

Environmental noise challenges and policies in low and middle income countries

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ABSTRACT

Information on environmental noise challenges was gathered for 139 countries, identified by the World Bank as of low income (31), lower middle income (52), and upper middle income (56). Data on noise levels were found in urban agglomerations of two low income, 13 lower middle income, and 20 upper middle income countries. Environmental noise pollution continues to grow in all studied cities due to increase in motor vehicle fleets, airport operations and industries. The main driving forces are population growth, urbanization, motorization and to a large extent technological development. In this paper the major noise sources in two low income countries, 13 lower middle income countries and 13 upper middle income countries (excluding Member States of and countries on the road to the European Union) are identified and observed environmental noise levels reviewed. The paper also compiles the adverse health effects of extensive noise exposures in urban agglomerations that have already been observed in some of these countries. The key laws and by-laws and other regulations on noise pollution in these countries and the level of their enforcement are discussed.

INTRODUCTION

Noise is the consequence of mankind's industrial, commercial, transport-related and recreational activities in urban areas. Population growth, urbanization and to a large extent technological development are the main driving forces responsible for the continuing growth of noise exposure in developing countries. Urbanization has accelerated during the last centuries and is still accelerating in this century as can be sensed from how fast a major city grows [1]. Noise and the health impacts it causes can best be understood by defining noise as "most impertinent of all interruptions because it interrupts or even crushes our own thoughts"[2]. As early as 1910 Robert Koch noted that noise will be the epidemic of the future and mankind will have to fight it as relentlessly as the plague and cholera [3], [4].

Environmental noise is defined as noise emitted from all sources, except noise at the industrial workplace [5]. Main sources of environmental noise include road, rail and air traffic, industries, construction and public work, and the neighbourhood. Typical neighbourhood noise comes from premises and installations related to the catering trade (restaurants, festival halls, discotheques, etc.); from live or recorded music; from sporting events including motor sports; from playgrounds and car parks; and from domestic animals such as barking dogs.

The noise pollution problem is severe in the cities of developing countries and is caused mainly by traffic. In contrast to many other environmental problems, noise pollution continues

to grow, accompanied by an increasing number of complaints from and adverse effects in affected individuals.

This paper will address issues of noise legislation, noise levels and impacts in low and middle income countries.

METHODOLOGY

The World Bank classification of countries according to their income was used to identify the low, lower middle and upper middle income countries [6].

Google search was applied to identify those low, lower middle and upper middle income countries which address noise issues using the search algorithm

((Country) AND ((noise legislation) AND (noise pollution) OR (noise levels) OR (noise exposure) AND ((noise impacts) OR (noise effects) OR (annoyance) OR (hearing loss) OR (sleep disturbance) OR (speech interference) OR (tinnitus) OR (performance))).

Search results were analyzed with respect to laws and by-laws including permissible noise and vibration levels, noise sources, environmental noise indicators, and observed or perceived noise impacts.

Noise indicators include equivalent sound pressure levels, $L_{Aeq,T}$ [dBA], where T is the time period of monitoring, maximal sound pressure levels, L_{Amax} [dBA], day-night noise level, L_{dn} [dBA], day-evening-night sound pressure levels, L_{den} [dBA], traffic noise index TNI [dBA], and the noise pressure level, NPL [dBA].

The information on legislation including country- and city-level permissible noise limits and the data on noise levels and impacts are compiled in an Excel spreadsheet-based database called NOISE_INFO.

LOW AND MIDDLE INCOME COUNTRIES

According to the World Bank income classification 31 countries are in the low income group, 52 are in the lower middle income group, and 56 are in the upper middle income group [6]. With respect to the search variables 'noise legislation' and 'noise levels' (or 'noise pollution' or 'noise exposure') only two countries emerged from the low income group, while 13 countries with legislation and noise levels were in the lower middle class group and 20 countries came in from the upper middle income group. Out of the 20 countries in the upper middle income group seven countries – Albania, Bulgaria, Macedonia, Montenegro, Romania, Serbia, and Turkey – are not considered in this paper because they are either Member States of the European Union or candidates for membership and, therefore, are adapting European legislation. Thus, 28 out of 139 countries in these income groups considered in this paper have legislation on noise control and information on noise levels, see Table 1.

NOISE LEGISLATION

The Constitution of each country considered in this paper incorporates the right of all inhabitants to enjoy an environment, which is healthy, balanced and suitable for human development. Legislation related to noise pollution exists in all 28 countries considered in this paper. However, legislation is mostly not specific and detailed with respect to noise but rather is embedded in general acts on air pollution prevention. A notable exception is the PR China, which has promulgated a law on prevention and control of noise pollution. Noise pollution is regulated through emission and immission standards i.e. in a command and control framework. Market mechanisms are not applied for noise management. Table 2 shows some key legislation on noise control in the 28 countries.

Table 1: Countries with legislation on noise control and information on noise levels.

Nepal	South Asia	Low income
Tanzania	Sub-Saharan Africa	
Indonesia	East Asia & Pacific	Lower middle income
Philippines		
Vietnam		
Egypt, Arab Rep.	Middle East & North Africa	
Morocco		
Syrian Arab Republic		
Bangladesh	South Asia	
India		
Pakistan		
Sri Lanka		
Ghana	Sub-Saharan Africa	
Kenya		
Nigeria		
China	East Asia & Pacific	Upper middle income
Malaysia		
Thailand		
Kazakhstan	Europe & Central Asia	
Argentina	Latin America & Caribbean	
Brazil		
Colombia		
Mexico		
Algeria	Middle East & North Africa	
Iran, Islamic Rep.		
Iraq		
Jordan		
Lebanon		

Table 2 shows that all countries considered have promulgated environment protection laws, which more or less explicitly regulate noise. In some countries noise is considered an air pollutant, e.g. in Mexico [58]. In some countries such as Algeria, environmental protection is explicitly considered in the context of sustainable development [7]. General principles include the prevention principle, the polluter pays principle, and the precautionary principle, e.g. Argentina [9]. Most of the legislation refers to the protection of the environment, and some legislation refers also to the improvement or enhancement of the environment. Some countries such as Bangladesh, Ghana, and Nigeria have established an agency for protection of the environment or an Environmental Quality Council such as Malaysia [11], [26], [53], [67].

All countries have set national rules and immission standards with the exception of Argentina where standards are set on a municipal level. At least the municipalities of Buenos Aires, Cordoba, La Plata, Mar del Plata, Mendoza, Parana, Rosario, and Santa Fe have published decrees or by-laws related to the implementation of noise immission permissible limits [97].

