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The Benefits and Costs of Noise Reduction: A Case Study in Israel

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Abstract:

This article tries to measure in a Cost-Benefit Analysis a stricter noise abatement program originated from traffic roads in Israel. Using hedonic prices method of three large cities and rural areas transactions, the benefit from noise reduction was found. In order to perform a social cost benefit analysis a measure of benefit was derived for a one kilometer of road and was compared with the cost of noise reduction under different assumptions of road structure. The results indicate that even tough benefits were largely increased from past decade (e.g., 1.4% of an average urban property value per 1 decibal reduction), the decision to insulate a given road is dependent on location and road structure. This raises the normative question of a national vs. regional standards that decision-makers should be aware of and such studies could be of help in this regard.

Key words: Noise abatement, cost benefit analysis, hedonic prices.

1. Introduction

The benefit from noise reduction is an issue of growing interest in developed countries. While benefits in the work place can usually be negotiated between employers and their employees, this is not the case regarding noise pollution from roads, airports, and the like. Solving this problem through negotiations is likely to be costly in social terms, therefore a social cost-benefit analysis (CBA) is warranted. Here the costs are those of reaching a less noisy standard, while the benefits are those associated with the better life quality obtained.

Most of the existing research on noise pollution was conducted in the 1970s and early 1980s. A survey of the literature revealed only four major studies carried out in the 1990s (see below), most of them focussing on noise originating from airports.

Recent years have been characterized by major developments in the technology available for reducing road noise, as well as a probable likelihood of an increase in the willingness to pay (WTP) for environmental resources, including noise reduction. This increase should be capitalized in the property value if one wishes to measure any changes in the noise damage.

The present study performs such a social CBA with respect to two proposed alternative noise standards – 64 decibels and 59 decibels – where the current standard is only 67 decibels. The analysis was performed on urban and rural areas in Israel. (It should be noted that in Israel, rural areas correspond more to suburban then rural areas elsewhere. Naturally, this affects the WTP, and hence, the results.)

The cost of the project (i.e., noise reduction) was estimated through engineering data regarding the cost-effective solution to reach a specified target. The benefits were estimated according to differences in property values due to different noise levels.

The results of the study do not provide a clear-cut solution. Rather, they provide a sort of "crystal ball" for decision makers with respect to the impact of their future decisions on taxpayers (through the higher cost of insulation) and residents in affected areas (through an increase in their property values).

The following sections are organized as follows: Section 2 deals with the theoretical foundations of measuring benefits from noise reduction. Section 3 summarizes past research efforts to estimate the benefits derived from noise reduction. Section 4 summarizes the cost of the given target. Section 5 presents a case study of two different alternative cost standards in Israel. Section 6 is a summary of the paper.

2. The Benefit from Noise Reduction

Two main features characterize the economics of noise abatement: it does not accumulate and it varies from person to person. With regard to the first point, the important difference between this and other types kind of pollution is that road noise is associated with almost no health damages. On the other hand, it causes stress, discomfort, and some degree of dysfunction, both within the working environment and in the privacy of one's home. With regard to the second point, there is an important policy problem related to the responsibility for the abatement measures that should be taken, if at all. Abatement can be undertaken by the individuals affected (home insulation) and/or by the government (national or regional noise standards).

Leaving aside the legal and distribution aspects of the liability issue, if one wishes to decide about the desirability of the given, or proposed change, one should judge the results on the basis of their benefits and costs to whomever they accrue.

Thus a social cost-benefit analysis should accompany each standard or proposed change in a standard.

With respect to benefits, there are four major techniques for measuring the economic benefit of noise reduction:

1. **Cost of Abatement (COA) –** Here we assume that the cost of abatement is a minimal estimate of the noise damage. This is based on revealed behavior. If the individual was willing to pay $100 for the insulation process, then the benefit from this action must be at least $100. The problem with this approach is that it ignores the true value of the benefit, which is probably higher than the cost involved.

