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Environmental Impact of Traffic Noise

MSc Riste RISTOV[1], PhD Slobodan OGNJENOVIĆ[2] & BSc Ivana NEDEVSKA[1]
[1] Prostor DOO Kumanovo and GEING Krebs und Kiefer – Skopje, Macedonia
[2] University "Ss. Cyril and Methodius", Faculty of Civil Engineering – Skopje, Macedonia

Abstract

The traffic systems, beside their economic and social advantage, have a negative impact as well as sources of significant environmental pollution in the area they are located. During planning and designing of the traffic communication, special attention needs to be paid to strict adherence of certain basic principles on environmental protection. The specificity of this issue can be seen in the multi-dimensional traffic impact on the environment.

Regardless whether it concerns a human, an animal in urban surrounding or an animal in nature, the impact of noise is almost the same for everyone.

As a consequence of the noise, problems can occur from psychological or physiological aspect, auditory perception might be damaged or lost for everyone. It is certain that the human is most resistant to the noise, so it can easily adjust and protect from the same. Most unfavourable impact the noise would have on animals in nature, for which the overexposure to noise would have extensive consequences both for finding food and reproduction.

As follows, this paper will include the impacts and consequences of overexposed traffic noise on the environment.

Keywords: traffic systems, exposure, noise, human, environment

1 Introduction

Noise is an unpleasant and unwanted external sound, created by human activities, which is imposed onto the environment creating discomfort and disturbance.

The most influential sound disturbances in the environment are the industrial and urban noise.

Industrial noise is created by the surrounding industrial facilities whereas urban noise originates from traffic and the other contents of an urban area generating unwanted sounds.

Urban environment is especially characterized by traffic noise mainly affecting human population. Besides being a nuisance in people's activities, disturbing them while they work, this noise type bothers them out of their professional working hours, at their homes and during rest, and especially at night.

The increase of motorisation level intensifies traffic noise. This problem is especially present in cities without an adequate roundabout and without an appropriate solution of the urban traffic flow. Unplanned development, planning of large investment projects of modern highways, the large traffic flow through narrow streets and the low pavement quality results in a condition of considerable increase of noise in urban areas.

2 Influence of noise on people

The reactions of the human body to noise are not the same in each individual. They depend not only on the personal sensitivity to sound, but also on the period of exposure and on the intensity and character of the noise.

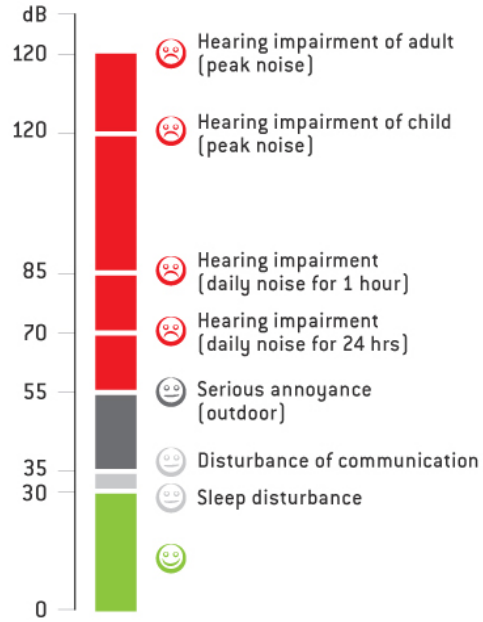

Figure 1. Critical health effects from noise

Each person senses and perceives sounds differently; similarly, each person withstands the sound intensity differently. This depends on the age of the person, on some innate deficiencies in the ear structure, as well as on shortcomings resulting from injuries and diseases. Human ear is adapted to receive sounds of 16 of 20 000 Hz frequencies. It is most sensitive to the high frequencies of 1 000 to 3 000 Hz, even to those of 5 000 Hz which are the most audible ones.

The lowest sound intensity capable of causing sense of sound is called absolute threshold of hearing. The lowest intensity capable of causing pain is called pain threshold.

The area between the hearing threshold and the pain threshold is called audible field.

There is not consent on the noise level that leaves adverse influence of human organism in the world, but it has been generally accepted that noise of over 85 dB (A) already has negative impact on the hearing sense.

2.1 Psychological influence of noise

The psychological interpretation of noise and its impact on people cannot be defined by laws, or measured by instruments.

The psychological impressions are assessed as pursuant to people's reactions, which are differently manifested and narrowly related to the nervous system and the person's psychological condition. Typical for the psychological influence of noise is the fact that the same noise is sensed differently by different individuals: some perceive it as noise and some as pleasant sound or bearable noise.

From the psychological aspect, noise leaves its impact on memory capacity, on the numerical and verbal intelligence on the capacity of spatial orientation and reasoning (2).

2.2 Physiological influence of noise

The physiological influence of noise on people is a complex one, due to the functional correlation and the complexity of the organs. The impact of noise on people and their body organs is presented from the spectrum aspect.

2.2.1 Influence of noise from the hearing spectrum

The hearing spectrum noise influences several systems of the human body: the central nervous system, voice and speech, cardiovascular system, the internal secretion glands, the equilibrium system, the organ of sight, the blood chemistry, the electrolyte balance and the digestive system.

2.2.2 Influence of the noise from the infrasound range

Infrasound is relatively frequent in nature and it does not damage human health to a certain level of intensity. Disturbances due to infrasound are manifested by unstable movements, dizziness and lack of concentration. The said disturbances of the genera condition of the organism is characterized by fatigue, apathy and reduction of work capacity. All these symptoms disappear shortly after the sound is interrupted.

