Reason for Objection

I object to the Beaches Link and Gore Hill Freeway Connection proposal (SSI-8862) because the health impact assessment (HIA - Appendix I of the EIS) has failed to recognise the health risks associated with the increases in road traffic noise exposure, therefore there is no guarantee that the proposed noise mitigation measures will ensure the objectives set by the World Health Organisation (WHO) are achieved. The issues are detailed in the following sections of this submission:

(1) Issue 1 – misinterpretation of scientific evidence
(2) Issue 2 – methodological inconsistency across the NVIA and HIA
(3) Issue 3 – order of priority of noise mitigation measures
(4) Issue 4 – effectiveness of low noise road surface

The noise and vibration impact assessment (NVIA) reported hundreds of residential receivers would be subjected to increases in traffic noise of over 2 dB(A) and a handful of residential receivers in Balgowlah would experience increases in traffic noise of over 5 dB(A). However, due to misinterpretation of scientific evidence, TfNSW has failed to recognise the extent of potential health impacts on affected communities associated with the increases in traffic noise. The HIA and NVIA identified an amalgamation of low noise road surface, noise barriers and at-property treatments to lessen road traffic noise to a level deemed acceptable by TfNSW (the Proponent). NSW Health, the Environment Protection Authority (EPA) and the Department of Planning need to recognise that meeting a noise level does not guarantee that WHO's health risk objectives would be met at the year of project opening, 5 years after project opening, 10 years after project opening and 15 years after project opening. If approved, the Department of Planning must consider intervention assessments over long periods of time to be a condition of approval since the Environmental Health Standing Committee (enHealth, 2018) identified the necessity for governments and regulatory authorities to understand the effects of change in environmental noise exposure on changes in health outcomes. This series of intervention studies must evaluate the effectiveness of the proposed noise mitigation measures at ensuring absolute risks are lower than 10% for highly annoyed (HA) and 3% for highly sleep disturbed (HSD), and that incidence of hypertension and mortality risks from ischaemic heart disease (IHD) are minimised (see Table 1).

Table 1 - Priority health outcomes and relevant risk increases for setting guideline levels (WHO, 2018)

Priority health outcome measure (associated DW)	Relevant risk increase considered for setting of guideline level
Incidence of IHD (DW: 0.405)	5% RR increase
Incidence of hypertension (DW: 0.117)	10% RR increase
%HA (DW: 0.02)	10% absolute risk
%HSD (DW: 0.07)	3% absolute risk
Permanent hearing impairment (DW: 0.0150)	No risk increase due to environmental noise
Reading and oral comprehension (DW: 0.006)	One-month delay in terms of reading age

Issue (1) – "Misinterpretation of Scientific Evidence"

TfNSW has failed to recognise the significance of increases in traffic noise exposure on the health and wellbeing of affected communities. This failure is exemplified by the following statements found in the HIA which are not supported by evidence or facts:

- "*Traffic noise level increase of less than 2 dB(A) represents a minor impact and is likely to be barely perceptible*" (pages 112, 115 and 119 of the HIA)
- "*However, where noise levels are predicted to increase by two dB(A), this has the potential to result in a small increase in individuals highly annoyed by noise. The increase in noise annoyance is not considered to be significant*" (pages 124 of the HIA)
- "*where noise levels are in the range 45 and 75 dB(A) (as Lden), increases in noise less than five dB(A) would not be considered to result in a significant increase in the %HA*" (page 125 of the HIA)

First and foremost, it is not correct to compare the change in magnitude of a sound pressure level (e.g. turning up the TV volume by 2 dB) to a change in energy average noise level of a collection of different traffic noise over a longer period of time (e.g. increasing the number of noisy buses from 100 to 160). This is akin to comparing apples and oranges. Try living next to a bus stop and tell me you can't notice the difference in noise from increases in bus service frequency during trackwork. The root cause of this misconception appears to stem from health risk and acoustic consultants blindly using incorrect information from EPA's 2011 NSW Road Noise Policy without understanding where they came from. The belief that an increase in traffic noise of 2 dB(A) is barely perceptible to the average person is invalidated by information provided in the 2018 US Federal Transit Administration (FTA) transit noise and vibration impact assessment manual and a 2015 research paper written by Simon Kean at Roads and Maritime Services NSW on the topic of "proposed methodology for the assessment of noise in a route selection process". This contradiction calls into question whether WHO's and EPA's objective can be achieved with the proposed safeguards, that is *environmental objectives for transportation-related noise sources are set approximately at the point at which 10% of residents are highly annoyed by the noise*.

