Training internship "Assessment of air quality in the Moldova-Romania Region" at the Czech University of Life Sciences Prague, CZU

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The purpose of this scientific research "Assessment of air quality in the Moldova-Romania Region" consisted in identifying, based on the statistical processing of the existing data base, some spatial and temporal trends in the manifestation (increase/decrease) of pollutant concentrations, in analyzing the cause-effect relationship between the factors that contribute to the contamination/self-purification of the atmosphere and the pollutants generated, and in studying the consequences of pollution on the air in the Moldova-Romania Region. The research focused on the adaptation and implementation of these methods to evaluate atmospheric pollutants and their impact on the environment and public health in the Moldova Region.

Through this training internship (November 18 – 29, 2024) coordinated by Assoc. Prof. Dr. Mgr. Vera Potopova from the Faculty of Agrobiology, Food and Natural Resources at the Czech University of Life Sciences Prague, we identified examples of good practice:

- the management of the air quality monitoring system in Prague (how the problem of the temporal and spatial resolution of the system and implicitly the territorial coverage is solved);
- the attributions established by law of the monitoring system;
- the typology of air quality monitoring stations and the pollutants monitored by them;
- the equipment of the coordination centers and monitoring stations;
- the research projects in which specialists in the field of air quality from Prague and the Czech Republic are involved;
- the software used in the preparation of air quality maps, pollution and heat islands for the Prague urban agglomeration;
- determination of precipitation acidity, environmental radioactivity (air, precipitation, water, vegetation) and biological pollution of the atmosphere;
- studies prepared by Prague specialists for reporting, archiving and informing the population on air quality;
- organization of the population warning system in case of accidental pollution and the existence of evacuation plans for the population in case of major pollution;
- existence of a noise and radon determination network or at least some observation points for them;
- issuance of biometeorological analyses in Prague;
- existence in Prague of accessible medical statistics on the number of illnesses caused/aggravated by pollution;
- existence of studies on the impact of air pollution on the population in the urban agglomeration;
- comparative analysis for a period of 1 year of the pollutant levels at the stations in Prague and those in Suceava to see the differences between their levels in the two cities.

On November 18, 2024, I participated in a meeting at the Faculty of Agrobiology, Food and Natural Resources of the Czech University of Life Sciences in Prague, together with Assoc. Prof. Dr. Dumitru Mihăilă, Assoc. Prof. Dr. Mgr. Vera Potopová and PhD students Anxhela Hameti (Albania), Trifan Tudor (Republic of Moldova) and Gazmir Cela (Albania). Assoc. Prof. Dr. Mgr. Vera Potopová presented the following aspects: the new agroclimatic forecasting platform (https://agropocasi.cz/plodiny/zeleniny/), the agrometeorological and agroclimatic indices database, the Davis model weather station located within the faculty, applied methods and models; discussions. Within the agroclimatic forecasting platform, I observed the variations in air temperature, precipitation, wind and cloudiness values for three days (today, tomorrow and the day after tomorrow). Forecasts of meteorological elements are updated every day at 9:00, and the values of air temperature, soil, air humidity, precipitation, wind speed, solar radiation are automatically graphically transposed, through interactive diagrams, over the time interval selected in the program. (https://agropocasi.cz/interaktivni-grafy/).

In the development of meteograms for localities in the Czech Republic (temperature, wind speed, wind gusts, precipitation, atmospheric pressure, degree of cloud cover), the Aladin 53 CNRM - CM5 forecast model is used, based on data provided by the Czech Hydrometeorological Institute. The site also presents risk factors, such as what the weather will be like in the coming period, the end of November, December until mid-January. (https://www.chmi.cz/files/portal/docs/meteo/ov/aladin/results/public/meteogramy/mhtml/m.html).

On November 19, 2024, I participated in a visit to the Hydrometeorological Institute in Prague, which resulted in a meeting with expert Václav Novák - Air Quality Department. The Department of Climatology is responsible for measuring, storing, evaluating and archiving meteorological elements, phenomena and information describing the

state and development of the atmosphere in the lower troposphere. It methodically manages the network of climatological, precipitation measuring and agrometeorological (phenological) stations on the territory of the Czech Republic. It provides measurements and ground observations at voluntary climatological stations, precipitation measuring stations and a network of phenological stations. The Doksany Observatory has a specialized observation program, ensures the processing of climatological information that territorially refers to several branches of the ČHMÚ or that is requested by foreign partners. It coordinates and solves operational, research and development tasks within institutional, national and international projects in the field of climatology, agrometeorology and phenology. The Department of Climatology is also responsible for the operation and development of the CLIDATA climatology database and for cooperation with specialized international organizations: European Centre for Medium-Range Weather Forecasts (ECMWF), World Meteorological Organization (WMO).