Table 2: Key legislation by country

Country	Environment protection law	Implementing rules and national immission standards	Local immission standards	National emission standards	National vibration standards	Reference
Algeria	Yes	Yes	No	No	No	[7],[8]
Argentina	Yes	No	Yes	No	No	[9],[10]
Bangladesh	Yes	Yes	No	Yes	No	[11],[12]
Brazil	Yes	Yes	Yes	Yes	No	[13],[14],[14],[15],[16],[17]
China	Yes	Yes	No	Yes	No	[18],[19]
Colombia	Yes	Yes	No	Yes	No	[20],[21],[22],[23]
Egypt, Arab Republic	Yes	Yes	No	No	No	[24],[25]
Ghana	Yes	Yes	No	No	No	[26],[27],[28]
India	Yes	Yes	No	Yes	Yes	[29],[30],[31],[32],[33],[34]
Indonesia	Yes	Yes	No	Yes	Yes	[35],[36],[37],[38]
Iran, Islamic Republic	Yes	Yes	No	No	No	[39],[40]
Iraq	Yes	Yes	Yes	No	No	[41],[42],[43]
Jordan	Yes	Yes	No	No	No	[44],[45]
Kazakhstan	Yes	Yes	No	Yes	No	[46],[47],[48]
Kenya	Yes	Yes	No	No	No	[49],[50]
Lebanon	Yes	Yes	No	No	No	[51],[52]
Malaysia	Yes	Yes	No	Yes	Yes	[53],[54],[55],[56]
Mexico	Yes	Yes	No	No	No	[57],[58],[59]
Morocco	Yes	Yes	No	No	No	[60],[61],[62]
Nepal	Yes	Yes	No	No	No	[63],[64],[65],[66]
Nigeria	Yes	Yes	No	Yes	No	[67],[68],[69],[70]
Pakistan	Yes	Yes	No	Yes	No	[71],[72],[73],[74],[75]
Philippines	Yes	Yes	No	No	No	[75],[76],[77],[78],[79]
Sri Lanka	Yes	Yes	No	Yes	Yes	[80],[81],[82],[83],[84]
Syrian Arab Republic	Yes	Yes	No	No	No	[85],[86],[87]
Tanzania	Yes	Yes	No	No	No	[88],[89],[90]
Thailand	Yes	Yes	No	Yes	No	[91],[92],[93]
Vietnam	Yes	Yes	No	Yes	Yes	[94],[95],[96]

Brazil has set national noise permissible limits but Rio de Janeiro and Curitiba have also promulgated additional noise standards which refine and/or supplement the national standards [16], [17]. In Iraq, the autonomous Kurdistan Regional Government has promulgated its own environmental legislation [43], while in Pakistan the Khyber Pakhtunkwa provincial administration has proceeded similarly [73].

Almost half the countries have adopted noise emission standards but only five countries appear to have set vibration standards – India, Indonesia, Malaysia, Sri Lanka and Vietnam (cf. Table 2).

NOISE SOURCES

Almost all publications related to sound pressure monitoring mention and address road traffic noise as the major source of elevated sound pressure levels. Other sources mentioned and sometimes assessed are neighbourhood noise, barking dogs (Algeria, Brazil), noise from entertainment activities such as weddings, noise from religious institutions [99, 110].

NOISE LEVELS

NOISE_INFO currently contains monitored noise levels from 135 cities. Most available noise level data are equivalent and maximal sound pressure levels. L_{dn} is available in cities of four countries (China, Egypt, India, Indonesia), L_{den} was determined in cities of Egypt, Iran, Nigeria and Vietnam. Percentiles, TNI and NPL are available from cities in six countries (Colombia, Ghana, India, Iran, Jordan, and Nigeria). Table 3 shows selected sound pressure levels.

Table 3: Sound pressure levels in 28 cities of low and middle income countries

City, Country	Time period [hours] day/night	L_{Aeq} [dBA] Daytime	L_{Aeq} [dBA] Night-time	L_{Amax} [dBA] Daytime	L_{Amax} [dBA] Night-time	Reference
Algiers, Algeria	2/4	79	77	100	104	[98]
Buenos Aires, Argentina	15/9	75	71	71		[99]
Pabna, Bangladesh	15/9	91	80			[100]
Sao Carlos, Brazil	3	69				[101]
Beijing, PR China	16/8	74	73			[102]
Bogota, Colombia	14/10	73-77		92-102		[103]
Cairo, Egypt	15/9	81	75			[104]
Accra, Ghana	24	70-72				[105]
Kolkata, India	4	70-83				[106]
Jakarta, Indonesia	8	64-72				[107]
Tehran, Iran	12	72				[108]
Duhok city, Iraq	8	55-85				[109]
Amman, Jordan	1	51-75				[110],[111]
Cities, Kazakhstan	N. r.	70-85		90-100		[112]
Kenya, Nairobi	N. r.	68-70		72-78		[113]
Beirut, Lebanon	12	60-75				[114]
Kota Bharu, Malaysia	16	55-75		59-83		[115]
Puerto Vallarta, Mexico	1	55-85		70-92		[116]
Rabat, Morocco	11	62-76				[117]
Kathmandu, Nepal	N. r.	45-75	42-81			[118]
Abuja, Nigeria	5/1	73-84	44-57			[119]
Karachi, Pakistan	15/9	71-79	60-70	75-90	72-81	[120]
Manila/Quezon City, Philippines	N. r.	76-80				[121]
Colombo area, Sri Lanka	8	77-84		95-109		[122],[123]
Damascus, Syria	N. r.	63-94		78-113		[124]
Morogoro, Tanzania	9	62-71		76-83		[125]
Bangkok, Thailand	24	48-99				[126]
Hanoi, Vietnam	16/8	73-81	71-77			[127]

According to Table 3 noise levels in these cities by far exceed WHO guideline values [5]. Noise levels very often also do not comply with national or local standards.

NOISE IMPACTS

NOISE-INFO contains data on perceived noise induced health impacts (based on social surveys using questionnaires) such as hearing loss, annoyance, sleep disturbance, headache, and irritability, studied in 38 cities. Table 4 shows the results for hearing loss, annoyance and sleep disturbance.

Table 4: Some noise impacts in 21 cities in low and middle income countries

City, Country	Noise levels [dBA]	Observed or perceived impact	Percentage [%]	Odds ratio (95% CI)	Economic Impact/year [million US\$]	Reference
Algiers, Algeria	68-79	Highly annoyed	44			[98]
			28			
Dhaka, Bangladesh	70-85	Highly annoyed	71			[128]
		Hearing impairment	18			
Beijing, PR China	52-74	Highly annoyed	39			[129]
Bogota, Colombia	70-83	Annoyed	31			[130]
		Sleep disturbance	68			
Asiut, Egypt	83-94	Highly annoyed	49-98			[131]
		Sleep disturbance	35			
Cape Coast Metropolis, Ghana	67-85	Sleep disturbance	48			[132]
Aurangabad, India	40-102	Hearing impairment	66			[133]
Chandigarh, India	51-75	Sleep disturbance	56			[134]
Villages around Manado airport, Indonesia	60-73	Hearing impairment	18			[135]
		Sleep disturbance	58			
Tabriz, Iran	65-75	Annoyed to highly annoyed	63		120	[136]
		Economic loss per year				
Amman, Jordan	56-73	Sleep disturbance	30		79-225	[111]
Beirut, Lebanon	>65	Hearing impairment	96			[114]
		Sleep disturbance	70			
Kuala Lumpur, Malaysia	75-85	Hearing impairment	61			[137]
Kota Bharu, Malaysia	55-76	Hearing impairment		3.1 (1.3-7.6)		[138]
Rabat, Morocco	>65	Annoyed	17-70			[139]
Kupondole, Nepal	70-100	Hearing impairment		4.0 (1.2-13.0)		[140]
Ibadan, Nigeria	59-101	Hearing impairment	16			[141]
		Annoyance	38			