According to FTA's assessment manual, an increase in noise of 2 dB(A) changes the impact category from "no impact" to "moderate impact" at Ldn noise level of 60 dB(A) (see Figure 1 overleaf on page 3). At Ldn noise level of around 70 dB(A), an increase in noise of only 1 dB(A) changes the impact category from "no impact" to "moderate impact". If increases in noise of 2 dB(A) is barely perceptible, then why would the percentage of people highly annoyed by traffic noise increase by 26% according to Figure 2 taken from the research document by Harrison, Kean & Hinze (2015)? Also, how can an increase in 5 dB(A) be considered insignificant? 5 dB(A) increase in traffic noise translates to severe impact at Ldn of 60 dB(A) or more according to Figure 1, or an increase in percentage highly annoyed by 35% according to Figure 2. An increase of 5 dB(A) in the long run would likely increase mortality risks from ischaemic heart disease according to WHO and is considered unacceptable.

A presumption can be made that the HIA expert engaged by TfNSW has mistakenly used the dose-response relationship shown in Figure 3 on page 4 of this submission which is not relevant to the change in community response caused by increases in traffic noise. According to Miedema and Oudshoorn (2001) and the International Standards on Environmental Noise (ISO, 2016), steady-state dose-response curves such as those shown in Figure 3 and Figure 4 are only applicable to existing situations (see D.4.4 from ISO 1996-1:2016) and not applicable to the assessment of change in noise climate.

Research indicates that the large nuisance changes observed in before and after studies are not simply short-term impacts. Griffiths and Raw (1989) found 'after' levels of nuisance to differ from 'steady-state' levels at seven and nine years after the change in traffic noise exposure. What happens to nuisance levels in the longer term is said to be uncertain by Highways England (2011). The effect of change was found persistent over a period of at least two years, and a major part of it was still visible over 7-9 years. The change in the percentage of people highly annoyed subjected to increases in traffic noise (Figure 2) may move slowly back towards those which would have been predicted from the 'steady-state' relation between noise exposure and nuisance (Figure 4). According to Highways England, one reason for expecting this 'bounce-back' in %HA to occur is that people who move in after the change in noise may react to the noise in a similar manner to people living at 'steady-state' sites. Individuals who experienced the noise change may continue to have a different level of nuisance, but the level of nuisance for the site as a whole may change as more of the original population are replaced by new residents.

If the desire is to promote the permanent relocation of existing residents, why not update the outdated 2011 NSW Road Noise Policy to reflect this aim? I truly hope the NSW State Government is not expecting residents affected by the Beaches Link and Gore Hill Freeway Connection proposal to move away so the health outcome objectives deemed acceptable by the WHO of 10% highly annoyed (absolute risk) and 5% incidence of IHD (relative risk increase) can be achieved.

