

Urban Noise and Air Quality: Correlation between Air and Noise Pollution; Sensors, Data Collection, Analysis and Mapping in Urban Planning

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Abstract : Architects and urban planners, when designing and renewing cities, have to face a complex set of problems, including the issues of noise and air pollution which are considered as hot topics (i.e., the Clean Air Act of London and the Soundscape definition). It is usually taken for granted that these problems go by together because the noise pollution present in cities is often linked to traffic and industries, and these produce air pollutants as well. Traffic congestion can create both noise pollution and air pollution, because NO₂ is mostly created from the oxidation of NO, and these two are notoriously produced by processes of combustion at high temperatures (i.e., car engines or thermal power stations). We can see the same process for industrial plants as well. What have to be investigated – and is the topic of this paper – is whether or not there really is a correlation between noise pollution and air pollution (taking into account NO₂) in urban areas. To evaluate if there is a correlation, some low-cost methodologies will be used. For noise measurements, the OpeNoise App will be installed on an Android phone. The smartphone will be positioned inside a waterproof box, to stay outdoor, with an external battery to allow it to collect data continuously. The box will have a small hole to install an external microphone, connected to the smartphone, which will be calibrated to collect the most accurate data. For air, pollution measurements will be used the AirMonitor device, an Arduino board to which the sensors, and all the other components, are plugged. After assembling the sensors, they will be coupled (one noise and one air sensor) and placed in different critical locations in the area of Mestre (Venice) to map the existing situation. The sensors will collect data for a fixed period of time to have an input for both week and weekend days, in this way it will be possible to see the changes of the situation during the week. The novelty is that data will be compared to check if there is a correlation between the two pollutants using graphs that should show the percentage of pollution instead of the values obtained with the sensors. To do so, the data will be converted to fit on a scale that goes up to 100% and will be shown thru a mapping of the measurement using GIS methods. Another relevant aspect is that this comparison can help to choose which are the right mitigation solutions to be applied in the area of the analysis because it will make it possible to solve both the noise and the air pollution problem making only one intervention. The mitigation solutions must consider not only the health aspect but also how to create a more livable space for citizens. The paper will describe in detail the methodology and the technical solution adopted for the realization of the sensors, the data collection, noise and pollution mapping and analysis.

Keywords : air quality, data analysis, data collection, NO₂, noise mapping, noise pollution, particulate matter

Conference Title : ICUNPATUP 2018 : International Conference on Urban Noise Pollution Assessment Techniques and Urban Planning

Conference Location : London, United Kingdom

Conference Dates : April 24-25, 2018