Karachi, Pakistan	>90	Hearing impairment of 56-70 dB	46			[142]
		Annoyed	70			
Colombo area, Sri Lanka	81	Minor hearing loss	28			[143],[144]
		Major hearing loss	14			
Morogoro, Tanzania	62-71	Hearing problem	31			[125]
		Sleep disturbance	28			
Hanoi, Vietnam	70-80	Highly annoyed	25-45			[127]

As shown in Table 4, noise-induced hearing loss was perceived/observed in 12 of the selected cities. Four studies have assessed hearing loss by audiometric survey [137], [138], [140], [143]. The percentages of affected people are appreciable, up to 96 percent for hearing loss, up to 98 percent of highly annoyed people, and up to 65 percent of sleep disturbed respondents. The costs of annoyance are also appreciable [111], [136].

CONCLUSION

The NOISE_INFO database has compiled information on legislation, noise levels and noise impacts from 28 out of 139 low income, lower and upper middle income countries. In some countries such as Brazil, India, Nigeria and Pakistan, sound pressure levels are monitored in a larger number of cities, especially India with monitoring in 46 cities. Monitoring, however, only assesses the noise challenge but does not mitigate it. Although all countries have set permissible noise limits, noise levels have not decreased in the last decade due to lack of enforcement. In addition, noise impacts are not often assessed and economic assessment of noise impacts have been evaluated in only two cities.

REFERENCES

- [1] Wan, G., Zhang, Y., 2017. Accelerating urbanization explained: The role of information. ADBI Working Paper No. 674. Asian Development Bank Institute, Tokyo. Report from: <https://www.adb.org/publications/accelerating-urbanization-explained-role-information>.
- [2] Schopenhauer, A., 1851. About noise and sound. Ueber Lärm und Geräusch. In: Parerga und Paralipomena. Kleine philosophische Schriften, Zweiter Band, Arthur Schopenhauer's sämtliche Werke, Fünfter Band, pp. 553-556. Globus Verlag, Berlin, 1902
- [3] Aphorism of Robert Koch. From: gutezitate.com/zitat/227675.
- [4] Vijayalakshmi, K.S., 2003. Noise pollution. In: Bunch, M.J., Suresh, V.M., Kumaran, T.V., Eds., *Proceedings of the Third International Conference on Environment and Health, Chennai, India, 15-17 December, 2003*. Chennai: Department of Geography, University of Madras and Faculty of Environmental Studies, York University. Pages 597 – 603. From: http://www.yorku.ca/bunchmj/ICEH/proceedings/Abstract_Vijayalakshmi_KS.htm.
- [5] *Guidelines for Community Noise* (Eds. B. Berglund, T. Lindvall, D. Schwela), World Health Organization, Geneva (1999). From: whqlibdoc.who.int/hq/1999/a68672.pdf.
- [6] World Bank country and lending groups – country classification. From: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>.
- [7] Law n° 83-03 of 5th February 1983 relating to the protection of the environment. Journal Officiel de la Republique Algerienne n° 25. Fevrier 1983. From: faolex.fao.org/docs/texts/alg4047.doc.
- [8] Executivte decree n° 93-184 of 27th July regulating sound emission, 1993. Journal Officiel de la Republique Algerienne n° 50, 28 juillet 1993. From: <http://www.vitamedz.org/articlesfiche/1211/1211383.pdf>.

- [9] Law on National Environmental Policy (Law 25,675), 2002. From: http://www.icaa.gov.ar/Documentos/Ges_Ambiental/LEY-25675-GENERAL-AMBIENTE.pdf.
- [10] Decree No. 39.025/83 of Buenos Aires. In: Miyara, F., undated. Aspectos legales de la lucha contra el ruido y pautas para su mejoramiento. From: <https://www.fceia.unr.edu.ar/acustica/biblio/legales.htm>.
- [11] Environment Protection Act, 1995. Bangladesh Gazette Extraordinary, 16.2.1995. From: extwprlegs1.fao.org/docs/pdf/bgd42272.pdf
- [12] Environment Conservation Rules 1997. Bangladesh Gazette Extraordinary, 28.8.1997. extwprlegs1.fao.org/docs/pdf/bgd19918.pdf
- [13] Law No. 6938/1981 National Environmental Policy, 1981. In: Isosceles Group, 2014. Brazil: Environment, health & safety profile and checklist. From: <http://www.mma.gov.br/port/conama/legi.cfm>.
- [14] CONAMA Resolution No. 01/1990 Criteria and Standards for Noise Emissions from Industrial Activities, 1990. Ministerio do Meio Ambiente - CONAMA, 2017. <http://www.mma.gov.br/port/conama/legiabre.cfm?codlegi=98>.
- [15] CONAMA Resolution No. 01/1990 Criteria and Standards for Noise Emissions from Industrial Activities, 1990. ABNT, 2000. Acústica – avaliação do nível do ruído em áreas habitadas, visando o conforto da comunidade – procedimento. Associação Brasileira de Normas Técnicas, NBR 10151. From: <http://www.semace.ce.gov.br/wp-content/uploads/2012/01/Avaliação+do+Ruído+em+Áreas+Habitadas.pdf>.
- [16] Pinto, F.A.de N.C., Mardones, M-D.M, 2009. Noise mapping of densely populated neighborhoods—example of Copacabana, Rio de Janeiro—Brazil. Environmental Monitoring and Assessment 155: 309–318.
- [17] Zannin, P.H.T., de Sant'Ana, D.Q., 2011. Noise mapping at different stages of a freeway redevelopment project – A case study in Brazil. Applied Acoustics 72: 479–486
- [18] Environmental Protection Law of the People's Republic of China, 1989. From: <http://www.china.org.cn/english/environment/34356.htm>.
- [19] Noise pollution prevention and control law, 1996. In: Beyer, S., 2006. Environmental law and policy in the People's Republic of China. Chinese Journal of International Law 5(1): 185-211. Laws of the People's Republic of China. From: <https://academic.oup.com/chinesejil>. <http://www.asianlii.org/cn/legis/cen/laws/lotprocotpacoenp931/>.
- [20] Law 2811: Renewable Natural Resources and Environmental Protection Code, 1974. In: Hoyos, A., 2012. Colombia Country Report, February 2012. Center for International Development at Harvard University. From: <https://juanfe.org/wp-content/uploads/2013/04/COLOMBIA-Country-Report-Feb-2012.pdf>.
- [21] Resolution 08321/1983 by the Ministry of Public Health. In: Blackman, A., Morgenstern, R., Murcia, L.M., Garcia de Brigard, J.C., 2006. Review of the efficiency and effectiveness of Colombia's environmental policies. Resources for the Future. From: <http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-Rpt-ColoEPEfficiency.pdf>.
- [22] DECRETO 948 DE 1995 (junio 5) por el cual se reglamentan, parcialmente la Ley 23 de 1973, los artículos 33, 73, 74, 75 y 75 del Decreto-Ley 2811 de 1974; los artículos 41, 42, 43, 44, 45, 48 y 49 de la Ley 9 de 1979; y la Ley 99 de 1993, en relación con la prevención y control de la contaminación atmosférica y la protección de la calidad del aire. From: <http://www.alcaldiabogota.gov.co/sisjur/normas/Norma1.jsp?i=1479>.
- [23] MAVDT, 2006. Resolución 0627 de 2006 por la cual se establece la norma nacional de emisión de ruido y ruido ambiental. Ministerio de Ambiente, Vivienda y Desarrollo Territorial. From: <http://www.alcaldiabogota.gov.co/sisjur/normas/Norma1.jsp?i=19982>.
- [24] Egyptian Environmental Law No. 4/1994, amended by Environmental Law No. 9/2009 and Environmental Law No. 105/2009. Cairo, Egypt: Egyptian Ministry of State for Environmental Affairs, 1994. From: faolex.fao.org/docs/pdf/egy4984E.pdf.
- [25] Prime Minister's Decree No. 338 of 1995 issuing the executive regulations of the Environment Law No. 4 of 1994. Ministry of Environment, 1994. Executive regulation of law number 4 of 1994. From: <http://www.eeaa.gov.eg/en-us/laws/envlaw.aspx>.
- [26] Environmental Protection Agency Act No. 490, 1994. Environmental Protection Agency Ghana. Regulations. From: <http://www.epa.gov.gh/epa/regulations>.
- [27] EPA set guidelines for noise-making. The Chronicle, May 16, 2012. From: <http://thechronicle.com.gh/epa-sets-guidelines-for-noise-making/>.
- [28] EPA launches motor emissions trial testing programme. Government of Ghana, 2017. From: <http://www.ghana.gov.gh/index.php/media-center/news/1813-epa-launches-motor-emissions-trial-testing-programme>.

