

# Societal Cost of Silence in Mumbai - Environmental Economic Perspective of Noise Pollution

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## Abstract

*The noise impact on people's quality of life goes beyond annoyance, and may affect somatic and psychic aspects of health. Environmental economics is the theoretical framework supporting instruments designed to evaluate the impact of noise on peoples' quality of life. The modern civilization creates more and more noise, because of the development of Industries, machinery and Technology. It has been reported that noise can become a health hazard causing deafness which includes temporary or permanent hearing loss. Noise is one of the major local disturbances associated with road traffic. Despite its major importance in the urban environment, the problem of noise has received little attention from environmental economists. This paper estimates the willingness to pay for silence for a noise reduction program in Mumbai city.*

**Keywords:** *contingent valuation, noise, road traffic, willingness to pay*

**Paper Type:** *Empirical Research*

## Introduction

The present generation and the coming generations have to solve three grave problems, namely, population, poverty and pollution, if they have to survive. Pollution being the most dangerous problem likes cancer in which death is sure but slow. Environment pollution is assuming dangerous proportions all through the globe and India is not free from this poisonous disease. This is the gift of modern living, industrialization and urbanization. Unless timely action is taken we have a forbid and bleak future for the world. There are various frameworks for thinking about sustainability. A widely-used approach is to represent sustainability in the context of three pillars — ecological, social and economic.

The decadal growth of the urban population in India rose to 31.8% during the last decade (2001-2011). Rapid urbanization has led to various public health challenges, including environmental pollution. Most activities that cause pollution are essential to meet the needs of the growing population and development. Therefore preventive measures to minimize pollutants are more practical than their elimination. Noise is regarded as a pollutant under the air (Prevention and Control of Pollution) Act, 1981. It has been defined as unwanted sound. Noise consists of unpleasant obtrusive, annoying, distracting, or persistent sounds that interfere with sleep or the ability to concentrate or enjoy life. The WHO guidelines for community noise recommend less than 30 A-weighted decibels (dB[A]) in bedrooms during the night for a sleep of good quality and less than 35 dB(A) in classrooms to allow good teaching and learning conditions. The WHO

guidelines for night noise recommend less than 40 dB(A) of annual average (L<sub>night</sub>) outside of bedrooms to prevent adverse health effects from night noise. Noise is an underestimated threat that can cause a number of short- and long-term health problems. It is increasingly becoming a potential hazard to health, physically and psychologically, and affects the general well-being of an individual. Excessive noise interferes with people's daily activities at school, at work, at home, and during leisure time. It can disturb sleep, cause cardiovascular and psycho physiological effects, reduce performance and provoke annoyance responses and changes in social behaviour.

Noise, which continues to be one of the main environmental problems facing India, is gaining its importance as a result of the rise in noise levels that comes about with increasing economic activity. Excessive levels of noise have both physiological and psychological consequences. The physiological effects include, for example, hearing impairment, disturbed sleep, high blood pressure, stomach ulcers and other digestive disorders. Monetary valuation of the external costs is also necessary in order to determine optimal environmental taxes on road traffic, rail traffic and air traffic. Noise is a major environmental effect of traffic. A wide variety of studies have examined the question of the external cost of transport noise to the society. The estimates range from 0.2% to 2% of GDP. Noise is therefore economically important and it stands to a reason that noise should be part of any ex-ante evaluation of major infrastructural projects. An ex-ante evaluation is often carried out in the form of cost –benefit analysis (CBA). In a CBA, as many as possible relevant economic, ecological and social impacts are assessed and monetised.

## **Framework of Study**

### ***Objectives of the Study***

1. To determine the willingness to pay for silence by using contingent valuation method.
2. To study different social and economic factors affecting peoples' willingness to pay and their attitudes towards noise reduction in Mumbai city.
3. To find out the monetary valuation of the noise in order to determine optimal environmental taxes on road traffic.

## **Research Methodology**

### ***Profile of the Study Area***

Mumbai (formerly known as Bombay) is located on the western seacoast of India on the Arabian Sea at 18°53' N to 19°16' N latitude and 72°0' E to 72°59' E longitude. The city is divided into different administrative zones known as 'wards' to ease the day-to-day functioning of the civic authority. According to CPCB Mumbai is among the three cities with highest rate of noise pollution in India. The increasing number of vehicles, musical instruments, small scale industries, and urbanization and human activities are the main source of noise pollution. Road traffic is the most important source of community noise.

### ***Survey Design***

The questionnaire was tested and revised through focus group meetings. Furthermore, a pilot study was conducted to check the reliability and validity of questionnaire. The final survey as started in June 2012 based on 24 wards in Mumbai. Face to face interview was conducted or a total sample size of 683 respondents. Cronbach's Alpha reliability coefficient is used to determine the consistency of the data.

## Result and Discussion

This section briefly discusses the effect of socio-economic factors on willingness to pay of the respondents. The prior objectives in willingness to pay survey are to calculate mean willingness to pay and estimating parametric model to allow inclusion of respondent's socio-economic factors into WTP function. Inclusion of individual's socio-economic characteristics into the CVM helps to gather the information on validity and reliability of the CVM results and increase confidence in practical application of results obtained from the CVM empirical analysis.

