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PATTERNS OF BEHAVIOR IN LODGINGS
EXPOSED TO TRAFFIC NOISE

Jacques Lambert, Francois Simonnet

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16. Abstract Threshold values at which public services should intervene to attenuate the noise nuisance are defined. Observations were made in the field of daily life at home. Data was collected on the use of lodgings, on effects of noise on health and sleep, and on the incidence of running away from home. A correlation was made also with the equipment and noise insulation of lodgings. The results show that above 66 dB in daytime, there are behavior patterns that are extreme so far as they modify in a considerable manner the way of life of people, living in both collective housing (apartments) and in individual houses.			
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I - OBJECTIVE

The objective of this study is to detect and analyze behavioral responses to road traffic noise and to assess its impact more objectively than earlier studies were able to do, particularly in terms of the annoyance people felt.

The existence of noise effects and behavioral responses deemed undesirable for the well-being of people living in residential complexes should allow us to establish noise thresholds beyond which action by Public Authorities becomes indispensable.

II - PROCEDURE

With this study, two different kinds of surveys were conducted:

- One was a questionnaire given to nearly 1,500 people living in residential apartment complexes;
- the other was in the form of thorough discussions and observations of some 40 people living in single-family homes.

Yet, both made it possible to evaluate the impact of noise in the following areas:

- use of home and outside spaces (balcony -garden);
- health and sleeping conditions;
- equipment and investments in the home;
- time spent outside the home and escapes from the home.

The noise levels were evaluated for each room in the home (i.e. /6 about 7,000 noise levels) and for three periods in the day: Leq 8 - 20 h, Leq 20 h - 24 h. Leq 0 h - 5 h.

This evaluation is based on the BRUIT (NOISE) program and on long- and short-term measurements.

II - RESULTS

1 - Noise Annoyance

The results obtained give us a significantly higher correlation between the individual annoyance ratings, i.e. $r = 0.64$ for daytime annoyance and $r = 0.48$ for nighttime annoyance than in earlier studies.

The factors which seem to affect the annoyance felt correspond to those revealed in earlier studies, namely: type of traffic, type of home, professional activity (active - nonactive), age in high noise levels.

The noise threshold beyond which annoyance seems to clearly increase is between 60 and 62 dB(A) in daytime Leq (8h - 20h) and between 50 and 52 dB(A) in nighttime Leq (0h - 5h).

Beyond these levels, and especially when the daytime Leq exceeds 65 dB(A), the annoyance felt is very high.

2 - Behavioral Patterns Caused By Noise

In regard to the use of the home, the two main responses observed were closing windows to allow noise-sensitive activities to be practiced (TV - reading - sleep) which becomes very accentuated beyond 60 - 62 dB(A) and moving activities to less exposed rooms (beyond 68 dB(A)) and into quieter areas of the garden.

The impact of noise on sleep seems to be much greater in terms of being awoken at night only if we retain as an indicator the time it takes for subjects to fall asleep, which is itself highly linked to age.

However, these disturbances on sleeping conditions tend to increase the number of sleeping pills taken beyond 50 - 52 dB(A) at night (i.e. about 60 - 62 dB(A) in the day). /7

Although at a fairly modest level, the consumption of heart medication is reinforced by noise, but at high levels (Leq > 70 dB(A) during the day).

Noise also led at high levels (Leq 66 - 68 dB(A) to a very clear increase in the percentage of homes which were insulated, especially among owners.

No significant impact was found concerning moving and maintenance of the exposed home or in terms of receiving equipment (TV, radio-electrophone, etc.).

If noise does not push families into increasing their excursions away from home (indication of escape-related behavior), it is a factor in making people plan to move away for tenants in particular as of 66 - 68 dB(A).

The scope of these behavioral patterns also depends on a fairly high number of factors, particularly the income level, size of home and its exposure to noise, the occupancy status in the home, the amount of rent, etc.

Some of these behavioral patterns are a fairly objective expression of the annoyance felt (closing windows), others tend to minimize it (sound insulation). Depending on the case, they may be highly related (planning to move, frequent week-ends excursions) or alternatives (soundproofing, moving).

IV - PROPOSALS

Even if the analysis of behavioral patterns caused by traffic noise deserves to be the subject of future research, the investigative field is so complex and delicate to grasp, particularly in single-family homes, it allowed us to establish the impact of traffic noise on lifestyles:

-Below 55 dB(A): in daytime Leq, we may consider that the damage caused by noise is very small, if not nonexistent and that the sound conditions allow a normal practice of those activities which are the most sensitive to noise.

-Between 55 and 60 dB(A): The impact of noise is still at a modest level, but certain disturbances occur, probably to the most sensitive people. /8

-Between 60 and 65 dB(A): behavior responses occur, but are still not limiting. However, the effects on sleep at about 55 dB(A) at night and especially the annoyance level increase considerably. It would be desirable to take steps to reduce the noise, but the "cost-advantage" ratio may be fairly nuanced, at least for corrective actions (screens, insulation).

-Above 65 dB(A): constrained behavioral responses occur which reveal heavy damage caused by noise. Public authorities must take action. This is particularly indispensable because in most cases the economic balance has every chance of being positive for apartment dwellers.

Although these proposals are more stringent than current French recommendations (65 ± 5 dB(A)), they agree perfectly with those of the Swiss Federal Commission for Environmental Protection, especially for daytime noise levels, as well as those of the Environmental Protection Agency in the United States.

PATTERNS OF BEHAVIOR IN LODGINGS EXPOSED TO
TRAFFIC NOISE

J. Lambert, François Simmonet

ABSTRACT

/1*

The government service approach consists of defining threshold values to be respected so that the situation of people living along noisy streets and roads should be bearable.

It is therefore necessary to assess the effects of noise on people.

If up to now these effects of noise were in general assessed in terms of the discomfort it caused, it would now be appropriate to project them to an objective level by examining in a precise manner the behavioral patterns associated with this discomfort so that it can be minimized. This is achieved by making observations of daily life in the home: use of lodgings - effects of noise on health and sleep - equipment installed and home insulation - seeking escape from the home.

The results showed that above 65 dB(A) Leq in the day, there are behavioral patterns that could be considered extreme, in that they have great impact on lifestyles and may be associated with high social costs incurred because of noise.

INTRODUCTION

/1

The impact of traffic noise depends both on the sound levels received in the home and people's sensitivity to this noise.

The government service approach is to determine the thresholds not to be exceeded so that the situation of people living along noisy streets should be bearable. It is therefore necessary to assess the effects of noise on people. This is generally the role of the human sciences. The usual procedure is to assess noise effects on health. However, in the past, the sound levels were such that psycho-sociological effects were emphasized. Thus, the first publications by McKENNEL, LANGDON (references 1 and 2) in Great Britain, by BORSKY in the United States (reference 3), by LAMURE and BACELON in France (4) thoroughly exhausted the various facets of human reaction to noise. These reactions may be verbal and learned through opinion surveys. They are also behavioral and their frequency is logged. The psychological methodology provides a hierarchical analysis (Guttman scale) and an instrument enabling the various activities affected to be classified. The results found show that people have a hard time understanding speech, the radio or TV, tend to open windows, and have sleeping disorders. The hierarchical analysis shows that a given effect always occurs (in the statistical sense) after exposure to another given effect.

*Numbers in the margin indicate pagination in the original text.

This analysis therefore led to the research of the various behavioral patterns which are modified due to exposure to noise.

These behaviors will both be observed and verbally reported. Next to the study of behavioral patterns modified by the environment, the second objective (which will depend on the success of the first one) will be an attempt to evaluate the associated economic and social costs.

CHAPTER I - OBJECTIVES AND GENERAL APPROACH

I-1 - OBJECTIVES AND MAIN FEATURES OF THE STUDY

/3

For many years, studies on the effects of traffic noise on people were conducted almost exclusively by opinion surveys.

A certain link was found between noise and discomfort. However, verbal reactions are subjective and very general and incorporate many other environmental aspects.

This is why, at the request of the Urban Transport Research Center (C.E.T.U.R.), I.R.T launched in 1978 a study for the purpose of observing and analyzing the behavior of people subjected to traffic noise levels of various intensities.

We started with the assumption that these behavioral patterns may be demonstrated in various areas of daily life in the home:

- utilization and organization of the home and close outside areas (balconies - gardens) to minimize noise annoyance;

- state of health, and in particular drug consumption;

- use of time: addressing the impact of noise on the time spent on and the type of daily activities outside the home (on the assumption that people are finding escape from a noisy home, for example);

- effective and equipment investments in the home (home maintenance, wall insulation).

The theoretical model associated with this study is that when an annoyance affects one's lifestyle, the individual may react in various ways to minimize this annoyance.

Having knowledge of the noise-discomfort link through previous studies, it now seems perfectly appropriate to study the noise-behavior and discomfort-behavior links.

The behavioral differences observed may later be used to establish socio-economic indicators for exposure to traffic noise.

I-2 - GENERAL APPROACH

/4

This study has made it possible to conduct three surveys providing us with preliminary methodological considerations.

I-2-1 - FIRST SURVEY

It was carried out in 1,500 homes in 15 apartment buildings or co-ops in Lyon and Marseille.

The method of collecting information was the questionnaire (see appendix 2).

To test this questionnaire and the basic assumptions formulated, a Pilot Survey was conducted on 300 people.

The assessment of people's exposure to noise resulted in a very important work. For each of the 1,500 dwellings, we established 300 noise levels per room (leq: 8 am to 8 pm; 8 pm to 12 pm; 12 pm to 5 am). These were either obtained by on-site measurements, or via calculations (BRUIT (NOISE) program - noise guide formula).

There are 20,000 noise levels covering virtually every conceivable exposure (between 47 and 77 dB(A) in Leq per day) which were used in the processing of this survey.

I-2-2 - SECOND SURVEY

This was the second aspect of the behavior survey, but differed by the method used to study collective dwellings, because the behaviors were identified:

- through extensive discussions on the subjects presented in the questionnaire;
- through direct observations of how garden areas are used.

This was therefore a more qualitative approach used in 5 residential areas in Lyon and in Marseille exposed to high noise levels (leq > 65 db(A)).

The information collected was analyzed in great detail to establish a typology of the behavior of people exposed to traffic noise (see chapter III of this report).

I-2-3 - THIRD SURVEY

/5

The third survey now being carried out differs considerably from the first two. It no longer compares behavioral patterns of people exposed to various noise levels (inter-subject method), but compares the behavioral patterns of individuals whose exposure to noise varies in time (intra-subject method).

This is why it seemed appropriate to launch this study - exploratory as it might be - in homes of the Bron Parilly complex along highways A 43 and Ly 1 (Department of Rhone) as they will be provided with wall insulation in the next few months.

The study pertains to 100 homes which will be surveyed before and after the sound-proofing.

The Budget-Time-Space method was retained: the activities in various rooms of the home, how long they last and annoyances felt (including noise) are recorded during 5 days of the week.

Due to the time it will take to carry out the insulation work on this group of buildings, the survey will not be taken up again until the autumn of 1981. A supplementary report will be available at the end of that year.

CHAPTER II - BEHAVIORAL PATTERNS IN COLLECTIVE DWELLINGS

/7

This is undoubtedly the investigation which gave the most quantitative results in terms of assessing behavioral patterns in homes exposed to traffic noise.

II-1 - DESCRIPTION OF THE SAMPLE: SITES AND PEOPLE

II-1-1 - GENERAL DESCRIPTION

The table below provides a description of the main features of the sample. The information collected for each of the 15 survey sites pertain to:

- the type of dwelling: H.L.M. (low-cost apartment complexes), co-ops,
- the type of roads: Fast Urban Thoroughfare (V.R.U.) - Highway - Transit - Arterial - Frontage Road;
- the traffic flow: mean flow per day - P.L. percentage;
- the population distribution into 3 noise classes:

.low noise : $Leq < 60$ dB(A)

.mean noise: $60 < Leq < 68$ dB(A)

.high noise: $Leq \geq 68$ dB(A).

- the dominating Socio-Professional Category of the site; the following typology was retained for this:

.C1: small businessman - craftsman - liberal profession - high and average-level executive - manufacturer;

.C2: employee - qualified worker - specialized worker - service personnel;

.C3: miscellaneous - inactive individuals (retired - unemployed).

- occupant's status: owner (including coming into ownership), renter;
- the average income level of occupants.

The overall characteristics of the people interviewed are:

-Sex

.Men: 6%
.Women: 94%

/10

-Age

Years of age	I.R.T. Survey 1979	French Population Female	French Population Female (mature age)
-from 18 yrs	0	28%	0
-18-34 yrs	30.4%	23%	32%
-35-64 yrs	52.2%	33%	45.8%
-+ 65 yrs	15.4%	16%	22.2%

The population sample surveyed was made up almost exclusively of women and was very similar insofar as that the age structure of the French population consisted of women over 18 years of age.

-C.S.P. of head of family

The table below shows the distribution of the heads of family of the households surveyed as a function of their C.S.P.

	1979 IRT Survey	French Pop. urban+100,000h*	Entire France
Active farmer Farm wage-earner	0	0,8	6,4
Industrialist- crafts-man	3,6	5,6	6,5
Liberal Prof. - High-level execut.	C 1 6,5 } 21,1	7,6 } 23,8	6,4 } 21,8
Av. level execut.	11	10,6	8,9
Employee	13,4	10,1	8,4
Worker - Service personnel	C 2 34,4 } 47,8	32,5 } 42,6	30 } 38,4
Miscellaneous	2,2	2,1	1,9
Inactive	C 3 28,9 } 31,1	30,7 } 32,8	31,5 } 33,4

*Reference no. 15.

N° du site -a-	Type d'habitat (nombre d'interviews) -b-	Type de voie -c-	Données trafic -d-		Exposition au bruit de jour Répartition en pourcentage -g-			Caractéristiques socio-économiques -n- de l'échantillon		
			Débit J/17 -e-	Pourcentage P.L. -f-	Faible Leq < 60 -h-	Moyenne 60 ≤ Leq < 68 -i-	Forte Leq ≥ 68 -j-	C.S.P. du chef de famille -k-	Statut d'occupation du logement -l-	Niveau moyen de revenu du ménage -m-
1	-o- Collectif H.L.M. 228	-p- Autoroute et Rode	6 000 1 500	11 15		46,9	53,1	C 1	L : 98 P : -	3 700
2	-q- Collectif H.L.M. 70	-r- Autoroute et Transit	6 000 1 850	11 30		52,9	47,1	C 3	L : 97 P : -	3 400
3	-v- Copropriété 98	-s- Artère	3 000	5	7,1	1,1	91,8	C 3	L : 38 P : 58	4 400
4	-v- Copropriété 131	-t- Artère et Distribution	3 000 950	5 2	16	53,5	30,5	C 2	L : 37 P : 59	5 300
5	-v- Copropriété 53	-u- Impasse			100			C 3	L : 60 P : 36	3 500
6	-v- Copropriété 49	-u- Impasse			100			C 1	L : 22 P : 76	3 900

Key: a-Site No.; b-Type of dwelling (interview number); c-Road type; d-Traffic data; e-Flow Day/17; f-P.L. percentage; g-Daily exposure to noise, Distribution in percentage; g/l-Socio-economic characteristics of population sample; h-Low Leq < 60; i-Average $60 \leq \text{leq} < 68$; j-High Leq ≥ 68 ; C.S.P. of head of family; l-Status of lodging occupant; m-Average income level of household; n -Socio-economic characteristics of population sample; o-Low cost housing ; p-Highway and strategic road; q-Low-cost housing (apartment complex) ; r-Highway and transit; s-Artery; t-Artery and distribution; u-Dead-end.