- [29] The Air (Prevention and Control of Pollution) Act, 1981. From: <http://www.envfor.nic.in/legis/air/air1.html>.
- [30] The Environment Protection Act, 1986. From: <http://envfor.nic.in/legis/env/env1.html>.
- [31] The Noise Pollution (Regulation and Control) Rules, 2000 & Amendments 2000, 2002, 2006. Ministry of Environment and Forests Notification, 14.12.2000. From: <file://localhost/www.envfor.nic.in:legis:noise:noise.html>. http://envfor.nic.in:legis:legis_all.htm - J2.
- [32] Noise limits for vehicles. Noise standards. Central Pollution Control Board. Ministry of Environment, Forest & Climate Change, Government of India. From: http://www.cpcb.nic.in/Noise_Standards.php.
- [33] Noise standards for firecrackers. Noise standards. Central Pollution Control Board. Ministry of Environment, Forest & Climate Change, Govt of India. From: http://www.cpcb.nic.in/Noise_Standards.php.
- [34] Vibration standards for different countries/researchers, 2014. From: <http://www.ultraenviro.com/wp-content/uploads/2014/03/vibration-standards-for-different-countries.pdf>.
- [35] Law No. 32/2009 regarding Environmental Protection and Management. Environmental protection and management - FAOLex, 2009. From: <faolex.fao.org/docs/pdf/ins97643.pdf>.
- [36] Law of the Republic of Indonesia number 36 of 2009 on health. From: <https://de.slideshare.net/adeblonde/uu-ri-nomor-36-tahun-2009-ttg-kesehatan>.
- [37] Decree of Environment State Minister No. KEP-48/MENLH/11/1996 on noise quality standard. From: http://web.ipb.ac.id/~tml_atsp/test/Kepmen_LH_48_Tahun_1996.pdf.
- [38] Steckdaub, M., Sekartini, R., 2001. Environmental policy & vehicles inspection in Indonesia. Report from: <http://www.un.org/esa/gite/iandm/swisscontactpaper.pdf>.
- [39] Law on the Protection and Improvement of the Environment, 1974. From: <http://rc.majlis.ir/fa/law/show/97090>.
- [40] Regulations on the Environmental Protection Law, 1975. Department of Environment. Noise limits. From: <http://www.doe.ir/Portal/home/?140762/>.
- [41] Law no. 27 of 2009 of environmental protection and Improvement. Ministry of Environment, 2009. In Arabic and English. From: <http://archive.basel.int/legalmatters/natleg/documents/iraq01e.doc>; http://www.ilo.org/dyn/natlex/natlex4.detail?p_lang=en&p_isn=102971&p_count=3&p_classification=14.01.
- [42] Law No. 41 on noise protection and control. From: http://www.ilo.org/dyn/natlex/natlex4.detail?p_lang=en&p_isn=102971&p_count=3&p_classification=14.01.
- [43] Salih, S.A., Ali, R.A., 2015. Environmental Legislation Guides in Kurdistan Region - Iraq. From: <http://www.natureiraq.org/uploads/5/2/9/9/52997379/english.pdf>.
- [44] Environmental Protection Law No. 52, 2006. Ministry of Environment. From: <http://www.moenv.gov.jo/En/LegislationAndPolicies/Legislation/Regulations/Pages/EnvironmentalProtectionLaw.aspx-.WNU-CoXmiHk>.
- [45] Maximum permissible noise levels. Ministry of Environment, 1997. Quoted by: Al-Shobaki, H., Jamrah, A., 2008. A Study of Noise Pollution in Zarqa and Irbid, Jordan. Jordan Journal of Civil Engineering 2(3):279-306. From: https://elearning.just.edu.jo/jjce/issues/show_paper.php?pid=50.
- [46] The Law of the Republic of Kazakhstan on environmental protection, 1997. Climate Change Coordination Centre. Kasakhstanskaya Pravda, 5.8.1997. From: <http://www.climate.kz/eng/?m=html&cid=46>.
- [47] Code of the Republic of Kazakhstan, No. 212, 2007. From: <http://adilet.zan.kz/eng/docs/K070000212>.
- [48] SNiP II-12-77 Noise Protection. KazakhstanLaws. From: https://issuu.com/priyadharshini941/docs/snip_ii-12-77. <https://www.kazakhstanlaws.com/c-147-snip.aspx>.
- [49] The Environmental Management and Co-ordination Act, 1999, revised 2012. Laws of Kenya. Environment Management and Co-ordination Act, revised edition, 2012. From: <faolex.fao.org/docs/pdf/ken41653.pdf>.
- [50] The Environmental Management And Coordination (Noise And Excessive Vibration Pollution) (Control) Regulations, 2009. Legal notice No. 61. From: http://www.nema.go.ke/index.php?option=com_content&view=article&id=199&catid=2&Itemid=321.
- [51] Environment Law 444/2002. Ministry of Environment. Official report on the work progress of the Directorate General of Environment between 1999 and 2003. Report from: http://www.databank.com.lb/docs/Environmental_Governance-2010.pdf.
- [52] Noise standard levels, 1996. Ministry of Environment, 1996. Quoted in: Ezzedine, R., Hallak, B., Khalifey, F., Ladan, T., Shokor, N., 2016. Urban noise mitigation. AUBMC case study, American University of Beirut. CIVE 402 - Final Year Project, final report, May 5, 2016. Report from: https://www.aub.edu.lb/Neighborhood/Documents/Sawt_wa_Samt/FYP_-_Civil_Engineering_-_Noise_Mitigation_AUBMC_-_PAPERFINAL.pdf.