2.2.3 Influence of the noise from the ultrasound range

Ultrasound can hardly travel through air, but can pass through fluids and solid bodies much more easily. This noise results in balance disturbances, headaches, dizziness, sleepiness, sleep disorders, irritability, increased temperature, increased sound sensitivity etc.

2.2.4 Influence of vibrations

Vibrations are low-frequency oscillations which usually create noise.

Changes and disturbances incur when the oscillations have higher velocity and acceleration. Low-frequency vibrations influence the muscles and their tendons as well as the blood vessels resulting in different levels of damages.

2.3 Influence of the sound volume

The influence of noise on human organism can be classified into four levels depending on the sound volume:

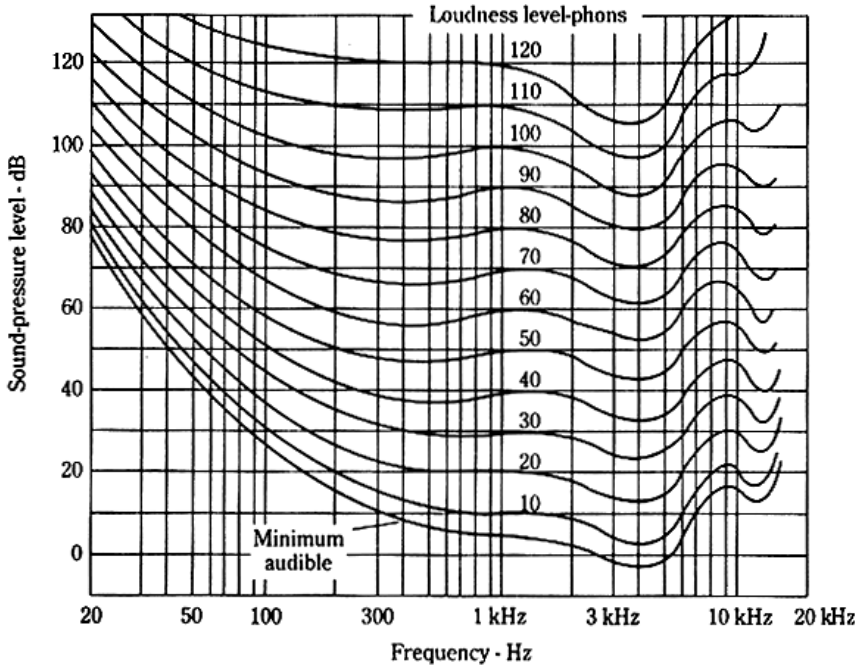

Figure 2. Curves of the same volume (12)

- The area from zero to 30 phones is considered as absolutely harmless
- First level: from 30 to 60 phones leaving psychological impact
- Second level: 60 to 90 phones triggers changes in the vegetative nervous system. This results in a psychological and emotional impact, manifested in mental fatigue.
- Third level: from 90 to 120 phones triggers rapid physical and vegetative reactions and endangers the hearing system, causes heart and blood vessel diseases, as well as sense of thirst and swallowing difficulties.

- The fourth level of noise is higher than 120 phones, causing intensified changes of the third level, including skin damage, damage of the mucous membranes and of the nerve endings.

2.4 Influence of the sound frequency

Human hearing system is capable of receiving frequencies ranging from 16 to 20 000Hz.

The frequency sensitivity limits vary depending on the individual, their age and the physiological condition of the hearing organs.

The infrasound's influence by sound pressure which leaves its consequences on the entire body and they are felt on the bones and the muscles, impeding the basic human reflexes. On the other hand, ultrasounds have thermal influence, attacking the sensitive nerve endings of the skin and of the mucous membranes endangering all the parts of the inner ear.

3 Influence of noise on the living beings

The influence of intensive noise is different in domestic and in wild animals.

Domestic animals react to noise similarly as people, as they live in the same location and share the same environment. Although they are more exposed to noise than the wild animals, their mortality rate is considerably lower. The noise exposure mostly influences their fertility rate, indirectly decrease the yield of regarding certain agricultural products.

The gradual increase of the noise level in quiet natural areas dictates that the animals should either adapt to the new acoustic condition or leave. Over-exposure to noise in nature can largely complicate activities such as communication or navigation.The main results of excessive noise in nature are the hearing impediment and sudden increases in heart rate.

Their reduced sense of hearing can make them into an easy prey and classify them among the endangered species. Also, in case of predators, impeded hearing can render them less able to hunt, resulting in the disturbance of the eco-system balance (13).

4 Influence of noise on plants

The number of researches estimating the effects of noise on the flora has recently increased. Noise influences plants indirectly, by affecting animals first. This is most visible in the areas with low wind intensity where the main fertilizers are certain types of insects and birds that disseminate the pollen. Great noise impact can be observed upon the sowing of some types of plants and trees where the seed is dispersed by rodents and insects that store seeds in the soil. On some tree types the influence of noise can be a long-lasting one, leaving its effects even after being completely eliminated, as noise delays the growth of such trees and thereby increases the time necessary for other ones to grow (15).

5 Conclusion

The rapid increase of high-velocity roads, as well as of water and air traffic makes the world an ever louder place to live. Therefore, it is clear that the overall traffic noise will leave important impact on the environment. This incites the opinion that the influence of noise is equal for all living beings. Although the most exposed to noise, people and domestic animals best adapt to it and are most often the subject of the measures taken in view of anti-noise protection. The wild animals are less influenced but the measures taken for their protection against noise are the fewest.

There is no place in the world where it is possible to establish complete isolation against artificially created noise. The result is the fact that even the most affected animals do not have anywhere to move or to hide from it. This leads to extinction of certain animal species and forced adaptation of, unfortunately, the fewer of them.

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