

# Noise studies and reduction possibilities in a residential area located by a highway

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Many residents suffer from traffic-generated noise. Traffic is the most prevailing source of noise in cities.

With the number of vehicles increasing and traffic intensity growing, the awareness of environment pollution issues necessitates a search for noise reduction possibilities.

Noise is justly considered as one of the key ecological problems in many cities and residential areas. Naujasodžiai residential area located by Highway A2 Vilnius–Panevėžys was selected for the investigation. The highest noise level in the daytime, 70–71 dBA, was recorded in the measurement locations A2–A3 at a 7.5 m distance from Highway A2 Vilnius–Panevėžys. Data of the spread of noise level indicates that higher levels of noise are recorded on the edges of the residential area. The measured level of traffic-generated noise in the residential area shows that the equivalent noise level limits are exceeded only within 30 m distance from the highway. This is mainly predetermined by the absence of noise reduction barriers. The spread of noise is partly subdued in the central part of the residential area by an embankment, running along the highway, planted with bushes and trees. The equivalent noise level measured at the height of 4.0 m in the living environment of Naujasodžiai residential area was around 1–2 dB bigger than at the height of 1.5 m. The most efficient way of reducing the noise is to install a noise-reduction wall on an embankment and to construct industrial-purpose buildings, i. e. shields, in the industrial zone in front of the residential area as well as to plant the slopes of the embankment.

**Key words:** traffic-generated noise, noise spread, noise level limit, noise reduction means

## INTRODUCTION

During the last 10 years, noise levels in towns have increased by approximately 0.5–1 dB per year. Noise has a major direct impact on human health and the quality of living and recreational environment. Many town citizens suffer from the traffic-generated noise. Traffic-generated noise accounts for 60–80% of the noise prevailing in towns. It has a negative effect in all the territories of the towns: residential areas, hospitals, sanatoriums, recreation areas, town centre, utility and industrial territories (Butkus, Grubliauskas, 2008).

With the growth of towns, development of manufacturing industries and an increase in the number of vehicles, the number of acoustic discomfort zones also grows. The facts suggest that the quality of life worsens because of overexposure to noise (Mačiūnas, Juozulynas, Genytė, 1999). It is esti-

ated that one third of Europe's employees (over 60 million people) is exposed to big noise for more than one fourth of their working time. Nearly 40 million people experience this effect at least half of their working time (Triukšmo ..., 2007).

Recently the European Union has established the requirement to efficiently and rationally deal with noise and related problems. Various types of noise reduction barriers are applied on roads (Bacevičius, Karalius, 1992; Drignelis, 1997). Acoustic, aesthetic, visual and technical qualities of the structures are studied in all cases evaluating likely priorities (Transportas ..., 2002).

Modern motor roads are very complicated engineering structures. They create favourable conditions for motor traffic. As a rule, the designs of such roads ensure the realisation of vehicles' dynamic characteristics. That is the reason why they create big noise. With traffic intensity growing, more efficient noise reduction means have to be sought (Grubliauskas, Butkus, 2006). Residents living in

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close proximity to roads wish and expect the designers to consider the possibilities of noise reduction or elimination (Klibavičius, 1998).

The investigations are aimed at determining and evaluating the noise levels at the height of 1.5 and 4 meters in Naujasodžiai residential area, situated by a highway, and, based on the obtained findings, presenting possible measures of noise reduction.

## METHODS

Naujasodžiai is a residential area consisting of 35 detached and semidetached houses in Vilnius district, Avižieniai ward which is 6 km away from Vilnius city in the north-western di-

rection. Noise levels were determined at the randomly selected locations of measurement in three periods: in the daytime (from 6 am to 6 pm), in the evening (from 6 pm to 10 pm) and at night (from 10 pm to 6 am).

The sites and number of noise measurement locations depend on the investigated environment and spatial spread of noise within it.

28 measurement locations in Naujasodžiai residential area were selected at nearly equal distances from each other (at a 50 to 80-metre distance) and situated within 7.5–380 metres from Highway A2 Vilnius–Panevėžys (Fig. 1).

In all 28 locations of noise measurement investigations were carried out at a level of 1.5 m, and in some of them – at a level of 4.0 m.

