

## Urban Noise and Transport as a Strategy of Environmental Quality

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## **2aNS4. Urban Noise and Transport as a Strategy of Environmental Quality**

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Urban noise has become an essential element of environmental analysis in recent years. It is a good tool for assessing environmental quality in urban environments. Residents of large cities are demanding more options of transportation to achieve energy efficiency, low emission of pollutants, and strategic routes, among others. This proposal presents the results of a diagnosis study of urban noise in a heavy traffic avenue in Guadalajara city. The project was performed at the time the infrastructure for the Bus Rapid Transit (BRT) was completed and right after the new transportation system started working on Independencia Avenue. The results of the project indicated that the operation of a fast and environmentally friendly bus reduces noise emissions significantly, and it also contributes to the improvement of acoustic quality of the avenue, benefiting both, people and the environment.

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## INTRODUCTION

Guadalajara city as the main urban complex at the Occidental part of the country is the supplier of goods and services to surrounding urban centers. Studies of environmental sustainable cities show that concentration of activities correlates well with environmental degradation and negative impacts on population's health due to compromised environments. [1, 2]

In the national context, the Metropolitan area of Guadalajara holds the second place of economic importance, right after Mexico City. Some of the activities associated with its development involve trade, investment, tourism, good health facilities, high education opportunities, and manufacture industry. Since Guadalajara is an important place for development and work opportunities, people from surrounded less developed counties feel attracted to it. Massive concentrations of people demand more resources and services, which disturb the balance of most natural systems that sustain the environment. As a consequence, urban communities face important challenges, for example the use and protection of the natural environment and resources, poverty, insecurity, housing and commuting, to name but a few. [3]

In order to handle these issues, it is necessary to design integral plans to stop environmental, social and commuting problems. These plans should include improvements on public transportation such as massive systems which are more efficient in terms of energy consumption, gas and noise emissions. [4]

Environmental conditions greatly influence quality of life within a community. Depending on the state of the surroundings, the environment may improve or degrade conditions for an individual. Deleterious health impacts may be observed in particularly vulnerable groups. [5]

Projects should be focused on how to take care of the environment, trying to look for ways to do it without harming nature. Environmental quality has different connotations in urban areas, and some of them are related to the presence of factors that define healthy or unhealthy settings for the development of life. The presence of pollutants in air, water quality, traffic jams in cities, lack of green areas and open spaces, as well as high noise levels, are factors that affect the quality of life of exposed communities. [6]

The quality of life of city residents and urban environment is influenced by noise hazards [7]. Noise is mainly produced by means of transportation, events in open spaces that attract large crowds of people, centers of industry, employment and commerce. In this sense, urban soundscapes are significantly different from the rural ones in terms of quantity and intensity of emission sources, and deterioration of living spaces. [8]

In the developed urban world, noise is well identified as an environmental problem, while in most Latin-American countries – specially México - it is underestimated or ignore in most official reports, which mainly stress problems related to water, air pollution and biodiversity loss. Even when there is enough evidence of noise impacts in industrial workers (hearing impairment and low productivity ratios to mention but a few), that problem has not been taken seriously in most developing countries. Environmental scenarios within these countries lack well-defined inspection and monitoring programs of

noise pollution due to the fact that authorities focus their attention on more evident and practical environmental issues such as water sanitation, vector diseases and urban waste [9].

In January 2009, Jalisco's government started a commuting project that involved the improvement and the development of new transportation infrastructures in the city. The construction of side road spaces for bicycle transportation and the BRT on Independencia Avenue were the principal proposals of the project. BRT is a massive transportation system that runs from north to south of the metropolitan area, and works with biofuel, which reduces gas and noise emission. [10]

This paper compares noise levels before and after BRT operation, and discusses improvements of noise levels on Independencia Avenue.

## METHODOLOGY

The methodology defined in Orozco et al, 2008 was used in this study. Ten measuring points were established on Independencia Avenue (Figure 1). Measurements were taken for 5 minutes at 6 different sites of the measuring points using a CESVA SC-160 sonometer attached to a calibrated filter (60- 120 dB A). Geoposition of each point was also measured using a Garmin 12 XL GPS system. Besides motor vehicles were counted, and present environmental conditions like road status, traffic lights, green areas, and building's height were also recorded. Measurements were taken using a tripod to fix the sonometer at 1.20 m above the ground and 3.5 m away of any reflecting structure.

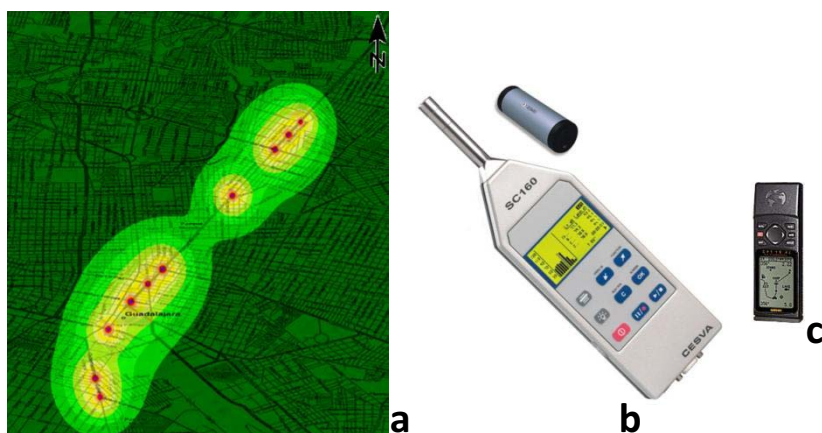


Figure 1. Location of measuring points along Independencia Avenue (a). CESVA SC-160 sonometer attached to a calibrated filter (b), and GARMIN 12 XL GPS (c).