N° du site -1-	Type d'habitat (nombre d'interviews) -2-	Type de voie -3-	Données trafic -4-		Exposition au bruit de jour Répartition en pourcentage -7-			Caractéristiques socio-économiques -7a- de l'échantillon		
			Débit J/17 -5-	Pourcentage P.L. -6-	Faible Leq < 60 -8-	Moyenne 60 ≤ Leq < 68 -9-	Forte Leq ≥ 68 -10-	C.S.P. du chef de famille -11-	Statut d'occupation du logement -12-	Niveau moyen de revenu du -13-
7	-14- Collectif H.L.M. 100	-15- Desserte	100		100			C 1	L : 99 P : 1	3 600
8	-16- Copropriété 118	V.R.U.	3 500	11	24,6	66,1	9,3	C 1	L : 61 P : 39	4 900
9	-16- Copropriété 110	-18- Artériel	2 500	5 à 10	6,4	6,3	87,3	C 3	L : 68 P : 24	4 100
10	-16- Copropriété 53	-15- Desserte	< 100		100			C 2	L : 24 P : 73	6 800
11	-14- Collectif H.L.M. 64	V.R.U.	3 500	13		32,8	67,2	C 1	L : 98 P :	4 000
12	-14- Collectif H.L.M. 54	V.R.U.	3 500	15			100	C 1	L : 100 P :	3 800
13	-14- Collectif H.L.M. 163	Autoroute -17-	2 700	14	22,7	68,7	8,6	C 1	L : 100 P :	4 700
14	-14- Collectif H.L.M. 120	Distribution	250	2	94,2	5,8		C 1	L : 98 P :	4 400
15	-16- Copropriété 74	-15- Desserte	< 100		100			C 1	L : 30 P : 68	5 100
	TOTAL (1486)				36,5	29,6	33,9	C 1	L : 74 P : 24	4 350

Key: 1-Site no.; 2-Type of dwelling (number of interviews; 3-Type of road; 4-Traffic data; 5-Traffic flow Day/17; 6-P.L* percentage; 7-Daily exposure to noise, percentage distribution; 7a-Socio-economic characteristics of sample; 8- Low leq < 60; 9-Mean level 60 < leq < 68; 10-High level Leq > 68; 11-C.S.P. head of family; 12-Occupancy status (L = tenant; P = owner; 13-Average income level; 14-Low cost apartment complex; 15-Frontage road; 16-Co-ownership; 17-Highway; 18-Arterial.

*P = owner; L = tenant.

The population sample therefore has a very similar structure to that of people living in cities of 100,000 inhabitants or more, as far as the C.S.P. variable is concerned.

-School level of the interviewee

No school	Primary	Secondary	HS Diploma	- College
1.5%	46%	37.5%	7.5%	7.5%

-Household income

The rate of response may be considered satisfactory, since 86.8% of the individuals interviewed answered the questions.

The table below shows the population sample distribution as a function of monthly income.

+ 1500 F	1500-2000 F	2000-2500 F	2500-3000 F	3000-3500 F	3500-4000 F
2,5 %	4,3 %	7,8 %	9,7 %	12 %	14,9 %
4000-5000 F	5000-7000 F	7000-9000 F	+ 9000 F		
20,5 %	19 %	6,1 %	3,2 %		

Compared to national data, this distribution does not seem very broad, i.e. it is more centered on average incomes. Actually, 84% of the households have an income between 2,500 and 7,000 French Francs.

-Occupancy status

Nearly 3/4 of the households surveyed are tenants, as we can see in the table below.

	Tenant	Owner or coming into ownership	Misc.
I.R.T Survey	74%	24%	2%
Urban France (reference no. 16)	50.4%	39.8%	9.8%

II-2-2 - EXPOSURE TO NOISE

Noise levels were assessed using various measuring methods: data processing program (with measurement adjustments) and calculation.

We were thus able to assign a noise level Leq 8 am to 8 pm for the front wall of each room in each lodging.

The evening (20 h - 24 h) and night (0 h - 5 h) Leq noise levels were deduced from the day levels checking the consistency with partial long term measurements performed on the various sites (see Appendix 3: Site description, two examples).

The histograms below indicate the housing distribution as a function of Leq on the walls for each of these periods.

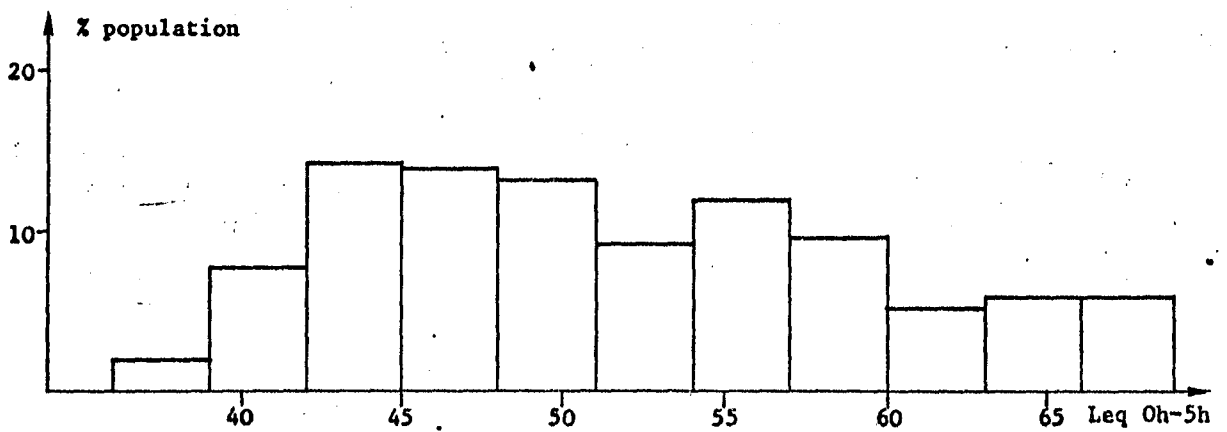
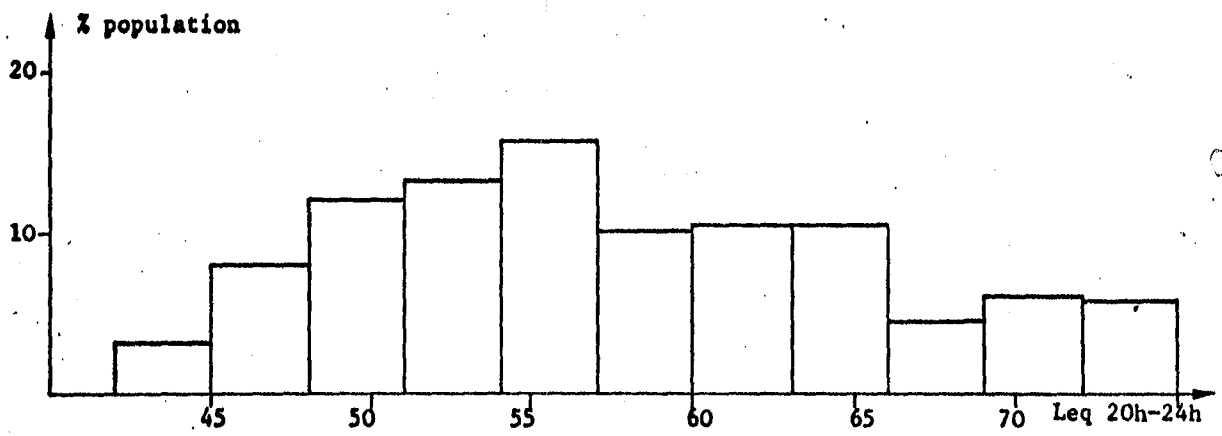
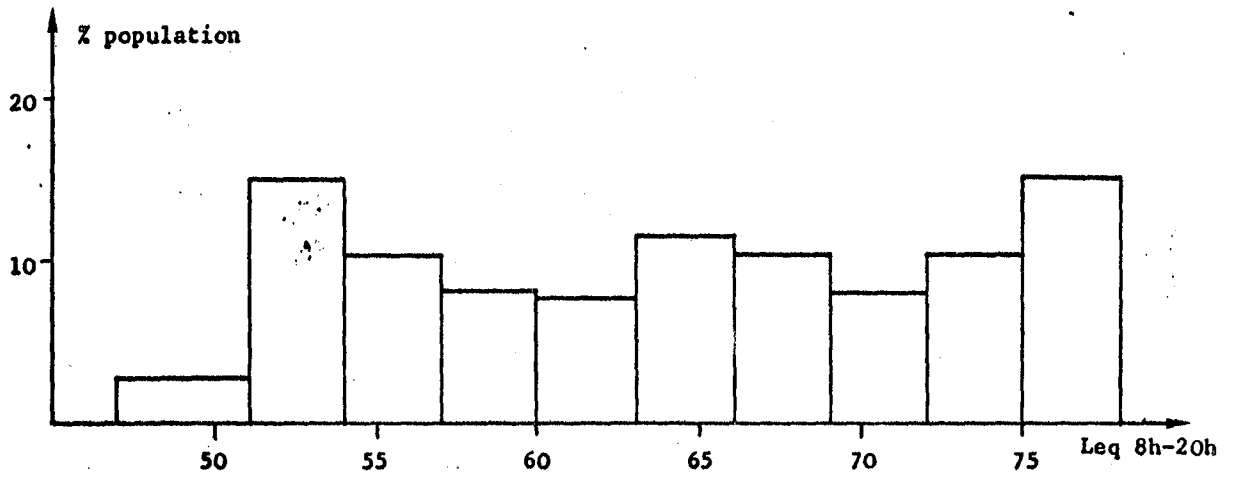
For the day, we retained the most exposed wall Leq ; for the evening and night, we retained the wall Leq of the bedroom.

The statistical characteristics of these three distributions are grouped in the table below.

-4-

-2- Indice acoustique	-1- Paramètres statistiques		Dispersion	
	Mode -5-	Moyenne -6-	Etendue -7-	Ecart-type -8-
Leq 8 h - 20 h	63 dB(A)	64 dB(A)	30 dB(A)	8,5 dB(A)
Leq 20 h - 24 h	55 dB(A)	57 dB(A)	32 dB(A)	8 dB(A)
Leq 0 h - 5 h	50 dB(A)	51 dB(A)	32 dB(A)	8 dB(A)

Key: 1- Statistical parameters; 2-Acoustic index;
4- Central trend; 5-Mode; 6-Average; 6-Difference;
7- Spread; 8-Standard deviation.



	Level of noise exposure (Leq 8 h - 20 h)							
	total	- 57	57-59	60-62	63-65	66-68	69-71	> 71
Numbers	1 486	421	122	116	171	153	120	382
	%	%	%	%	%	%	%	%
Age								
.18 to 34 years	30	33	38	39	36	28	26	22
.35 to 49 years	31	30	33	31	38	38	36	24
.50 to 64 years	23	24	18	18	15	23	24	29
.65 years and above	16	13	11	12	11	11	14	25
	100	100	100	100	100	100	100	100
Income level								
.average monthly income in French francs	4 360	4 470	4 435	4 400	4 335	4 635	4 360	4 100
.deviation from average income of sample(%)	-	+ 2,5	+ 1,7	+ 0,9	- 0,6	+ 6,3	0	- 6
Profession head of family								
.C1	21	26	14	22	17	22	22	19
.C2	48	46	58	56	56	49	43	39
.C3	31	28	26	22	27	29	35	42
	(see definition in text)							
Status of occupant								
.owner	24	36	9	8	14	27	26	24
.renter	74	62	89	91	85	72	73	74
.other	2	2	2	1	1	1	1	2

For the age criterion, the Leq > 71 dB(A) includes a higher percentage of senior citizens.

This phenomenon is found at the professional level of the head of family (more retired people in this noise class) and a lower mean income level than the average for the population sample.

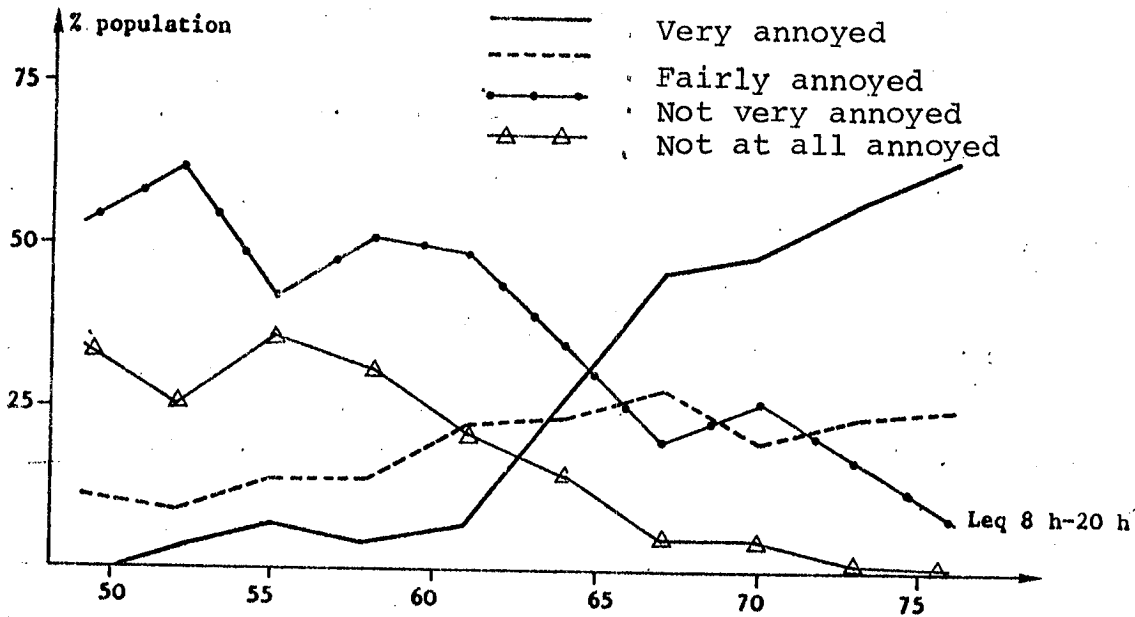
Although the study undertaken by I.R.T concentrated on behavioral reactions to noise, it is just as interesting to establish a link between the behavioral patterns and the annoyance expressed and to make a comparison with the results of previous studies.

A group of questions was also included in the survey pertaining to annoyance felt in the daytime and at night.

II-2-1 - ANNOYANCE IN THE DAYTIME

Individual Annoyance

The graph below shows the variation of daytime annoyance (on 4 points) as a function of Leq 8 h - 20 h on the most exposed wall of each dwelling.



Graph 1

The "very annoyed" curve inflects sharply toward 60 - 61 dB(A).