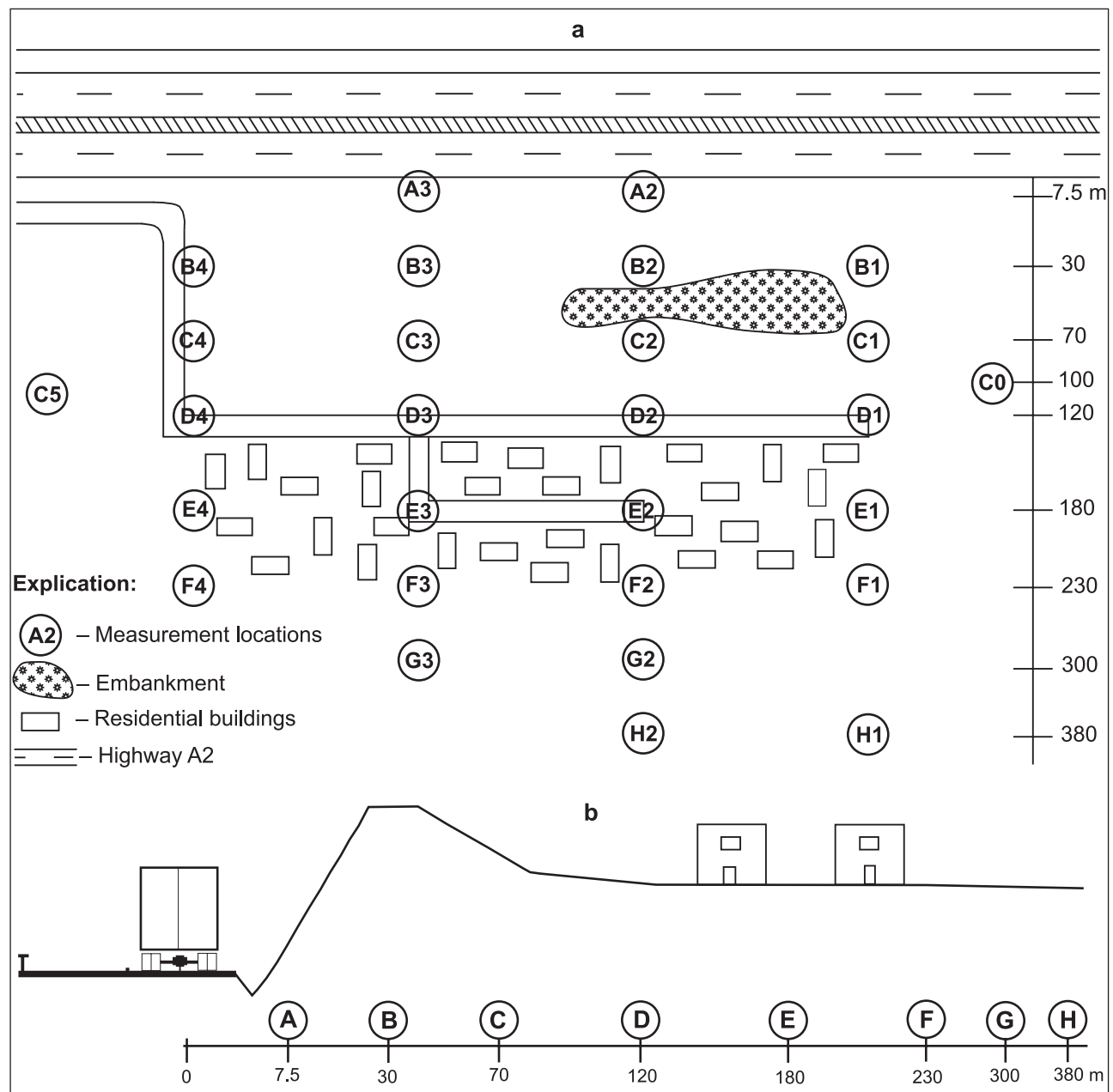


Fig. 1. Schemes of the noise level measurement locations in the environment of Naujasodžiai residential area: a) horizontal projection; b) transverse section

**Measurement locations A2 and A3.** Measurement locations A2 and A3 were positioned in the closest vicinity of Highway A2 Vilnius–Panevėžys. They parallel the highway at a 7.5-metre distance (Fig. 1). Measurement locations A2 and A3 are placed 75 metres away from each other. The noise level measurements in the locations were recorded at a height of 1.5 m.

**Measurement locations B1–B4.** Measurement locations B1–B4 are placed at a 30-metre distance from the highway. The measurement locations are on an embankment overgrown with small bushes and deciduous trees, 5 metres above the roadway of the highway. There are no trees in front of the measurement location B2. The noise level measurements at these locations were recorded at a height of 1.5 m.

**Measurement locations C0–C5.** Noise measurement locations C0–C5 were positioned within a 70-metre distance from the highway. At the measurement locations C1, C2 and C3 the noise created by vehicles that run along the highway is obscured by an artificial earth embankment (~3 metres high). The measurement sites C0 and C5 are in an open locality with no barriers blocking them off the highway. They are situated within 100 metres from the highway. In locations C0 and C5 measurements were taken at the level of 1.5 m and 4 m.

**Measurement locations D1–D4.** Measurement locations D1–D4 are within approximately 120 metres from the highway. At all the measurement points measurements were recorded at the level of 1.5 m and 4 m.

**Measurement locations E1–E4.** Measurement locations E1–E4 are around 180 metres away from the source of noise. At point E1 measurements were taken at a level of 1.5 m and 4 m, and at the measurement points E2, E3 and E4 – only at a height of 1.5 m.

**Measurement locations F1–F4.** Measurement points F1–F4 are placed 230 metres away from the highway Vilnius–Panevėžys. At point F1 measurements were taken at a level of 1.5 m and 4 m, and at measurement points F2, F3 and F4 – only at a height of 1.5 m. All the measurement points were selected behind a residential block.

**Measurement locations G2–G3.** Noise measurement locations G2–G3 are at a 300-metre distance from the highway. The measurements were recorded at a level of 1.5 m. The measurement locations were selected in a non-built-up territory, behind Naujasodžiai residential block.

**Measurement locations H1–H2.** Measurement locations H1–H2 are positioned 380 metres away from the highway. The measurements were recorded at a level of 1.5 m. The measurement points were selected in a non-built-up locality, overgrown with tall grass and shrubs. These measurement points are next to Avižieniai forest.

Noise levels were determined by comparing the measurement results with the values of noise level limits specified in the Lithuanian Hygiene Norm HN 33 : 2007 (HN 33 : 2007). According to HN 33 : 2007, the maximum noise level in a residential area should not exceed 70 dBA in the day time,

65 dBA in the evening and 60 dBA at night. The equivalent noise level in the residential area should not exceed 65 dBA in the day time, 60 dBA in the evening and 55 dBA at night.

Bruel & Kjaer mediator 2260, a sound and vibration meter, was used for the measurements. When measuring noise level with Bruel & Kjaer mediator 2260, the relative measurement error is  $\pm 1.5\%$ . Two microphones may be used to record noise parameters. The instrument records noise in the frequency range of 6.3 Hz to 20 kHz. It can be used to measure the effective noise level defined by the characteristics A, B or C or in separate octaves, which are separated by standardised filters. The measurements of the noise frequency spectrum are made in the frequency range of 31.5–8.000 Hz (Baltrėnas et. al., 2008).

The traffic-generated noise level is characterised by the equivalent and maximum noise level caused by passing vehicles.

The calculations also cover the number of passing vehicles within a time unit, i. e. traffic intensity is determined and the type of passing vehicles is evaluated.

Motor traffic flows were estimated on the same day when the noise level measurements were done. The number and types of vehicles that run in both directions within the selected interval of time were determined.

## RESULTS

Atmospheric conditions have effect on the spread of noise. During noise tests in the residential area, the air humidity varied from 40 to 61%. In autumn or winter, when the humidity is higher, noise spread is subdued by the air humidity. During measurements, the atmospheric temperature reached 9–15 °C and the wind speed in the daytime and in the evening was around 2.7–3.5 m/s. The prevailing winds were of the north western direction.