2. **Cost of Illness (COI) –** In this approach, one uses the health expenditures as a proxy market for the noise damage. Here we take the hearing capacity of two types of population – one that was subjected to noise and the other that was not – and we measure the economic cost associated with hearing loss. The problem with this approach is that, as mentioned earlier, there is no specific evidence of a correlation between hearing losses and road traffic. Furthermore, it is quite difficult to assign a specific value to the noise and its contribution to the hearing loss. The affected person might work in a noisy place and live in a quiet one or vice versa, and people can move from one place to another with different noise levels. Therefore, it is quite difficult to obtain reliable estimates by this method.

3. **Contingent Valuation Method (CVM) –** This method is based on stated preferences of a representative sample of the public, which is going to be affected by the new noise standard. By asking people how much they are

willing to pay (WTP) for a given amount of noise reduction, we can get an estimate on the benefit of noise reduction. For example, Soguel (1994) evaluated the WTP in Switzerland for cutting the noise level by half. Results ranged between 56 and 67 SF per month. The problem with this approach is the residents' general lack of familiarity with what the researcher calls, x% reduction. Other issues of CVM that contribute to "noise" in the results could be found in Mitchell and Carson (1989).

4. **Hedonic Prices Method (HPM)** – This seems to be the best and the most popular approach to estimate the true value of noise reduction. Here we use the real estate market as a proxy for the WTP for a less noisy apartment. If we assume that the price of a product is determined by the vector of its attributes, then noise is one such attribute, and we are looking for its unique effect on the real estate price. Thus we want to examine the following relationship:

(1) $V = v(N, Z)$

Where V is the real estate value and it is determined by:

N – the noise level; and

Z – all the other characteristics that might affect the real estate price.

If we can distinguish between N and Z regarding their respective effects on V, then the coefficient of N represents the value of 1 decibel, that is, how much people are willing to pay, in terms of property value, in order to eliminate it. In other words:

(2) $\partial V/\partial N = NV$ (= Noise value).

This is the approach taken in the present study. The drawback of this approach is that people do not have perfect information when buying a new apartment or a new house and that the real estate market is not a perfectly competitive one, thus introduces some statistical noise in the estimated system. However, in the case of Israel, it seems that apartment values are high enough to induce people to seek all the information they can get regarding the true value of a given apartment. With respect to the second objection, since the government stepped out of the mortgage market, the real estate market has become quite competitive. As the regression results shows, the statistical estimation is rather significant, hence, in general, individuals are pretty aware of house characteristics.

3. Relevant Literature – Property Value

There is a major gap between the present and the time when most of the relevant research with respect to noise (especially from road traffic) was conducted. Clearly, if one compares studies done in the 1970s and 1980s to the situation in the 1990s, then one should take into account that the awareness of environmental aspects of the quality of life have changed dramatically, especially in developed countries. Hence, substantial differences should come at no surprise in comparing different decades.

Anderson and Wise (1977) studied differences in property values in four suburbs in the US that are located near highways. Their results show differences of $42-129 on a $30,000 house (about 0.3%). The results of Baily's (1977) study also suggest an 0.3% change for each decibel above 55. A discrete analysis of a house close to the highway compared to another 1,000 feet away (a critical distance value for noise) was found to be 7.5%.

Other studies have found similar results (Allen 1980; Gamble et al. 1974; Hall et al. 1978; Langley 1976; Nelson 1982**,** Oosterhuis and Van der Pligt 1985; Palmquist, 1981; Vaughan and Huckins 1975). In most of the research correlation between a given increase in the noise level and reduction in the property value is determined by what is called NDSI (Noise Depreciation Sensitivity Index), which is the percent of reduction in the property value. Alternatively, a dollar amount is attached to each decibel. The range in the NDSI is between 0.08% and 1.05%, with an average estimate of 0.4%. Hence, an apartment that is subjected to a 75-decibel noise level would sell for 8% less then an apartment with the same characteristics but a noise level of 55 decibels. When trying to compare a house that is located in a “noisy” area with one in a “quiet” one, the difference is 20-25 decibels. In all the relevant studies, then there is a hidden assumption that the NDSI is linear. However, for our purposes, the noise standard change is probably too small to worry about linearity.