The individual correlation between the discomfort felt and the noise heard pertains to 1,465 people; the results are the following:

Noise Index Leq 8 h - 20 h	Correlation with individual rating r
-most exposed wall	0.64
-bedroom	0.54
-kitchen	0.39
-living room	0.36

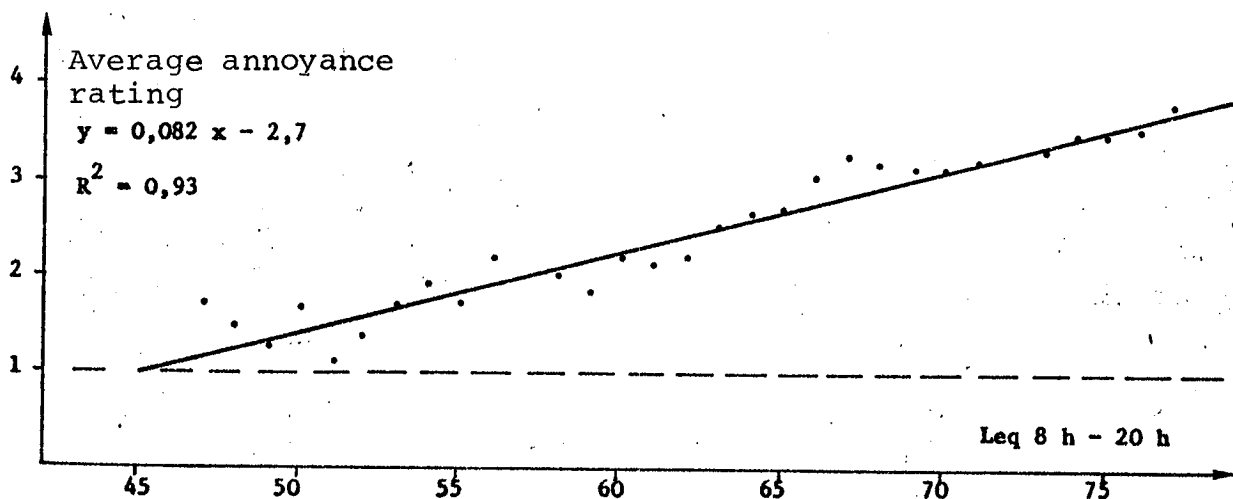
Two remarks should be made here:

-the best correlation is obtained with the Leq of the most exposed wall which makes us think that the discomfort felt incorporates the overall situation;

-the correlation is highly significant; 40% of the discomfort variance is explained by the noise variance.

Average Annoyance

The graph below shows the relationship between average annoyance by dB(A) and the Leq 8 h - 20 h noise level.



Graph 2

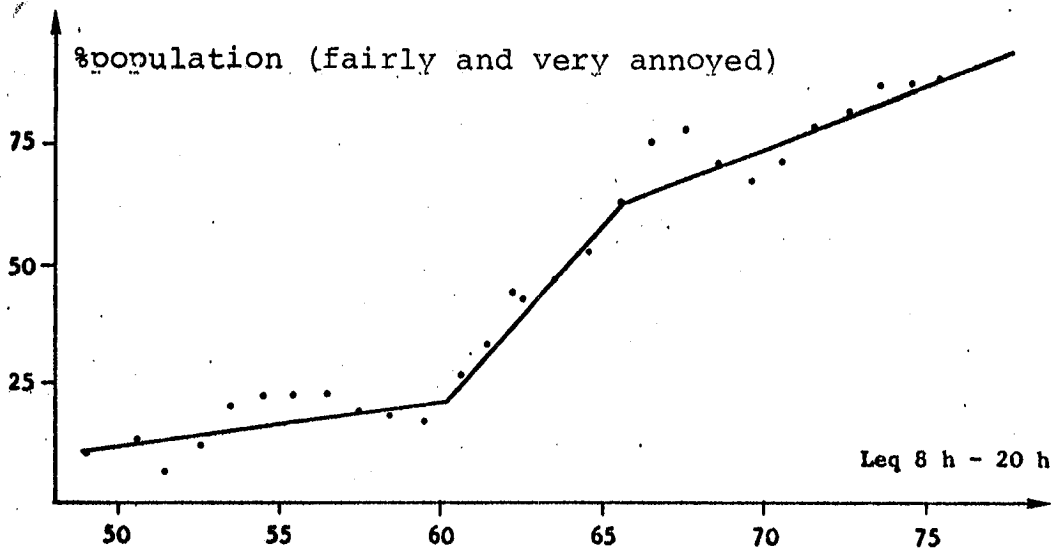
A strong linearity between this variable and noise may be seen; the correlation is moreover good since $r = 0.96$ is obtained, i.e. 93% of the mean annoyance variance is explained by the acoustic level variance.

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Determination of Noise Thresholds

Although the mean annoyance variation is linear with noise, it hides the existence of noise thresholds from which individual discomfort accentuates considerably.

This is why the "5" indicator was retained for the fairly and very annoyed subjects. Its variation to noise is shown in the graph below:



Graph 3

A segmentation of the annoyance data confirms the very distinct trend revealed on the graph, namely, the existence of three noise regions.

-First Region: $Leq \leq 60$ dB(A)

/18

In this region, which groups about 55% of the French urban population*, the indicator varies moderately with noise; Based on this indicator, the discomfort caused by noise is still bearable.

-Second Region: $60 < Leq \leq 65$ dB(A)

This region contains about 20% of the urban population; the indicator varies highly with noise, since from 60 to 65 dB(A), we have an increase from 20% to 60% of people who are fairly or very annoyed.

The annoyance in this region may be considered very strong.

*French cities of more than 20,000 inhabitants (reference 17).

Third Region: Leq > 65 dB(A)

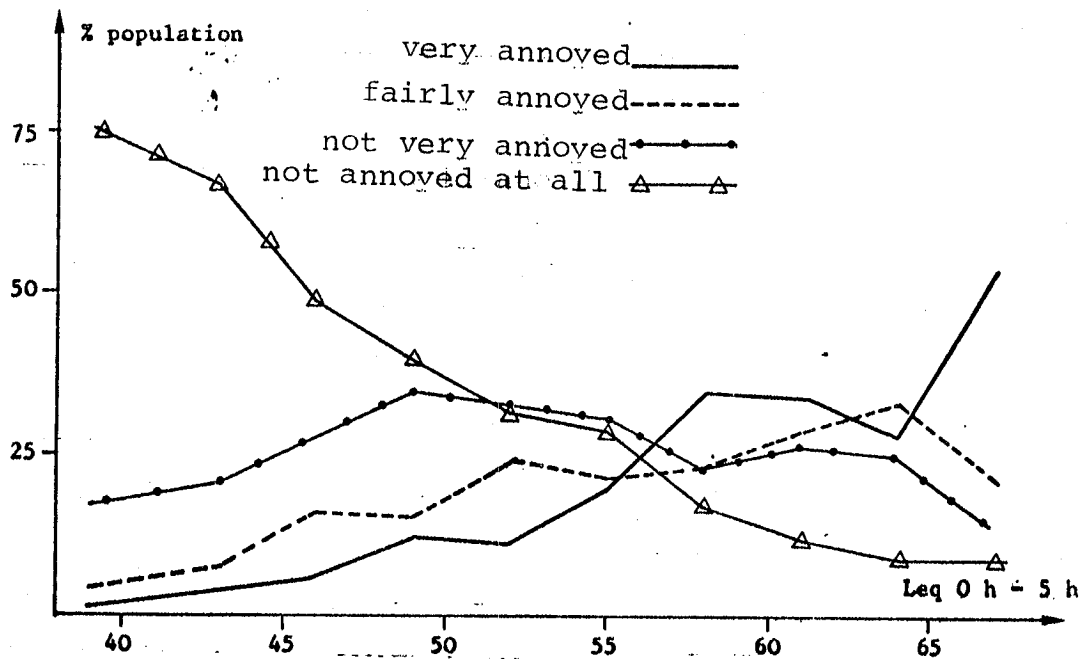
This region contains 25% of the French urban population; the indicator, which was already at a high level, continues to vary considerably with noise to reach a very critical level at 75 dB(A) where nearly 90% of the population is fairly or very annoyed.

It seems that in that protective actions are imperative in this region.

II-2-2 - NIGHT ANNOYANCE

Individual Annoyance

The graph below shows the variation of annoyance as a function of Leq 0 h - 5 h on the front wall of a bedroom.



/19

Graph No. 4

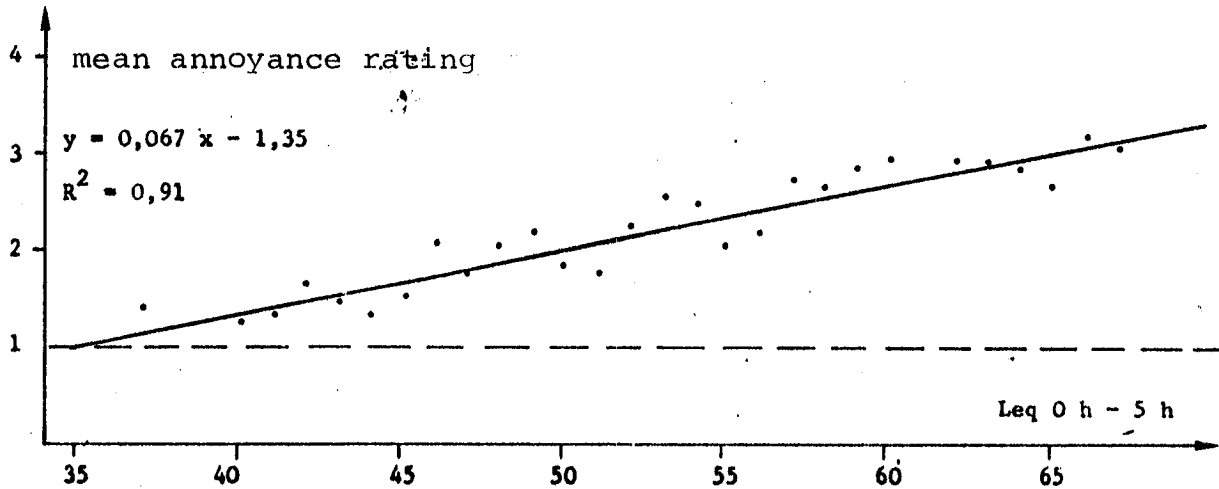
The "very annoyed" and "not annoyed at all" curve inflects at about 52 to 55 dB(A).

The individual correlation between the annoyance felt and the noise received on the bedroom wall is 0.48 ($R^2 = 0.23$). Although not as high as the daytime correlation, it is still very high. This correlation is still slightly higher than that obtained with the Leq of the most exposed wall in the daytime and the bedroom Leq in the evening.

Mean Annoyance

The graph below shows the variation of annoyance as a function of Leq 0 h - 5 h.

/20

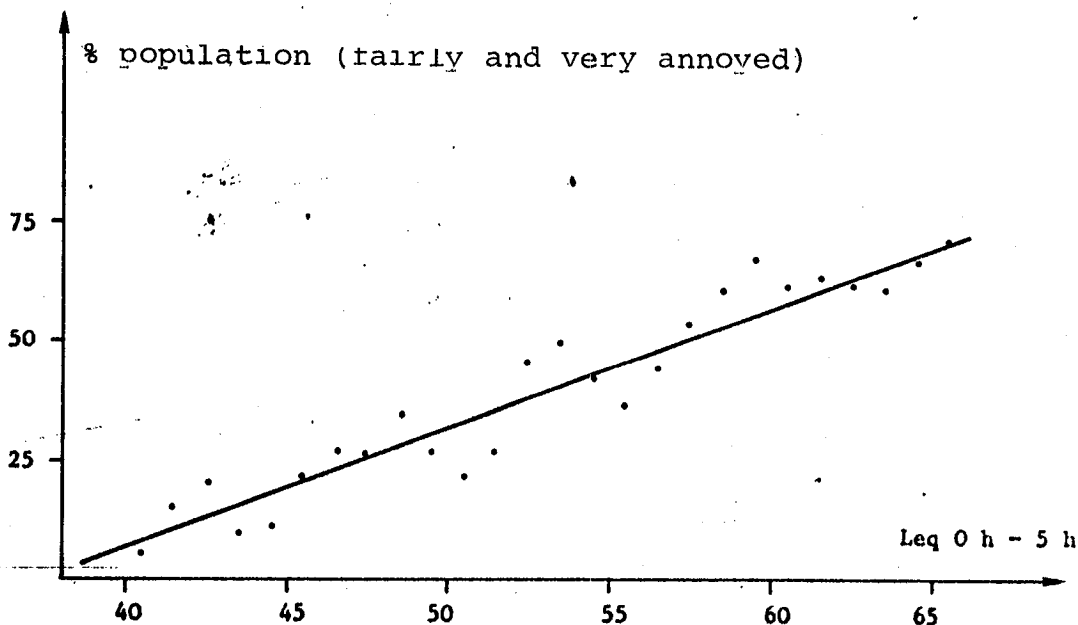


Graph 5

Like daytime annoyance, we see a strong linearity in the mean annoyance confirmed by the value of the correlation factor ($r = 0.95$).

Determination of the Noise Thresholds

The graph below shows the relationship between night annoyance (percentage for fairly and very annoyed subjects) and Leq 0 h - 5 h.



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Graph 6

actual survey \ Corrélation	ANNOYANCE		GENE
	indiv. rating	mean rating	acoustic index
I.R.T. 1980 (1 500)	0,64 (de jour) * 0,48 (de nuit) **	0,96 (de jour) * 0,95 (de nuit) **	Leq 8 h - 20 h Leq 0 h - 5 h
Bradley - Jonah 1979 (300) Référence 22	0,46 0,48		Leq jour * Leq nuit **
Brown 1978 (818) Référence 21	0,06 (de jour) * 0,06 (de nuit) **	0,31 (de jour) * 0,34 (de nuit) **	Leq 6 h - 18 h Leq 18 h - 6 h
Myncke - Cops 1977 (775) Référence 19	0,42 (de jour) *	0,86 (de jour) * 0,52 (de nuit) ** meilleur des cas best case	Leq 7 h - 19 h Leq 23 h - 7 h
Yeowart et al 1977 (846) Référence 20		0,74	Leq 24 h
I.R.T. 1974 (1 000) Référence 7	0,31 0,21 (de nuit) **		Leq 8 h - 20 h Leq 0 h - 5 h
C.S.T.B. 1971 (700) Référence 18	0,32		L 50 7 h 30 - 22 h 30
J. Langdon 1968 (1 200) Référence 2	0,29	0,88	T.N. I

Key: *daytime; **nighttime

In contrast to daytime annoyance, no sudden variation in the indicator is seen.

However, for 50 and 55 dB(A) (figure given by segmentation) there seems to be a more pronounced accentuation of the discomfort felt, which would confirm the daytime thresholds of 60 and 65 dB(A) (difference between daytime bedroom Leq and nighttime bedroom Leq is 9.5 dB(A), i.e. very close to 10 dB(A)).

II-2-3 - COMPARISON OF DAYTIME ANNOYANCE - NIGHTTIME ANNOYANCE

The discomfort felt at night does not seem to be as great as for the day for the simple reason that the noise levels during this period are generally lower (on the average 10 dB(A) at least).

This observation hides fine lines which may distinguished between the various cases.

If we compare the mean annoyance curves between the two periods, we may note that:

- less annoyance is felt at night than in the day when $Leq_{day} - Leq_{night} > 6$ dB(A); the most frequent case;
- more annoyance is felt at night than in the day when the $Leq_{day} - Leq_{night} < 6$ dB(A); more infrequent case, although it does exist.

II-2-4 - COMPARISON OF RESULTS WITH PREVIOUS STUDIES

The table below shows the results obtained in the studies conducted since 1970 on noise annoyance caused by road traffic.

Comparisons are sometimes difficult to make because of the diversity in the acoustic indices retained and particularly the periods being considered. /22

However, we may estimate that the results obtained in this survey on annoyance are at a considerably higher level than those obtained in the past.

Until present, most studies detected a correlation between the individual annoyance rating and noise from 0.3 to 0.4 (more recently close to 0.5 in BRADLEY's study) and from 0.75 to 0.85 for the mean annoyance ratings and noise.

The same is true for nighttime where the link between noise and annoyance was established only very rarely (AUBREE) and remained modest in VALLET's survey (L 1 Index) and in LANDGON's study (L 10 index).

How can these differences be explained?

-the more accurate measurement and the assignment of noise levels are probably the greatest reasons for these more solid links;
-people possibly have become more aware of the noise problem.