**Results of the noise tests in the daytime.** The measurements of the noise level at a level of 1.5 m in Naujasodžiai residential area recorded the highest noise levels in the measurement locations A2, A3, B1, B2, B3, B4, which are closest to Highway A2 Vilnius–Panevėžys (Fig. 2). The highest measured equivalent noise levels reached 69–71 dBA, the noise level limits varied in the range of 75 to 84 dBA. With the distance from the highway to the residential area growing, decreasing noise levels were recorded at the measurement locations.

The equivalent noise levels sampled closest to dwelling houses in the residential area reached 50–52 dBA at a level of 1.5 m, and 53–56 dBA at a level of 4 metres. The noise level limits in the measurement locations positioned near residential houses closest to the highway reached 63–77 dBA.

The equivalent noise levels recorded in the most remote measurement locations amounted to 38–43 dBA, and the maximum noise levels – around 50 dBA.

The maximum noise level limits (70 dBA) were exceeded most at the measurement locations A2, A3, B1, B2, B3, C1 and

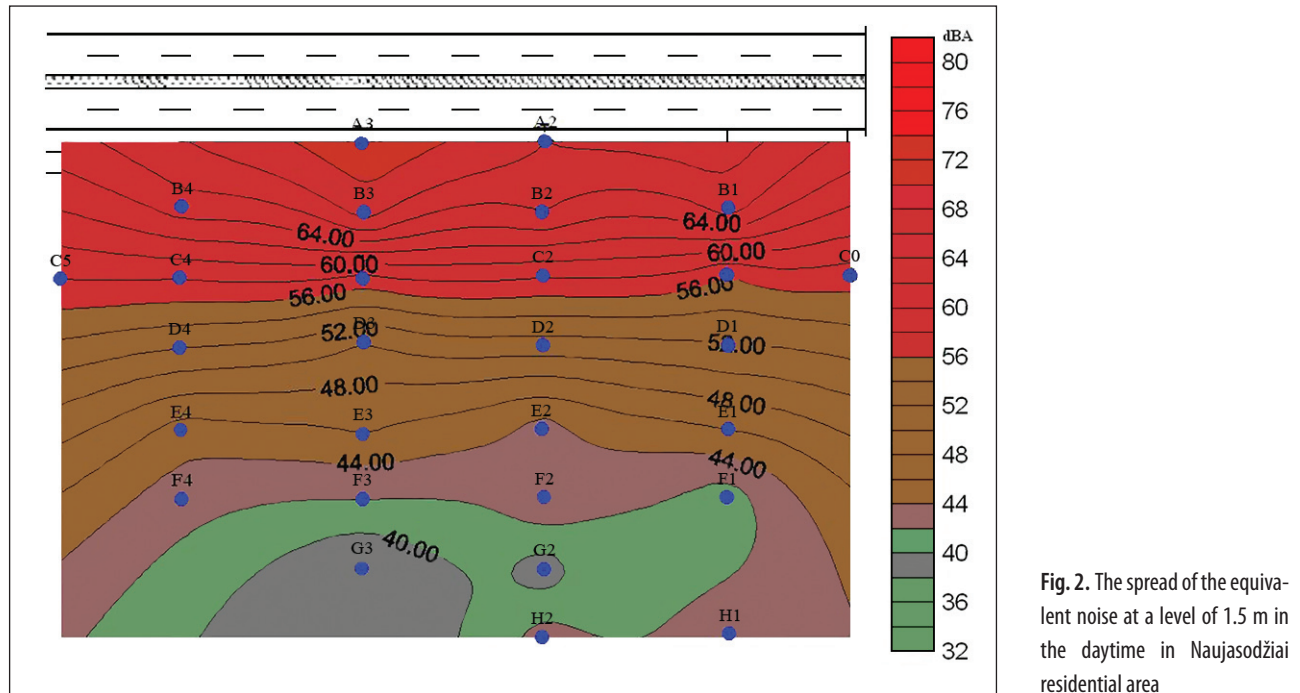


Fig. 2. The spread of the equivalent noise at a level of 1.5 m in the daytime in Naujasodžiai residential area

D4. At these measurement locations, the excess noise level ranged between 7 and 15 dBA. This was predetermined by the fact that these measurement locations are in the closest vicinity of the highway and the measurement location D4 is on the edge of the residential area where there is no earth embankment obstructing the noise from the highway. Another predetermining factor is that even the noise of a single technically unfit car or motorcycle or one that is passing the highway at high speed generates a high maximum (momentous) noise level.

The performed tests show that in the measurement locations 70 metres or more away from the highway the maximum noise levels do not exceed the noise level limit, varying from 63 to 69 dBA.

When assessing the equivalent noise levels created by vehicles passing the highway, the highest ones were determined in the measurement locations that are in the closest proximity to the highway. The noise level recorded at a 7.5-metre distance from the highway ranged between 68 and 71 dBA. With the distance from the highway to Naujasodžiai residential area increasing, the noise level decreases. The equivalent noise levels at the measurement locations selected on the earth embankment vary from 65 to 69 dBA. The equivalent noise level recorded at the noise measurement locations selected nearby residential houses closest to the highway at a level of 1.5 m varies from 50 to 52 dBA in the day time.

The measurements of the noise levels taken at a level of 4.0 m in the daytime in the living environment of Naujasodžiai residential area show that the equivalent noise level limit (NLL) is exceeded in none of the measurement locations. The highest measured equivalent noise levels amounted to 59–60 dBA.

The noise levels recorded at the measurement sites placed in the locality built-up with two-storied dwelling houses reached 47–56 dBA.

The lowest equivalent noise level (42 dBA) was recorded in the measurement location F1, which is furthest from the highway (230 m) of all the locations selected for noise measurements at a level of 4 metres.

Even though the maximum noise level limit is exceeded only in the measurement location D2 (by 2 dBA), the maximum noise levels recorded in many measurement locations at a smaller distance than 120 metres from the highway ranged from 60 to 70 dBA, reaching the limit.