- [53] Environmental Quality Act, 1974; Amendment 2007. Laws of Malaysia - Act 127 of 1974. From: faolex.fao.org/docs/pdf/mal13278.pdf. Laws of Malaysia - Act A1315 of 2007. From: <https://www.doe.gov.my/portalv1/wp-content/plugins/download-attachments/includes/download.php?id=317456>.
- [54] Environmental noise limits, 2007. The planning guidelines for Environmental Noise Limits and Control. Ministry of Natural Resources and Environment. From: <https://www.doe.gov.my/portalv1/en/info-umum/the-planning-guidelines-for-environmental-noise-limits-and-control/272>.
- [55] Guidelines: Application for motorcycles exhaust emission and noise emission type approval. Jabatan Alam Sekitar Malaysia, July 2016. Report from: http://www.gunungganang.com.my/pdf/Malaysian-Policies-Standards-Guidelines/Guidelines/Planning_Guidelines_for_Environmental_Noise_Limits_and_Control.pdf.
- [56] The Planning Guidelines for vibration limits and control in the environment. Official Portal of Department of environment, ministry of Natural Resources & Environment. 2007. Report from: <https://www.doe.gov.my/portalv1/en/info-umum/the-planning-guidelines-for-vibration-limits-and-control-in-the-environment-2nd-edition-2007/265>.
- [57] General law for ecological equilibrium and the protection of the environment, 1988, amended 2010. DOF, 1988. Ley General del Equilibrio Ecologico y la Proteccion al Ambiente. Diario Oficial de la Federacion. From: http://www.oas.org/dsd/fida/laws/legislation/mexico/mexico_1988.pdf. Amendment: DOF, 2010. From: http://www.wipo.int/wipolex/es/text.jsp?file_id=199942.
- [58] General law for the environment and natural resources, 1996. DOF, 1996. Ley General del Medio Ambiente y los Recursos Naturales. Diario Oficial de la Federacion. From: <http://www.fao.org/forestry/12986-0fa4d65be6f7ff94fa7781bd750bed521.pdf>.
- [59] Maximum permissible noise levels. INE, 1994. Norma oficial mexicana nom-081-semarnat-1994, que establece los limites máximos permisibles de emisión de ruido de las fuentes fijas y su método de medición. Instituto Nacional de Ecología. From: <http://siga.jalisco.gob.mx/Assets/documentos/normatividad/nom081semarnat1994.htm>.
- [60] Law 11-03 on the protection and development of the environment, 2003. FAOLEX database, 2017. Food and Agriculture Organization of the United Nations. From: faolex.fao.org/docs/pdf/mor42766.pdf.
- [61] Law 12-03 relating to environmental impact assessment, 2003. FAOLEX database, 2017. Food and Agriculture Organization of the United Nations. From: faolex.fao.org/docs/pdf/mor42768.pdf.
- [62] Law 13-03 relating to air pollution abatement, 2003. FAOLEX database, 2017. Food and Agriculture Organization of the United Nations. From: faolex.fao.org/docs/pdf/mor42768.pdf.
- [63] Protection of Environment Act, 1997. Democracy gateway to Nepal politics and civil society. Friedrich Ebert Stiftung. From: http://www.nepaldemocracy.org/documents/national_laws/environment_protection_act.htm.
- [64] Environment Protection rules, 1997. Nepal Climate Change Support Programme, Ministry of Population and Environment. From: http://www.nccsp.gov.np/publication/environment_protection_rules-2054_1997.pdf.
- [65] Sound quality national standard, 2012. Document archives and downloads. Ministry of Science and Technology, Nepal. From: http://moste.gov.np/legal_documents/Regulation_-_WNzTi4XmiHk.
- [66] Regulations/Standards/Guidelines. Document Archives and Downloads. Ministry of Science and Technology, Government of Nepal. From: http://moste.gov.np/legal_documents/Regulation?sort=pd.name&order=DESC_-_WOE2B4XmiHk.
- [67] Federal Environmental Protection Agency (FEPA) Act, 1988. Pace University, Elisabeth Haub School of Law. From: http://www.law.pace.edu/sites/default/files/IJIEA/primary_sources/Nigeria_Environmental_Protection_Agency_Act_1988.pdf
- [68] National Environmental Standards and Regulations Enforcement Agency (Establishment) Act, 2007. FAOLEX database, 2017. Food and Agriculture Organization of the United Nations. From: faolex.fao.org/docs/pdf/nig120569.pdf.
- [69] National Environmental (Noise Standards and Control) Regulations, 2009. Official Gazette No. 67, Vol. 96, Abuja - 19 October 2009. From: <http://www.ecolex.org/details/legislation/national-environmental-noise-standards-and-control-regulations-2009-si-288-of-2009-lex-faoc146077/>.
- [70] Ijajja, H., 2014. The legal regime of noise pollution in Nigeria. Beijing Law Review 5(1): 1-6. From: http://file.scirp.org/Html/1-3300230_43969.htm.
- [71] Pakistan Environmental Protection Act (PEPA), 1997. From: <https://www.elaw.org/system/files/Law-PEPA-1997.pdf>.