II-2-5 - ANNOYANCE MODULATION FACTORS

If a good correlation was established between noise and annoyance, on the whole, a certain number of individual factors modulate it more or less (see next table).

Age

On the whole, there is no significant age difference. However, it seems that in the mean noise levels, people 35 years or older express greater discomfort.

C.S.P

/24

If there is no impact due to C.S.P., the active/nonactive criterion may be pertinent in some cases (which confirms VALLET's results - reference 7).

Occupant's Status

No meaningful difference between renter and owner was found. However, the type of dwelling and more specifically the contrast low-cost apartments and co-ownership seems to considerably modulate the annoyance expressed.

Type of Traffic

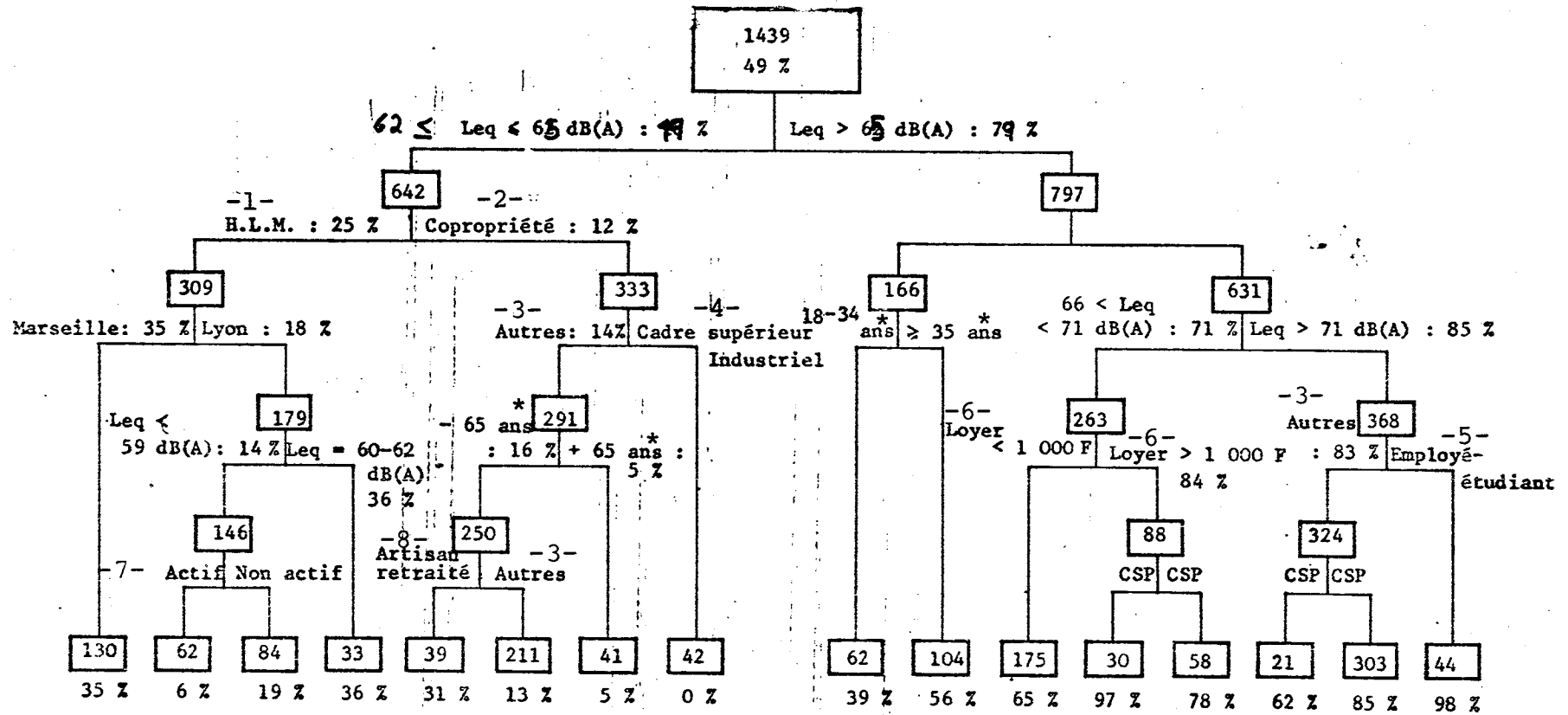
The graph no. 7 shows that daytime annoyance is greater in heavy traffic conditions (arterial, for example) for the same noise level.

Climatic Difference

A variance analysis shows that there is a difference in the annoyance level expressed between sites in different climates.

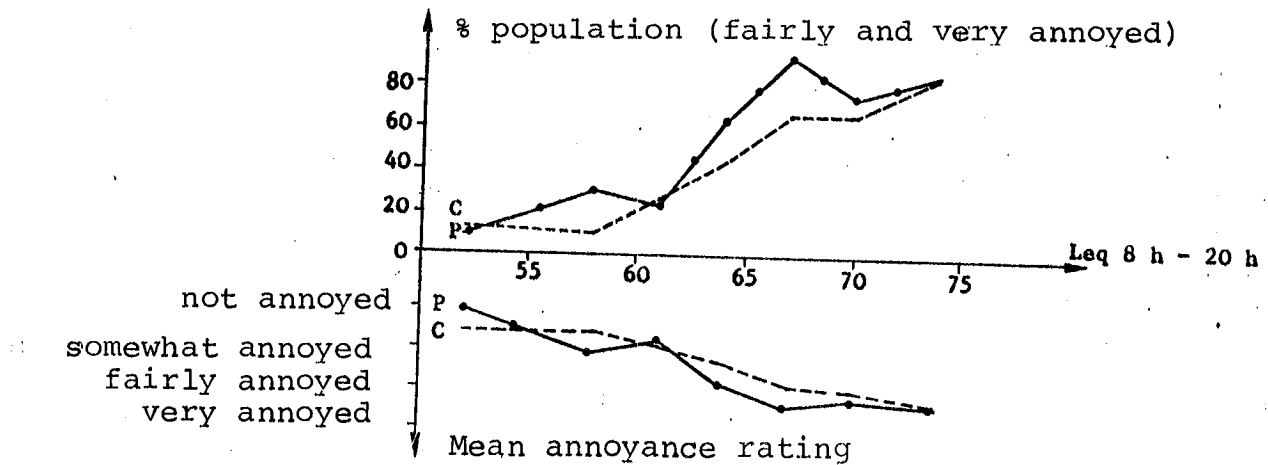
This difference will, moreover, be connected with the fact that more people open windows (and hear more noise) in Marseille than in Lyon.

These results simply indicate a general trend in later, more detailed studies, and are not within the framework of this study. They will more clearly show the actual influence of each of these factors. It is nonetheless true that the noise variable is more tied to annoyance at higher noise levels



Annoyance: for people who are fairly or very annoyed

Key: 1-Low cost apartments; 2-Co-ownership; 3-Other; 4-Higher executive (industrial producer); 5-Rent; 6-Active/Nonactive; 8-Retired craftsman;

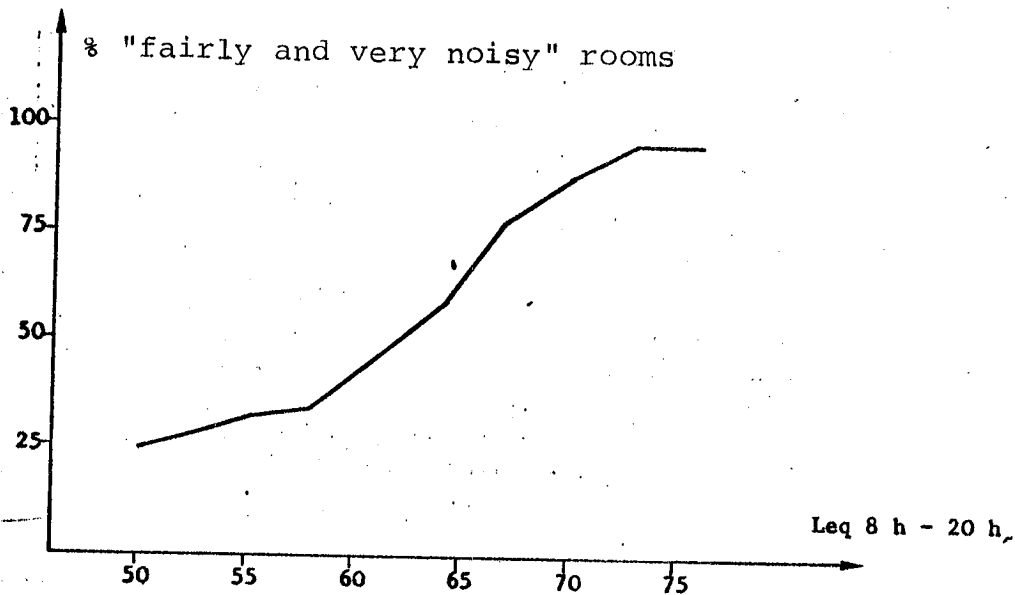


Graph no. 7

II-2-6 - CLAMOUR

In conjunction with the notion of annoyance, it seemed of interest to assess the impact of traffic noise in terms of the clamour felt.

The graph below shows the relationship between the daytime noise level and the perencetage of rooms declared to be fairly and very noisy.



Graph no. 7a

A segmentation of the data indicates that the two thresholds /28 in which clamour tends to accentuate are:

- First threshold: 58 dB(A)
- Second threshold: 64 dB(A).

These results are therefore fairly close to those obtained for daytime annoyance.

One may also check whether this indicator may be expressed as follows, within the noise interval 50 - 70 dB(A):

$$I = A \left| 2 \frac{Leq - 50}{10} \right|$$

In other words, one can confirm whether the clamour felt doubles when the noise level increases by 10 dB(A).

The table below shows the observed and theoretical values.

Noise Level	Obseved I Values	Theoretical I Values
50	23	23
55	32	32.5
60	42	46
65	64	65
70	88	92

There is no significant statistical difference between these two distributions (CHI 2 = 0.54 - ddl = 4).

II-3 - NOISE AND BEHAVIOR PATTERNS

/29

II-3-1 - USAGE OF RESIDENTIAL SPACE

Usage of Dwelling

The assumption formulated is that noise may "discourage" individuals from practicing certain noise-sensitive activities, i.e. force them to practice them in rooms not "socially" designated for these activities.

a - Existence of the Activity

The results obtained do not show any noise impact on the

existence of certain activities such as watching TV, listening to the radio or music and intellectual work in the home (children's homework - family paperwork, etc.).

β - Location of Activities in the Home

If one does not question the existence of activities practiced in the home, one may wonder if they are not practiced by preference in less exposed areas.

In other words, one tries to find out whether activities are transferred to less noisy rooms.

The method consists of comparing the acoustic distribution of the rooms where the activity under study is practiced, with the acoustic distribution of rooms in which this activity "normally" should be exercised.

In the first place, a "normal" room should be defined. This is accomplished as follows:

Lodgings are classed into three groups:

- .those for which the L_{eq} 8 h - 20 h is < 60 dB(A)
- .those for which L_{eq} is between 60 and 68 dB(A)
- .those for which L_{eq} is > 68 dB(A).

This method of proceeding seemed appropriate to us because it is highly unlikely that transfers occur in quiet dwellings. We therefore made the assumption that the "normal" distribution of rooms in which the activity is exercised was determined on the least exposed dwelling group ($L_{eq} < 60$ dB(A)).

730

-we compared the acoustic distribution of the rooms in which the activity is exercised with the distribution considered to be normal;

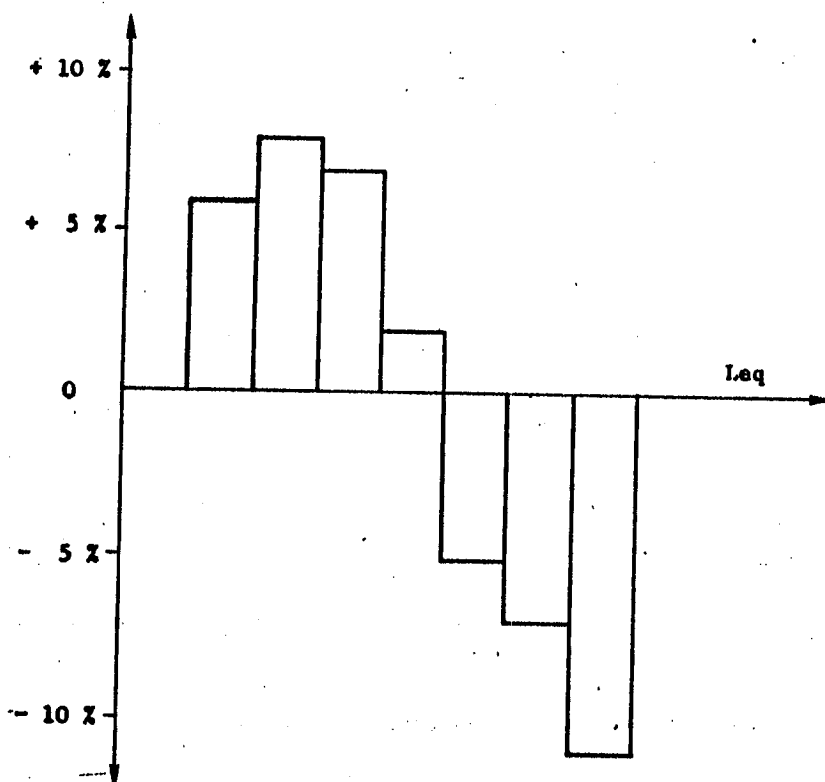
-if activities are transferred between rooms, we should have the type of result shown below on the next page.

The graph below shows per noise class the difference between the percentage of rooms in which the activity is practiced and the percentage of rooms where this activity should have been practiced (this is therefore a histogram difference).

/31

It shows that based on a certain noise threshold, there is an underexposure of the rooms used compared to normal rooms; this difference increases with noise.

This transfer assumption was tested on noise-sensitive activities, namely:



- listening to TV,
- reading;
- intellectual work in the home (writing letters, administrative paperwork, etc.);
- sleep.

Now, let's examine the results.

In regard to watching TV, graph 8 shows for quiet homes that there is a correlation between the TV room and the living room of the apartment. Actually, the sound distributions are very close and probably do not differ statistically ($X^2 = 0.32$, $ddl = 2$).

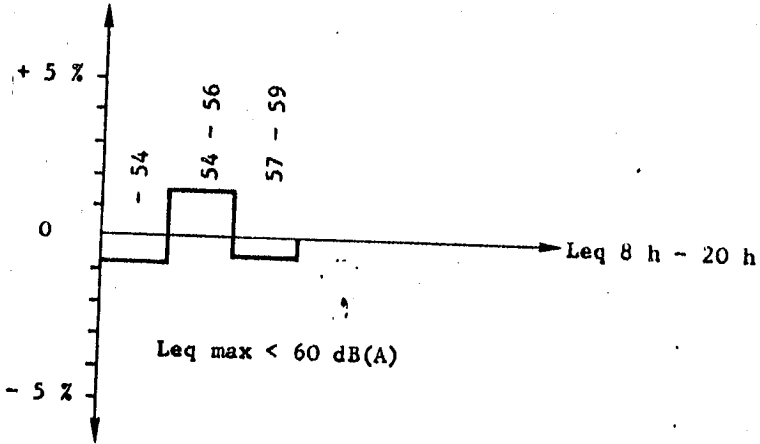
For the most exposed dwellings ($60 < Leq < 68$ dB(A)), the results are identical ($X^2 = 1.8$, $ddl = 5$) (graph 8a).

Finally, for the most exposed dwellings ($Leq > 68$ dB(A)) significant differences are not always found ($X^2 = 1.76$, $ddl = 7$) (graph 8 ter).