With the aim to evaluate the causes of change of the traffic-generated noise, the number of vehicles passing in the daytime was calculated and the results are given in Fig. 3. More intensive traffic flows were recorded in the evening than in the daytime. The presented results show that, on average, around 50% more and over 4 times more of heavy goods vehicles passed the highway during one hour in the daytime than in the evening and at night, respectively. The flow of cars is around 10% higher in the evening than in the daytime. The average number of cars that passed Highway A2 Vilnius–Panevėžys within one hour in the daytime was 720, heavy goods vehicles – 126, compared to 792 and 84 in the evening, and 250 and 30 at night, respectively (Fig. 3).

**The results of noise tests in the evening.** The measurements of the noise level in the living environment of Naujasodžiai residential area at a level of 1.5 m in the evening show that the equivalent noise level limit (NLL) was exceeded at the measurement locations that are closest to Highway A2 Vilnius–Panevėžys (at the measurement locations A2, A3, B1, B2, B3, B4) (Fig. 4).

Fig. 3. The number of cars that passed Highway A2 by Naujasodžiai residential area per hour in the daytime, in the evening and at night

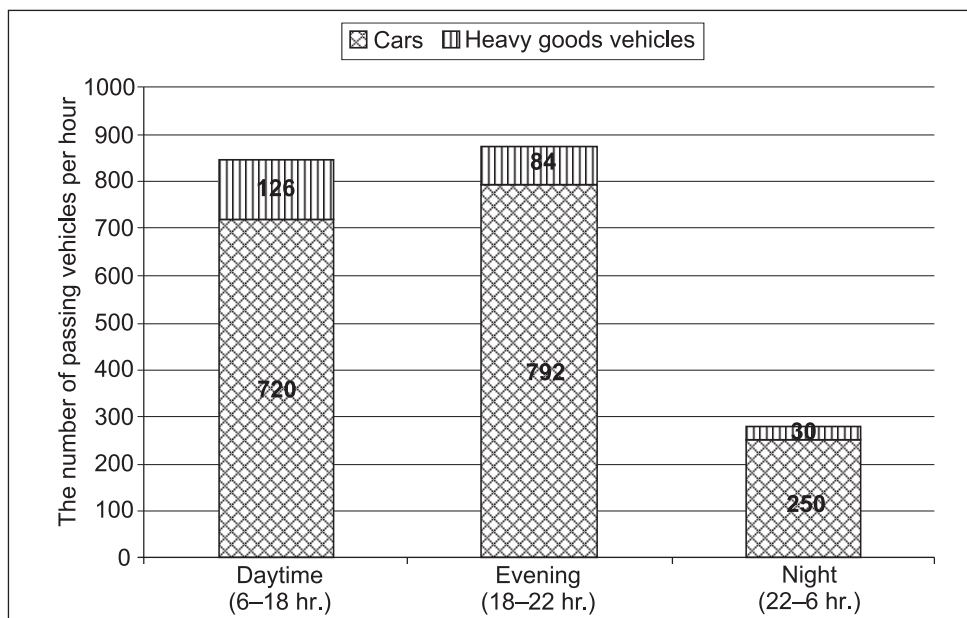
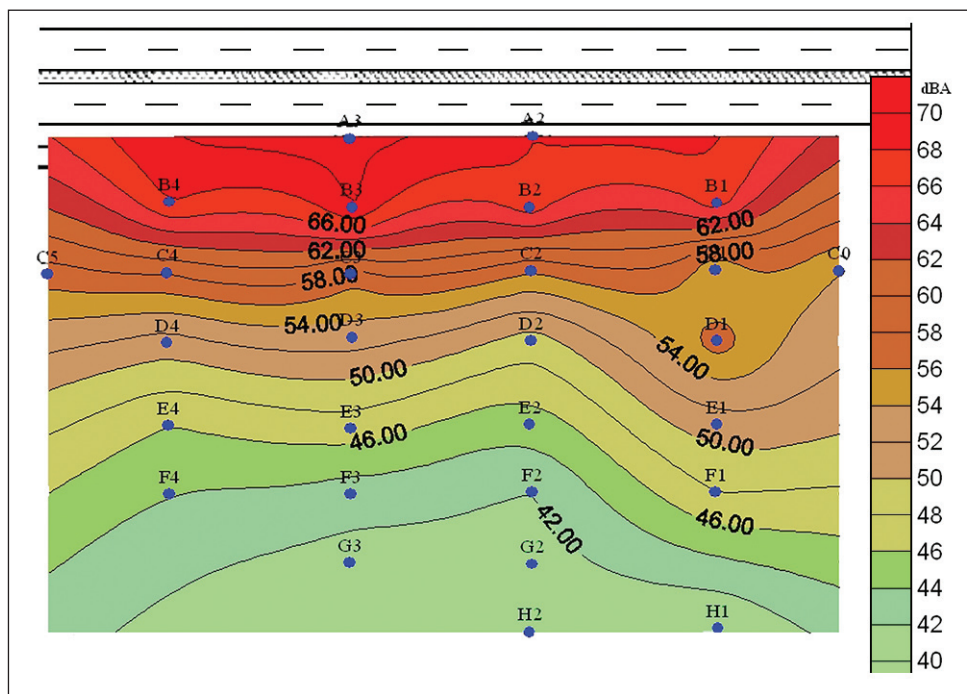


Fig. 4. The spread of the equivalent noise at a level of 1.5 m in Naujasodžiai residential area in the evening



The equivalent noise levels recorded at these measurement locations stood at 67–70 dBA and the noise level limit in the evening (60 dBA) was exceeded by up to 7–10 dBA.

The highest equivalent noise levels in the residential area built-up with houses ranged between 54 and 58 dBA. The lowest equivalent noise levels were sampled at the locations that are most remote from the highway. The measurement locations E2–F3 are at distance of 180 m and 230 m from the highway, respectively. The equivalent noise levels established at these measurement locations were 42 to 45 dBA. The equivalent and the maximum noise level limits in the evening are by 5 dBA lower than in the daytime.

The maximum noise level limit was exceeded in the noise measurement locations placed in non-built-up territories. At these measurement locations, the noise level limit (65 dBA) was exceeded by 11 to 18 dBA. This was predetermined by the fact that these measurement locations are closest to the highway. It was also calculated that an increase in the traffic flow in the evening was 10 % compared with the daytime.