### Multiple Regression Model

Multivariate analysis used by different people for willingness to pay, the multiple regressions function was specified as the maximum willingness to pay amount mentioned by the respondents is function of the socio-economic characteristics of the respondent, as

$$\begin{aligned} Max_{WTP} = & \alpha + \beta_1 AGE + \beta_2 EDU + \beta_3 M\_STAT + \beta_4 H\_SIZE + \beta_5 SEX \\ & + \beta_6 H\_OWN + \beta_7 W\_SER + \beta_8 INCOME + \beta_9 E\_AWR + ui \end{aligned}$$

MaxWTP = Maximum willingness to pay, this variable is used for the open ended question in questionnaire, which accounts for the maximum amount the respondents are willing to pay for reduction of noise levels.

**Table: Multiple Regression Results for the Determinants of Willingness to Pay**

Dependent Variable : WTP Multiple Regression Results				
Variable		Co - Efficient		Probability
Age		- 0.315618		0.7067
B_A		56.68003		0.0084*
M_A		97.44190		0.0003*
Sex		- 1.768804		0.8879
E_AWR		51.08488		0.0052*
H_OWN		-13.73659		0.2959
H_SIZE		- 11.95707		0.0055*
M_STAT		- 30.61121		0.0776
INCOME		0.004363		0.0000*
Mean Dependent Watson Statistics	287.46 1.992912 -	R Squared Durbin Adjusted R Squared	0.577792 0.56915	Variable

Thus in the regression results the E\_AWR (environmental awareness) has coefficient value of 51.084, which shows that if the E\_AWR within the respondents increase by one unit, on average the MAX\_WTP increase by 51 units. This variable shows positive relation between environmental awareness and

maximum willingness to pay and is also significant at 5 percent and 1 percent level of significance. This shows that the environmentally aware people are willing to pay and it also increases concern about their surrounding environment and adverse impacts of noise pollution. In accordance to theory and logic they will be aware of all the threats, diseases and damages that are caused because of improper management. To have such sort of activities we need to make our population aware.

The M\_STAT (marital status) showed a high significance level. This shows a positive relationship between marital status and willingness to pay, the respondents who are married are willing for such services than those who are unmarried. This may be the reason for their concerns about their family's health; they may not have the enough time to properly manage the noise levels or to take precautionary measures to avoid noise pollution.

The variable of household monthly income labeled as INCOME has coefficient value of 0.004363, if all other variables are kept constant it shows that if income of the respondents increase by one unit, on average the MAX\_WTP increase by 0.004363 units. This effect of this variable is significant at 1 percent, 5 percent and 10 percent level of significance but its contribution is very low.

Regarding the education of the respondents this variable was split into different levels of education as otherwise the effect of highly qualified and low qualified respondents could not be differentiated. So two levels of education were specified as, variable B\_A specified for respondent who responded as 13 – 14 years of education. The level of education M\_A specified for respondents having 15+ years of education. Education as B\_A and M\_A in order to capture the effect of lower and higher education on the maximum amount of respondent's willingness to pay. The first level of education B\_A has coefficient value of 56.68003 this shows that if all other variables are kept constant, as respondents with B\_A level of education increases by one unit, on average the MAX\_WTP goes up by 56.68 units. And this variable is significant at 1 percent level of significance. Likewise M\_A has coefficients of 97.441, showing that as the respondents with M\_A levels education increases by one unit, on average the MAX\_WTP increases by 97.44 units. Both the variables are significant at 1 percent level of significance. These results show that education level is an important determinant of willingness to pay. Our household willingness to pay (without protest zeros) represents Rs. 287.46 per month. These results are also consistent with those found in developed as well as other developing countries.

## Recommendations

Fortunately, hearing loss due to community noise pollution is largely preventable. Preventive and control measures have been recommended, viz., stringent implementation of legislation, efficient engineering products, proper planning of roadways, considering their proximity to human settlements. Recommendations of the Maharashtra Pollution Control Committee include ban on pressure horns, phasing out of three wheeler autos, extensive plantation of trees on the roadsides, encouraging use of noise-absorbent materials, adequate noise barriers around silence zones, monitoring of loudspeaker, and generator sets to ensure compliance with prescribed rules.

Above all, awareness of the public and stakeholders is the key component in the prevention and control of community noise pollution. Basic and essential information should be extensively disseminated, such as noise levels created by common sources of noise pollution, adverse health effects on both the person creating noise, and the public preventive measures and conditions punishable under law. Graphic displays in public places are a good medium to spread the message. School campaigns, health education programs, and publicizing through print and electronic media can actively address this issue. Involvement

of non-governmental organizations in generating public interest and co-operation, and providing audiological facilities will immensely help the cause.

Further exploratory studies and valuation of noise related studies are urgently required in India. Socio-demographic factors and determinants of noise-induced health effects, co-morbidities, population-specific thresholds for normal or impaired hearing should be studied.

## Conclusion

With the existing poor environment quality and no reduction programmes for noise and very less legal provision, it is extremely difficult for authorities to recover the cost of provision and maintain the silence of Mumbai city. Active participation of the community is of prime importance. The regression estimated MAX\_WTP gave an average willingness to pay value of Rs. 287.46 per month per household. If such charges are properly collected the government would be able to properly handle the situation. This process would be cost recovery and revenue generating for the government. Road Traffic noise has a cost to the society. A considerable amount of money is spent every year by government and local authorities to reduce or limit transport noise. Unfortunately the financial resources dedicated to noise control are limited, so must be used in the most effective way possible. In India, few policy decisions related to noise concerns actually use as an economic tool as cost-benefit analysis, although the economic analysis of noise now has a rather good rational basis. Consequently, in order to introduce a more rational utilization of resources, the costing of noise pollution has to be developed, and encouraged especially in developing countries like India.

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