishing, as in the higher parts the typical features of the mountain climate are observed: short and cool Summer, long and harsh Winter with low temperatures and great clouds, heavy snowfalls.



Geographic Map of Kresna Municipality

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IV. MUNICIPALITY OF STRUMYANI



1. Geography, Borders and Size

The municipality is located in the Western part of the Blagoevgrad Region and its area of 355,19 km² ranks 9th place among the 14 municipalities of the Region, which represents 5.51% of the territory of the Region. Its boundaries are as follows:

- To the North - to Kresna Municipality;
- To the Southeast - with the Municipality of Sandanski;
- To the South - to the Municipality of Petrich;
- To the West - Republic of Macedonia.

The municipality has 21 settlements with a total population of 5778 inhabitants (01.02.2011).

The territory of the Municipality of Strumyani represents an extremely interesting mosaic of different types of relief - valley, low, middle and high mountain. About 3/4 of its territory to the west is occupied by the ridges of Maleshevska Mountain, with the highest point Mount Golack 1453 m. In the most southwestern part, on the land of the village of Nikodin, South of the River Lebnitsa extend the extreme northern branches of the Ograzhden Mountain with Fichov Chukar Peak (1158 m). About 15% of its territory to the East falls on the Western

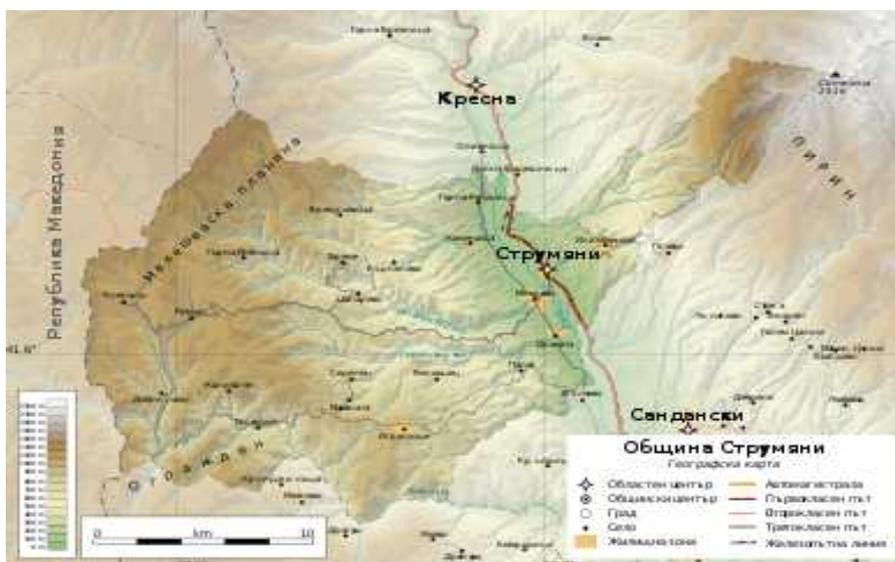


slopes of North Pirin and here is the highest point of the municipality - Mount Sinanitsa (2516 m). The remaining 20% of the lands are located along the valley of the Struma River, which here is the northern part of the Sandanski-Petrich Valley. Here is the lowest point of Strumyani Municipality - about 114 m above sea level. These lands have a high degree of absorption and great importance for the development of agriculture, which determines the greater density of the population and concentration of the economic functions of the municipality. Particularly important are the well-known terraces of Struma, almost all of which are arable land.

On the climatic zoning of Bulgaria in the Atlas of the People’s Republic of Bulgaria in 1973 the majority of the municipality falls into the climatic zone and the rest in the transitional Mediterranean. The first sub-area covers the parts of Pirin and Maleshevska Mountain and is characterized by a longer Winter and a cool and short Summer.

In the Sandanski-Petrich Valley the climate is transitional Mediterranean. The Winter is characterized by the absence of strong frosts (the average January temperature is 2.5° C), the summer is dry and hot (average July temperature 24.3° C) and the Autumn is long and warm. Spring occurs relatively early, with average air temperatures staying steadily above 5 degrees Celsius from February 19, and for the high parts of the mountains this date is only May 9.

The precipitations are about the average for Bulgaria (650 mm / year) in the Struma Valley from the South inflow of hot winds and from the North, much less - cold winds.