Continuation of activities at the Hydrometeorological Institute in Prague with the presentation by Assoc. Prof. Dr. Mgr. Vera Potopová of the monitoring equipment for physical and chemical parameters of the atmosphere, owned by the institute; analysis of statistics, graphic and cartographic materials on air quality in the Czech Republic, which can be found in the Annual Reports.

On November 20, 2024, I went to the field to the Praha 6-Suchdol air quality monitoring station, located on the campus of the Czech University of Life Sciences. The station has sensors: temperature PT100; temperature and humidity Campbell Scientific HMP155A; atmospheric pressure Campbell Scientific CS106 PTB110; Kipp & Zonen CNR4 shortwave and longwave radiation; MW7 rain gauge; ATMOS-22 ultrasonic anemometer. The measurement system provides data every 15 (10) minutes. The time used is CET (GMT +1h). Daily characteristics are calculated for 24 hours in the interval 7:00 - 6:59. The following are measured: air temperature, daily extreme temperatures, daily minimum air temperature at the ground (at a height of 5 cm), air humidity, total precipitation, wind speed and direction, air pressure, global radiation, shortwave radiation reflected from the earth's surface, longwave radiation of the earth, longwave radiation of the atmosphere, soil temperature (at depths of 5, 10, 20, 50, 100 cm) and soil moisture (at depths of 10 and 30 cm) (https://agropocasi.cz/meteostanice-czu/).

Also on November 20, 2024, I had a scheduled visit to the Romanian Embassy in Prague: meeting with Her Excellency Antuaneta Barta, representative of the Romanian Embassy, where discussions were held on academic and international cooperation topics – UEFISCDI.

On November 21, 2024, I went to the Department of Meteorology and Climatology (ÚMK) of the Czech Hydrometeorological Institute, which is responsible for measuring, storing, evaluating and archiving meteorological elements, phenomena and information describing the state and development of the atmosphere in the lower troposphere. It has a specialized observation program at the Praha-Libuš, Doksany, Temelín and Dukovany observatories.

I went to the field at the Praha 4-Libus air quality monitoring station, which monitors SO_2, NO_2, PM_{10} and O_3 emissions and climate elements: air temperature, atmospheric precipitation, wind speed and global solar radiation. It ensures the reception of satellite information from stationary and polar meteorological satellites (EUMETSAT, NOAA), operates two Doppler and polarimetric radars (CZ-RAD), performs basic lightning data processing (LDS) and launches a weather balloon to the Praha-Libuš sounding station 3-4 times a day. It provides measurements and ground observations at professional meteorological stations and observatories, aviation stations, volunteer climatological stations and rain gauge stations. The Department of Meteorology and Climatology is also responsible for the development and operation of the ALADIN-CZ forecast/meteorological model, the development of the CLIDATA climatological database and cooperation with international organizations WMO, EUMETSAT, ECMWF, etc.

On November 22, 2024, I participated in the event at the Food Pavilion of the University of Agricultural Sciences in Prague, at the proposal of Assoc. Prof. Dr. Mgr. Vera Potopová. The objective of the activity was to discover the secrets of food production in the Czech Republic. At the same time, we started analyzing air quality databases - consulting the air quality website https://aqicn.org/city/prague/. Consulting the website of the Czech Hydrometeorological Institute - https://www.chmi.cz/; downloading and analyzing the database.

On November 23, 2024, we carried out individual activities: consulting the Annual Reports on Air Quality in the Czech Republic / Prague for the period 2009 - 2023 and profile articles published in specialized journals with impact factor Q1 and Q2 by Czech researchers (https://www.chmi.cz/files/portal/docs/uoco/isko/tab_roc/tab_roc_EN.html).