The measurements of the noise levels conducted at a level of 4.0 m in the living environment in the evening show that the equivalent noise level limit (NLL) is exceeded in none of the measurement locations. The highest equivalent noise levels reached 57–59 dBA but did not exceed the level limit.

They were determined at the measurement locations D1 and C5 that are close to the boundary of the residential area.

The analysis of the obtained maximum noise level data shows that the level limit is exceeded at the measurement locations D1 and F1. The maximum noise level limit recorded at the measurement locations C5 and D5 corresponds with the level limit, i. e. 65 dBA. The maximum noise level limits were exceeded by 2–4 dBA at the measurement locations D1 and F1. This might have been caused even by a single technically unfit car, heavy goods vehicle or motorcycle or the one passing the highway at a high speed.

**The results of noise tests at night.** The measurements of the noise levels done at a level of 1.5 in Naujasodžiai residential area at night show that the equivalent noise level limit (NLL) was exceeded only at the measurement locations that were at no more than 30 metres away from the highway (the measurement locations A3, B2, B3, B4) (Fig. 5). The highest recorded equivalent noise levels were 61–62 dBA, exceeding the level limit of 55 dBA. The lowest equivalent noise levels were recorded at the locations that are at a bigger distance from the highway (180–380 metres). The equivalent noise levels established at these measurement locations were 41 to 42 dBA.

The maximum noise level limit was exceeded at the measurement locations A3, B2, B3, B4, C3 and D1 that are situated within 120-metre distance from the highway. The maximum noise level limits were exceeded even by 16 dBA. It was partly due to the fact that these measurement locations are closest to the highway, as well as to the established equivalent and maximum noise level limits that are by 5 dBA lower at night than in the evening and by 10 dBA lower than in the daytime.

The maximum noise levels recorded at the measurement locations D2 and D4 that are in front of dwelling houses, reached 65 dBA, i. e. corresponded with the noise level limit.

It was also noticed that the number of passing vehicles was three times less at night compared to those in the evening.

The measurements done at a level of 4.0 m in the living environment show that the equivalent noise level limit (NLL) was exceeded by 1 dBA at the measurement location D1. The highest recorded equivalent noise level was 56 dBA. The lowest equivalent noise levels vary in the range of 52–53 dBA.

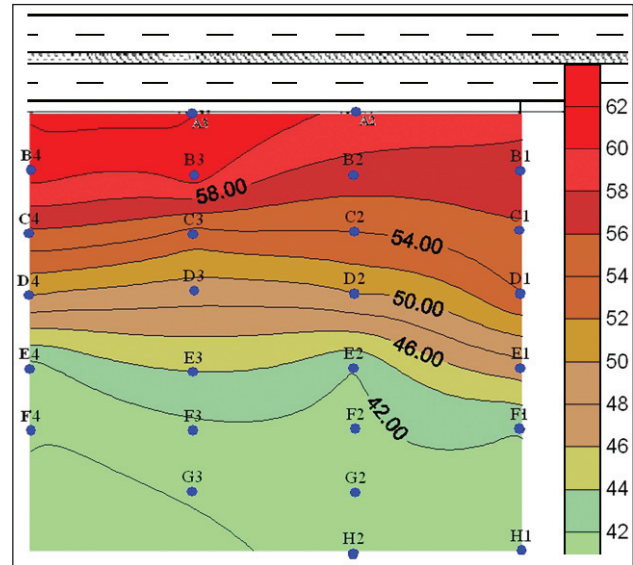


Fig. 5. The spread of the equivalent noise level in Naujasodžiai residential area at night

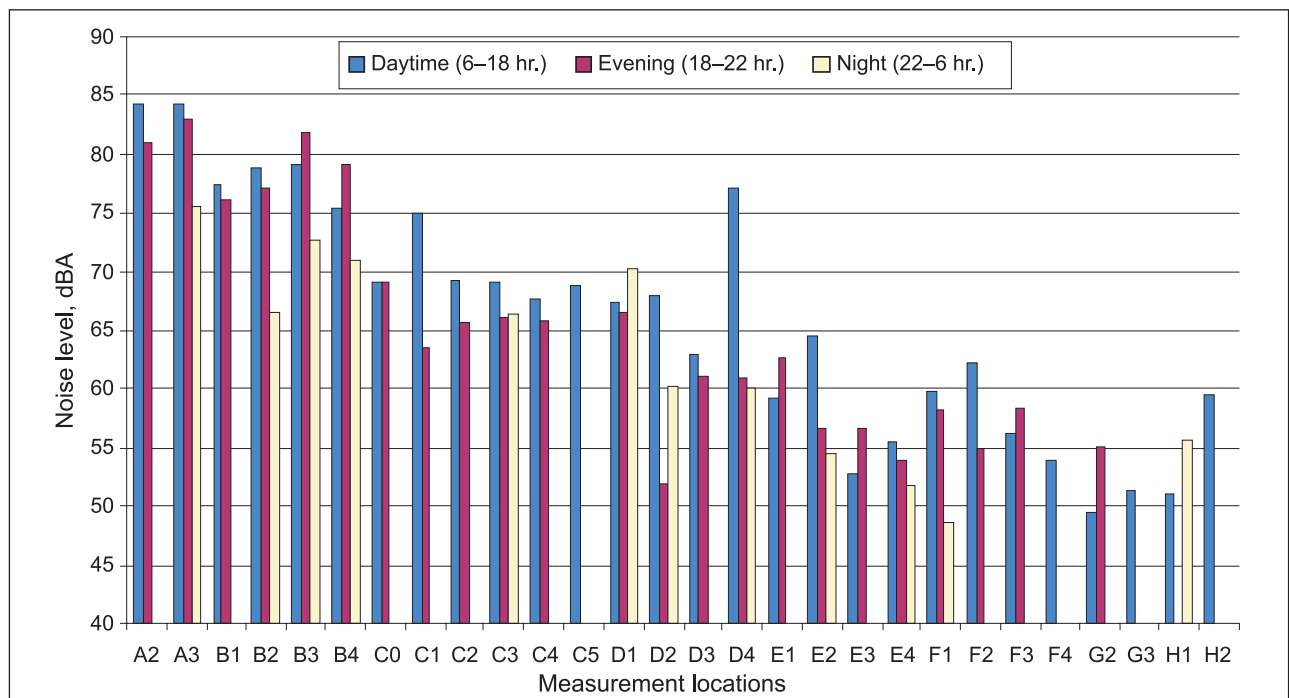


Fig. 6. The maximum noise levels in Naujasodžiai residential area in the daytime, in the evening and at night

The maximum noise level limit at a height of 4.0 m was exceeded at all measurement points: by 6 dBA at measurement location D1, by 2 dBA at D2, and by 3 dBA at D4. This can be partly explained by the fact that the measurement location D1 is on the edge of the residential area where there is no earth embankment obstructing the noise from the highway, and the measurement location D4 is on a higher level than locations D1 and D2.