Geographic Map of Municipality of Strumyani

V. MUNICIPALITY OF SANDANSKI



1. Geography, Borders and Size

The Municipality of Sandanski is situated in the Southern part of the Blagoevgrad Region and its area of 998,416 km² is the largest among the 14 municipalities of the Region with a 15,48% of the territory of the District. With this area, the municipality falls into the top 10 largest municipalities in Bulgaria - in the 9th place. Its boundaries are as follows:

Northwest – with Municipality of Strumyani;

To the North – a very narrow border with the Municipality of Simitli;

To the Northeast – to the Municipality of Bansko;

To the East – to the Municipality of Gotse Delchev and the Municipality of Hadzhidimovo;

Southwest – with the Municipality of Petrich;

To the South – Republic of Greece.

The municipality has 54 settlements with a total population of 40 470 inhabitants.

The town of Sandanski is characterized by a variety of terrain - flat in the Valley of the Struma River, Alpine and foothills of the Pirin, Slavyanka, Ograzhden and Maleshevska

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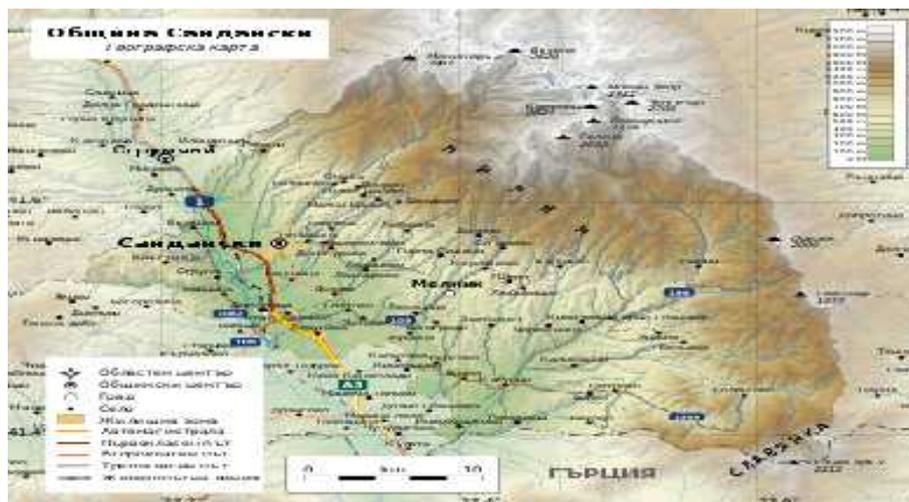
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Mountains. This terrain diversity predetermines the great differences in the altitude, as in the high mountainous parts of Pirin it reaches over 2800 meters (with the highest point Kamenitza Peak - 2822 m above sea level) and over 2000 m for Slavyanka and is the most - low in the Valley of the Struma River after the village of Levunovo, where it is slightly above 100 m above sea level. The main mountains and the main river valleys located between them have a meridian location from North to South.

Municipality of Sandanski is situated in Southwestern Bulgaria. This location combined with the specific terrain in the area forms a very peculiar and unique climate. It features Continental climate and the near Mediterranean climate. This impact particularly the annual distribution of rainfall and the temperature regime. Orography also influences the formation of climate in the area.

As the altitude increases, the climate becomes mountainous with clear vertical zoning. In the Municipality of Sandanski there are four climatic zones - the Sandanski-Petrich climate zone, the Maleshevo-Pirin mountain climatic region, the mountain climatic region - the middle mountain part, the mountain climatic region - the high mountain part.



Geographic Map of Municipality of Sandanski

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VI. RESULTS

Based on the data obtained during the measurements, covering the Winter, Spring, Summer and Autumn seasons of 2017, the following conclusions can be drawn:

I. Analysis of the data from the Winter Season:

1. Regarding the Particle Matter up to 10 μm (PM10) - no exceedance of the average daily fine particulate matter summary [$50 \mu\text{g}/\text{m}^3$] was observed in the following municipalities: Blagoevgrad, Simitli, Kresna, Strumyani and Sandanski for the respective measurement period;
2. Regarding the indicator Sulphur Dioxide (SO₂) - no exceedance of the average hourly level [$350 \mu\text{g}/\text{m}^3$] is observed in the municipalities: Blagoevgrad, Simitli, Kresna, Strumyani, Sandanski for the respective measurement period;
3. Regarding the indicator Nitrogen Dioxide (NO₂) - no exceedance of the average hourly level [$200 \mu\text{g}/\text{m}^3$] is observed in the municipalities: Blagoevgrad, Simitli, Kresna, Strumyani, Sandanski for the respective measurement period;
4. Regarding the indicator Nitrogen Oxide (NO) - no exceedance of the territory of the municipalities: Blagoevgrad, Simitli, Kresna, Strumyani, Sandanski for the respective measurement period;
5. Regarding the Ozone (O₃) indicator - no exceedance of the short-term target rate [$120 \mu\text{g}/\text{m}^3$] was observed in the municipalities: Blagoevgrad, Simitli, Kresna, Strumyani, Sandanski for the respective measurement period;

