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On the Issue of Drawing up a Noise Map of the City: Aktobe's Model

G. Berdesheva, Zh. Moldashev, G. Koyshigulova, M. Zhaylybaev, G. Tulegenova, A. Tamenova and I. Kazbekova

Department of General Hygiene and Ecology, West Kazakhstan State Medical University named after Marat Ospanov, Aktobe, Kazakhstan

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Corresponding Author:
Zh. Moldashev
Department of General Hygiene and Ecology, West Kazakhstan State Medical University named after Marat Ospanov, Aktobe, Kazakhstan

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Abstract: Noise is one of the physical environmental factors. The authors present data on the state of the noise climate Aktobe. Conditional zoning areas of the city have been identified in excess of the RC noise. The author points out the need to implement a number of measures aimed at reducing the negative effects of noise and the preservation of public health. The aim of research is preparation and analysis of data to compile a noise map of the city of Aktobe. A retrospective collection and analysis of environmental quality. Environmental factors (air, noise); Epidemiology; sanitary and statistics; descriptive; copying; laboratory. The studies will be analyzed and assessed the real situation with the level of noise in the, city. Retrospective evaluation of the environmental situation in Aktobe makes it possible to develop preventive measures for the development of noise map of the city in order to reduce the negative impact on public health. As a result, measurement and analysis of the data will be developed for the preparation of background noise map of the city and the development of measures to mitigate the adverse effects of noise on the human body. In connection with the above stated, it is appropriate to emphasize that the solution set of problems will allow to assess the quality of the environment, to identify the real impact of environmental factors on the body and the extent of its impact on public health.This will allow, in the future, development of a set of measures aimed at improving the environment and public health.

INTRODUCTION

The most important physical factors significantly effectsthe working and living conditions of the population in urban areas are noise, vibration and electromagnetic radiation[1, 2]. Adoption by the industry of new technological processes including electricity and electronics, the growth of the power of technological equipment, mechanization of production processes, use of land, air and water transport, numerous domestic and building services, the wide spread development of television, radio, radar, high-frequency electromagnetic

energy use and various sectors of the economy have led to the fact that people in the workplace and at home constantly exposed to intense noise[3, 4].

Fighting harmful physical factors is relevant complex problem associated with the decision of a wide variety of tasks-hygienic, technical, administrative and legal. Studies have shown that noise worsens the conditions and quality of life has an extremely adverse effect on the human body; it increases the overall incidence and causes undesirable mental and physiological responses. Noise is one of the most common adverse factors and scientific and technological progress and urbanization[5, 6].

Thus, the problem of noise control is not only a social and sanitary importance but also large technical and economic importance. Noise is a physical phenomenon in the environment that accompanies man from birth and throughout life. Noise can be considered as one of the most common adverse factors and scientific and technological progress and urbanization, polluting the environment. Noise can have an adverse psychological or physiological effect on humans and interfere with communication, work, recreation, entertainment, sleep[7, 8].

With the development of cities, industry and transport noise pollution of the environment in the economically developed regions, more and more of the population exposed to significant noise levels. Previously these levels were high enough to cause some hearing loss, due mainly to industrial activity and the situations related to the implementation of a certain kind of work, it is now approaching the noise levels to a similar intensity recorded on the city streets and sometimes in residential areas and in homes[9-12].

Physical and physiological characteristics of noise: The term "noise"refers to any unpleasant or unwanted sound or set of sounds that hinder the perception of useful signals, breaking the silence, have a harmful or irritating effect on the human body, reducing its efficiency. Sound as a physical phenomenon is a mechanical vibrations of an elastic medium in the range of audible frequencies. As a physiological phenomenon, sound is audible to human ears when exposed to sound waves on the body[13-16].

Sound waves are always, if in an elastic medium has a vibrating body or the particles of an elastic medium (gaseous, liquid, or solid) come to oscillate due to exposure to any emerging power. However, not all oscillatory motion perceived by the ear as a physiological sensation of sound. The human ear can hear only those oscillations whose frequency is from 16-16,000 vibrations per second. The oscillation frequency is measured in hertz (Hz). Oscillations with a frequency of 16 Hz are called infra sound at a frequency of over 16,000 Hz-ultrasound and are not perceived by the ear. In the future, it will go just about audible sound vibrations which are called sound[17].

The main noise sources in the city: The main sources of noise in the city are road transport, rail and air transport, industrial activities and municipal engineering structures[18].

