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Reducing noise pollution using panels: The case of Konya City

Sedanur Ertekin [*1], **Şükrü Dursun** [1]

[1]*Konya Technical University, Department of Environmental Engineering, Türkiye, ertekinsedanur@hotmail.com; sdursun@ktun.edu.tr*

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Abstract

Complaints about noise caused by the increasing vehicle load in big cities are increasing. City center transmission density, wide roads, road location and road surface coverage, traffic signaling systems in the city are the factors that monitor environmental pollution. Non-compliance with the rules in traffic, especially the stop-stops of small public transportation vehicles, wrong parking, heavy use of motorcycles and other transportation vehicles cause noise in the traffic density. Insufficient increase of road surface in the city. To minimize the negative effects of evaluations on people, the use of environmental panels on urban and extra-urban highways is one of the solutions. In this study, the use of environmental panels to prevent traffic congestion in Konya province and the usability of end-of-life tires (ÖTL) as the basic material of the panels were investigated. In this way, it has been investigated that the tire hose that has completed its life is not thrown away and the possibility is evaluated. Arrangements made within the scope of zero waste of the study will be supported. His designated area for evaluation of behavior is measuring data before and after panel installations. In the study, the boundaries of which points can be placed have been studied. With the obtained data, the environmental simulation application of Konya was modelled with SURFER software and reflected on the map. In this way, a clearer differentiation of the normal distribution of the environment in the city and the predicted diffraction after the panel was achieved

Introduction

Noise is a collection of sudden or continuous complex sounds in acoustically arbitrary waveforms and with multiple unrelated frequency components, also with high pressure and time varying pressure. It is necessary not to be exposed to noise because of the negative effects of noise such as adversely affecting the hearing performance and perception of people in terms of health, disrupting the physical and psychological balance, reducing the work performance, disturbing the peace and tranquility of the environment, and thus changing the quality of the environment. Also, measures should be taken to deal with noise. Therefore, noise measurements are very important. Dalkılıç and Dursun [1] have shown in their studies that the noise level of municipal buses and minibuses, and even heavy vehicles entering the city center uncontrolled, increases up to 85-86 dBA. It has been determined that such vehicles cause a noise increase of 8 dBA, and three-wheeled engines 10 dBA.

Road traffic noise is of paramount importance in terms of overall environmental impact and the problem should be technically assessed and solutions or alternative ways considered through appropriate and consolidated procedures. So far, there is no regulated guide for determining well-founded priorities when dealing with the various road sections covered in the relevant Action Plans against noise within the scope of the Environmental Noise Directive [2]. In recent years, population movement between cities, unplanned development of cities, traffic congestion and excessive increase in motor vehicles cause environmental problems, especially noise pollution. The effect of the city plan implementation (ideal use in road and building areas, building-green area ratio) on noise pollution was investigated. Konya noise pollution map is presented with 366 sampling points selected on the main roads in the city centre of Konya. Modelling with Konya city noise pollution map is shown. A significant impact of increased building levels on noise levels was also found near major roads [3].

Material and Method

Study Area: To evaluate the noise caused by the highways of the city connection roads, to reveal the effects on the people living in the areas close to the road, and to exemplify the control measures, it was preferred to examine the houses living in this area with the following steps. The measurements were carried out on Adana Ring Road (Figure 1).

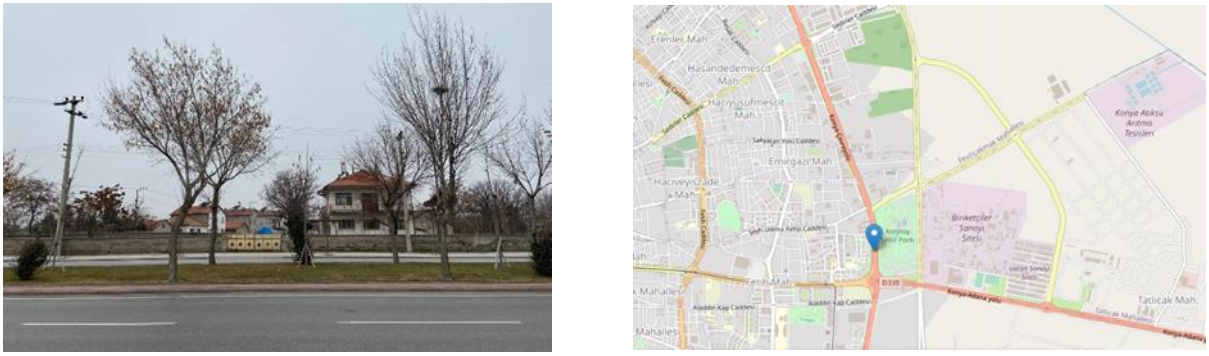

Figure 1. Measurement point and area map image on Adana Ring Road

Styrofoam Panel: EPS (Expanded Polystyrene) Styrofoam is a thermoplastic, closed steam, heat release material produced by inflating and combining polystyrene particles, and 98% of it consists of inert dry air. It provides high thermal insulation. The thermal conductivity group is 0.40. It is not fragile; Styrofoam is pressure resistant. There is no capillary water permeability. The thickness of the Styrofoam remains constant with pressure. It is an environmentally friendly material and Styrofoam does not harm the ozone layer. It provides an easy and economical system to implement. It is used today to prevent sound noise. For this reason, it was thought that it would be a suitable material for the panel.