Other research, conducted in the 1980s, found higher NDSI than the previous ones (Ariel and Barde 1985; Nelson 1982; Pearce et al. 1987). This fact backs up our previous claim that the WTP for improvements in the quality of the environment increases with time, as GDP per capita increases.

The first research on this subject in the 1990s was published by Pennington et al. (1990). The results of this study, which was conducted on residential properties near the Manchester airport, show that the correlation between the other explanatory variables influences the estimation of the noise impact. Collins and Evans (1994 repeat the analysis on Pennington et al. (1990)’s data set using the artificial neural network approach. They demonstrate that this approach enables separation of the valid value of a unit of noise reduction. Uyeno et al. (1993) tried to estimate a new data set from the US and test Nelson’s functional form. Their conclusion was that the results obtained a decade earlier were still pretty relevant. Finally, Delucchi and Hsu (1998) use data on noise from motor vehicles in order to estimate the externality associated with the data on property values. According to their conclusions, the associated damages could reach up to 1.3 NDSI.

However, neither of these studies incorporates two features that are essential to the assessment of the policy problem of defining a noise standard. One is the aggregation of the benefits and their estimation on a length scale (that is, one kilometer of road or one square kilometer). The second is the comparison with cost estimates of noise reduction. Without these two characteristics, it is impossible to perform a national CBA and/or test a new proposed standard. This is what this study tries to do, with respect to Israel for two proposed new noise standards.

4. The Application of Benefit Assessment to Israel

4.1 The effect of noise components

Noise reduction in this study is approximated by the location of the property relative to the nearest main road and the exact location of the apartment: floor number and front or back view. Prices in the main cities of three different regions in Israel (Tel-Aviv, Haifa and Beer-Sheva), as well as transactions in rural areas were compared.

The semi-logarithmic functional form was chosen. This choice was based on previous studies that indicate this form to be statistically the most significant. The coefficients in this kind of regression should be interpreted as the impact of one unit of the considered variable on the rate of change in the property price. Accordingly, the NDSI can be derived directly from the noise coefficient.

4.1.1 Description of variables

1. **Area of apartment (SQM) –** This variable, which represents the area of the apartment in square meters, was found to be highly correlated with the variable of number of rooms. Thus only one variable was left. It should be noted that in Israel, it is common practice to change the number of rooms in a given apartment (by adding or removing dividing walls). Thus the area of apartment provides a better description with respect to price differences.

2. **Age of Building (Age) -** there wasn't any significant change in price when this variable was treated as a continuous one. Therefore, a dummy variable was chosen. In the comparison of over and under 10 with over and under 20 years, the latter was statistically more significant; therefore it was chosen as the age variable.

3. **Lift (Lift) –** Again, a dummy variable. The existence of a lift can significantly increase the price of a property, but many of the buildings built in the 1970s and 1980s have no lift (and are no more than four stories high).

4. **Floor (Floor) –** In contrast to the variable describing the age of the building, with regard to the story, or floor of the apartment, a continuous variable seemed to better reflect the impact. A dummy variable, in which the floors are split into up to the second floor and over the second floor, was also tried, but it was statistically inferior to the continuous case.

5. **Neighborhood quality** – This variable was considered as a dummy variable. In each region, three real-estate appraisers were asked to specify whether a given property is located in the "better half" of the city or not. If there was a disagreement, the majority decision was applied.

6. **View of the sea (View1)** – This variable applies to some (not all) areas in Tel-Aviv and Haifa, as well as some of the rural areas. Again, the natural way to include such a variable was as a dummy variable.

7. **View of an open space (View2)** – This variable applies to all regions and was treated as a dummy variable, as well.

8. **Front-facing apartment** – This variable was a dummy variable but was split into two: front-facing property on a noisy street and a front-facing property on a non-noisy street. The effects were expected to be opposite in their signs.