Motor transport: The highest noise levels are marked on the main streets. The average traffic reaches 2000-3000 transport units per hour or more and the maximum noise levels are 90-95 dB. Noise characteristics of traffic flows are primarily determined by the appointment of the street. The level of street noise determined by the intensity, speed and character (composition) traffic. In addition, the level of street noise depends on planning decisions (longitudinal and transverse profile of the streets, the height and density of development) and landscaping elements such as covering the roadway and the availability of green space[19-22]. Each of these factors can change the level of traffic noise to 10 dB.

Rail transport: Increase speed of trains also results in a significant increase in the level of noise in residential areas along the railroad tracks or near the marshalling yards. The maximum sound pressure level at a distance of 7.5 m from a moving passenger train reaches 91 dB and from the freight train-92 dB.

Maximum noise levels at the boundary of residential development at breaks 50-100 m permitted SIT 2.04-03-2005 "Protection against noise "of 55-70 dB and cause complaints from the public in 70-90% of cases. The movement of locomotives, freight trains, dispatch communications, signals locomotives also serve the cause of violations of acoustic regime in residential areas[23-25].

Air transport: A significant proportion of the noise mode of town is air transport. Civil aviation fleet is constantly being updated with new aircraft. Increased transport passenger and cargo transportation, construction and reconstruction of airfields and airports. Often, civil aviation airports are located in close proximity to residential areas and air routes pass directly over the numerous settlements[26].

Aircraft noise has a significant impact on the noise regime of the territory in the vicinity of the airport. The noise level depends on the direction of the runways and routes flown aircraft, flight intensity during the day, the seasons, from the types of aircraft, etc. When clock intensive exploitation of airports equivalent sound levels on a residential area in the daytime reach 80 dB at night-78 dB, the maximum levels range from 92-108 dB. In some cities on the noise level and the total area of the territory of the air transport noise ranks first among all sources of noise. Extremely adverse acoustic conditions for the population are formed at the location of the airport in the city or at a short distance from it (Table 1).

Table 1: Noise levels from the different modes of transport

Types of noise source	Level of noise		Maximum permissible levels (dB)	
	Min.	Max.	Min.	Max.
1	2	3	4	5
Motor transport	90	95	55	70
Rail transport	91	92	55	70
Air transport	92	108	75	80

Industrial enterprises: A significant source of noise in residential areas of cities are industrial enterprises. Violation of the acoustic mode is marked in cases where their area is directly adjacent to residential areas. The study of industrial noise showed that the character of the sound he was a regular and broadband. Most significant levels observed at 500-1000 GHz frequencies, i.e., in the zone of maximum sensitivity of hearing. This illustrates the need for measures to normalize the acoustic mode in areas where data objects[27-30].

Effects of noise on the human body: Man has always lived in a world of sounds; absolute silence oppresses and frightens. Organ of hearing person can adapt to some constant or repetitive noise (auditory adaptation). However, this device cannot protect against hearing loss but only postpones the timing of its occurrence. In the context of the city, noise is a constant voltage of the auditory analyzer. This causes an increase in hearing threshold of 10-25 dB. Noise intelligibility difficult, especially when the noise level of >70 dB. The damage caused by loud noises depends on the spectrum of sound vibrations and how they change[31].

Gradual exposure to loud noise can not only adversely affect the ear but also cause other harmful effects such as ringing in the ears, dizziness, headache, increased fatigue. Noise in big cities reduces human lifespan from 8-12 year. Excessive noise can cause nervous exhaustion, mental depression, vegetative neurosis, peptic ulcer disease, disorders of the endocrine and cardiovascular systems. Noise prevents people from working and relaxing and reduces productivity[32].

Most sensitive to noise older persons. Thus, under the age of 27 year on the noise react 46.3% of people aged 28-37 years-57% from 38-57 year-62.4% and at the age of 58 years and older-72%. A large number of complaints in the elderly is clearly associated with age-related characteristics and condition of the central nervous system in this age group population. There is a relationship between the number of complaints and the nature of the work. The survey data show that the disturbing effect of noise affects more on people engaged in mental work than physical work (60.2 and 55.0%, respectively). A large number of complaints from persons of mental work, apparently due to the large exhaustion of the nervous system.

Physiological and hygienic study subjects showed that changes in the functional state of the central nervous system, cardiovascular, auditory sensitivity depended on the level of exposure to sonic energy, sex and age. The most pronounced changes were found in patients who have experienced noise impact in terms of both labor and life. Observations indicate the activation of the central and autonomic nervous system and reduce hearing sensitivity.