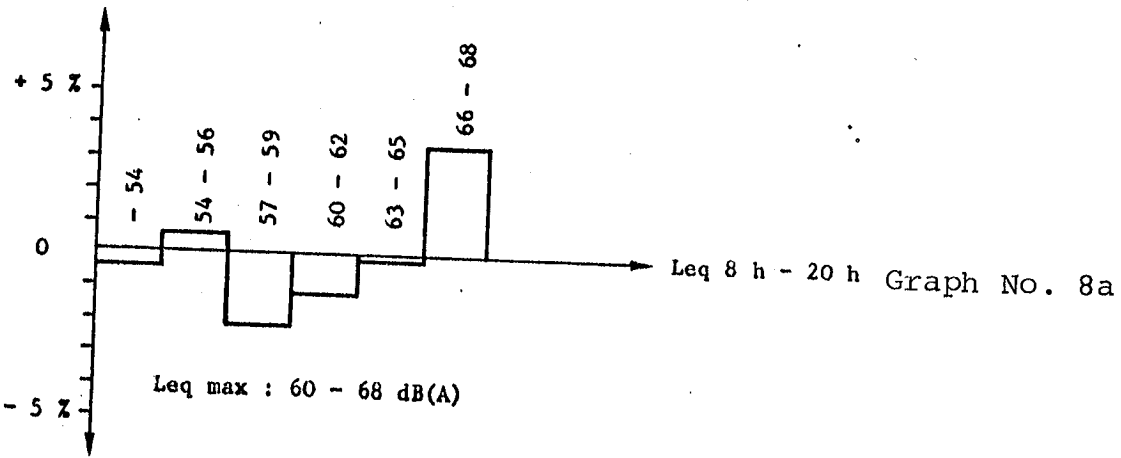
We may thus conclude that TV is most often listened to in the living room no matter what the façade noise level is.

In regard to sleeping, one comes to the same conclusions, namely, that people sleep in their bedroom. However bedrooms reserved for in-laws and friends are more exposed than the other bedrooms (parents and children). This phenomenon occurs as of 66 - 68 dB(A).

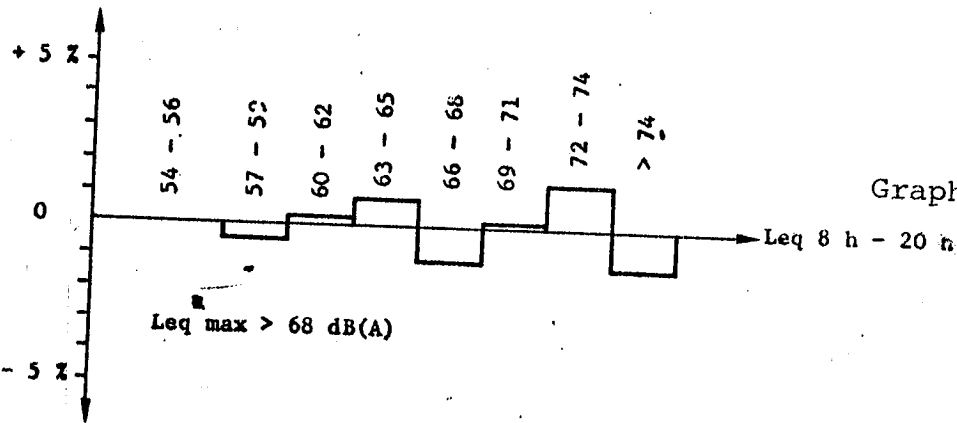
TV LISTENING



Graph no. 8



Graph No. 8a



Graph No. 8b

-In regard to reading, in quiet homes people mostly read in the living room (graph 9) ($X^2 = 1.2$, $ddl = 2$). For the most exposed dwellings, the phenomenon is the same (graph 10) ($X^2 = 1.27$, $ddl = 8$). As of 66 - 68 dB(A) there is no longer a coincidence between the room in which people read and the living room. This activity is therefore transferred to one (or several) less exposed rooms (in some cases the kitchen is plotted in a dotted line).

Finally, the same procedure was followed for intellectual work at home (graphs 12 - 13 - 14). The conclusions are the same as for reading: as of 66 - 68 dB(A) there is a statistical difference between this activity and the living room ($X^2 = 47$ - $ddl = 8$). Once again, for this type of activity also, there is a transfer to the least exposed rooms.

From this analysis, we may draw the following conclusions:

-the transfer of activities to the least exposed rooms takes place only in certain conditions.

-these conditions are associated with:

.the distribution of the various rooms of the dwelling as a function of noise: whether or not a double exposure exists;

.the size of the dwelling and of the household: people sleep in less exposed bedrooms only if one is available (when a child leaves the family, for example);

.the nature of the activity: if reading and intellectual work in the home are easily "transferable", as we have shown. In contrast, it is more limiting for family members when a TV is moved to another room;

.the noise level of the room where the activity is normally takes place: existence of a transfer when $Leq > 66 - 68$ dB(A). 0736

γ - Closing Windows

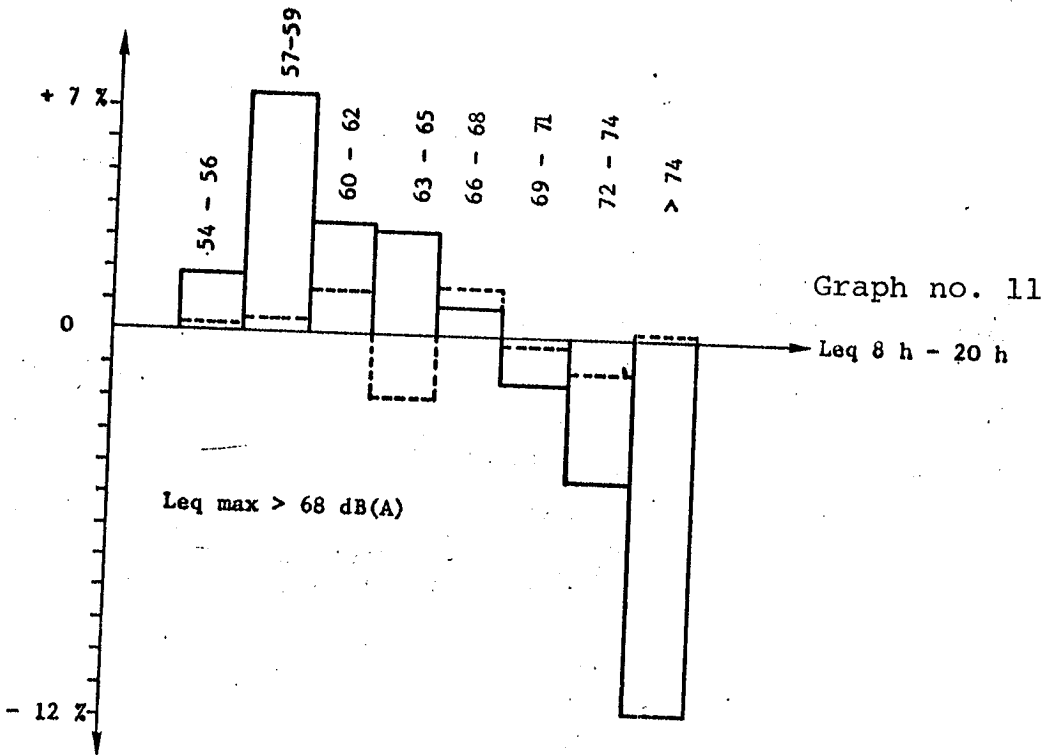
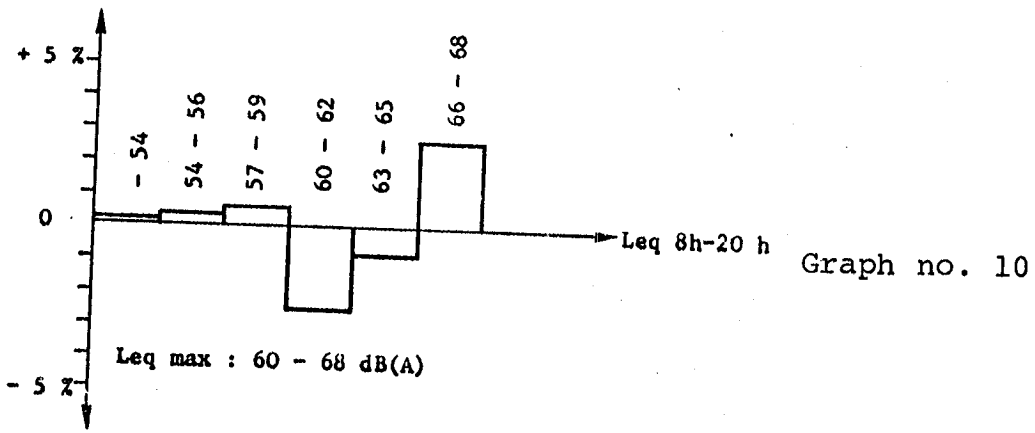
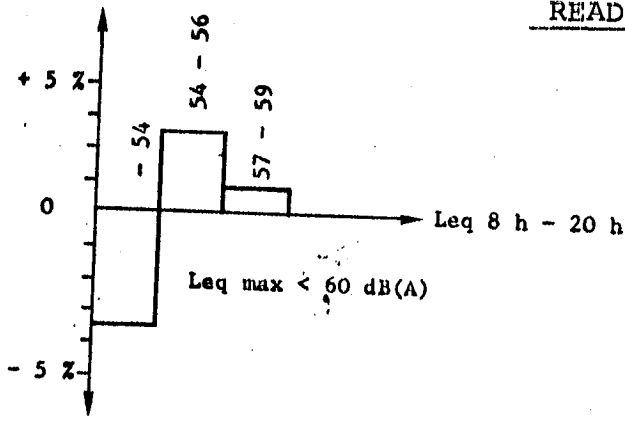
The need to close windows to do certain activities is shown in the results as one of the behaviors which is the most sensitive to noise.

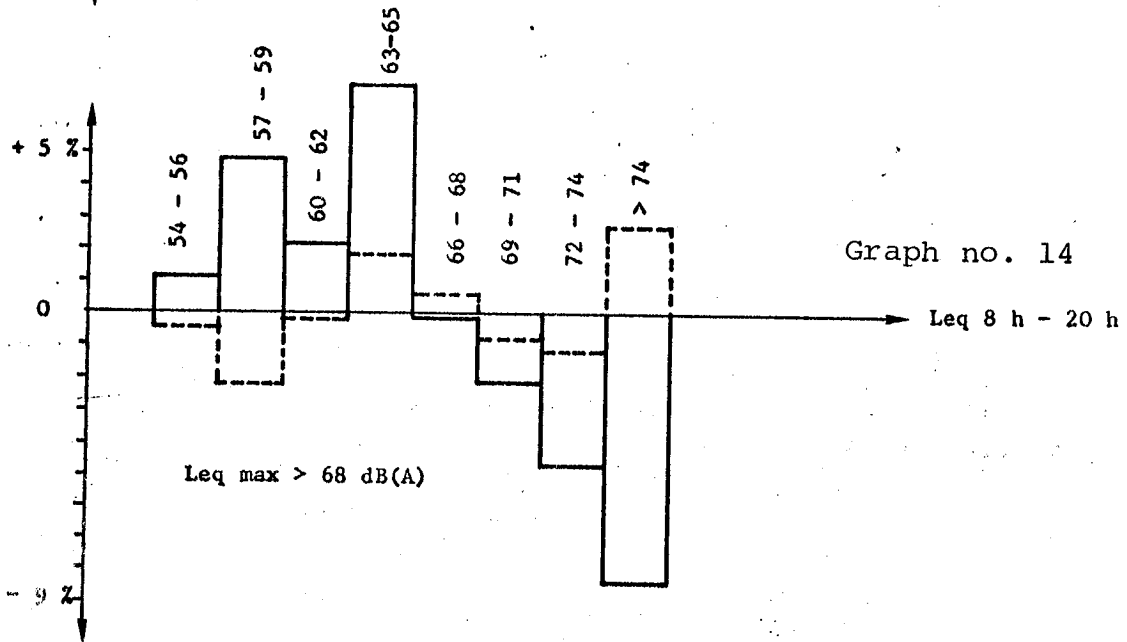
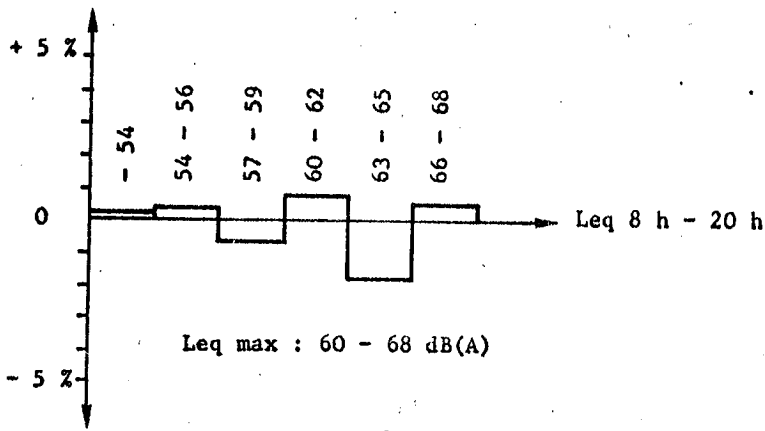
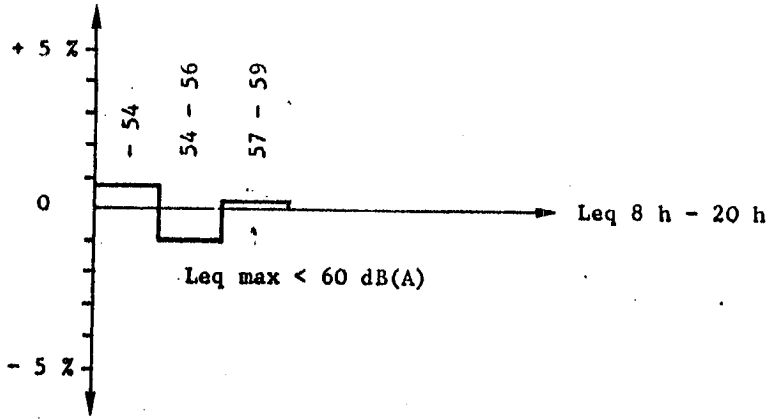
We measured it for the following activities: TV listening - reading - sleeping - kitchen (see graphs 15 to 18).

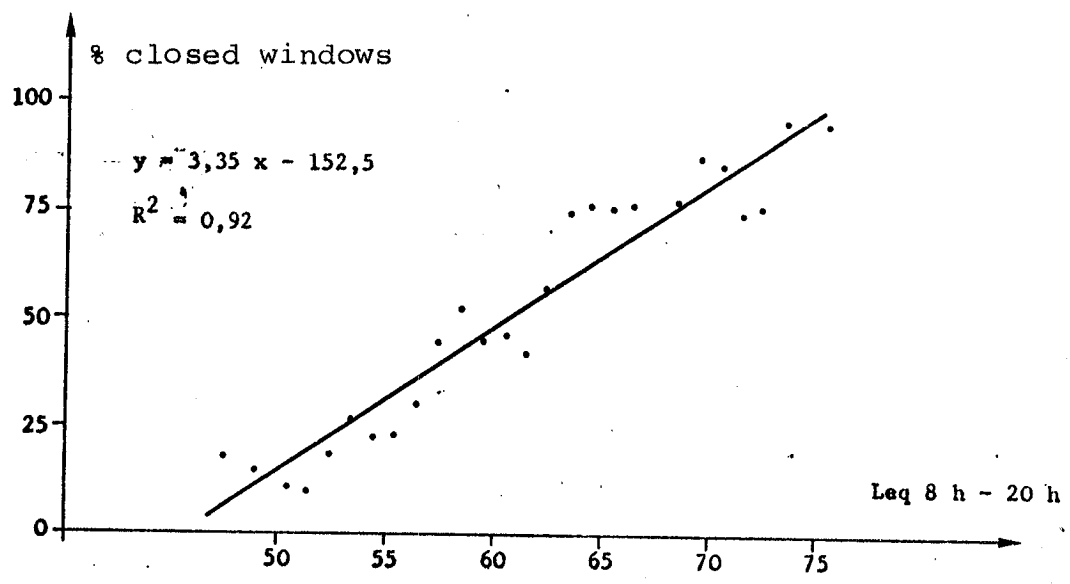
Although the noise - window closing relationship is linear, one may investigate the noise thresholds at which this behavior tends to sharply increase.

