JOURNAL OF TRANSPORT

ISSUE 3, 2025 vol. 2
E-ISSN: 2181-2438
ISSN: 3060-5164

SLIB.UZ
Scientific library of Uzbekistan

RESEARCH, INNOVATION, RESULTS

TOSHKENT DAVLAT TRANSPORT UNIVERSITETI
Tashkent state transport university

JOURNAL OF TRANSPORT

RESEARCH, INNOVATION, RESULTS

E-ISSN: 2181-2438
ISSN: 3060-5164
VOLUME 2, ISSUE 3
SEPTEMBER, 2025

jot.tstu.uz

TASHKENT STATE TRANSPORT UNIVERSITY

JOURNAL OF TRANSPORT

SCIENTIFIC-TECHNICAL AND SCIENTIFIC INNOVATION JOURNAL

VOLUME 2, ISSUE 3 SEPTEMBER, 2025

The **"Journal of Transport"** established by Tashkent State Transport University (TSTU), is a prestigious scientific-technical and innovation-focused publication aimed at disseminating cutting-edge research and applied studies in the field of transport and related disciplines. Located at Temiryo'lchilar Street, 1, office 465, Tashkent, Uzbekistan (100167), the journal operates as a dynamic platform for both national and international academic and professional communities. Submissions and inquiries can be directed to the editorial office via email at jot@tstu.uz.

The Journal of Transport showcases groundbreaking scientific and applied research conducted by transport-oriented universities, higher educational institutions, research centers, and institutes both within the Republic of Uzbekistan and globally. Recognized for its academic rigor, the journal is included in the prestigious list of scientific publications endorsed by the decree of the Presidium of the Higher Attestation Commission No. 353/3 dated April 6, 2024. This inclusion signifies its role as a vital repository for publishing primary scientific findings from doctoral dissertations, including Doctor of Philosophy (PhD) and Doctor of Science (DSc) candidates in the technical and economic sciences.

Published quarterly, the journal provides a broad spectrum of high-quality research articles across diverse areas, including but not limited to:

- Economics of Transport
- Transport Process Organization and Logistics
- Rolling Stock and Train Traction
- Research, Design, and Construction of Railways, Highways, and Airfields, including Technology
- Technosphere Safety
- Power Supply, Electric Rolling Stock, Automation and Telemechanics, Radio Engineering and Communications
- Technological Machinery and Equipment
- Geodesy and Geoinformatics
- Automotive Service
- Air Traffic Control and Aircraft Maintenance
- Traffic Organizatsion
- Railway and Road Operations

The journal benefits from its official recognition under Certificate No. 1150 issued by the Information and Mass Communications Agency, functioning under the Administration of the President of the Republic of Uzbekistan. With its E-ISSN 2181-2438, ISSN 3060-5164 the publication upholds international standards of quality and accessibility.

Articles are published in Uzbek, Russian, and English, ensuring a wide-reaching audience and fostering cross-cultural academic exchange. As a beacon of academic excellence, the "Journal of Transport" continues to serve as a vital conduit for knowledge dissemination, collaboration, and innovation in the transport sector and related fields.

Analytical assessment of noise levels of urban vehicle flows

S.S. Sulaymanov[1][a], Z.A. Abdullaeva[1][b]
[1]Tashkent state transport university, Tashkent, Uzbekistan

Abstract: This article considers the issue of theoretical assessment of the sound level of urban traffic flows. In urban environments, especially on main streets near multi-storey residential buildings, the sound level of traffic flows (noise level heard by humans in dB(A) values) is one of the most harmful factors that negatively affect human health. The physical parameters and characteristics of traffic noise were determined based on the quasi-cylindrical sound wave model and were evaluated sanitary-hygienic.
Keywords: server efficiency, default service model, request service index, request service time

Shahar avtotransport oqimlarini tovush darajasini analitik baholash

Sulaymanov S.S.[1][a], Abdullayeva Z.A.[1][b]
[1]Tashkent davlat transport universiteti, Toshkent, O‘zbekiston