End-of-Life Tire (ELT) panel: Tires are complex materials made from rubber and various other reinforcement materials. Thanks to its shock absorbing feature and flexibility, it prevents fragmentation that may occur because of falling and impact. Long lasting, easy to clean. Being weather resistant. It was preferred because it is a recyclable material, and it has a dry, clean and non-slip surface feature without puddles even after heavy rain (Figure 2).

Results

Highways have been developed to a great extent in Konya with connection roads; Konya is among the few provinces of Turkey in terms of the number and size of motor vehicles. In addition, in terms of transportation, Konya is located on the main traffic axes of Turkey. It has a significant traffic potential due to its capacity in agriculture and tourism. The houses living in this area are generally detached houses, while the number of households living in this area is around 2200, it is assumed that approximately 1000 households are affected by noise because they are close to the roadside. More detailed measurements were taken in certain areas over the areas where the people living in this area heard the soundest.

During the measurement time, the short-term sound pressure level should be recorded with a sampling time slightly lower than the time constant set for time weighting. The class intervals from which recorded results will be determined should be 1.0 dB or less, and the baseline on which the parameters are based and, where appropriate, the time weight (record time) and class interval used when assigning the LNT should be reported. In the residential area, noise level measurements were made outside the building within the scope of the study. The testo 815 noise level measuring device was used in the measurements and the measurements were started after the calibration of the device was completed.

The measurements were made in accordance with the TS 1996-1: 2020 standard, at 1 meter from the main road and at a height of 1.5 meters from the pavement; Outside the area where the building area is located, five-minute measurements were taken at 1.5 m from the ground and 2 m from the facade. Noise level measurements were made at 10 points without the panel during the car passing on the roadside and at 20 points in total, including 10 points on the back of the panel during the passing of the cars. Noise modelling was carried out to evaluate the noise panel from all aspects within the scope of the study. The order in which the maps are created is as follows: First, the coordinate data are saved in the Excel program. Then it was saved as Surfer data application and configured as grid data. The noise level is colored with the Contour maps tool (Figure 2-3).

Conclusion

Previously researched and 2.5. given under the heading; In September 2005, in the study conducted for the high-speed train in Turin-Novara region of Italy, the acoustic barrier installed along the high-speed railway line was tested and the 45/48 dB degree obtained in the laboratory increased to 37 dB in front of the concrete elements and 20/19 dB' behind the concrete elements. was found to have fallen. However, in the on-site application, these results could not be obtained, and the study was unsuccessful. As a result, the researcher determined that the lesson to be learned in the study is that the blocks are weakly attached to each other and to the poles, and that very large insulation panels are useless and unstable. It was concluded that all components of the acoustic barrier and their connections must be carefully designed [4].

In our study, the designed barrier structure achieved a dynamic potential and enabled us to obtain more consistent results in this context. According to the evaluations, it was determined that an area of 8 km^2 and approximately 2% of the total city population were affected by the noise level above 75 dB(A) in a 24-hour period. It has been calculated that the 37 km^2 area in the study area and approximately 14% of the total city population are affected by the noise level above 80 dB(A). As a result of the calculations, it has been determined that the 28.6 km^2 land around the highways and approximately 38% of the total city population are exposed to a noise level of 71 dB(A) and above. Noise is harmful to human health. It can cause hearing loss. Studies on the identification, calculation and modeling of noise sources have been explained in the previous chapters. It has been determined in scientific studies that the most common source of noise pollution is motor vehicles. Within the scope of the study, it has been determined that no exposure to noise due to the negative effects of noise such as adversely affecting the hearing performance and perception of people in terms of health, disrupting the physical and psychological balance, reducing the work performance, disrupting the tranquility and tranquility of the environment, and thus changing the quality of the environment. In addition, it has been determined that noise pollution continues to increase with the increase in industry and vehicle use due to the increasing population. Within the scope of the research, different noise panels were tried in industrial facilities and achieved successful results.

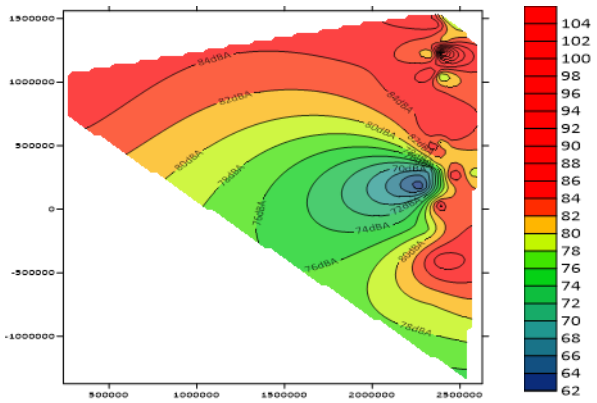

Figure 2. Noise map Measurements Taken During Daytime (Data taken when no panel)

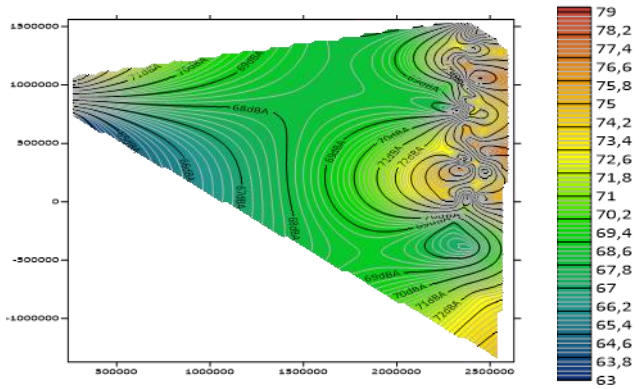

Figure 3. Noise map Measurements Taken During Daytime (Data taken when panel is present

Acknowledgement

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