9. **Region of transaction (Zone) -** This dummy variable was split into the four regions that were tested. Hence, each variable should be independently considered as the specific area impact, relative to the weighted average of the four regions (denoted by the intercept).

10. **Noise variable (Noise)** – This variable was described in a continuous form, and was split into transactions made in urban areas (Noise1) and rural areas (Noise2). The unit of measurement

was dB. The size of the coefficient can be translated into the impact of a 1-dB change on the value of the given property.

The results of the analysis are shown in Table I. There were 280 observations, a small number compared to other studies. However, the relative advantage of this study is the ability to precisely locate each transaction with respect to its noise characteristic up to a 2-dB confidence range.

Insert Table I about here

As can be seen from the table, all coefficients have the expected sign. The noise variables in this semi-logarithmic case can be thought of directly as the NDSI, that is, the rate of impact of 1 unit of change (1 dB, in this case) on the property value. In this case it turned out to be 1.4% and 2.4% for urban and rural areas respectively. It should be noted that these results are in the higher range of results in terms of impact relatively to the studies examined earlier in the paper.

4.2 The density effect

An accurate measure of damage can not be found without looking at the population at risk in the affected area. In the case of noise, the apartment's density is the relevant factor. With respect to density, Israel can be split into rural and urban areas. Within the rural areas, the density is 5 units per 100 meters of road. In the urban areas, the density depends on the height of the building: For a four-floor building, the density is 8 units per floor per 100 meters road, while for buildings of eight or more floors, it is 6 units/floor/100 meters road. All figures are for apartments facing one side (the front). That is, the apartments facing the back should be added by the same ratio. The average unit price in Israel is NIS 534.4K (Annual statistics, 1998). Therefore, an NDSI of 1.4% implies:

- Four floors or less – NIS 42.8K/m/floor[1]

- Eight floors or more – NIS 32.1K NIS/m/floor.

We are now in a position to calculate the total benefit in a given urban area. This is done as follows:

(3) PVC = 1.4*(Dec.0 – Dec.1)*Ci*(NF-1)

Where:

PVC = Property value change (In NIS 000s/meter road).

Dec.0 = Old noise standard (In decibels)

Dec.1 = New noise standard (In decibels)

Ci = Change in total property value/floor/meter (In NIS 000s).

C1 = NIS 42.8K

C2 = NIS 32.1K

NF = Number of floors.

The results are shown in Table II. As can be seen, insulation reduces the noise by 10 decibels; therefore, we have added that case as well.

Insert Table II about here

4.3 The rural sector

The density in the rural-suburban areas is 1 unit for every 20 meters.

Therefore we can use the following formula:

(4) PVC = (1000/20)*V*0.024*(Dec.0 – Dec.1)

Where V is the initial property value and all the other variables are as previously defined.

The results are shown in Table III, which includes a sensitivity analysis to the NDSI. As the table illustrates, there is a large price difference among rural-suburban houses, so a different benefit estimate is derived for each property price.

Insert Table III about here

5. Analyzing the Acoustic Costs

5.1 Definitions

The cost of reaching a new noise standard is the difference in cost after moving from one level of noise to another. The analysis was made for the transition from the 67-dB to the 64-dB level, and for the transition from the 67-dB to the 59-dB level.

The analysis shows only the marginal cost necessary for reduction of noise from one level to another, we calculate the cost to achieve the level of 67-dB, and the cost to achieve the level of 64-dB, the incremental deference is the marginal cost necessary for reduction of noise from one level to another. The analysis was done for several theoretical schematic types of roads and buildings. The different types differ in their parameters: road pattern, number of floors, the distance of the building from the road. For each type, a cost-effective analysis was performed. Again, the numbers were normalized for one meter of road.[2]

5.2 Technical assumptions

These assumptions are related to the volume of traffic, as well as other technical parameters of the road or the noise barrier.

- The volume of traffic was determined as the level of service “C” in both directions of an 80-kmph road. This means that a full capacity traffic load is assumed on the road.