Map of the city as an indicator of noise index: The noise mode idea of placing the noise sources and noise propagation in a city gives noise maps. According to the map, you can judge the state of the noise mode streets, neighborhoods, the entire city. Of great importance are forward-noise maps, especially with the planned development of the city's infrastructure and mass housing. Noise map of the city makes it possible to adjust the level of noise in residential areas of the city and serves as a basis for the development of integrated urban development measures to protect residential areas from noise. In drawing up the noise maps of the city, traffic conditions on the main streets, the intensity and speed, the number of vehicles per stream and the presence of diesel vehicles are taken into account.

To map the need to have information about the main streets (profile, length, coating, etc.,). At stake is the noise of the city shall be marked large parking lots, transformer substations; the card should contain information about the location of industry, etc. At stake is the noise of the city cause significant noise sources and their levels, obtained by in-situ measurements that take into account the estimated noise levels[33].

According to the map, you can judge the state of the noise mode on highways and residential areas immediately adjacent to them, to identify the most dangerous areas acoustically. Map of different years gives an indication of the effectiveness of interventions aimed at reducing noise. Thus, the card gives you the opportunity to identify the complex factors influencing the acoustic mode, recommend rational distribution of the functional areas of the city, allowing reduce or completely eliminate the influence of the main sources of noise[34].

MATERIALS AND METHODS

State of certain background noise

City districts: The studies were conducted according to the methodological guide. "Physiological and hygienic aspects of mechanical vibrations," provides guidance on the development of noise maps of the road network of cities using an apparatus for measuring the noise.

When measured in residential areas, a microphone sound level meter was pointed towards the building (noise

source) and a distance of not <0.5 m from the man. Measurement of noise in the air flow at a rate >1 m sec^{-1} was performed by used instruments (devices) against the wind.

Sound level meter measurements were carried out included the position of the "fast."At constant noise with fluctuation levels up to 50 dB, the countdown ghosting on the middle position of the arrow when it swings and for non-permanent noise it hadon the maximum deviation of the instrument pointer.At each point, the measurements were repeated at least threetimes and the results were averaged.

For noise fluctuation levels with >5 dB, the sound level meter took readings at short intervals (about 1-5 sec) for the subsequent calculation of an equivalent level.

Measurement of noise in the areas adjacent to buildings with normalizing them in noise levels at rest areas districts and neighborhoods but areas of hospitals and dispensaries, held at a height of 1.2 m above the ground at points located at a distance of 2 m from the walls of the building and greenery.

Intermittent noise levels measured during the most busy hour day or night time. For transport noise measurements were carried out during the hours of "peak" in the most intense days of the week. The distribution of noise levels from vehicles makes it possible to visualize the noise map of the road network of the city. Under the map noise, the scheme of distribution of traffic noise, characterized by its level of 7.5 m from the axis of the first lane built on the main thoroughfares of the city. The noise map showing the state in figures mode noise on the streets and urban roads, indicate the most dangerous acoustically areas in the city where you want to take measures to reduce traffic noise. It allows you to monitor the activities aimed at reducing the noise by comparing before and after these events. Work on the noise map of the road network of cities includes the following steps.

The first stage: Data on traffic in the city are determined by full-scale surveys on the main highways of the city. The end result of the survey was quantitative data traffic in natural units of hours of the day in each area of streets and roads. From these data we can determine the intensity and nature of the traffic on the streets each site for any hour of the day. Due to the fact that the traffic varies considerably during the day, to produce a noise map should be based on data obtained from the clock "peak" in the most intense days of the week.

The second stage: Work at this stage is to determine the level of traffic noise at 7.5 m from the axis of the front page of the traffic on the streets and highways of urban areas in accordance with the data traffic as well as on the territory of districts, neighborhoods and places of recreation. Levels of traffic noise on residential areas in dB based on the measurement or calculation method.

Table 2: Measurements of noise

Season selection	Time selection	No. of samples
1	2	3
Winter	09.00-15.00-18.00-22.00	189
Spring	09.00-15.00-18.00-22.00	215
Summer	09.00-15.00-18.00-22.00	245
Autumn	09.00-15.00-18.00-22.00	209

The third stage: Work is to apply a certain scale noise levels obtained in the second stage on a city map (Table 2).

Selecting the areas of observation: In the city of conditionally allocated seven sectors when dividing into account noise sources, the system of housing, industry, transport infrastructure, etc.