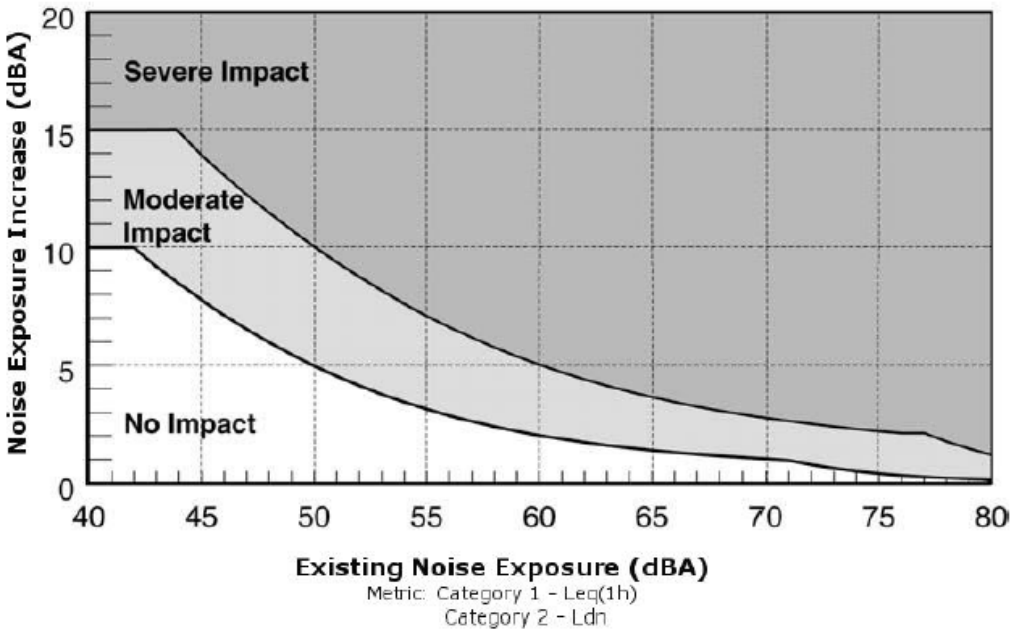

Figure 1 - Increase in cumulative noise levels and impact categories (FTA, 2018)

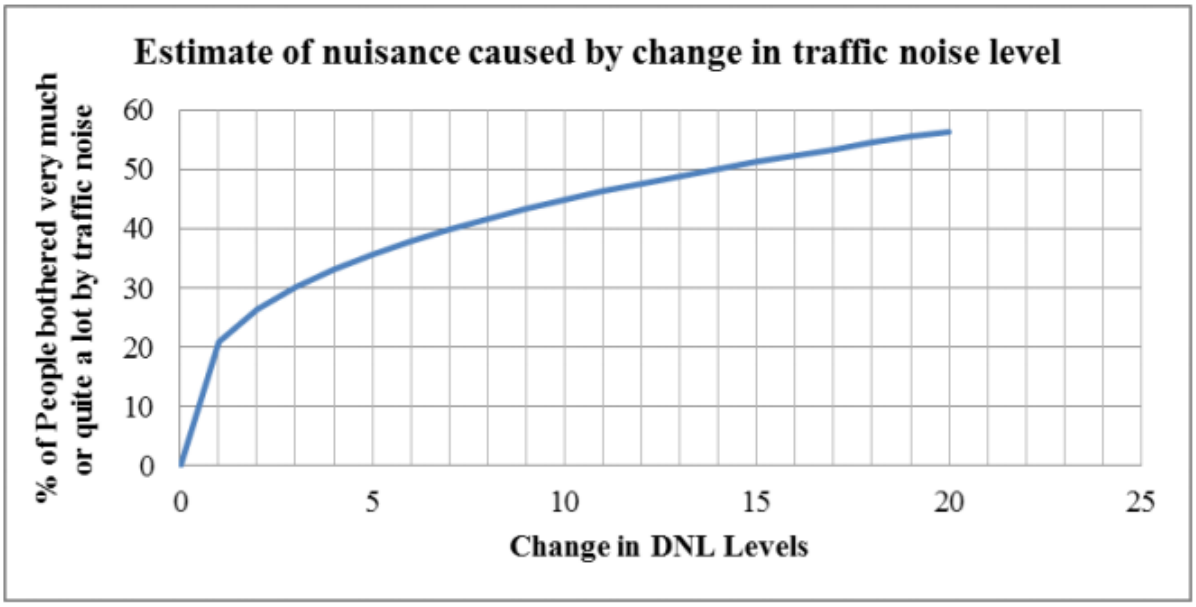

Figure 2 - Relationship between the change in % bothered very much by traffic noise and the change in road traffic noise (delta Ldn) (Harrison, Kean & Hinze, 2015)