- The spread of noise is based on the FHWA – highway traffic noise predictor model (FHWA, 1978).

- The maximum height of an acoustic barrier is 6 meters.

- The minimum effect of a barrier is 5 dB and the maximum is 15 dB.

- Silent asphalt decreases the noise by 3 dB.

- The upper limit of deviation is 0.5 dB.

The results with regard to the 64 and 59 noise standards are shown in Tables IV and V, respectively.

Insert Table IV about here

Insert Table V about here

6. Results

6.1 Description

As in the cost section, we divide the net benefit estimates into the two proposed noise standards, namely, from the 67-dB level to the 64-dB level, and to the 59-dB standard.

The results for the urban and rural-suburban areas are shown in Tables VI and VII, respectively. In the tables we show both the marginal cost necessary for reduction of noise from one level to another, and the benefit from the reduction. The analysis was done for several types of roads and buildings. The types differ in terms of the parameters of road pattern, number of floors, distance of the buildings from the road, overflow of traffic, and type of acoustic treatment.

The net benefit was calculated first for a one meter of road. In order to analyze the value of a specific project, one has to characterize the parameters above and then multiply the corresponding value (from the tables) by the length of the specific road.

Insert Table VI about here

6.2 Analysis of the results

A glance at the findings reveals that there is no clear cut in the optimal level. The result depends on several parameters: road pattern, number of floors, the distance of the buildings from the road, density of housing, prices of housing, and the type of acoustic treatment. For some of the parameters, a clear direction of influence is evident, but for most, there are two components with opposite influences. Two of these are described below.

Number of floors – the higher the building, the higher the acoustic barriers needed to protect it. However, in the higher buildings, the number of flats is also greater, so the benefit from noise reduction is higher.

The distance of the buildings from the road – The greater the distance between the road and the building, the lower the acoustic barriers needed to protect it, but as the effect of the acoustic barriers declines, so does the benefits from them.

Price of housing – This has a clear impact on direction. The higher the price of the houses, the greater the benefit from noise reduction.

Finally, another important result was that as long as the acoustic means are “regular” (e.g., acoustic barriers, quiet asphalt), the optimal level of noise is lower – 64 dB and even 59 dB – while the use of expensive acoustic means (e.g., roofed roads or triple barriers) raises the optimal level of noise to 67 dB.

6. Summary

A social cost benefit analysis was performed with respect to noise standards in Israel. Two proposed new standards were analyzed. The analysis was divided into urban and rural-suburban areas, and the costs were taken from engineering data. The hedonic price method was employed in order to calculate the price differences between less and more noisy apartments.

The results indicate that, based on the NDSI measure, there is a 1.4% and 2.4% reduction in the property value for the urban and rural-suburb areas, respectively. On the other hand, the higher population density in the urban areas balances out the lower WTP in these areas.

A noise standard of 59 decibels clearly fails on the grounds of a social cost benefit test in almost all cases. It simply is not worth the cost involved. With regard to the 64 decibels standard, the benefit depends on the type of area and type of acoustic solution for the noise reduction.

This type of research can be helpful in designing either a national noise standard, as was done in this paper, or a regional standard, based on regional measures of costs and benefits. A national standard would not be optimal for each and every region or city but would be consistent with basic rights to the same amount of noise for every citizen. This is, however, a matter to be resolved by policy makers and not by an economic cost benefit analysis.

With respect to the regional standards, this paper shows that the benefit of reducing 1 dB is not all that matters. Rather, this benefit should be aggregated, taking into account the density factor, and compared with the cost component of reaching a given noise standard. Should a standard be national or regional? We leave this normative question for policy makers.

Notes:

[1] Except for the first floor which is the foundation of the house.

[2] In addition, in order to calibrate the model, we analyzed several existing representing projects.