Annotatsiya: Mazkur maqolada shahar avtotransport oqimlari tovush darajasini nazariy baholash masalasi ko‘rib chiqilgan. Shahar muhitida, ayniqsa ko‘p qavatli turar-joylar yaqinidan o’tgan shoh ko’chalarda harakatlanuvchi avtomobillar oqimi tovush darajasi (dB(A) qiymatlardagi insonlar eshitadigan tovush darajasi) insonlar salomatligiga salbiy ta’sir ko‘rsatuvchi o’ta zararli omillardan biri hisoblanadi. Avtotransport oqimlarining shovqinini fizik parametrlari va xususiyatlari kvazitsilindrik tovush to‘lqinlari modeliga tayangan holda aniqlandi va sanitar-gigienik baholandi.
Kalit so‘zlar: avtotransport oqimi, shovqin, tovush darajasi, akustik hisoblash, masofa, shovqin, atrof-muhit muhofazasi, chora-tadbirlar

1. Kirish

Aholining yashash joylarida transport vositalarining harakati ortib borayotganligi bilan birga, ushbu harakatlar natijasida yuzaga keladigan akustik ifloslanish — ya'ni transport shovqini ham dolzarb ekologik muammolardan biri sifatida namoyon bo‘lmoqda. Bu turdagi shovqin inson organizmiga, ayniqsa yurak-qon tomir tizimi, asab tizimi va umumiy psixoemotsional holatga salbiy ta'sir ko‘rsatadi. Jahon sog‘liqni saqlash tashkilotining (JSST) ma’lumotlariga ko‘ra, shovqin ifloslanishi inson salomatligiga ta’sir ko‘rsatuvchi ikkinchi eng xavfli ekologik omil hisoblanadi (havo ifloslanishidan keyin).

Shaharsozlikda va transport infratuzilmasini loyihalashda avtomobillar oqimidan kelib chiqadigan tovush darajasini oldindan hisoblab chiqish muhim ahamiyatga ega. Bu hisob-kitoblar orqali sanitariya me'yorlariga mos keluvchi loyihaviy masofalarni belgilash, shovqinga qarshi himoya vositalarini tanlash hamda transport oqimini boshqarish strategiyasini ishlab chiqish mumkin.

Tadqiqot natijalari shuni ko‘rsatadiki, transport vositalarining turi (yengil, yuk, jamoat), harakatlanish tezligi, ularning soni, yo‘lning fizik xususiyatlari (uzunlik, yo‘l qoplamasi sifati) va aholi yashash joylarining yo‘lga nisbatan joylashuvi umumiy tovush darajasining shakllanishiga sezilarli darajada ta’sir qiladi.

Shuningdek, ko‘plab shahar aholisining shikoyatlarida eng ko‘p uchraydigan omillardan biri sifatida tungi vaqtda transport shovqinining oshib ketishi qayd etilgan. Bu esa uyqu sifati va umumiy sog‘liq holatiga bevosita zarar yetkazadi.

2. Tadqiqot metodologiyasi

Shovqin — bu inson eshitish diapazonida joylashgan tartibsiz akustik tebranishlar bo‘lib, uning manbai ko‘pincha mexanik harakat yoki tebranishlardir. Transport vositalari harakati natijasida paydo bo‘ladigan shovqin manbai dinamik harakatdagi obyektlar, ya’ni avtomobillar, avtobuslar, yuk mashinalari va boshqalar hisoblanadi. Bu shovqin ko‘cha va magistral yo‘llardan atrofdagi hududlarga tarqaladi hamda insonlar salomatligi va hayot sifatiga salbiy ta’sir ko‘rsatadi.

Transport akustikasi bo‘yicha olib borilgan ilmiy tadqiqotlar transport shovqinining shakllanishida bir necha muhim omillar mavjudligini ko‘rsatadi. Avtomobil harakati paytida yuzaga keladigan akustik energiya quyidagi asosiy manbalardan kelib chiqadi:

1. Shinalar bilan yo‘l orasidagi ishqalanish — tezlik ortishi bilan shinalar tomonidan yuzaga keladigan shovqin sezilarli darajada kuchayadi. Ayniqsa asfalt sifatining yomonligi bu shovqinni yanada kuchaytiradi.

2. Aerodinamik shovqin — avtomobilning harakat tezligi ortgani sayin, uning atrofidagi havo oqimlarida turbulensiyalar yuzaga keladi va bu ham o‘z navbatida shovqinga sabab bo‘ladi.