- Thus, sector No. 1 is located in the old part of the city. It is characterized by the absence of large industrial enterprises, the presence of two major highways and sorting railway junction
- Sector No. 2 is the old part of the city. It is characterized by the presence of heavy traffic and the train station
- Sector No. 3 is in the old part of the city. It is characterized by the presence of large vehicles and companies that serve as sources of noise
- Sector No. 4 district includes "Moscow" and 11-12 neighborhoods. It is characterized by the presence of combined noise pollution from different sources
- Sector No. 5 is the sector with the main source of noise- urban vehicles
- Sector No. 6 is the neighborhoods. The main source of noise is from urban vehicles
- Sector No. 7 is also neighborhoods. It is characterized by a combination of traffic and industrial noise

Characteristics of the studied sectors mode noise: To estimate the noise regime studied sectors were used preliminary data from the regional center of sanitary-epidemiological examination (AO TSSEE) and the results of their research.

Sector No. 1: Characterized by a predominance of private households. The studies established the average noise level of the sector, amounting to 77.5 and 17.5 dB above the equivalent sound level to traffic on residential streets.

Sector No. 2: Characterized by a mixed system development with a predominance of high-rise buildings. The average background noise in the Gaza 81.5 dB.

Table 3: Data on control points average noise level in Aktobe

Name of sector	No. of measurements	The average level (dB)
1	2	3
1	119	72.0
2	132	61.0
3	115	70.8
4	134	78.6
5	118	80.9
6	121	79.8
7	119	80.4

Sector No. 3: Characterized by an absolute predominance of private households. The average noise level of 70.6 dB.

Sector No. 4: Characterized by a large range of noise of various origins. Average noise level in the sector is 78.6 dB. This sector can conditionally be divided into three different levels of noise.

Sector No. 5: Characterized by an average noise level of 80.9 dB in. The main noise is ensured by a large traffic of public transport and availability of the plant for the production of bread.

Sector No. 6: The average noise level at the site is 79.8 dB. The main source is road transport.

Sector No. 7: The area adjacent to the industrial zone of the city. Characterized by mixed noise sources areroad, rail and industrial enterprises. The average noise level is 80.4 dB (Table 3).

RESULTS AND DISCUSSION

The data obtained results of measurements of noise in Aktobe suggest that part of the housing sector is exposed to noise levels despite the fact that the average for the sector does not exceed the permissible limits. Thus, the most disadvantaged in relation to the noise sector are 2 and number 3, located in the old part of the city where the noise level, on average is equal to 61.4 and 70.5 dB. However, the sector No. 2 has a number of points at the intersections of several streets where noise exceeds acceptable levels, not only for residential areas but also for roads and railways.

In the Gaza No. 3 as well as in the sector No. 2, there are several areas where noise levels exceed the maximum allowable. This is mainly on the outskirts of the territory of the sector; its central part is not exposed to noise levels. Further, the degree of increase of the weighted average sound level is the sector No. 1 where the noise level is about 77.4 dB.

The average noise level of 78.6 dB in noise regime characterizes the state sector No. 4. For this sector is characterized by juxtaposed noise load all modes of transport. The average noise level in sector 6 is 79. 8 dB. The sector is characterized by excess remote by A. Moldagulova Avenue. Overall noise sector No. 7 is 80.4 dB. Throughout the Gaza noise levels do not exceed the standard. The most unfavorable in terms of noise in Aktobe is the sector No. 5. The average noise level in the sector is 80.9 dB.

CONCLUSION

Residential areas in the city of Aktobe and people living in them are exposed to significant noise impacts from road, rail and air transport. The observed excess noise on the remote prospect A. Moldagulovais due to their congestion all modes of transport. Much of the noise burden on residential neighborhoods array No. 8, 9,11 and 12 due to the close proximity to the residential area of the runway of the airport. Having an urban education railroad causes a significant level of noise pollution on the population of the streets running along the railway. In the areas of residential development in excess of the RC marked in figures 1.5-2.0 maximum allowable.

RECOMMENDATIONS

- To provide for the construction of bypass roads in the places most intense traffic
- Streets with heavy vehicular traffic offload, translating them into a one-sided or single-row movement (for example: St. Ualikhanov and the perimeter of Central Farmers Market)
- Conduct sanitary measures to improve urban areas and highways
- Use natural conditions and special facilities, i.e., screens near highways
- Rational methods zoning under the terms of modes for different types of buildings, sites and areas for recreation
- Rational bypass roads, rail transit flows provided outside the city
- It is necessary to determine the Approved lines of plants by calculating the sound level at the design point in the territory of the object to be protected from noise
- When installing the new trunk roads in residential areas must include measures to protect from traffic noise, acoustic-based calculations

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