The table below shows the two segmentation thresholds of the sample for this behavior in several of the activities discussed.

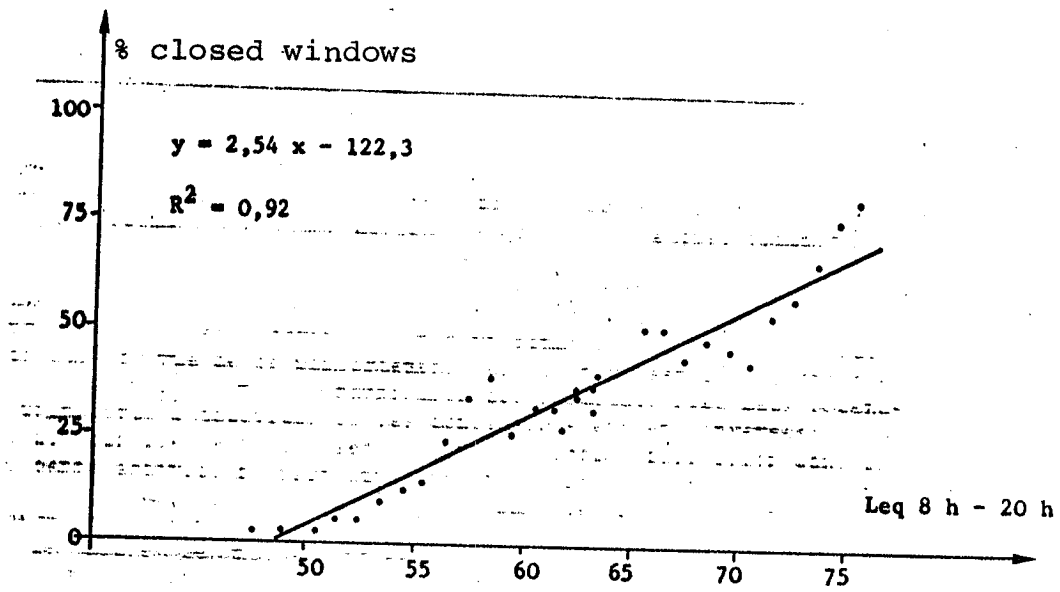
READING



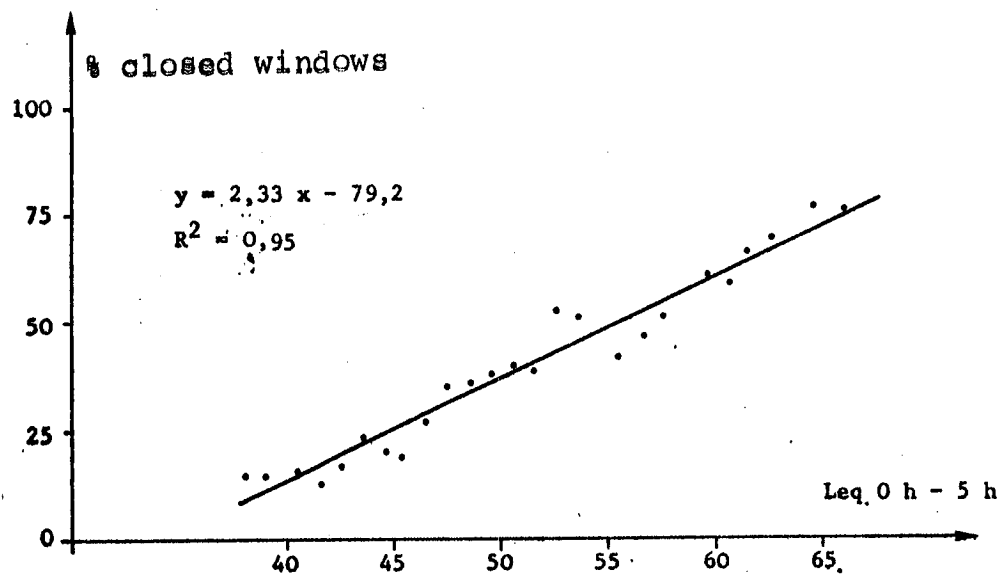




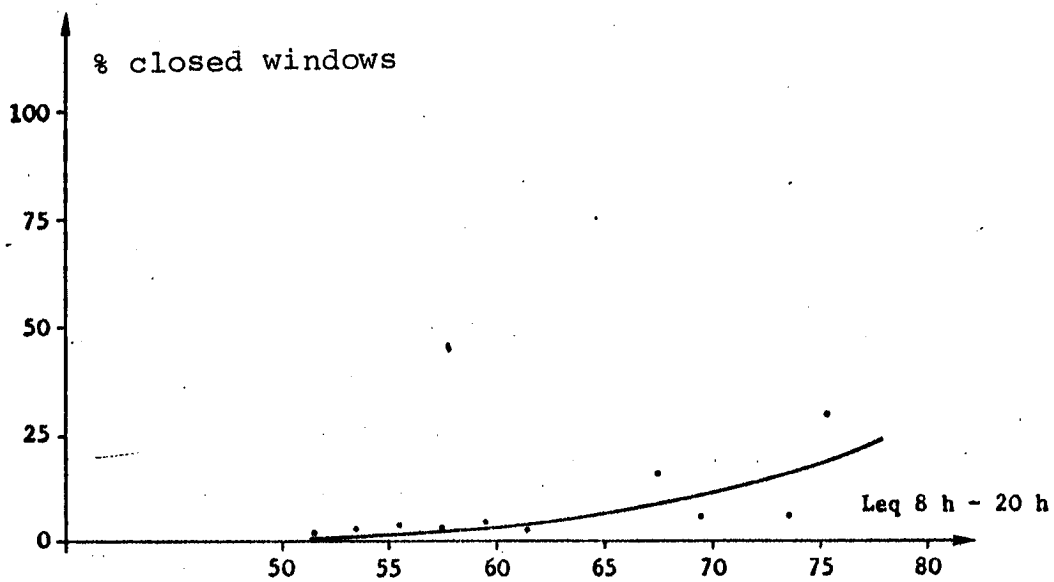
Graph no. 15 - TV Listening



Graph no. 16: Reading



Graph no. 17: Sleep



Graph no. 18: Activities in the kitchen

Activity	Sound Index	1st Thresh- old	2nd Thresh- ol
TV listening	Leq 8 h - 20 h	56	62
Reading	leq 8 h - 20 h	56	71
Sleeping	Leq 8 h - 20 h	57	67
	Leq 0 h - 5 h	46	57
Kitchen	Leq 8 h - 20 h	64	71

For sensitive activities, there is a close agreement on the first threshold (56 - 57 dB(A)); this behavior is therefore marginal below this level and is associated with other parameters than noise.

The second threshold is rather variable and probably depends on the sensitivity between noise and the activity. TV listening is the most sensitive in terms of this behavior whereas reading is the least. These results may be compared with those obtained for activity transfers for which the conclusions were the opposite. Window closing is more sensitive for TV listening insofar that this activity cannot be transferred to other rooms. In contrast, reading is less sensitive in high noise levels because people have the alternative of going to less exposed rooms to read.

One of the main factors which may modulate this behavior is the difference in the climate of Marseille and Lyon. /39

Graphs 19 to 21 show the clear difference in regard to window closing between Marseille and Lyon. This difference tends to attenuate, then disappear at about 72 - 73 dB(A). Above this noise level, it seems that the climatic difference between these two cities is not great enough and that window closing becomes an absolute necessity in any climate.

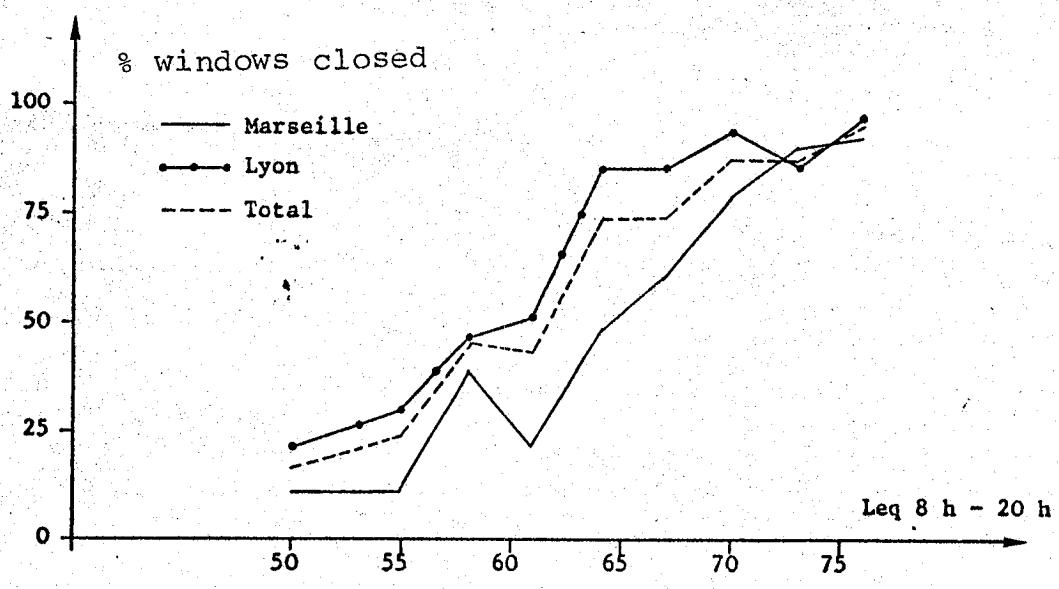
Use of Balconies

The impact of noise on the use of balconies was assessed, based on the existence of several activities which are more or less sensitive to noise.

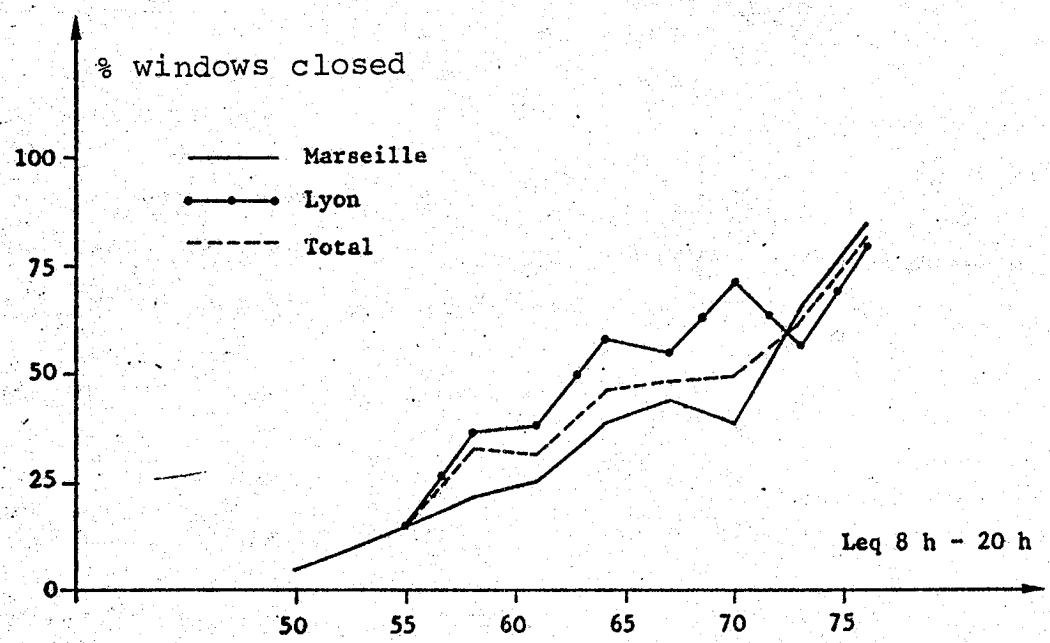
Graph 22 shows the only activities for which noise seems (but only marginally) to have an impact.

Actually, even at very low noise levels (Leq < 50 dB(A) most activities are not practiced in high percentages (for example: only 23% of the people talk on their balcony as quiet as it might be).

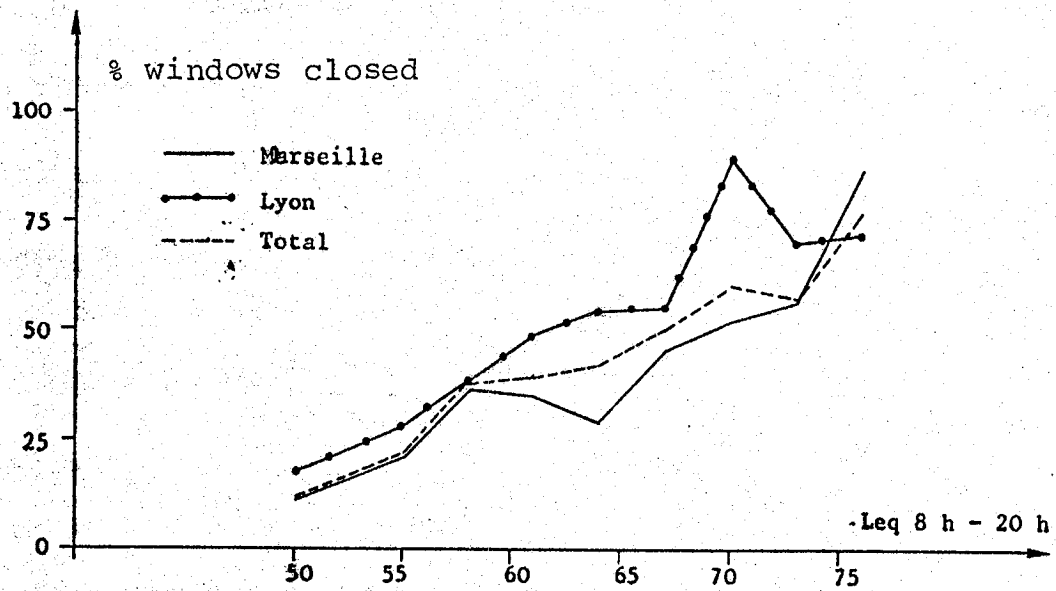
Therefore, probably only parameters like the amount of sunshine and the size of the balcony play a crucial role in the use of this space, with noise being only a secondary factor.