- [72] National Environmental Quality Standards, 1994. The Gazette of Pakistan, November 26, 2010. Ministry of Environment Notifications. National environmental standards for noise. In: Study on NEQS development (National Environmental Quality Standards) for transport sector. UNDP-NEQS-Final-Report, 2015. Report from: pakstran.pk/docs/reports/UNDP-NEQS%20Final%20Report.pdf.
- [73] Khyber Pakhtunkwa Environmental Protection Act, 2014. In: Khan, S., Environmental legislation in Pakistan, undated. Environmental Protection Agency, Government of Khyber Pakhtunkhwa. From: <http://docplayer.net/33023236-Environmental-legislation-in-pakistan.html>.
- [74] The Gazette of Pakistan, 2009. Statutory notifications containing Rules and Orders issued by all Ministries and Divisions of the Government of Pakistan and their Attached and Subordinated Offices and the Supreme Court of Pakistan. From: [environment.gov.pk/NEQS/SRO%2072\(KE\)2009%20vehicle.pdf](http://environment.gov.pk/NEQS/SRO%2072(KE)2009%20vehicle.pdf).
- [75] Presidential Decree No. 984, 1976. The LAWPHiL Project. Arellano Law Foundation. Philippine laws and jurisprudence databank. From: http://www.lawphil.net/statutes/presdecs/pd1976/pd_984_1976.html.
- [76] Presidential Decree No. 1152 - Philippine Environmental Code, 1977. The LAWPHiL Project. Arellano Law Foundation. Philippine laws and jurisprudence databank. From: http://www.lawphil.net/statutes/presdecs/pd1977/pd_1152_1977.html.
- [77] Clean Air Act, 1999. Republic Act No. 8749/1999. Chan Robles virtual law library. From: <http://www.chanrobles.com/philippinecleanairact.htm>.
- [78] DENR Administrative Order No. 2002-17. Defining the organizational structure and major responsibilities of the Environmental Management Bureau as a line Bureau by virtue of Section 34 of the Philippine Clean Air Act of 1999 (RA 8749). From: http://www.mgb.gov.ph/images/stories/DAO_2002-17.pdf.
- [79] Noise standards, 1980. NPCC Memorandum Circular No. 002/1980. Amendments to Article 1 (Noise Control Regulations). Ministry of Human Settlements. Official Gazette, October 6, 1980. From: <https://d0ctrine.com/2012/04/03/noise-standards-in-the-philippines/>.
- [80] National Environmental Act, 1980. Act No. 47, amended 1988 and 2000. Central Environmental Authority. From: <http://www.cea.lk/web/index.php/en/acts-regulations>. Amendment Act No. 56, 1988. From: <http://www.cea.lk/web/index.php/en/acts-regulations>.
- [81] National Environmental (Amendment) Act, 1988. Act No. 56, 1988. Central Environmental Authority. Amendment Act No.53, 2000. From: <http://www.cea.lk/web/index.php/en/acts-regulations>.
- [82] National Environmental (Noise Control) Regulations No.1, 1996, amended 1997. Order published under the Gazette Notification No. 924/12 dated 23.05.1996. Minister of Transport, Environment and Women's Affairs. Amendment Regulation No. 1, Notification No. 973/7, 1997. From: <http://www.cea.lk/web/index.php/en/acts-regulations>.
- [83] National Environmental (Vehicle Horns) Regulations No. 1, 2011. Order published under the Gazette Notification No.1738/37 dated 29.12.2011. Minister of Environment. From: <http://www.cea.lk/web/index.php/en/acts-regulations>.
- [84] Noise and vibration measurements, 2017. Central Environmental Authority. From: <http://www.cea.lk/web/index.php/en/air-quality>.
- [85] Law No. 50, 2002 on Environmental Protection. Ministry of Local Administration and Environment, 2017. From: <http://www.parliament.gov.sy/arabic/index.php?node=201&nid=16193&ref=tree&>.
- [86] Implementing Regulation of Law No. 50 of 2002 on Environmental Protection. In: Kasperek, M., Dimashki, M., 2009. Country environmental profile for the Syrian Arab Republic. Delegation of the European Commission to Syria. Final report. Report from: <https://www.researchgate.net/>.
- [87] Maximum Noise Thresholds, 2003. Ministry of State for Environmental Affairs, undated. Noise - The permissible limits of sound intensity. From: <http://www.4enveng.com/pdetails.php?id=28>.
- [88] Environmental Management Act, 2004. In. Walmley, B. & Patel, S., 2011. Handbook on environmental assessment legislation in the SADEC region, 3rd edition. Pretoria: Development Bank of Southern Africa (DBSA) in collaboration with the Southern African Institute for Environmental Assessment (SAIEA). Report from: http://www.saiea.com/dbsa_handbook_update2012/pdf/Handbook.pdf.
- [89] Environmental Impact Assessment and Audit Regulations, 2005. From: <http://www.ecolex.org/details/legislation/environmental-impact-assessment-and-audit-regulations-2005-gn-no-349-of-2005-lex-faac071740/>.
- [90] Noise schedules for various areas, undated. EMDC 6 (1733) P 2: Acoustics - General tolerance limits for environmental noise. Tanzania Bureau of Standards. National Environmental Standards Compendium. From:

- http://www.tzdpq.or.tz/fileadmin/migrated/content_uploads/National_Environmental_Standards_Compendum.pdf.
- [91] The Enhancement and Conservation of the National Environment Quality Act, 1992. Thai Environmental Regulations. Pollution Control Department. From: http://www.pcd.go.th/info_serv/en_reg_envi.html.
- [92] Noise and vibrations standards, 1997. Notification of Environmental Board No. 15, 1997, under the Conversation and Enhancement of National Environmental Quality Act, 1992, dated March 12 1997. Pollution Control Department. From: http://www.pcd.go.th/info_serv/en_reg_std_airsnd04.html.
- [93] Air quality and noise standards, 2017. Pollution Control Department, From: http://www.pcd.go.th/info_serv/en_reg_std_airsnd02.html.
- [94] Law on Environmental Protection, 2014. National Assembly No. 55/2014/QH13, Socialist Republic of Vietnam. From: http://www.ilo.org/dyn/legosh/en/f?p=LEGPOL:503:::503:P503_REFERENCE_ID:172932. Also see: Revised law on environmental protection. Vietnam Law & Legal Forum. From: <http://vietnamlawmagazine.vn/revised-law-on-environmental-protection-4074.html>.
- [95] National technical regulation on noise. QCVN 26:2014/BTNMT. Ministry of Natural Resources and the Environment. In: Hang, N.T., 2016. Vibration and noise regulation in Vietnam. APMP-TCAUV Workshop, Da Nang, Vietnam. From: http://www.apmpweb.org/fms/get_file.php?index=NDkyNA==.
- [96] National technical regulation on vibration. QCVN 27:2010/BTNMT. Ministry of Natural Resources and the Environment. In: Hang, N.T., 2016. Vibration and noise regulation in Vietnam. APMP-TCAUV Workshop, Da Nang, Vietnam. From: http://www.apmpweb.org/fms/get_file.php?index=NDkyNA==.
- [97] Miyara, F., undated. Aspectos legales de la lucha contra el ruido y pautas para su mejoramiento. From: <https://www.fceia.unr.edu.ar/acustica/biblio/legales.htm>.
- [98] Bousseksou, N., Peters, A., Wilson, M., 2008. Preliminary results of noise monitoring from entertainment halls in Algeria. Conference: Institute of Acoustics Spring Conference of the Institute of Acoustics 2008 "Widening Horizons in Acoustics" Proceedings of the Institute of Acoustics Volume 30, Part 2 April 10 – 11, 2008 Reading, UK. From: https://www.researchgate.net/publication/284680596_PRELIMINARY_RESULTS_OF_NOISE_MONITORING_FROM_ENTERTAINMENT_HALLS_IN_ALGERIA.
- [99] Ausejo, M., Recuero, M., Asensio, C., Pavon, I., Lopez, J.M., 2010. Study of Precision, Deviations and Uncertainty in the Design of the Strategic Noise Map of the Macrocenter of the City of Buenos Aires, Argentina. Environmental Modelling and Assessment 15: 125–135.
- [100] Arifuzzaman, K., Razu, S.M.H., 2015. Road traffic noise pollution: Present scenario and potential noise attenuation strategy for Pabna Municipality, Bangladesh. International Journal of Advanced Research 3(4): 782-789.
- [101] Giunta, M.B., Suriano, M.T., de Souza, L.C.L, Viviani, E., 2015. The role of traffic flow and the Floor Space Index (FSI) in predicting environmental noise. http://web.mit.edu/cron/project/CUPUM2015/proceedings/Content/analytics/143_giunta_h.pdf.
- [102] Li, H.-J., Yu, W.-B., Lu, J.-Q., Zeng, L., Li, N., Zhao, Y.-M., 2008. Investigation of road traffic noise and annoyance in Beijing: A cross-sectional study of 4th Ring Road. Archives of Environmental & Occupational Health 63(1): 27-33.
- [103] Pacheco, J., Franco, J.F., Behrenz, E., 2009. Caracterización de los niveles de contaminación auditiva en Bogotá: Estudio piloto. (Noise pollution on Bogotá City: A pilot study). Revista de Ingeniería, Universidad de los Andes, Bogotá, Colombia. Report from: <http://www.scielo.org.co/pdf/ring/n30/n30a10.pdf>.
- [104] Ministry of Environment, 2016. Annual report on noise pollution. Report from: <http://www.eeaa.gov.eg/en-us/home.aspx>.
- [105] Sowah, R.A., Alfred, Y.A., Carboo, D., Adaboh, R.K., 2014. Noise Pollution in Teshie-Nungua Schools. Journal of Natural Sciences Research 4(21): 90-98.
- [106] Chowdhury, A.K., Debsarkar, A., Chakrabarty, S., 2015. Critical assessment of daytime traffic noise level at curbside open-air microenvironment of Kolkata City, India. Journal of Environmental Health Science and Engineering 13: 65, 1-6. From: <http://download.springer.com/static/pdf/641/art%3A10.1186%2Fs40201-015-0219-6.pdf?originUrl=http%3A%2F%2Fjehse.biomedcentral.com%2Farticle%2F10.1186%2Fs40201-015-0219-6&token2=exp=1491299896~acl=%2Fstatic%2Fpdf%2F641%2Fart%3A10.1186%2Fs40201-0>.
- [107] Prasetyo, S., Kusnopranto, H., Alikorda, H.S., Koestoer, R.H., 2016. Model of noise propagation in urban area: A case study in Jakarta. OIDA International Journal of Sustainable Development 9 (2): 45-50. From: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2739810.