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Table I: Regression Results

(Dependent variable = ln of price[1])

	Variable	Description	Coefficient
0.	Intercept		13.1986 (1.18)
1.	SQM	Area of residence (m^2)	0.85 (0.11)
2.	Age	Age of building 1= Over 20 years 0= Under 20 years	-2.71 (-0.66)
3.	Lift	Lift: 1= Exists 0= Not exists	11.4 (4.86)
4.	Floor	Floor	-0.706 (-0.52)
5.	NQ	Neighborhood quality: 1= Good 0= Bad	8.945 (3.85)
6a.	VIEW1	View of the sea: 1= Yes 0= No	0.11 (0.03)
	Variable	**Description**	**Coefficient**
6b.	VIEW2	View of an open space:	0.064

[1] Numbers in parentheses indicates standard error of variables. Critical t-values for 1%, 5% and 10% significance level are: 2.576, 1.960 and 1.645 respectively.

		1= Yes 0= No	(0.027)
7a.	Front1	Front-facing apartment on a noisy street: 1= Yes 0= No	-0.034 (-0.023)
7b.	Front2	Front-facing apartment on a non-noisy street: 1= Yes 0= No	0.046 (0.037)
8a.	Zone 1	Beer Sheva	-0.34 (-0.088)
8b.	Zone 2	Haifa	-0.05 (-0.022)
8c.	Zone 3	Tel-Aviv	0.75 (0.608)
8d.	Zone 4	Rural	1.01 (0.818)
9a.	Noise1	Noise in urban area	0.014 (0.00288)
9b.	Noise2	Noise in rural area	0.024 (0.00451)
	Mean Price	**$156,375**	
	No. of cases	**280**	
	r^2 = 0.81		
	F = 32.69		

Table II: The Benefit of Noise Reduction in Urban Areas: The Density Effect

	Cost of change for different housing densities (NIS 000s/1 m road)				
Change in standard dB	**2 floors**	**4 floors**	**8 floor**	**12 floors**	**Average**
67-64	1.8	5.4	9.4	14.8	7.9
67-59	4.8	14.4	25.1	39.5	20.9
67-57[2]	6.0	18	31.4	49.4	26.2

[2] In some cases, in order to reduce the noise to the right level, the road has to be roofed. In this case there will be a leap in the reduction of noise (10 dB instead of 3 dB).

Table III: The Benefit of Noise Reduction in Rural Areas - 1 dB reduction

Change in standard dB	Cost of change (NIS 000s per 1 m road) for different property values							
	540	**720**	**900**	**1,080**	**1,260**	**1,440**	**1,620**	**1,800**
67-64	1.9	2.6	3.2	3.9	4.5	5.2	5.8	6.5
67-59	5.2	6.9	8.6	10.4	12.1	13.8	15.6	17.3
67-57[3]	6.5	8.6	10.8	13.0	15.1	17.3	19.4	21.6

See footnote 2. [3]

Tables IV: The Cost of Noise Reduction – Moving from 67 dB to 64 dB

(In NIS 000s per 1 meter road)

Number of floors in the building	distance of Building frontier[4] from the road	Road											
		flat road			sunk road			Upper road			intersection		
		25	50	100	25	50	100	25	50	100	**Upper diamond**	**sunk diamond**	**loop**
2 Floors		8	0	5.5	8	8	5.5	8	8	5.5	Im[5]	8	8
4 Floors		0	8	5.5	10	8	5.5	8	8	5.5	Im	Im	Im
8 Floors		10	10	5.5	0	10	5.5	10	8	8	Im	Im	Im
12 Floors		0	10	10	0	10	6	0	10	10	Im	Im	Im

[4] Building frontier – the distance of the buildings from the center of the road.

[5] In some cases it is impossible to reduce the noise to the proposed level (e.g., it is not possible to roof an intersection). The is noted by **– IM** (impossible).