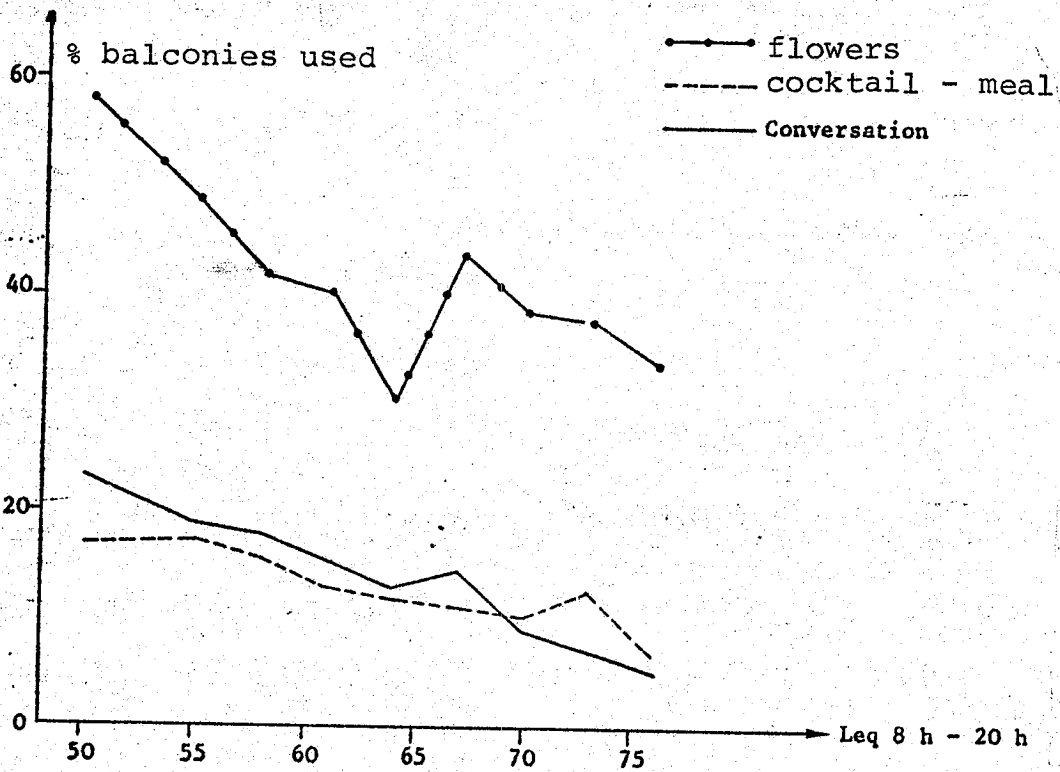
Graph 19: Listening to TV



Graph no. 20: Reading



Graph no. 21: Sleep



Graph no. 22: Use of balconies

Disturbing Sleep

The impact of noise on sleep was the subject of many investigations, particularly in the physiological area (references 23 to 25).

Our study is more focussed on a search for indicators.

Graphs 23 to 25 show the relationships between noise and the indicators associated with going to sleep, on the one hand, and sleeping at night, on the other hand.

α - Time required to go to sleep

/54

Although the correlation between the time required to go to sleep and noise is very small, it was possible to find a significant relationship between the percentage of people who go to sleep quickly ($t < 20$ mn) and the noise along the front wall of the bedroom.

β - Difficulty in going to sleep

The results are fairly similar, although there is a slightly higher individual correlation for people under 50 years of age; there is a significant correlation between noise and the percentage of people who often or very often have difficulty in going to sleep.

θ - Waking up at night

Graph 24 shows the variation of the percentage of people who wake up at night often or very often.

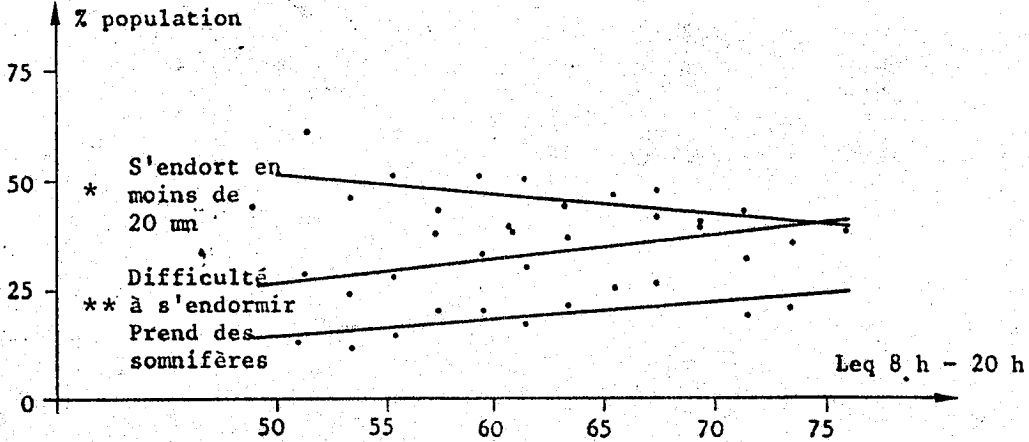
Although the individual correlation is low, and higher for people under 50 years of age, this link is significant.

ρ - Tired upon awakening

Graph 25 shows that between the lowest noise levels (37 - 40 dB(A) and the highest noise levels (65 - 67 dB(A), the percentage of people who are tired when they wake up has virtually doubled.

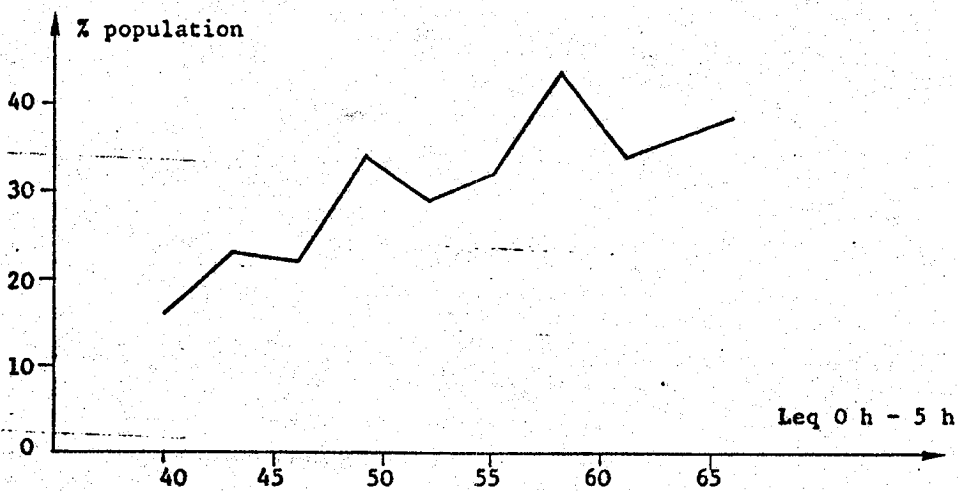
These results show on the whole that if noise is not the main factor for explaining this, it has a considerable impact on sleep.

The table below depicts this set of statistical elements.

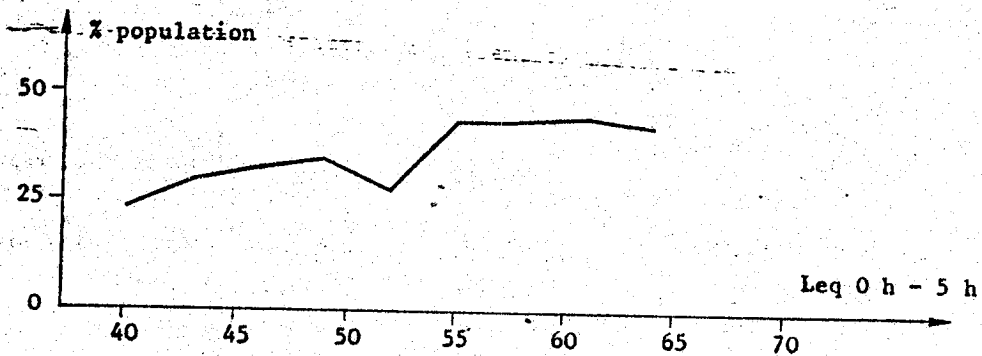


*Go to sleep in less than 20 mn; **Have a hard time going to sleep; take sleeping pills.

Graph no. 23



Graph no. 24: often wake up at night



Graph no. 25: tired in the morning

Indicator	Correlation with noise	Significativity Threshold	Nighttime (day- time) noise threshold	
			1st Th.	2nd Th.
Time it takes to go to sleep	-	-	-	-
Percentage of people who go to sleep in less than 20 mn	0.65	1%	44 (55)	53 (65)
Difficulty in going to sleep				
+50 years old	0.04	Insignificant		
-50 years old	0.17	1%		
Percentage of people who often and very often have difficulty in going to sleep	0.73	<1%	45 (56)	55 (65)
Percentage of people who take sleeping pills at bedtime	0.76*	<1%	45 (55)	55 (65)
Awaken at night				
+ 50 years old	0.09	Insignificant		
- 50 years old		<1%		
Percentage of people who often and very often awaken at night	0.86	<1%	45 (55)	55 (63)

It is striking to note that the thresholds for the variation of sleeping disturbances are the same for any indicator retained.

If we investigate the factor explaining sleep disturbances, we see in graph 26 (result of the analysis of main component) that: /57

-the disturbances which affect the time it takes to go to sleep are highly associated with the age of the individual, in particular for those 50 years old or more or noise is not a factor;

-for those 50 years or under, the disturbances are less significant, as we have seen in the explanation for noise;

-waking up in the middle of the night is a factor closely associated with noise.

Impacts of Noise On Health

Graph 27 shows the meaningful relationships between noise in the home and a few typical "health problems".

With these results we see an increase in the impact of noise in the vicinity of 64 dB(A) (leg pains - digestive problems) and 61 dB(A) for headaches.

The impact of noise on one's nervous condition may be determined from the capability of relaxing at home. Graph 28 shows a slight variation due to noise, which becomes sharper at about 58 dB(A).

An analysis of drug consumption allows one to think it is connected with noise on the average (see graph 29).

Actually the two most significant links pertain to the consumption of sleeping pills and heart medicine. The other two consumptions are less associated with noise (tranquilizers and medication for the stomach).

Noise tends to increase these behavioral patterns only at high levels for the consumption of heart medicine (Leq > 70 dB(A)) and in the vicinity of 60 - 62 dB(A) for the consumption of sleeping pills.

Now, if we apply our reasoning to cumulated consumption (see graph 30), we have a better idea of what the impact of noise may be on health.

A segmentation of the data pertaining to drug consumption (see next table) shows quite well the link with sleeping problems.

Subjects having a hard time going to sleep (which depend on individual and reactional factors) tend to consume more drugs (33% against 10%) especially if they are older (on the average 57% of those over 65 years of age). Noise only reinforces this behavior (69% when Leq > 62 dB(A)).

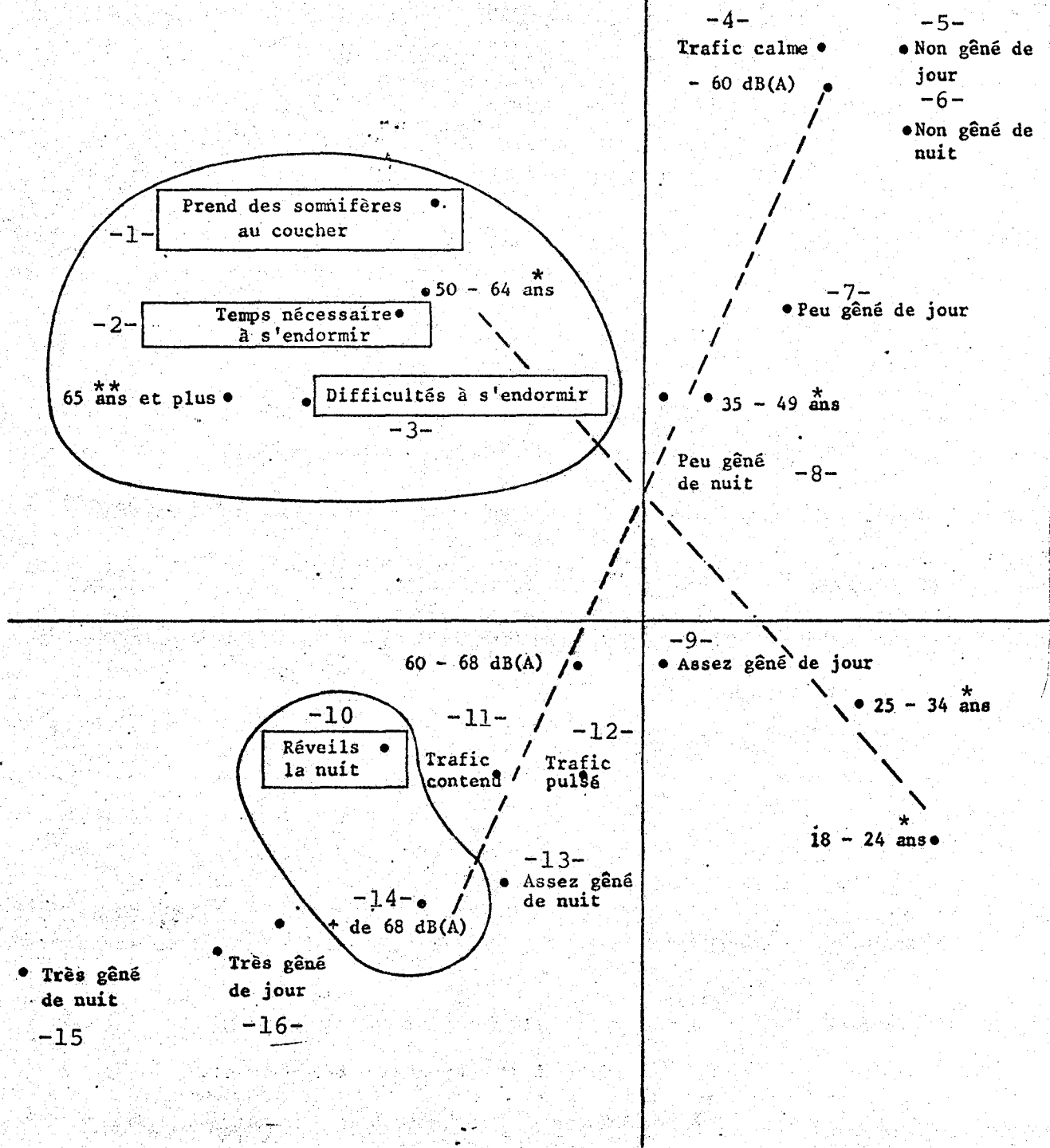
Subjects who fall asleep quickly take less drugs, especially if they're young (<5%). /61

When the subjects awaken at night, this disturbance reinforces drug consumption.

Other more secondary variables seem to play a role also: active people, undoubtedly living at the fast pace of modern life, seem to take more drugs.

