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Editorial

Assessing Atmospheric Pollution and Its Impact on the Human Health

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In recent decades, atmospheric pollution has become a major risk for public health and ecosystems. In this era, when industrial development and urbanization are accelerated, decreasing the contamination level from different sources became a must to ensure a friendly and healthy climate for future generations.

The Special Issue "Assessing Atmospheric Pollution and Its Impact on the Human Health" contains articles with the following topics: assessment of the PM10, PM2.5, nitrogen oxides, ozone, and dust on the pollution life using different health indicators and statistical methods, building artificial intelligence method for evaluating the pollution trend and the admission of people in hospital due to pulmonary diseases. It was emphasized that there is insufficient data, and the monitoring network is not uniformly distributed to provide a correct insight into the atmospheric contamination level and its adverse effects on the people. Moreover, the authorities should consider the studies' results and take urgent measures to reduce or eliminate, when possible, the pollution sources.

Given that dust is an important source of pollution in the United Arab Emirates, Nazzal et al. [1] investigated its impact on the health of inhabitants from the Sharjah and Ajman Emirates based on data series collected from April to August 2020, continuing the investigations on the pollution from different sources in the United Arab Emirates [2,3]. They found that the average daily dose (ADD), the hazard quotient (HQ), and the health index (HI) have been used for this aim. The highest concentrations found in the study samples were those of Zn, Ni, and Cu, with anthropogenic origin. The HQ and HI indicated, respectively, an acceptable and negligible non-carcinogenic risk for people's health. Clustering the observation sites based on the original series and those of the health indices found three clusters, one of them formed only by a single location, where the highest concentrations of heavy metals were detected.

Cui et al. [4] investigated the impact of the grain dust on the workers' health using samples of different types of grain collected in six locations in China and developing a probabilistic risk assessment model. Using this approach, the risk to the people's health was transposed into disability-adjusted life years (DALY). It was shown that for the people working in the grain storage and transportation, the mean DALY was greater than 0.4 years, with the values between 0.1 and 3.3 years for the former. The highest DALY corresponds to maize (1.01 years, for in-warehousing), followed by those of rice (0.89 years) and wheat (0.83 years) in the transportation phase.

The article of Maftei et al. [5] addressed the impact of the pollution (with PM10 and nitrogen oxides) on the population's health in the county of Brasov, Romania.

The research tried to correlate the air pollution level with the laboratory analysis results of the patients confirmed with pulmonary malignant tumors. It was shown that most patients suffer from squamous cell carcinoma (76%), the rest of them being diagnosed

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with pulmonary adenocarcinoma (24%). The disease rate was lower in the rural zones than in the urban ones. In both cases, squamous cell carcinoma has the highest frequency. The limits of this study were the low number of stations recording the atmospheric pollution, their unequal distribution, and the limited database of the medical records.

In their research, Tadano et al. [6] proposed two artificial intelligence models—the echo state networks and the extreme learning machines (ELM) for estimating the impact of the PM10 on the hospital admissions due to respiratory diseases. Other parameters taken into account were air temperature and humidity. The regularization parameter (RP) and the Volterra filter have been used for increasing the model's generalization capability and exploring the nonlinear patterns of the networks' hidden layers. Results show that the ELM better performed in most cases. The research is important for estimating the hospital admission and pointed out the lack of data for other pollutants that could bias the results.

Qin et al. [7] provided the results of the analysis of polycyclic aromatic hydrocarbons (PAHs) in the environment and freshwater fish in the area of Lake Chaohu. First, they identified the atmospheric pollution sources. The exposure to PAHs through water intake, inhalation, and freshwater fish ingestion was evaluated by different techniques, such as the assessment model, probabilistic risk assessment, and Monte Carlo simulation. They showed that the primary source of atmospheric pollution is biomass combustion. The atmospheric transport significantly contributes to the contaminants spreading. Significant differences were found between the samples only for a gaseous BaP equivalent concentration. Among the risk sources, the fish intake and the particles' inhalation occupied the first two places, based on the lifetime average daily dose. The probabilistic cancer risk assessment indicated a potential carcinogenic risk for the population in the neighborhood of Lake Chaohu.

Buch et al. [8] assessed the transport influence on the pollution due to carbon species (elemental—EC and organic—OC) in a zone from the Littoral of the Gdansk Gulf in the periods 13–22 July 2015 (holiday period) and 14–30 September 2015 (holidays and school periods) for two hours in the morning and two in the afternoon. The highest OC (EC) mean concentration in small aerosols was recorded during the holidays (the school period, between 7.00–9. 00 a.m.). Still, the statistical tests rejected the hypothesis that there is a significant difference between the OC concentrations recorded between 7.00–9.00 a.m. and 3.00–5.00 p.m. During the holidays (school period), the EC, sulphate, and nitrate (CO) concentrations were the highest. It was found that the regional wind has an important role in the pollutants' transport.

Huang et al. [9] analyzed the particulate matter (PM) distribution and the trend of heavy metals and water-soluble ions in PM2.5 and PM10 during the haze periods from March 2016 to January 2017 in Chengdu, China, at different pollution levels. It resulted in heavy metals being enriched in fine (PM2.5) particles compared to PM10, and the mobile sources had significant contributions to the haze formation.

Johnston et al. [10] addressed indoor air pollution in the houses of brick workers in the Kathmandu Valley, Nepal, taking into account the type of cooking device used. Higher concentrations of black carbon (349 $\mu g/m^3$) have been detected in the houses using wood fire than where the liquefied petroleum gas cookstoves are used or in outdoor air (5.36 $\mu g/m^3$). Indoor chlorine (potassium) in the first kind of house was 34 (4) times higher than in the second type of residence. Ca, Al, Co, Fe, Ti, and Si concentrations exceeded the allowable limits in all the studied locations. The research pointed out the necessity of the authorities' intervention to improve the region's indoor air quality.

Reliable scenarios or models for atmospheric pollutants dynamics are of high interest for a correct estimation of the pollution impact on the environment and human health. However, the outliers' existence may significantly bias the models' quality and, implicitly, the forecast based on them. In this idea, Bărbulescu et al. [11] studied the existence of outlying values in the daily nitrogen oxides and ozone series collected from 1 January to 8 June 2016 in Timisoara, Romania. Four methods have been employed: the interquartile range (IQR), isolation forest, local outlier factor (LOF), and the generalized extreme studentized deviate (GESD). Three models (ARIMA, GRNN, and ARIMA-GRNN) have been

built for the raw series and those without aberrant values. The best one was the hybrid ARIMA-GRNN for the series without aberrants, which can be used for the forecast.

In the article [12], the author analyzed the 387 series of the aerosol optical depth (AOD) collected for 178 months over the Arabian Gulf, continuing the research from [13–15] related to the dust aerosols and storms in the United Arab Emirates. The Principal Component Analysis (PCA) extracted the main data subspace of the temporally indexed and spatially indexed time series (TITS and SITS, respectively). Over 90% of the variance of SITS is explained by the first principal component (PC), and only 60.5% of the variance of TITS by six PCs. Hierarchical clustering applied to SITS indicates that one group contains the locations on the Shamal trajectory, whereas applied to TITS resulted in grouping based on seasonality. The regional and temporal trend series (RTS and TTS, respectively) have been detected using a two-step algorithm, which firstly determined the clusters with the highest number of elements, followed by a mediation process, as presented in [16]. RTS and TTS are trend-stationary, the former being also level-stationary, and fit the data series well.

More research should be done to develop new indices for providing a correct evaluation of the degree of cumulated pollution from different sources and its impact on people's health. At the same time, the decision factors must implement plans to reach a cleaner environment.

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