Table V: The Cost of Noise Reduction – Moving from 67 dB to 59 dB

(in NIS 000s per 1 meter road)

Number of floors in the building	distance of Building frontier from the road	**Road**											
		Flat road			**Sunk road**			**Upper road**			**intersection**		
		25	50	100	25	50	100	25	50	100	**Upper diamond**	**sunk diamond**	**loop**
2 Floors		10	3.3	0.7	5.3	4.9	0	2.2	1.4	0.7	5.7	9.9	6.7
4 Floors		NR[6]	6.6	NR	93.5	5.5	NR	10	3.6	1.4	Im	11.3	6.7
8 Floors		47.8	25.8	6	NR	16.1	NR	NR	23.9	1	Im	Im	Im
12 Floors		NR	NR	2.9	NR	93.5	4.6	NR	47.8	0.6	Im	Im	Im

[6] In some cases the solution for both standards (e.g., 64 Dba and 59 Dba) is the same. Hence the marginal cost of moving from 64 to 59 is actualy zero. This is denoted by **– NR** (not relevant).

Table VIa: The Net Benefit of a Transition from 67 dB to 64 dB – Urban Areas

(in NIS 000s per 1 meter road)

Number of floors in the building	distance of Building frontier from the road	Road type											
		Flat road			**Sunk road**			**Upper road**			**intersection**		
		25	50	100	25	50	100	25	50	100	**Upper diamond**	**sunk diamond**	**loop**
2 Floors		8.2-	1.5-	0.4-	3.5-	3.1-	NR	0.4-	0.4	0.4-	3.9-	8.1-	4.9-
4 Floors		NR	1.2-	1.1	75.5-	0.1-	1.7	4.6-	1.8	1.8	IM	5.9-	1.3-
8 Floors		16.4-	16.4-	3.4	NR	6.7-	1.1-	NR	14.5-	1.8	IM	IM	IM
12 Floors		NR	NR	4.5	NR	44.1-	2.0-	NR	1.6	1.9	IM	IM	IM

Table VIb: The Net Benefit of a Transition from 67 dB to 59 dB – Urban Areas
(in NIS 000s per 1 meter road)

Number of floors in the building	distance of Building frontier from the road	road											
		road flat			**road sunk**			**Upper road**			**intersection**		
		25	50	100	25	50	100	25	50	100	**Upper diamond**	**sunk diamond**	**loop**
2 Floors		-30.1	10.3-	10.3-	22.4-	3.1-	0.7-	35.8-	8.3-	0.1	39.-	8.1-	4.9-
4 Floors		NR	20.5-	20.5-	75.5-	3.0-	6.9	19.8-	4.4	4.6	IM	5.9-	1.3-
8 Floors		-16.4	27.2-	27.2-	NR	68.9-	15.6	16.4-	1.0	14.3	IM	IM	IM
12 Floors		NR	1.6	1.6	NR	44.1-	24.5	NR	1.6	10.9-	IM	IM	IM

Table VIIa: The Net Benefit of a Transition from 67 dB to 64 dB - Rural Areas

(in NIS 000s per 1 meter road)

decrease in property value for 1dB	**Road**						**Intersection**		
	Upper road		**Sunk road**		**Flat road**		**Upper diam ond**	**sunk dia mond**	**loop**
	50	100	50	100	50	100			
1.8%	-0.6	-0.3	-2.2	NR	1.3	-0.2	-3.0	-7.2	-4.0
2.4%	0.3	-0.0	-1.3	NR	2.2	0.7	-2.1	-6.3	-3.1
2.9%	1.1	0.8	-2.2	NR	3.0	1.5	-1.4	-5.6	-2.4

Table VIIb: The Net Benefit of a Transition from 67 dB to 59 dB - Rural Areas

(in NIS 000s per 1 meter road)

decrease in the value of property for 1 dB	Road						intersection		
	Upper road		Sunk road		Flat road		Upper diamond	sunk dia mond	loop
	50	100	50	100	50	100			
1.8%	-7.9	0.1	-0.7	1.7	-5.9	2.5	NR	-22.0	-19.3
2.4%	-5.5	2.0	1.7	4.1	-3.5	4.9	NR	-19.6	-16.9
2.9%	-3.5	4.0	3.7	6.1	-1.5	6.9	NR	-17.6	-14.9