Noise measurements were taken once the project infrastructure was completed (August 08) and right after the BRT started its operation on the mentioned avenue (January 09). Data recorded in these two different situations helped to understand how the condition of the environment was improved in terms of gas and noise emission. Before the project, there were about ten public transportation routes running on the avenue and now there are only a few connection routes.

## RESULTS

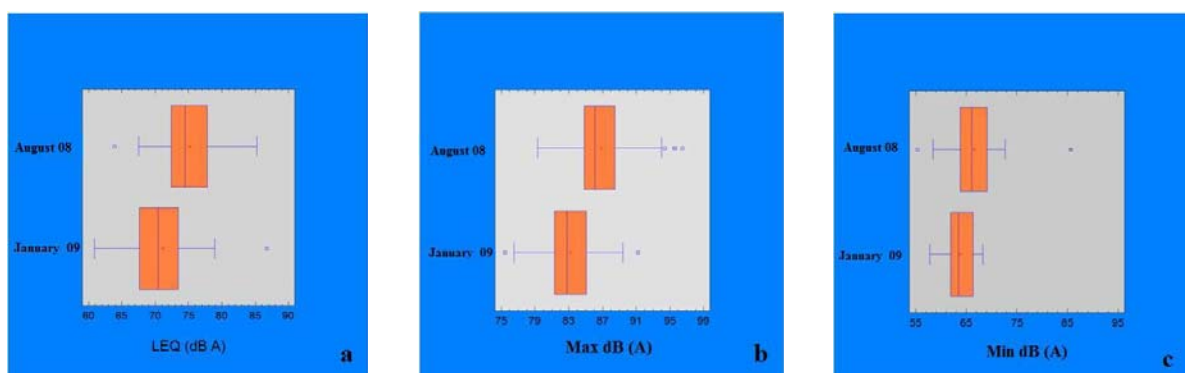


Figure 2. Mean noise levels of LEQ (a), Maximum (b) and Minimum (c) before and after BRT operation.

Descriptive analysis of data showed some improvement of noise condition on Independencia Avenue, mainly due to the elimination of all the bus routes that used to run on the corridor. Mean noise levels before and after BRT operation were about 76 dB and 71 dB respectively (Figure 2a). These results support massive transportation as environment friendly systems in terms of gas and noise emissions. A similar pattern is shown by the maximum and minimum noise levels (Figure 2 b and c). Although noise condition were improved about 5%, some work needs to be done to fit the WHO community noise standard of 65 dB-A [11, 12]. Soundscape of the avenue is the product of traffic flow, commercial activities and services occurring along its corridor. Average noise levels are showed in blue (Figure 3).

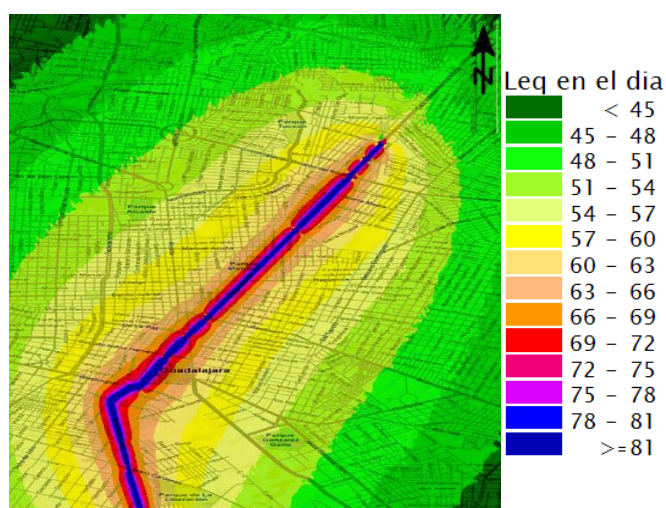


Figure 3. Projected noise levels on Independencia Avenue.

## DISCUSSION

Studies of environmental noise contribute to create sound management policies, since they make it possible to identify and integrate critical conditions within the cities, including the presence of contaminant sources. Citizens are becoming aware of consequences of noise pollution; hence, they require authorities to fulfill their obligations, i.e. people ask them to assure that ongoing activities in the cities comply with noise regulations and legal frameworks. Furthermore, noise diagnosis studies are good reference tools from which valuable recommendation to improve the city's soundscape can be given. A clear example of that is the introduction of BRT in one of the main busy roads of Guadalajara. The system is aimed to reduce gas and noise emission, as well as to improve the image and conditions of the area.

Bus rapid transportation (BRT) is comfortable, reliable and cheap, and it offers the following services:

- Exclusive road side physically unlimited to ordinary traffic.
- Enough doors that facilitate boarding and descending of passengers.
- Large units with low gas emissions systems to make massive and rapid journeys.
- Facilities for people with disabilities.
- Intercity commuting.

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