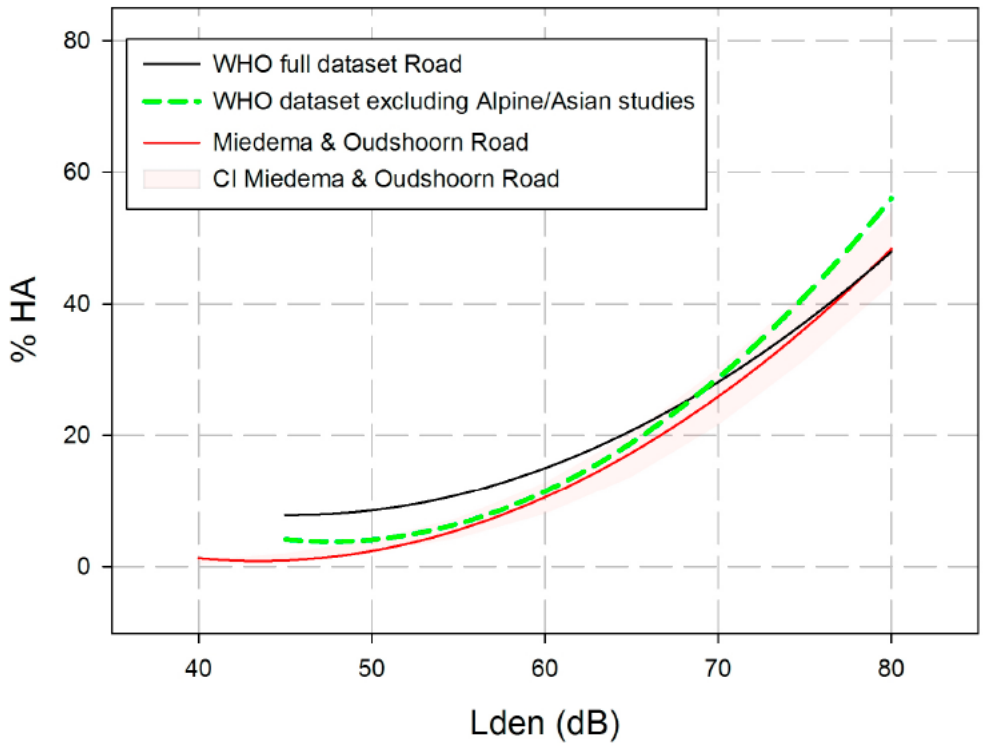

Figure 3 – Relationship between the percentage of people highly annoyed and road traffic noise (Lden) (Guski, Schreckenberg & Schuemer, 2017)

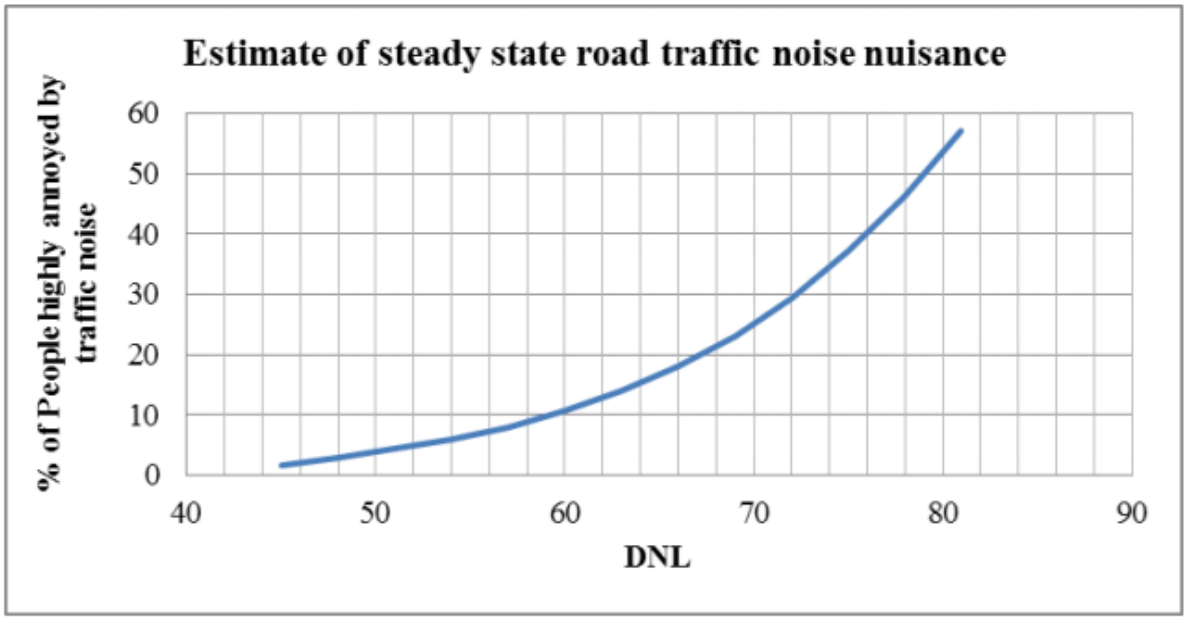

Figure 4 – Relationship between the percentage of people highly annoyed and road traffic noise (Ldn) (Harrison, Kean & Hinze, 2015)

Issue (2) – "Methodological Inconsistency across the NVIA and HIA"