- [108] Biglari, H., Saeidi, M., Poursadeghivan, M., Sharafi, H., Narooie, M.R., Alipour, V., Rahdar, S., Khksefidi, R., Zarei, A., Ahamadabadi, M., 2016. A study on noise pollution in the city of Tehran. IJPT 8(3): 17942-17948. From: <http://www.ijptonline.com/wp-content/uploads/2016/10/17942-17948.pdf>.
- [109] Yousif, K.M., 2015. Study of noise pollution during Nawruz festival in Duhok city, Iraq. International Journal of Advanced and Applied Sciences, 2(8): 23-28.
- [110] Al-Qdah, K.S., 2014. The Assessment and Analysis of Traffic Noise Pollution in the City of Amman. International Journal of Environmental Protection 4(5): 68-72.
- [111] Goussous, J. Al-Dakhlallah (Tomah), A., Jadaan, K.S., Al-Zioud, M. A., 2012. Road traffic noise in Amman, Jordan: Magnitude and cost investigation. Journal of Traffic and Logistics Engineering 2(2): 104-107. From: <http://www.jtle.net/uploadfile/2014/0428/20140428032707397.pdf>.
- [112] Seksenova, L.S., Mukhamejjanova, Z.T., Battakova, J.E., Abitayev, D.S., 2011. Causes of high noise level in cities of Kazakhstan. International Journal of Applied and Fundamental Research 6:19-21. <http://cyberleninka.ru/article/n/causes-of-high-noise-level-in-cities-of-kazakhstan>.
- [113] Wawa, E.A. and Mulaku, G.C. (2015) Noise Pollution Mapping Using GIS in Nairobi, Kenya. Journal of Geographic Information System 7: 486-493. From: <http://dx.doi.org/10.4236/jgis.2015.75039>.
- [114] Fooladi, M.M., 2012. Involuntary and persistent environmental noise influences health and hearing in Beirut, Lebanon. Journal of Environmental and Public Health, Volume 2012, Article ID 235618, 7 pages. doi:10.1155/2012/235618. From: <https://www.hindawi.com/journals/jep/2012/235618/>.
- [115] Hassan, S., Taha, H.M., Sidek, D., Ismail, C., 2012. Field survey on road traffic noise, evaluation of hearing loss and associated risk factors in the community of Kota Bharu, Malaysia. Pakistan Journal of Otolaryngology 2012; 03-06. From: www.medic.usm.my/images/files/pub-june/nonindexed_07.pdf.
- [116] Ruiz-Boullosa, R.R., Alvarado-Zamorano, C., 2011. On the sound environment of the city of Puerto Vallarta, Jalisco, Mexico. Journal of Applied Research and Technology 9(12): 430-441. From: <http://www.revistas.unam.mx/Home/Vol9/No03/Boullosa>.
- [117] Mohammed, G., Najma, L., Adil, A., 2016. Road traffic noise analysis and annoyance in Moroccan cities: case of Rabat. 22nd International Congress on Sound and Vibration, Florence, Italy, 12-15 July, 2015. From: https://www.researchgate.net/publication/305612697_road_traffic_noise_analysis_and_annoyance_in_moroccan_cities_case_of_rabat.
- [118] Environment Statistics of Nepal, 2013. Central Bureau of Statistics, National Planning Commission Secretariat, Government of Nepal. Report from: cbs.gov.np/sectoral_statistics/Environment/esn2013.
- [119] Anomohanran, O., 2013. Evaluation of environmental noise pollution in Abuja, the capital city of Nigeria. IJRRAS 14 (2): 470-476. From: www.arpapress.com/Volumes/Vol14Issue2/IJRRAS_14_2_24.pdf.
- [120] Study on NEQS development (National Environmental Quality Standards) for transport sector. UNDP-NEQS-Final-Report, 2015. Report from: pakstran.pk/docs/reports/UNDP-NEQS%20Final%20Report.pdf.
- [121] Fajardo, B., I., 2007. A study on individual perceptions of road traffic noise. Presentation at the 27th IAIA Conference, Seoul, Korea. From: <http://conferences.iaia.org/2007/pdf/185>.
- [122] Nagodawithana, N.S., Pathmeswaran, A., Pannila, A.S., Wickremasinghe, A.R., Sathiakumar, N., 2016. Environmental pollution by traffic noise in the city of Colombo, Sri Lanka. Asian Journal of Water, Environment and Pollution 13(3):67-72. DOI: 10.3233/AJW-160028. From: https://www.researchgate.net/publication/305431182_Environmental_Pollution_by_Traffic_Noise_in_the_City_of_Colombo_Sri_Lanka.
- [123] Kalansuriya, C.M., Pannila, A.S., Sonnadara, D.U.J., 2015. Traffic composition and variability of road traffic noise levels in the vicinity of Colombo, Sri Lanka. J. National Science Foundation Sri Lanka 43(2):135-140. From: <http://jnsfsl.sljol.info/articles/abstract/10.4038/jnsfsr.v43i2.7941/>
- [124] Ministry of State for Environmental Affairs, undated. Noise - the permissible limits of sound intensity. From: <http://www.4enveng.com/pdetails.php?id=28>.
- [125] Gaganija, M.S., Mkoma, S.L., Lema, E.s., 2012. Attitudes of community to urban traffic noise in Morogoro, Tanzania. Ethiopian Journal of Environmental Studies and Management 5(3): 218-224. From: [http://www.ajol.info/JournalHome/Vol5/No3\(2012\)](http://www.ajol.info/JournalHome/Vol5/No3(2012)).
- [126] Sound pressure levels at eight urban sites in Bangkok. Pollution Control Department, 2015. Compiled from: http://qendb.pcd.go.th/noise/en_noiselevel.asp?view_month=12&view_year=2015.
- [127] Phan, H.Y.T., Yano, T., Phan, H.A.T., Nishimura, T., Sato, T., Hashimoto, Y., 2010. Community responses to road traffic noise in Hanoi and Ho Chi Minh City. Applied Acoustics 71: 107-114.