In order to select and apply noise reduction means to mitigate noise generated by the noise source, it is important to determine the frequency characteristics of the noise. Fig. 7 shows the dynamics of the frequency characteristics of the traffic-generated noise when a distance from the highway to the residential area is increasing.

The frequency characteristics of the noise tests performed in Naujasodžiai residential area in the daytime show that the highest noise levels are recorded at the measurement locations selected at a distance of 7.5 and 30 metres away from the highway. With the distance from the highway increasing, the noise levels are proportionally decreasing, and at the measurement locations near residential houses, at low frequencies, the noise levels varied from 48 to 62 dB, at medium frequencies – around 45 dB (Fig. 7).

The noise levels recorded at the measurement locations that are closest to the highway, within 7.5-metre distance, ranged between 62 and 75 dB at low frequencies (31.5–250 Hz), and between 62 and 65 dB at medium frequencies (500 – 2,000 Hz).

The highest noise levels recorded at the measurement locations nearby and between residential houses, i. e. within 120–230 m distance from the highway, reached around 62 dB at low frequencies, and 35–43 dB at medium frequencies.

The noise levels sampled within 300–400 metres from the highway reached 40–60 dB at low frequencies, and 24–42 dB at medium and high frequencies.

## CONCLUSIONS

1. Based on the findings of the performed noise level tests in Naujasodžiai residential area, it has been determined that the equivalent noise level limits are exceeded only at a 30 m distance from Highway A2 Vilnius–Panevėžys; however, these measurement locations are not classified as territories used for residential activities.

2. The equivalent noise level limit (65 dBA) in the daytime was exceeded at the measurement locations A2–A3, B1–B4. The highest noise level, 70–71 dBA, was recorded at the measurement locations A2–A3 that are within 7.5 m distance from Highway A2 Vilnius–Panevėžys. At the measurement locations that are farther away from the highway (70 metres and more) the equivalent noise levels did not exceed the level limit and did not reach 53 dBA.

3. The equivalent noise level limit set for the evening (60 dBA) was exceeded in the evening at the measurement locations A2–A3, B1–B4 that are within 30-metre distance from the highway.

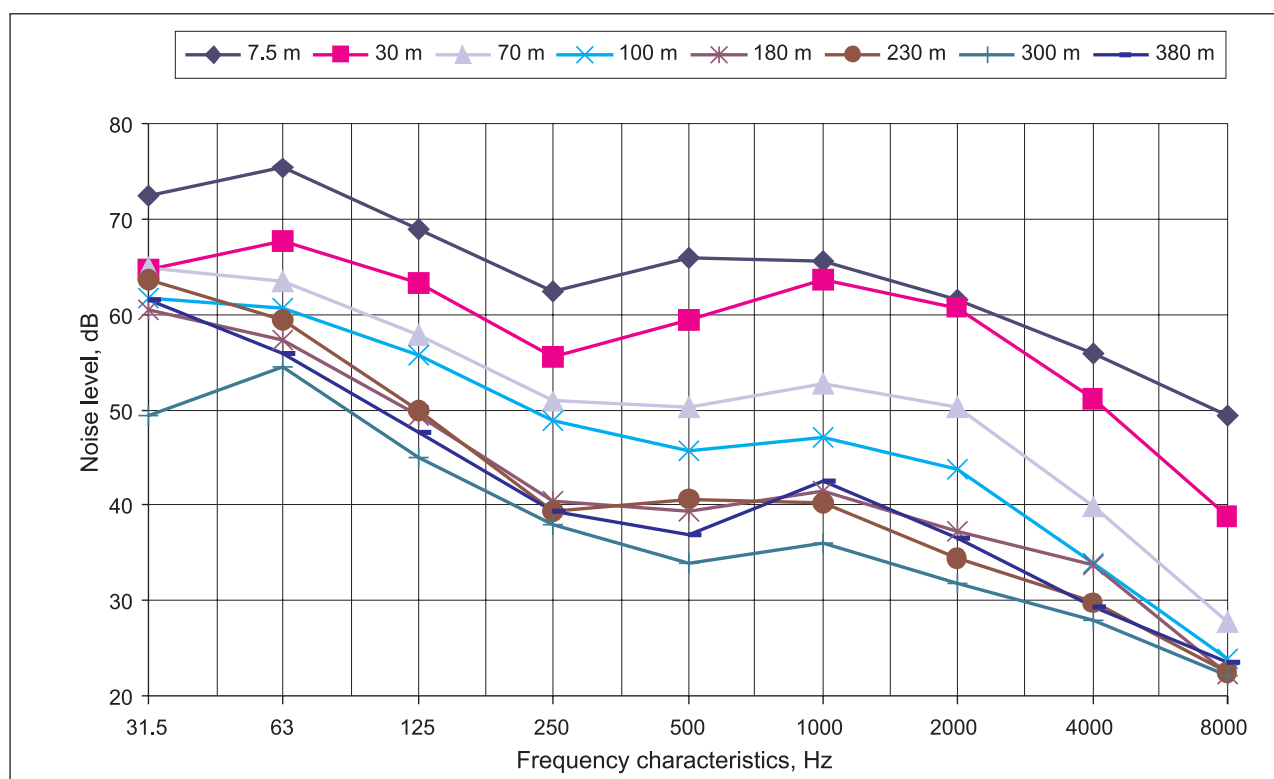


Fig. 7. The frequency characteristics of noise spread in Naujasodžiai area in the daytime

4. The noise tests performed at night show that the equivalent noise level limit (55 dBA) was exceeded in measurement locations A3, B2–B4. The highest equivalent noise level limit was determined at the measurement location A3 and reached 62 dBA.