On November 24, 2024, we worked on the project: comparative analysis of the method and principles of organization at national / regional / local level of the air quality monitoring network in the Czech Republic and Romania. In Romania, air quality is monitored by the National Environmental Protection Agency, which centralizes data from the Environmental Protection Agencies in each county. In the Czech Republic, the Hydrometeorological Institute centralizes data from 200 monitoring stations. The types of stations are automatic (direct measurements) and

manual (data obtained from measurements arrive with a delay of 3 months). Each monitoring station has a "characteristic" passport in accordance with the classification and purpose of the measurements.

The classification of air quality monitoring stations in the Czech Republic is:

Station type: Traffic (T), Industrial (I), Background (B);

Area type: Urban (U), Suburban (S), Rural (R);

Characteristics of the area: Residential (R), Commercial (C), Industrial (I), Agricultural (A), Natural (N), Residential / Commercial (RC), Commercial / Industrial (CI), Industrial / Residential (IR), Residential / Commercial / Industrial (RCI), Agricultural / Natural (AN).

On November 25, 2024, a comparative analysis of air quality indices in the Czech Republic and Romania was conducted.

Czech Republic

Index	Air quality	SO_2	NO_2	CO	O_3	PM_{10}
		1h (µg/m³)	1h (µg/m³)	8h (µg/m³)	1h (µg/m³)	1h (µg/m³)
1	Very good	0 - 25	0 - 25	0 - 1000	0 - 33	0 - 15
2	Good	> 25 - 50	> 25 - 50	> 1000 - 2000	> 33 - 65	> 15 - 30
3	Correct	> 50 - 120	> 50 - 100	> 2000 - 4000	> 65 - 120	> 30 - 50
4	Proper	> 120 - 250	> 100 - 200	> 4000 - 10000	> 120 - 180	> 50 - 70
5	Bad	> 250 - 500	> 200 - 400	> 10000 - 30000	> 180 - 240	> 70 - 150
6	Very bad	> 500	> 400	> 30000	> 240	> 150

Romania

Index	Air quality	SO_2	NO_2	CO	O_3	PM_{10}
		1h (µg/m³)	1h (µg/m³)	8h (µg/m³)	1h (µg/m³)	1h (µg/m³)
1	Excellent	0-50	0-50	0 și 3	0-40	0-10
2	Very good	50-75	50-100	3 și 5	40-80	10 și 20
3	Good	75-125	100-140	5 și 7	80-120	20-30
4	Average	125-350	140-200	7 și 10	120-180	30-50
5	Bad	350-500	200-400	10 și 15	180-240	50-100
6	Very bad	>500	>400	>15	>240	>100

On November 26, 2024, we worked on consulting the Czech air quality legislation. The basic legal norm regulating the assessment and management of air quality and the exploitation of air pollution sources is Law No. 201/2012 on air protection, as amended. The National Emission Reduction Program is one of the basic strategic documents in the field of improving air quality and reducing emissions from air pollution sources. The Czech Ministry of Environment has been continuously processing and updating it since 2007.

In Romania, air quality is regulated by Law No. 104/2011 on ambient air quality, which aims to protect human health and the environment as a whole by regulating measures intended to maintain ambient air quality where it meets the objectives for ambient air quality established by this law and to improve it in other cases. The law was updated by Government Decision No. 336/2015, Government Decision no. 806/2016 and Order No. 598/2018 of June 20, 2018 on the approval of the lists of administrative-territorial units drawn up following the inclusion in management regimes of areas in the zones and agglomerations provided for in Annex no. 2 to Law no. 104/2011 on ambient air quality.

On November 27, 2024, he exchanged experience with doctoral students from the UDC regarding the software used in the preparation of statistics, graphs, air quality maps, heat pollution islands for the Prague urban agglomeration.

On November 28, 2024, we continued individual activities: project work, research, centralization of information and preparation of materials.

On November 29, 2024, we made an analysis of the achievement of the objectives of the research internship, establishing future joint research directions (articles, participation in scientific events of students from CZU and USV, research project proposals).

This training internship will lead, through the implementation of good practices acquired in Prague, to: the development in Romania of administrative - organizational and technical measures and solutions that support the sustainable development of the area in order to maintain air quality and reduce its pollution; the adaptation and implementation of new methods for the assessment of atmospheric pollutants; the creation of graphic and cartographic products and a related database that will support the theoretical and practical part of the work.

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