DATA
ACCOMPANYING REPORT

AIR QUALITY

In 2021, the intensive monitoring program for assessment of air quality in the forest ecosystems was implemented in 4 stationary areas. The territories, where the monitoring stations are located, attributed to two different climatic regions: Black sea climatic region – Eastern Balkan mountain sub region (site Staro Oriahovo) and Mountainous climatic region – Middle mountain sub region up to 2000 m. (sites Yundola, Vitinia and CBMS Rojen - complex background monitoring station).
The permanent monitoring stations (PMS) are equipped with automatic devices, which continuously measure air quality parameters and transmit collecting data to the central data base of the National System for Environmental Monitoring (NSEM) in real time.
These stations monitor for a variety of air contaminants, including nitrogen oxides (NO, NO_2 and NO_x), ozone (O_3), sulphur dioxide (SO_2) and particulate matter (PM_{10}).

A short description of the stations:

- **Vitinia (SP0001)** - This area is situated in the western part of Middle Stara planina (the Balkan mountain), at an altitude of about 953 m. above the sea level, on the territory of Vitinia State forestry district. It is representative for the beech forests. The region is under the influence of local and regional pollution sources;

- **Staro Oriahovo (SP0004)** – It is situated in the eastern part of Stara planina, at an altitude of about 200 m above sea level in “Gorska baraka” area of the Staro Oriahovo State forestry district. The region is representative for oak forests. There are regional pollution sources;

- **Yundola (SP0003)** – This area is situated in the western part of the Rodope mountains, at an altitude of about 1602 m above sea level, in the “Starina” area, on the territory of the experimental training forest station Yundola of the University of Forestry /UF/. It is representative for coniferous forests and is far away from local pollution sources.

- **CBMS Rojen (SP0005)** – this station is situated at 1750 m. a.s.l. in the southern part of the Rodope mountains in the close of The National Astronomical Observatory (NAO). It is representative for coniferous forests and is far away from local pollution sources.

Air Quality equipment

Sensor/ System	Manufacturer	Type	Specifications
Remote transmission	Siemens	Siemens GSM Dualband Modem TC 35T, antenna,	GSM Dualband Modem Terminal
Data logger	Infologica	Super Micro SBC-19	Data logger
Software	Project Automation	Eco Remote	Data management, Import, Export; Meteorological and Air Quality data interpretation, remote transmission
SO2	Monitor Labs.	ML9850	Air quality measure
NOx	Monitor Labs.	ML9507	Air quality measure
O3	Monitor Labs.	ML9812	Air quality measure

Due to neglect low concentrations of ammonia it was accepted that pollutant to be not measured.

The air quality monitoring in the level 2 SPs in 2021 were prepared in compliance with the ICP Forests Manual and comprise the following activities:

- **Assessment of ambient air quality** – air pollution concentrations are measured in every 1 hour. Data for automatically measured atmospheric pollutants -

SO_2, NO, NO_x, NO_2, PM_{10} and **O_3** are transmitted to the CDB of NSEM in real time. For the needs of ICP Forests, only **SO_2, NO_2** and **O_3** data were reported;

- **Validation of the data -** the present submission report for air quality is based on the more than 90% valid data for each of the measured compounds. The percentage of the valid data is as follow:

Sample Plot	Parameter	Number of data records	Percent of valid data (%)
0001	O3	8467	96.7
0001	SO2	8358	95.4
0001	NO2	8169	93.3
0003	O3	5005	57.1
0003	SO2	4929	56.3
0003	NO2	5005	57.1
0004	O3	8072	92.1
0004	SO2	8163	93.2
0004	NO2	8119	92.7
0005	O3	8297	94.7
0005	SO2	7602	86.8
0005	NO2	8452	96.5

***The large lack of data from the Automatic Measuring Station in Yundola (SP0003) is due to a failure in the data logger and the interrupted data submission in the period 12.03 - 12.08.2021. The analyzers were turned off and did not transmit data to the real time system until the problem was fixed.*

- **Submission of the data –** online check of the uploaded PAC and AQA forms and submission of validated data to the ICP Forests online DB.