5. The lowest noise levels in the daytime, in the evening and at night were determined in the locality behind a territory built-up with dwelling houses. This can be explained by the fact that these measurement locations are at the biggest distance, over 230 metres, from the noise source, i. e. Highway A2 Vilnius–Panevėžys.

6. The data of noise level spread shows that higher levels of noise were recorded on the edges of the residential area. This is for the most part predetermined by the absence of highway-generated noise reduction barriers there, as the spread of noise is successfully subdued only in the central part of the residential area by an embankment parallel to the highway, planted with bushes and trees.

7. The performed noise level tests in the living environment of Naujasodžiai residential area at a level of 4.0 m show that the recorded equivalent noise level is only by around 1–2 dBA higher than at a level of 1.5 m. A bigger difference was recorded only at the measurement locations that were selected in a hollow (the measurement location D2) and the spread of noise is influenced by unevenness of the relief.

8. With the aim to select and apply the most reasonable noise reduction means to mitigate noise generated by the noise source in question, it is important to determine the frequency characteristics of the noise. The frequency characteristics obtained during noise tests performed in Naujasodžiai residential area show that the highest noise levels were recorded at the prevalence of low (31.5–250 Hz) and medium (500–2,000 Hz) frequencies.

## PROPOSALS

The results obtained during tests of the noise generated by vehicles passing Highway A2 Vilnius–Panevėžys at different periods of the day (in the daytime, in the evening and at night) in Naujasodžiai residential area show that the highest equivalent noise levels of 65–71 dBA were recorded at the noise measurement locations in the closest vicinity (7.5–30 m) of the highway. With the distance from the highway to the residential territory increasing, the noise levels decline and the equivalent noise levels nearby the nearest residential houses reach 49–57 dBA.

The analysis of the frequency characteristics of the noise spreading from the highway shows that the highest noise levels were recorded at the prevalence of low (31.5–250 Hz) and medium (500–2,000 Hz) frequencies.

In the presence of a linear source of noise (vehicles running along the highway), the recommendation is to install noise reduction means closer to the highways. Some literary sources present designers' recommendations stating that if the distance from the location in question where the noise level is to be reduced to a highway is around 100 metres, the noise reduction means should be at least 4 times longer and stretch 400 metres to each side of the noise source.

But in this case, this particular requirement cannot be fulfilled as the residential area is surrounded by private and other owners' land. Therefore, it is necessary to search for other means and methods to deal with the problem of noise in the residential area near the highway.

In order to reduce the noise spread via the embankment, it should be planted and extended whereas its slopes should be formed at the steepest possible angle so that traffic-generated sound waves should be reflected to the maximum extent and the smallest possible amount thereof should access the living environment.

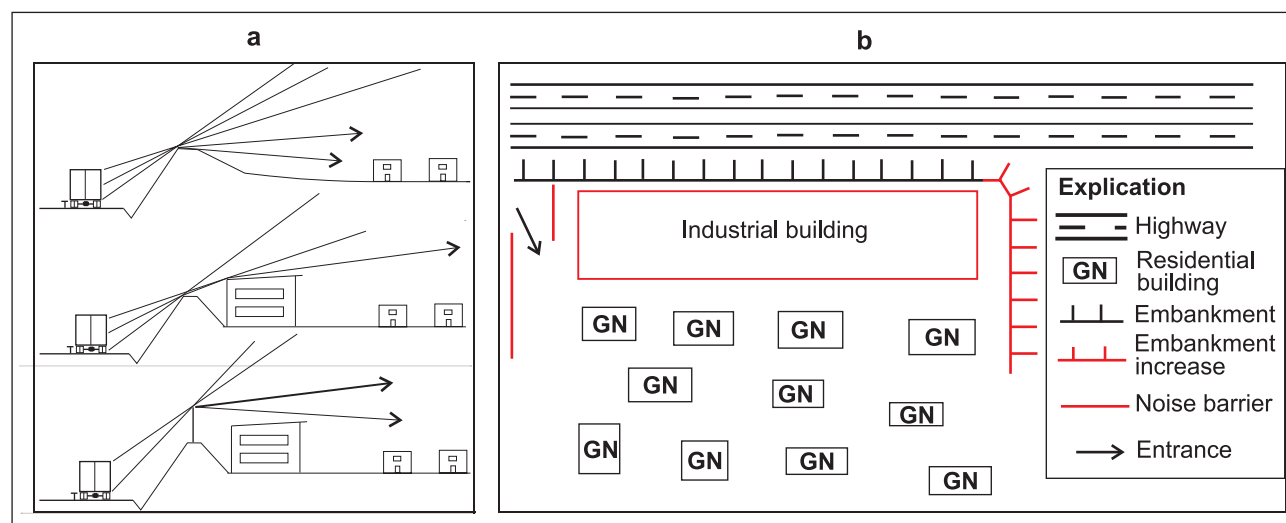


Fig. 8. Reduction of traffic-generated noise spread to the residential area: a) the influence of embankment, industrial building and noise reduction wall on the noise spread to the residential area; b) layout scheme of the proposed noise reduction means in the residential area



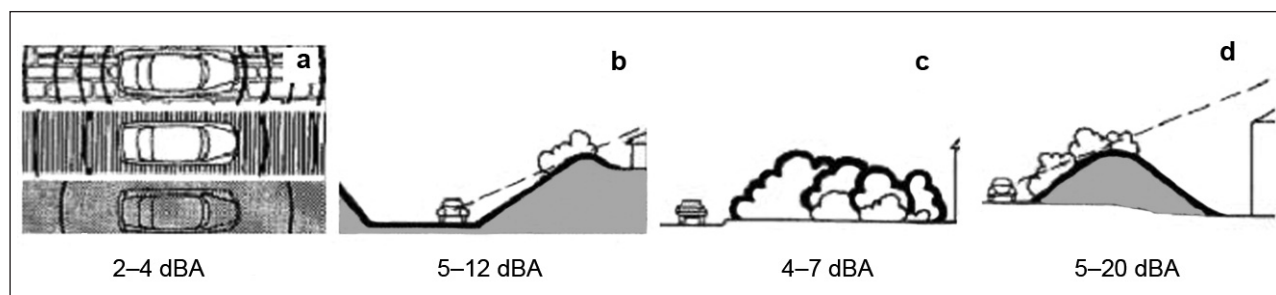


Fig. 9. Examples of traffic-generated noise reduction: a) smooth street paving; b) streets along excavations; c) planting; d) embankments

