JGIS> Vol.4 No.4, August 2012

OPEN ACCESS

3D Analysis and Investigation of Traffic Noise Impact from Hemmat Highway Located in Tehran on Buildings and Surrounding Areas

PDF (Size:1554KB) PP. 322-334 DOI: 10.4236/jgis.2012.44037

Author(s)

Hamid Reza Ranjbar, Ali Reza Gharagozlou, Ali Reza Vafaei Nejad

ABSTRACT

This study analyzes and investigates the impact of traffic noise on high rise buildings and surrounding areas by the side of Hemmat Highway that links west of Tehran to the east. In this study, a 3D traffic noise simulation model is applied on a GIS system. Visualized noise levels are formulated by the proposed model for noise mapping on all surfaces of the buildings and surrounding ground in a 3D platform. The investigation shows that there is a high traffic noise impact on the foreground and front facades of buildings, rendering these areas unsuitable for residential purposes. The ground area by the sides of buildings and the building side panels receive a lower noise impact. Most of these areas are still not acceptable for residential and even commercial use, only the back yards and back panels, have the lowest traffic noise impact. It also shows that the building height is not an effective factor for reducing motorway noise on the upper part of the building. Finally, construction cantilever barriers with a height of seven meters, close to the outer edge of the highway was presented as an effective way to reduce noise within the allowable range of noise pollution for commercial and residential purposes.

KEYWORDS

Noise Pollution; Traffic Noise Model; 3D City Model; Three-Dimensional Modeling of Noise

Cite this paper

H. Reza Ranjbar, A. Reza Gharagozlou and A. Reza Vafaei Nejad, "3D Analysis and Investigation of Traffic Noise Impact from Hemmat Highway Located in Tehran on Buildings and Surrounding Areas," *Journal of Geographic Information System*, Vol. 4 No. 4, 2012, pp. 322-334. doi: 10.4236/jgis.2012.44037.

References

[1] M. Arana and A. Garcia, "A Social Survey on the Effects of Environmental Noise on the Residents of Pamplona," Applied Acoustics, Vol. 53, No. 4, 1998, pp. 245-253. doi:10.1016/S0003-682X(97)00067-4

[2] G. Belojevic, B. Jakovlevic and O. Aleksic, "Subjective Reactions for Traffic Noise with Regard to Some Personality Traits," Environmental International, Vol. 23, No. 2, 1997, pp. 221-224. doi:10.1016/S0160-4120(97)00008-1

[3] M. El-Fadel, S. Shazbak, M. H. Baaj and E. Saliby, "Parametric Sensitivity Analysis of Noise Impact of Multihighways in Urban Areas," Environmental Impact Assessment, Vol. 22, No. 2, 2002, pp. 145-162. doi:10.1016/S0195-9255(01)00101-9

[4] J. C. Seong, T. H. Park, J. H. Ko, S. I. Chang, M. Kim, J. B. Holt and M. R. Mehdi, "Modeling of Road Traffic Noise and Estimated Human Exposure in Fulton County, Georgia, USA," Environment International, Vol. 37, No. 1, 2011, pp. 1336-1341. doi:10.1016/j.envint.2011.05.019

[5] D. Butler, "Noise Management: Sound and Vision," Nature, Vol. 427, No. 6974, 2004, pp. 480-482. doi:10.1038/427480a

[6] V. K. Kurakula and M. Kuffer, "3D Noise Modeling for Urban Environmental Planning and Management," REAL CORP, Vol. 432, No. 1, 2008, pp. 517-523.

JGIS Subscription

Most popular papers in JGIS

About JGIS News

Frequently Asked Questions

Recommend to Peers

Recommend to Library

Contact Us

[7] S. A Hojat and M. A. Rajabi, "Modeling of Noise Pollution by Using 3D City Model in GIS Environment," M.Sc. Thesis, GIS Department, Faculty of Geodesy & Geomatics Engineering, Tehran University, Tehran, 2008.

[8] S. Rahmani, S. M. Mousavi and M. J. Kamali, "Modeling of Road-Traffic Noise with the Use of Genetic Algorithm," Applied Soft Computing, Vol. 11, No. 1, 2011, pp. 1008-1013. doi:10.1016/j.asoc.2010.01.022

[9] P. Pamanikabud and M. Tansatcha, "3D Analysis and Investigation of Traffic Noise Impact from a New Motorway on Building and Surrounding Area," Applied Acou stics, Vol. 71, No. 1, 2010, pp. 1185-1193. doi:10.1016/j.apacoust.2010.08.003

[10] T. M. Barry and J. A. Reagan, "FHWA Highway Traffic Noise Prediction Model," Computers, Environment and Urban Systems, Vol. 27, No. 1, 2003, pp. 85-102.

[11] R. Silvia, H. Ricardo and C. J. Luis, "Evaluation and Prediction of Noise Pollution Levels in Urban Areas of Cdiz (Spain)," Acoustical Society of America Journal, Vol. 114, No. 1, 2003, pp. 2439-2439.

[12] Bruel and Kjaer, "Environmental Noise," 2002. http://www.bksv.com/pdf/Environmental%20Noise%20Booklet.pdf

[13] World Health Organization, "Guidelines for Community Noise," 1999. http://www.ruidos.org/Noise/WHO_Noise_guidelines_contents.html

[14] H. Kluijver and J. Stoter, "Noise Mapping and GIS: Optimising Quality and Efficiency of Noise Effect Studies," Computers, Environment and Urban Systems, Vol. 27, No. 1, 2003, pp. 85-102. doi:10.1016/S0198-9715(01)00038-2

[15] Environment Agency, "Horizontal Guidance for Noise," 2002. www.environmentagency gov.uk/commondata/acrobat/h3_pt2__june_2004__v3_353249.pdf

[16] M. G. S. Rao, P. R. Rao, K. S Dev and K. V. Rao, "A Model for Computing Environmental Noise Levels Due to Motor Vehicle Traffic in Visakhapatnam City," Applied Acoustics, Vol. 27, No. 2, 1989, pp. 129-136. doi:10.1016/0003-682X(89)90005-4

[17] P. Pamanikabud and P. Vivitjinda, "Noise Prediction for Highways in Thailand," Transportation Research Part D: Transport and Environment, Vol. 7, No. 6, 2002, pp. 441-449. doi:10.1016/S1361-9209(02)00012-3

[18] E. Murphy and E. A. King, "Strategic Environmental Noise Mapping: Methodological Issues Concerning the Implementation of the EU Environmental Noise Directive and Their Policy Implications," Environment International, Vol. 36, No. 1, 2010, pp. 290-298. doi:10.1016/j.envint.2009.11.006

[19] C. A Steele, "Critical Review of Some Traffic Noise Prediction Models," Applied Acoustics, Vol. 62, No. 1, 2001, pp. 271-287. doi:10.1016/S0003-682X(00)00030-X

[20] G. R. Watts, "Harmonoise Prediction Model for Road Traffic Noise," 2005. http://www.imagine-project.org/

[21] AEA Technology Rail BV, "Harmonised Accurate and Reliable Methods for the EU Directive on the Assessment and Management of Environmental Noise," 2005. http://www.imagineprojectorg/bestanden/D13p1_WP1.2_manual_HAR12TR-040112-SNCF10.pdf

[22] Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieu, "Handleiding Meten en Rekenen Industrielawaai (Calculation and Measurement Methods Industry Noise)," Ministry of Housing,