II. Analysis of the data from the Spring Season:

1. Regarding the Particle Matter up to 10 μm (PM10) - no exceedance of the average daily fine particulate matter summary [$50 \mu\text{g}/\text{m}^3$] was observed in the



following municipalities: Blagoevgrad, Simitli, Kresna, Strumyani and Sandanski for the respective measurement period;

2. Regarding the indicator Sulphur Dioxide (SO₂) - no exceedance of the average hourly level [350 µg/m³] is observed in the municipalities: Blagoevgrad, Simitli, Kresna, Strumyani, Sandanski for the respective measurement period;
3. Regarding the indicator Nitrogen Dioxide (NO₂) - no exceedance of the average hourly level [200 µg/m³] is observed in the municipalities: Blagoevgrad, Simitli, Kresna, Strumyani, Sandanski for the respective measurement period;
4. Regarding the indicator Nitrogen Oxide (NO) - no exceedance of the territory of the municipalities: Blagoevgrad, Simitli, Kresna, Strumyani, Sandanski for the respective measurement period;
5. Regarding the Ozone (O₃) indicator - no exceedance of the short-term target rate [120 µg/m³] was observed in the municipalities: Blagoevgrad, Simitli, Kresna, Strumyani, Sandanski for the respective measurement period;

III. Analysis of the data from the **Summer Season**:

1. Regarding the Particle Matter up to 10 µm (PM₁₀) - no exceedance of the average daily fine particulate matter summary [50 µg/ m³] was observed in the following municipalities: Blagoevgrad, Simitli, Kresna, Strumyani and Sandanski for the respective measurement period;
2. Regarding the indicator Sulphur Dioxide (SO₂) - no exceedance of the average hourly level [350 µg/m³] is observed in the municipalities: Blagoevgrad, Simitli, Kresna, Strumyani, Sandanski for the respective measurement period;
3. Regarding the indicator Nitrogen Dioxide (NO₂) - no exceedance of the average hourly level [200 µg/m³] is observed in the municipalities:



Blagoevgrad, Simitli, Kresna, Strumyani, Sandanski for the respective measurement period;

4. Regarding the indicator Nitrogen Oxide (NO) - no exceedance of the territory of the municipalities: Blagoevgrad, Simitli, Kresna, Strumyani, Sandanski for the respective measurement period;
5. Regarding the Ozone (O₃) indicator - no exceedance of the short-term target rate [120 µg/m³] was observed in the municipalities: Blagoevgrad, Simitli, Kresna, Strumyani, Sandanski for the respective measurement period;

IV. Analysis of the data from the Autumn Season:

1. Regarding the Particle Matter up to 10 µm (PM₁₀) –

- Municipality of Blagoevgrad – no exceedance of the average daily fine particulate matter summary [50 µg/ m³] for the respective measurement period was observed;
- Municipality of Simitli – exceedance of the average daily fine particulate matter summary [50 µg/ m³] for the respective measurement period was observed on 03.11.2017 [82 µg/m³];
- Municipality of Kresna – exceedance of the average daily fine particulate matter summary [50 µg/ m³] for the respective measurement period was observed on 06.11.2017 [51 µg/m³];
- Municipality of Strumyani – exceedance of the average daily fine particulate matter summary [50 µg/ m³] for the respective measurement period was observed on 08.11.2017 [55 µg/m³];
- Municipality of Sandanski – exceedance of the average daily fine particulate matter summary [50 µg/ m³] for the respective measurement period was observed on 10.11.2017 [98 µg/m³] and on 11.11.2017 [57 µg/m³]



2. Regarding the indicator Sulphur Dioxide (SO₂) - no exceedance of the average hourly level [350 µg/m³] is observed in the municipalities: Blagoevgrad, Simitli, Kresna, Strumyani, Sandanski for the respective measurement period;
3. Regarding the indicator Nitrogen Dioxide (NO₂) - no exceedance of the average hourly level [200 µg/m³] is observed in the municipalities: Blagoevgrad, Simitli, Kresna, Strumyani, Sandanski for the respective measurement period;
4. Regarding the indicator Nitrogen Oxide (NO) - no exceedance of the territory of the municipalities: Blagoevgrad, Simitli, Kresna, Strumyani, Sandanski for the respective measurement period;
5. Regarding the Ozone (O₃) indicator - no exceedance of the short-term target rate [120 µg/m³] was observed in the municipalities: Blagoevgrad, Simitli, Kresna, Strumyani, Sandanski for the respective measurement period;