The zone of residential houses is separated from the highway by an industrial purpose zone without any buildings on it as construction of dwelling houses there is not allowed. Therefore, this territory can and must be used to protect the residential area from the spread of the noise generated by vehicles passing the highway. In this location, it would be most suitable to construct an industrial purpose building – a shield (or several buildings) that would subdue the spread of the noise from the highway (Fig. 8a). The efficiency of this building in reducing noise spread to the residential area depends on its height, width, area taken and positioning with respect to the residential area.

The best solution is when the building is as high, wide and long as possible, i.e. covers the biggest possible area limiting noise spread. Furthermore, considering the option of building-shield construction, it should be located as close as possible to the noise source, in this case – the highway. The wider the building is, the less noise accesses. It is important to construct the building not only considering its functionality and aesthetics but also the reduction of the noise spread.

Another recommendation is to continuously plant the embankment slopes with the aim to form a plant tract. The embankment could be planted with dwarf pine-trees so that, when densely composed with the present plants, it would contribute to noise reduction. The advantage of these coniferous trees over the deciduous ones is that they are efficient not only during the warm season of the year.

## DISCUSSION

Recently the European Union has established the requirement to efficiently and rationally deal with traffic-generated noise and related problems. Where possible, the noise has to be minimised. European states deal with noise reduction issues in different ways (Fig. 9).

With traffic intensity growing, the awareness of environmental issues forces a search for noise reduction possibilities. Residents living in close proximity to roads wish and expect the designers to consider the possibilities of noise reduction or elimination.

As noted by Mr J. Kulakauskas, director of a Vilnius municipal enterprise, the practice of foreign states shows that upon constructing acoustic walls by intensive traffic lines and upon changing windows in dwelling houses the noise level falls to the permissible standards. Nearly 7 dBA of noise less pass through the windows with insulating glass packages compared with old type windows.

Tests performed on the initiative of Mr J. Kulakauskas that were aimed at dealing with the problem of spread of the traffic-generated noise to the living environment show that the noise level near Gudeliai residential area of Vilnius district at night would reach 48 dBA whereas upon constructing a sound-absorbent wall, it would decrease to 43 dBA.

A similar situation was determined in Naujasodžiai residential area where noise levels in the residential zone at night did not reach 50 dBA.

Some literary sources state that noise increases when vehicles run along bridges, tunnels or close to buildings. If a street is lined with buildings on both sides, the average noise level grows by 4.5 dBA, whereas if only one side of the street is built-up – by 3.5 dBA. Where a road runs along an excavation, 3–4 m deep, the noise decreases by 8–10 dBA. The street noise level depends on traffic intensity, speed, type of cars, road paving, driving conditions and other factors and varies in the range of 70–90 dBA.

It is common knowledge that when wishing to remove negative effects it is best to eliminate the causes thereof. Unfortunately, contemporary man cannot imagine daily life without own car. Therefore, the proposal is to upgrade technical means – engines, tyres, street paving or strengthen acoustic insulation of walls and windows of houses.

However, man needs not only a comfortable room but also a cosy environment of a yard, residential district and city. On the other hand, not everyone can afford technical upgrades. The world's heaviest, noisiest and most-polluting cars will still be used for long.

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### TRIUKŠMO ŠALIA AUTOMAGISTRALĖS ESANČIOJE GYVENVIETĖJE TYRIMAI IR MAŽINIMO GALIMYBĖS

#### Santrauka

Daugelis gyventojų kenčia dėl transporto priemonių keliamo triukšmo. Tai labiausiai paplitęs miesto triukšmo šaltinis. Gausėjant transporto priemonių bei didėjant eismo intensyvumui, aplinkos taršos klausimų suvokimas verčia ieškoti triukšmo mažinimo galimybių. Daugelyje miestų ir gyvenviečių triukšmas pagrįstai yra laikomas viena svarbiausių ekologinių problemų. Triukšmo tyrimams parinkta Naujasodžių gyvenvietė, esanti šalia A2 automagistralės Vilnius–Panevėžys. Dieną didžiausias triukšmas nustatytas A2–A3 matavimo vietose, kurios nuo A2 automagistralės Vilnius–Panevėžys nutolusios 7,5 m atstumu ir siekė 70–71 dBA. Triukšmo sklaidos duomenys rodo, kad aukštesni triukšmo lygiai nustatyti gyvenvietės pakraščiuose. Gyvenvietėje išmatuotas transporto keliamas triukšmas parodė, kad leistini ekvivalentinio triukšmo lygiai yra viršijami tik iki 30 m atstume nuo A2 automagistralės Vilnius–Panevėžys. Didelę įtaką tam turi automagistralės keliamą triukšmą slopinančių kliūčių nebuvimas, nes lygiagrečiai automagistralei esanti krūmais ir medžiais apželdinta sankasa triukšmą sėkmingai slopina tik centrinėje gyvenvietės dalyje. Nagrinėjamo šaltinio keliamą triukšmą – didžiausi triukšmo lygiai nustatyti vyraujant žemiems (31,5–250 Hz) ir vidutinio aukščio (500–2000 Hz) dažniams efektyviausia mažinti ant sankasos įrengiant triukšmo mažinimo sienelę, priešais gyvenvietę esančioje gamybinės paskirties zonoje pastatant gamybinės paskirties pastatus-ekranus bei apželdinant sankasos šlaitus.

**Raktažodžiai:** automobilių transporto triukšmas, triukšmo sklaida, leistinas triukšmo lygis, triukšmo mažinimo priemonės