- [128] Banglapedia, 2015. Noise pollution. National Encyclopedia of Bangladesh. http://en.banglapedia.org/index.php?title=Noise_Pollution&oldid=19302.
- [129] Li, H.-J., Yu, W.-B., Lu, J.-Q., Zeng, L., Li, N., Zhao, Y.-M., 2008. Investigation of road-traffic noise and annoyance in Beijing: A cross-sectional study of 4th ring road. *Archives of Environmental & Occupational Health* 63(1): 27-33.
- [130] Preliminary results of a noise study: Debate consejo de Medellin - ruido, Secretariat de Salud, 02-06-2015. From: <https://de.slideshare.net/ConcejoMDE/niveles-de-ruido-secretara-de-salud>.
- [131] Ali, A.A., 2005. Railway noise levels, annoyance and countermeasures in Asiut, Egypt. *Applied Acoustics* 66: 105–113
- [132] . Armah, F.A., Odoi, J.O., Yawson, D.O., Yengoh, G.T., Arifa, E.K.A., Pappoe, A.N.M., 2010. Mapping of noise risk zones derived from religious activities and perceptions in residential neighbourhoods in the Cape Coast metropolis, Ghana. *Environmental Hazards* 9(4): 358-368. doi:10.3763/ehaz.2010.0003.
- [133] Khan, S.T., Karadkhedkar, S., Khadkekar, S., 2014. Noise induced hearing loss in city policemen. *Research & Reviews: Journal of Medical and Health Science*. From: <https://www.rroij.com/open-access/noise-induced-hearing-loss-in-city-traffic-policeman.php?aid=34818>.
- [134] Ravindra, K., Singh, T., Tripathy, J.P., Mor, S., Munjal,s., Patro, B., Panda, N., 2016. Assessment of noise pollution in and around a sensitive zone in North India and ist non-auditory impacts. *Science of the Total Environment* 566-567: 981-987. doi: 10.1016/j.scitotenv.2016.05.070. From: https://www.researchgate.net/publication/304066680_Assessment_of_noise_pollution_in_and_around_a_sensitive_zone_in_North_India_and_its_non-auditory_impacts.
- [135] Sondakh, D., Maryuani, Soemarno, Setiawan, B., 2014. Analysis of noise pollution on airport environment (Case study of international airport of Sam Ratulangi Manado, Indonesia). *International Journal of Engineering Intervention* 4(2): 13-19.
- [136] Roshan, S., A., Ahmadi, O., 2015. Measurement and Monetary Valuation of Traffic Noise Pollution by the Top-Down Method in Tabriz City. *Health Scope* 4(4): e29019. DOI: 10.17795/jhealthscope-29019. From: jhealthscope.com/48498.pdf.
- [137] Thomas N, Mariah AN, Fuad A, Kuljit S, Philip R.,2007. Noise exposure and noise induced hearing loss among Kuala Lumpur traffic point duty personnel. *Medical Journal of Malaysia* 62(2):152-155. From: <http://www.e-mjm.org/2007/v62n2/index.html>.
- [138] Hassan, S., Taha,H.,M., Sidek, D., Ismail, C., 2012. Field survey on road traffic noise, evaluation of hearing loss and associated risk factors in the community of Kota Bharu, Malaysia. *Pakistan Journal of Otolaryngology* 2012; 03-06. From: www.medic.usm.my/images/files/pub-june/nonindexed_07.pdf.
- [139] Garoum, M., Kharbaoui, W., Bahoussa, A., Rhachiand, M., Moreno, A., 2007. Preliminary analysis of community response to road traffic noise in Moroccan cities. 19th International Congress on Acoustics. Madrid, 2-7 September 2007. From: https://www.researchgate.net/publication/305612697_road_traffic_noise_analysis_and_annoyance_in_moroccan_cities_case_of_rabat.
- [140] Joshi, S.K., Devkota, S., Chamling, S., Shrestha, S., 2003. Environmental noise induced hearing loss in Nepal. *Kathmandu University Medical Journal* 1(3): 177-183. From: https://www.researchgate.net/publication/7383590_Environmental_noise_induced_hearing_loss_in_Nepal.
- [141] Oguntoke, O., Olatinwo, M., Taiwo, O.J., 2015. Spatial association between environmental noise levels and occurrence of children hearing impairments in Ibadan Metropolis, Nigeria. *Applied Environmental Research* 37(3): 79-89. From: <http://www.tci-thaijo.org/index.php/aer>.
- [142] Siddiqui, I.A., Nizami, S., Chandio, R.R., Nizami, S., Sikander, N., Ashraf, S., 2015. Consequences of traffic noise in residents of Karachi, Pakistan. *Pakistan Journal of Medical Science* 31(2): 448-452. doi: <http://dx.doi.org/10.12669/pjms.312.6367>. From: [pjms.com.pk](http://www.pjms.com.pk) > Home > Vol 31, No 2 (2015) > Siddiqui.
- [143] Nagodawithana, N.S., 2015. Prevalence and correlates of noise induced hearing loss among traffic policemen in the city of Colombo, Sri Lanka. Abstracts from the 20th IEA World Congress of epidemiology, Anchorage, Alaska, USA, 17-21 August 2014 (WCE 2014). *International Journal of Epidemiology* 44(suppl_1): i266.
- [144] Nagodawithana, N., Pathmeswaran, P., Pannila, A., Sathiakumar, N., 2015. Hearing loss among policemen in the city of Colombo, Sri Lanka. *Asian Journal of Water, Environment and Pollution* 12(3): 9-14. DOI 10.3223/AJW-150002. From: https://www.researchgate.net/publication/280625100_Noise-induced_Hearing_Loss_among_Traffic_Policemen_in_the_City_of_Colombo_Sri_Lanka.