Bu omillar birgalikda turli transport vositalarining shovqin chiqish darajasini belgilaydi. Xalqaro miqyosda,

[a] https://orcid.org/0000-0001-5275-5200
[b] https://orcid.org/0009-0004-7460-9254

ayniqsa Yevropa Ittifoqi, Rossiya Federatsiyasi va AQShda ishlab chiqilgan akustik standartlar asosida turli transport vositalari uchun o‘rtacha shovqin darajalari quyidagicha aniqlangan:

- **Yengil avtomobillar** — ~80 dBA
- **Yuk avtomobillari** — ~90 dBA
- **Jamoat transporti (avtobuslar va boshqalar)** — ~86 dBA

Transport shovqini, asosan, ko‘chalar va magistral yo‘llar bo‘ylab harakatlanuvchi vositalar orqali paydo bo‘lib, uning tarqalishi bir necha muhim omillarga bog‘liq:

- Transport vositalari soni (oqim zichligi)
- Avtomobil turi
- Harakat tezligi
- Yo‘l qoplamasi sifati
- Binolar bilan yo‘l orasidagi masofa
- Yerli relyef va landshaft xususiyatlari

Ushbu omillar shovqinning fazoda qanday tarqalishini aniqlashda muhim rol o‘ynaydi. Shovqin baland binolar, asfalt sifati, daraxtlar mavjudligi yoki yo‘qligi kabi omillar bilan ham yutiladi yoki aks ettiriladi.

1-rasm. Transport oqimi shovqinini baholash uchun tanlangan shahar hududining sun’iy yo‘ldoshdan ko‘rinishi
(yo‘l uzunligi: 110 m, uy-yo‘l masofasi: 29.8 m)

Transport akustikasi sohasida olib borilgan tadqiqotlar shuni ko‘rsatadiki, avtomobil shovqini asosan dvigatel, shinalar bilan yo‘l orasidagi ishqalanish va aerodinamik effektlardan hosil bo‘ladi. Xalqaro ekologik va akustik tadqiqotlar, shuningdek, Rossiya, Yevropa va AQShdagi akustika institutlari tomonidan ishlab chiqilgan metodikalarga ko‘ra, shovqin tarqalishida masofa, avtomobil turi, tezlik va oqim zichligi muhim rol o‘ynaydi.

Hisoblashlar Toshkent shahrida joylashgan ko‘chalardan biri misolida olib borildi. Google Earth orqali yo‘l uzunligi (110 m) va binogacha bo‘lgan masofa (29.8 m) aniqlanib, 1 daqiqada 70 ta transport vositasi o‘tishi kuzatildi. Harakat tarkibi yengil, yuk va jamoat transportlaridan iborat bo‘lib, ularning tipik shovqin darajalari mos ravishda 80 dBA, 90 dBA va 86 dBA deb belgilandi.

Ushbu hisoblashlarda “Метод расчёта уровней шума транспортных потоков в открытом пространстве”ga asosan1-, 1.1-, 1.2- va 1.3-formulalardan foydalanildi:

1-formula: transport vositalarining o‘rtacha oralig‘ini aniqlash uchun:

$$n = 1 + \frac{\lg \frac{l}{\pi}}{\lg r} \quad (1)$$

2.1.1-formula: shovqinning masofadagi qiymatini hisoblash:

$$L(r) = L_{7,5} - 10\left(1 + \frac{lg \frac{l}{\pi}}{lg\, r}\right)\lg \frac{r}{7,5} \quad (2)$$

3. 1.2-formula: shovqin kamayishini baholash:

$$L(r) = L_{7,5} - 10\left(1 + \frac{lg \frac{l}{\pi}}{lg\, r}\right)\lg \frac{r}{7,5} \quad (3)$$

4.1.3-formula: barcha manbalar shovqinining umumiy yig‘indisini hisoblash

$$\Delta L_{\text{сум}}(r) = 10 \lg \sum_{i=1}^{m} 10^{-n_j \lg \frac{r_i}{r_0}} \quad (4)$$

3. Natija va muhokamalar

Tanlangan 110 metrli ko‘chada 1 daqiqada 70 ta avtomobil harakatlanadi. Ularning tarkibi quyidagicha:

- Yuk avtomobillari soni: **2 ta**, darajasi **90 dBA**
- Yengil avtomobillar soni: **19 ta**, darajasi **80 dBA**
- Jamoat transporti: **1 ta**, darajasi **86 dBA**
- Aholi turar joygacha masofa: **30 m**
- O‘rtacha tezlik: **57 m/s**
- 1 daqiqada o‘tuvchi mashinalar soni: **70 ta**

Hisoblashlar quyidagi natijalarni berdi:

$$n = 1 + \frac{\lg \frac{l}{\pi}}{\lg r} \quad (5)$$

Bu yerda:

- l — transport vositalari orasidagi o'rtacha masofa (m)
- r — hisob nuqtasigacha bo‘lgan masofa (m)
- $\pi \approx 3.1416$

l ni hisoblash uchun avval N ni topamiz:
Formulada:
Q = 70 — 1 daqiqadagi mashina soni
60 — daqiqani soatga aylantiramiz
L = 110 m — yo‘l uzunligi
O'rtacha masofa asosida n koeffitsiyenti:

$$n = 1 + \frac{log_{10}(\frac{l}{\pi})}{log_{10}(r)} \approx 2,84 \quad (6)$$

Har bir transport vositasi uchun masofadagi shovqin 2 - formula:

$$L(r) = L_{7,5} - 10\left(1 + \frac{lg\frac{l}{\pi}}{lg\, r}\right)\lg\frac{r}{7,5} \qquad (7)$$

Bu formula har bir transport turi uchun, siz bergan L_0 qiymatlaridan foydalanib masofada shovqinning kamayishini hisoblaydi:

- Yuk avtomobil:
  $L(r)=90-7.5*2.84*log_{10}(30) \approx 66.4dBA$
- Yengil avtomobil:
  $L(r)=80-7.5*2.84*log_{10}(30) \approx 56.4dBA$
- Jamoat transporti:
  $L(r)=86-7.5*2.84*log_{10}(30) \approx 62.4dBA$

Har bir transport vositasidagi shovqin kamayishi 3-formula:

$$\Delta L = 7.5 * n * log_{10}\left(\frac{r}{7.5}\right) \approx 12.8\, dBA$$

Umumiy shovqin kamayishini hisobga olgan holda 4-formula:

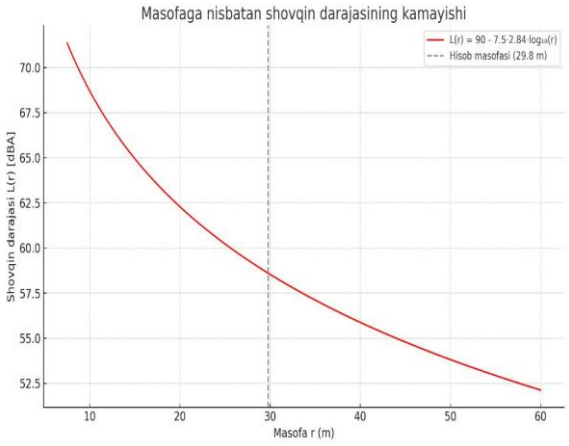
$$\Delta L_{\text{сум}}(r) = 10\lg\sum_{i=1}^{m} 10^{-n_j \lg\frac{r_i}{r_0}} \qquad (8)$$

Bu yerda barcha transport vositalari (2 yuk, 19 yengil, 1 jamoat) uchun L(r) qiymatlarini olamiz va ularni quyidagicha yig‘amiz:

$$L_{sum} = 10 * log_{10}(2 * 10^{0.1*66.4} + 19 * 10^{0.1*56.4} + 1 * 10^{0.1*62.4})$$

Natijada:

$$L_{sum} = 10 * log_{10}\left(\sum 10^{0.1*L_i}\right) \approx 64.9\, dBA$$



2-rasm. Masofaning ortishi bilan tovush darajasining pasayish grafigi. Model 90 dB(A) shovqin manbasi uchun hisoblangan bo‘lib, tanlangan nuqtadagi masofa (29.8 m) vertikal chiziq bilan ko‘rsatilgan

1-jadval

Turli transport vositalarining tovush darajasi va umumiy akustik ta'sir ko‘rsatkichlari

Ko‘rsatkich	Qiymati
Transportlar orasidagi o‘rtacha masofa	1628.57 m
Shovqin pasayish koeffitsiyenti (n)	2.84
Yuk avtomobili tovush darajasi (30 m da)	66.4 dB(A)
Yengil avtomobil tovush darajasi (30 m da)	56.4 dB(A)
Jamoat transporti tovush darajasi (30 m da)	62.4 dB(A)
Har bir manbadan tovush darajanisi kamayishi	~12.8 dB(A)
Umumiy tovush darajasi ($L(A)_{sum}$)	≈ 64.9 dB(A)

Bu natija 30 metr uzoqlikdagi turar joy hududida transport oqimidan kelib chiqadigan tovush darajasi 64.9 dB(A) atrofida bo‘lishini ko‘rsatadi. Ushbu daraja ko‘pgina sanitariya me’yorlariga yaqin yoki biroz yuqori hisoblanadi.Demak, agar transport oqimi ko‘payadigan bo‘lsa yoki masofa qisqarsa, tovush darajasi sezilarli oshadi. Shu sababli, shaharsozlikda yo‘l va turar joylar orasidagi optimal masofa, akustik to‘siqlar yoki yashil hududlar joylashtirilishi lozim.