The NVIA has failed to address the Secretary's Environmental Assessment Requirements for "4. Noise and Vibration – Amenity". It is reported in the HIA that compliance with WHO guideline levels would address health impacts associated with sleep disturbance in the community (page 125 of the HIA). However, the NVIA has not acknowledged the 2009 WHO Night Noise Guidelines nor the 2018 Environmental Noise Guidelines. Instead, the NVIA simply assumes the LAeq(9hour) criterion level should sufficiently account for sleep disturbance impacts. The WHO clearly reported different dose-response relationships for annoyance (see Figure 3 on the previous page) and sleep disturbance (see Table 2 and Figure 5 below). It is not logical to use a criterion level established from dose-response relationship for annoyance to assess sleep disturbance impacts. Methodological inconsistency across the NVIA and HIA calls into question the adequacy of proposed safeguards at mitigating sleep disturbance impacts. For night noise exposure, the WHO strongly recommends reducing noise levels produced by road traffic during night-time below 45 dB(A) Lnight as road traffic noise above this level is associated with adverse effects on sleep (WHO, 2018). Night noise criteria adopted by TfNSW in the NVIA are 5 to 10 dB(A) higher than WHO's strong recommendation.

Table 2 – Relationship between the percentage of people highly sleep disturbed and road traffic noise (Lnight) (WHO, 2018)

L_{night} (dB)	%HSD	95% CI
40	2.0	0.9–3.15
45	2.9	1.40–4.44
50	4.2	2.14–6.27
55	6.0	3.19–8.84
60	8.5	4.64–12.43
65	12.0	6.59–17.36

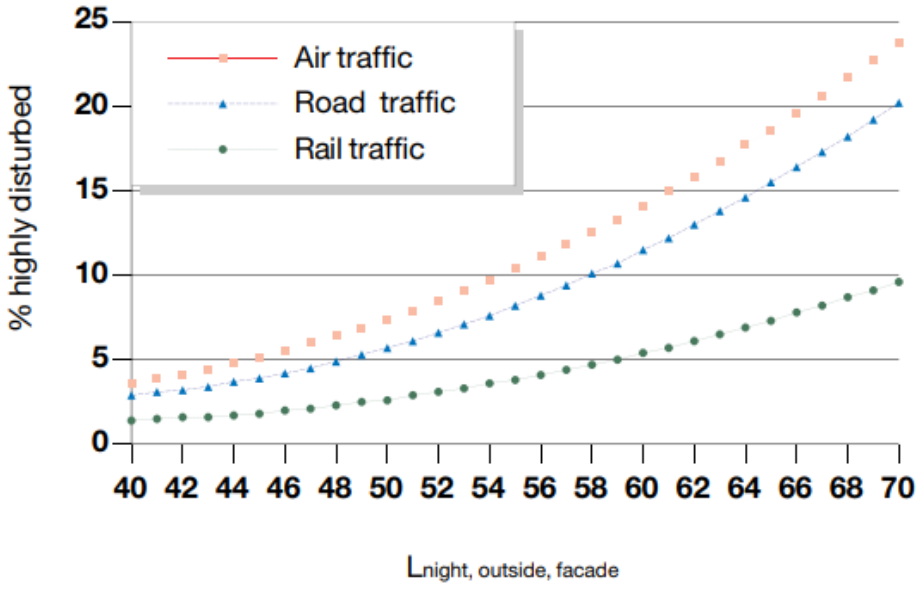

Figure 5 – Relationship between the percentage of people highly sleep disturbed and road traffic noise (Lnight) (WHO, 2009)

Issue (3) – "Noise Mitigation Measures – Order of Priority"

The World Health Organisation recognises the importance of reducing outdoor noise so residents can keep their windows slightly open when in bed / during sleep:

If negative effects on sleep are to be avoided the equivalent sound pressure level should not exceed 30 dBA indoors for continuous noise. If the noise is not continuous, sleep disturbance correlates best with LAmax and effects have been observed at 45 dB or less. This is particularly true if the background level is low. Noise events exceeding 45 dBA should therefore be limited if possible. For sensitive people an even lower limit would be preferred. It should be noted that it should be possible to sleep with a bedroom window slightly open (a reduction from outside to inside of 15 dB). To prevent sleep disturbances, one should thus consider the equivalent sound pressure level and the number and level of sound events. Mitigation targeted to the first part of the night is believed to be effective for the ability to fall asleep.

One thing that stands out is the desire of a large part of the population to sleep with windows (slightly) open. If noise levels increase, people do indeed close their windows, but obviously reluctantly, as complaints about bad air then increase and sleep disturbance remains high. This was already pointed out in the WHO Guidelines for community noise (1999).