4. Xulosa

Ushbu tadqiqot doirasida shahar ko‘chasida real vaqtda o‘tkazilgan kuzatuvlar asosida transport vositalaridan chiqadigan tovush (shovqin) darajasi aniqlandi. O‘lchov natijalariga ko‘ra, tanlangan hisob nuqtasida **umumiy tovush darajasi 64.9 dBA** ni tashkil etdi. Bu shovqin darajasi inson salomatligi va yashash sifati uchun muhim bo‘lgan me'yorlar bilan taqqoslanib baholandi.

Tadqiqot davomida quyidagi omillar shovqin darajasiga bevosita ta’sir ko‘rsatishi aniqlangan:

- Transport vositalarining turi (yengil avtomobillar, yuk mashinalari, avtobuslar va boshqalar);
- Ularning soni (ya'ni harakat zichligi);
- Transport vositalarining harakatlanish tezligi;
- Tovushni o‘lchash nuqtasining yo‘lga nisbatan masofasi.

Mazkur omillar har biri tovush to‘lqinlarining tarqalishi, ularning intensivligi va odamga yetib kelish darajasiga o‘zgarish kiritadi. Misol uchun, og‘ir transport vositalari ko‘proq shovqin keltirib chiqaradi, yuqori tezlikda harakatlanayotgan avtomobillar esa tovush intensivligini oshiradi. Shuningdek, yo‘lga yaqin joylashgan binolar va ochiq joylar tovushni to‘smasligi sababli ko‘proq ta’sir ko‘rsatadi.

Tadqiqot natijalariga asoslanib, quyidagi muhim choralarni amalga oshirish tavsiya etiladi:

1. Transport oqimini optimallashtirish
2. Akustik to‘siqlar o‘rnatish
3. Yashil zonalarni kengaytirish
4. Shahar rejalashtirishda akustik omillarni hisobga olish.

Foydalangan adabiyotlar / References

[1] Николов Н.Д. Метод расчета уровней шума транспортных потоков в открытом пространстве на основе модели квазилиндрических звуковых волн. — Институт строительной физики, технологии и логистики, София, 2009. — С. 240–245.

[2] Осипов Г.Л. (ред.). Снижение шума в зданиях и на территориях застройки. — Москва: Стройиздат, 1986. — 423 с.

[3] Прутков Б.Г. (ред.). Борьба с шумом в городах. — Москва: Стройиздат, 1987. — 244 с.

[4] Руководство по расчету и проектированию средств защиты застройки от транспортного шума. — Москва: Стройиздат, 1982. — 31 с.

[5] Государственные санитарные нормы и правила Республики Узбекистан. ГСанПиН 0257-21. Уровни шума в жилых и общественных зданиях и на территории жилой застройки. — Тошкент, 2021.

[6] Korobkov V.E., Николов Н.Д. Влияние плотности транспортного потока на снижение шума на примагистральной территории. — Труды НИИ строительной физики, Москва, 1984. — С. 91–94.

[7] Google Earth Pro. Kosmik xarita va masofa o‘lchovlari orqali fazoviy tahlil. — https://earth.google.com — (murojaat qilingan sana: 2025-yil iyul).

[8] Вылчев И. Электроакустика. — София: Техника, 1975. — 356 с.

Mualliflar to‘g‘risida ma’lumot/ Information about the authors

Sulaymanov Sunanatilla Sulaymanovich	Toshkent davlat transport universiteti “Texnosfera xavfsizligi” kafedrasi professori. Tel.: +99897 775-51-79 https://orcid.org/0000-0001-5275-5200
Abdullayeva Zilola Asqar qizi / Abdullaeva Zilola Askar kizi	Toshkent davlat transport universiteti “Texnosfera xavfsizligi” kafedrasi magistri Email: zilolaab2000@gmail.com Tel.: +99893 396-13-09 https://orcid.org/0009-0004-7460-9254

CONTEXT / MUNDARIJA