There is no guarantee that the sleep disturbance objective of the WHO can be met because the HIA reported over 600 receiving buildings as being potentially eligible for consideration of at-property treatment. The HIA concludes by saying where specific individuals do not take up the recommended at-property treatments, there is the potential for road traffic noise to result in adverse health effects including increased levels of noise annoyance and sleep disturbance. Asking people to shut their windows to keep noise out is a poor outcome according to the WHO. Why is this acceptable to TfNSW? It appears that TfNSW is not aligned with EPA's policy and there is a general lack of commitment around outdoor noise reduction strategies in the EIS.

EPA's NSW Road Noise Policy prioritises noise source controls over at-property treatments which seems to align with WHO's thinking of reducing outdoor noise. However, no solid information can be found in the EIS around whether TfNSW is committed to making sure that outdoor traffic noise will be reduced using long-term noise reduction strategies identified in Section 5.8 of the NSW Road Noise Policy. Buses and trucks in Sydney are notoriously loud. How come the NVIA and HIA made no mention of promoting the use of electric bus fleets in the Northern Beaches and en route to Sydney CBD? UK just committed to banning the sale of petrol cars and vans from 2030 and California recently committed to banning the sale of petrol cars and trucks from 2035. What is the NSW Government doing about zero net emission and the Paris Agreement? The Department of Planning must make sure TfNSW makes clear commitments to reduce outdoor noise at the source if this proposal must be approved. If not, the EPA should update their long-term noise reduction strategies in the NSW Road Noise Policy to continue to promote the use of petrol cars and trucks to match current reality.

Issue (4) – "Effectiveness of Low Noise Road Surface"

The NVIA states that:

- *A 2 dB(A) noise reduction (compared to dense graded asphalt (DGA)) has been assumed for the quieter pavements.*

TfNSW's assessment looks at traffic noise for the year 2027 and 2037. Is this assumption of 2 dB(A) used for both timeframes? Roads in NSW are so poorly maintained I wonder how surface degradation, potholes and transverse cracks are modelled in the NVIA. What is the noise emission guarantee of low noise road surface over long periods of time? Why not use a low noise road surface that can guarantee 5 dB(A) over long periods of time?

The NVIA further states that:

- *for the purpose of this assessment, quieter pavements such as open grade asphalt or similar, have been assumed for all sections of the Gore Hill Freeway and Burnt Bridge Creek Deviation affected by the project*

The Department of Planning must make sure TfNSW investigate all available low noise pavement technologies (including double layer porous asphalt and rubberized asphalt) and select the best available technology.

In Closing:

I strongly believe it is the duty of the Department of Planning, EPA and NSW Health to consider:

(1) health outcome objectives of the World Health Organisation when assessing the adequacy and scientific merits of the EIS; and
(2) recommendations made by the Environmental Health Standing Committee when setting conditions of approval for the Beaches Link and Gore Hill Freeway Connection proposal.

Reference List

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2. World Health Organisation (2018), "Environmental noise guidelines for the European region", WHO Regional Office for Europe, ISBN 978-92-890-5356-3.
3. Federal Transit Administration (2018), "Transit noise and vibration impact assessment manual", U.S. Department of Transport, FTA Report No. 0123.
4. M. Harrison, S. Kean, B. Hinze (2015), "Proposed methodology for the assessment of noise in a route selection process", in proceedings of Acoustics 2015, 15-18 November, Hunter Valley.
5. R. Guski, D. Schreckenberg, R Schuemer (2017), "WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Annoyance", International Journal of Environmental Research and Public Health.
6. H. M. Miedema, C. G. Oudshoorn (2001), "Annoyance from transportation noise: relationship with exposure metrics DNL and DENL and their confidence intervals", Environmental Health Perspectives, vol. 109, no. 4, 409-416.
7. International Organization for Standardization (2016), "ISO 1996-1 Acoustics – Description , measurement and assessment of environmental noise – Part 1: Basic quantities and assessment procedures".
8. I. D. Griffiths, G. J. Raw (1989), "Adaptation to changes in traffic noise exposure", Journal of Sound and Vibration, vol. 132, no. 2, 331-336.
9. Highways England (2011), "Design manual for roads and bridges, Volume 11 environmental assessment, Section 3 environmental assessment techniques, Part 7 noise and vibration", HD213/11 – Revision 1.
10. World Health Organisation (2009), "Night noise guidelines for Europe", WHO Regional Office for Europe, ISBN 978-92-890-4173-7.