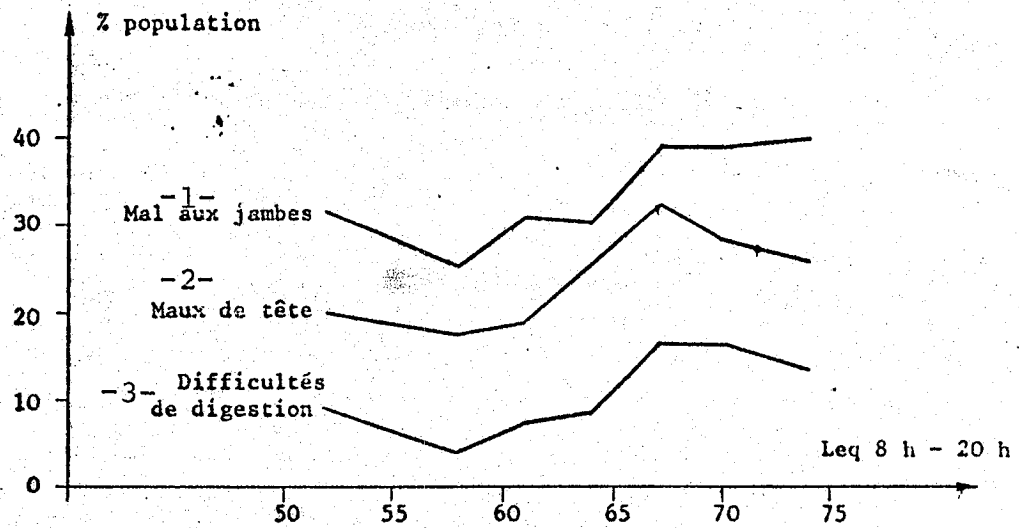
II-3-3 - EQUIPMENT - INVESTMENTS IN THE HOME

Another area where we could make an assumption on the impact



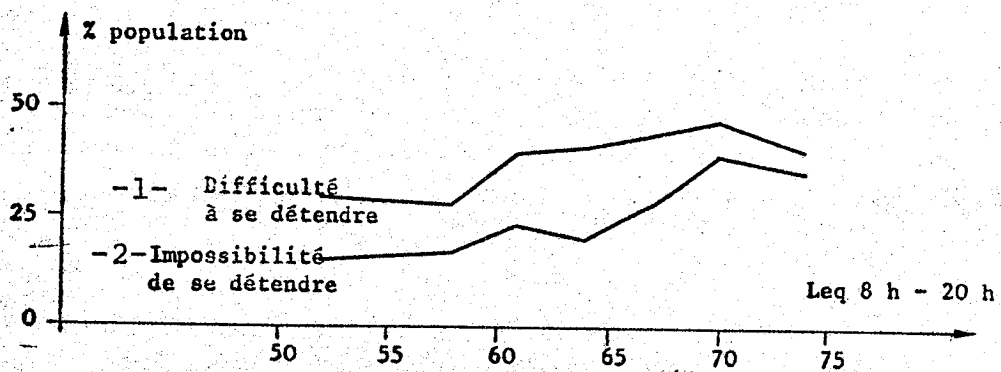
Graph no. 26

Key: *years; ** years or more; 1-Takes sleeping pills to go to sleep; 2-Time it takes to go to sleep; 3-Difficulty in going to sleep; 4-Quiet traffic; 5-Not annoyed in the daytime; 6-Not annoyed at night; 7-Not very annoyed at day; 9-Fairly annoyed at night; 10-Awakens at night; 11-Continuous traffic; 12-Pulsed traffic; 13-Fairly annoyed at night; 14-+ as of 68 dB(A); 15-Very annoyed at night; 16-Very annoyed in the daytime.



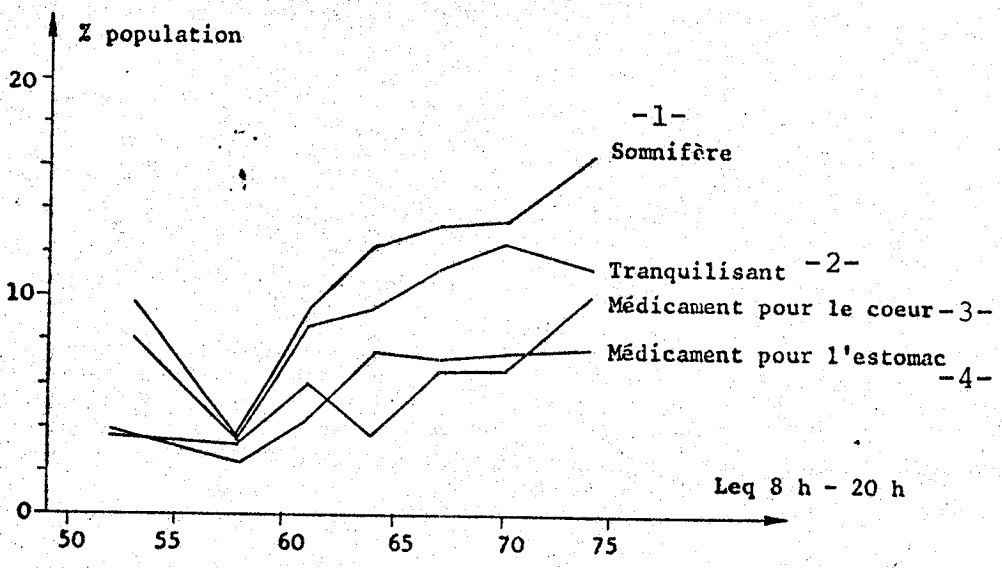
Key: 1-Leg pains; 2-Headaches; 3-Digestive problems.

Graph no. 27



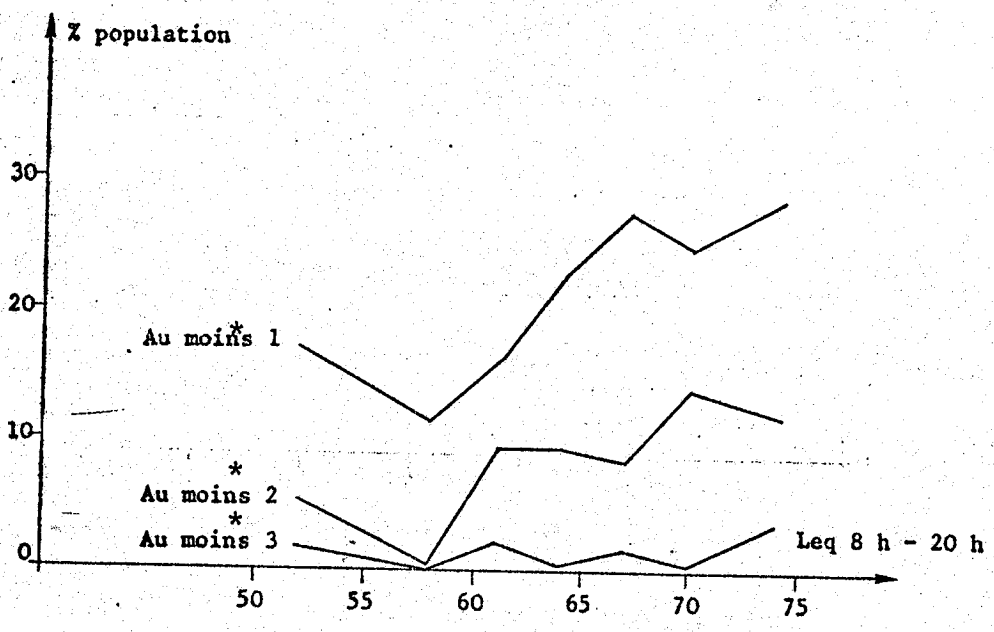
Key: 1-Difficulty in relaxing; 2-Impossibility in relaxing.

Graph no. 28



Key: 1-Sleeping pill; 2-Tranquilizer;
3-Heart medication; 4-Stomach medicine.

Graph no. 29



*At least

Graph no. 30

of traffic noise is equipment and investments in the home.

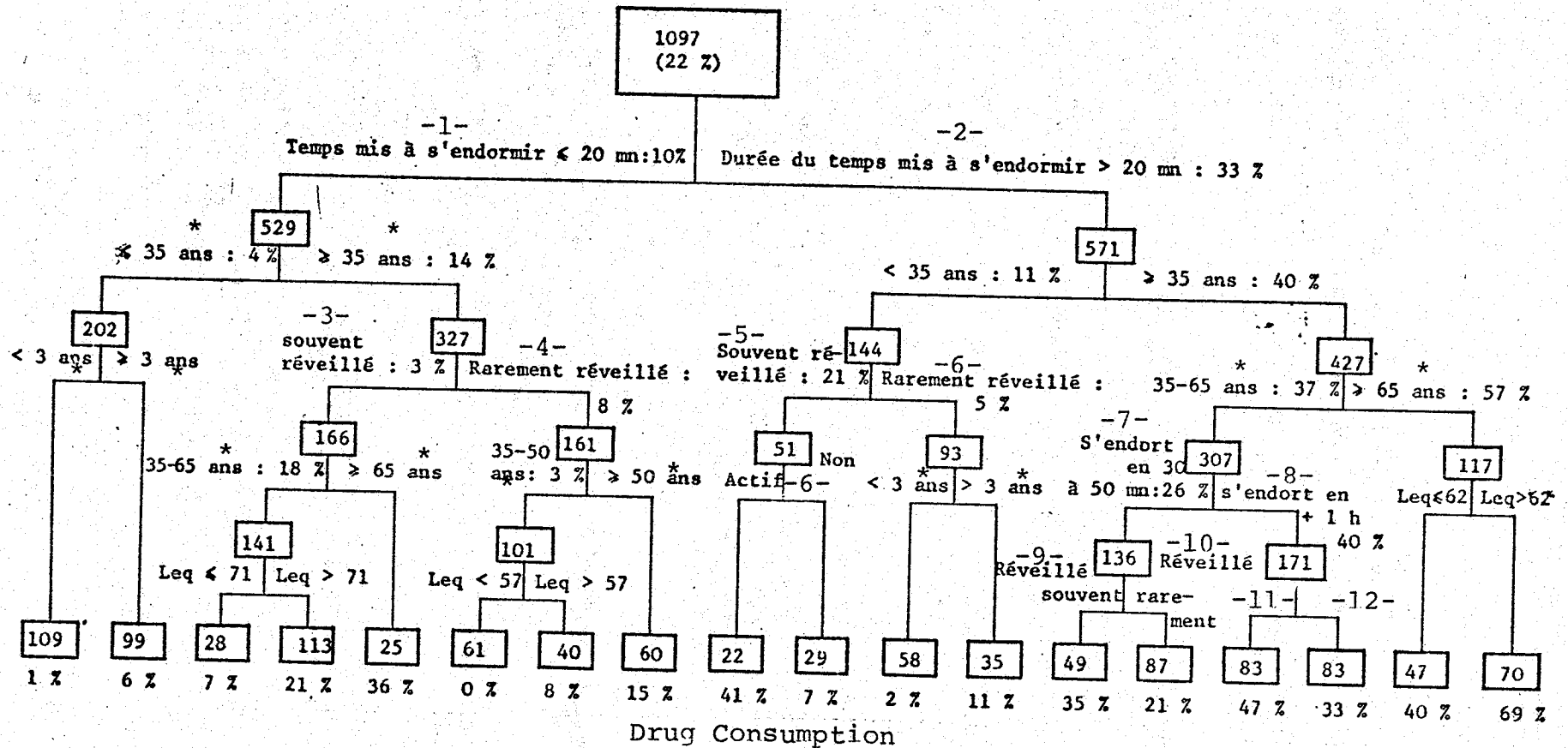
For equipment, we thought it would be appropriate to retain as indicator the number of reception devices in the home insofar as these reception devices are necessary for practicing activities which are sensitive to noise.

For home investments, we distinguished "conventional" investments for maintenance and improvements and "heavier" investments for sound insulation of the home.

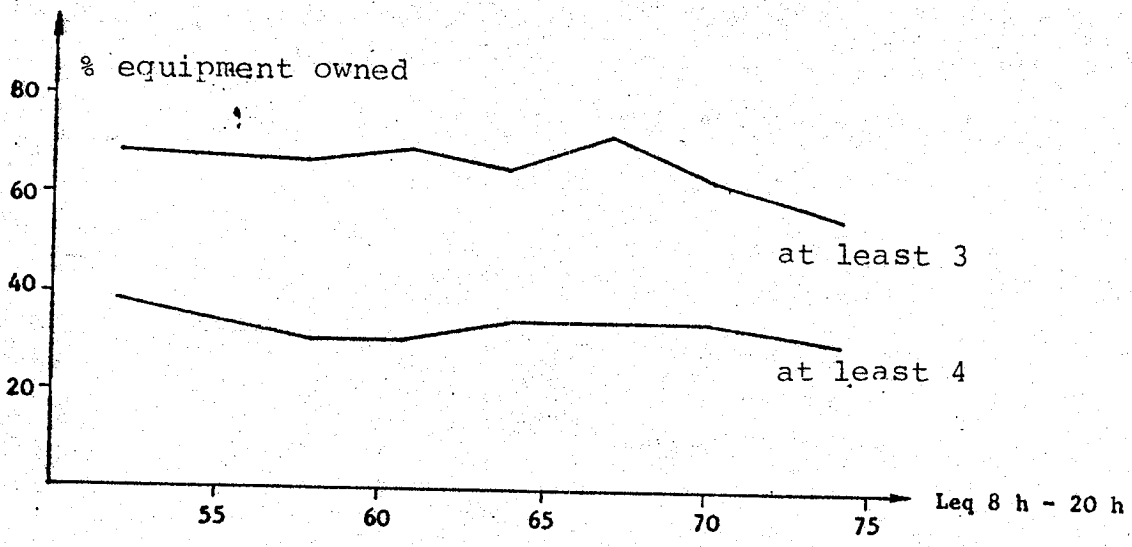
Reception Equipment

Graph 31 below shows the variation of the percentage of equipment cumulated for the following sets: TV - radio -HI-FI or tape recorders.

If the percentage of equipment for the two main sets (TV and radio) is very stable with respect to noise, we could conclude in contrast that for more of them (3 and 4 equipment) the noise might possibly lead to a reduction in this percentage.



Key: 1-Time it takes to fall asleep < 20 mn: 10%; 2-Time it takes to fall asleep > 20 mn: 33%; *years; 3-Often awoken; 4-Rarely awoken; 5-Often awoken; 6-Rarely awoken; 6-Falls asleep in 30 to 50 mn; 26%; 8-Falls asleep in + 1 h 40%; 9-Often awoken; 10-Rarely awoken; 11-Continuous; 12-Pulsed;



Graph no. 31

For "at least 3 equipment" this rate remains stable up to 70 dB(A) and is slightly lower afterward.

This trend is not confirmed by the "maximum equipment" curve (at least 4).

This amount of time these devices are listened to does not vary much with the noise levels.

Home Investments

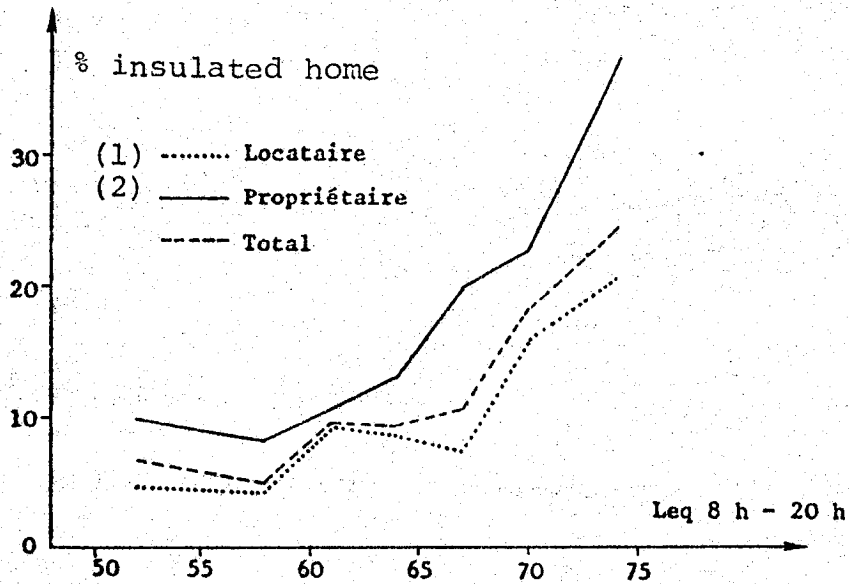
a The following variables were retained for maintenance and improvements of the various rooms:

- .percentage of rooms repainted or recarpeted in the past 5 years,
- .percentage of rooms equipped with a moquette,
- .percentage of rooms equipped with thick carpet.

The latter two indicators might be more directly related to noise.

The graph below shows that noise does not have a definite influence on these indicators.

It is barely noticeable that above 72 dB(A) (very critical case) there is a very slight variation due to noise.

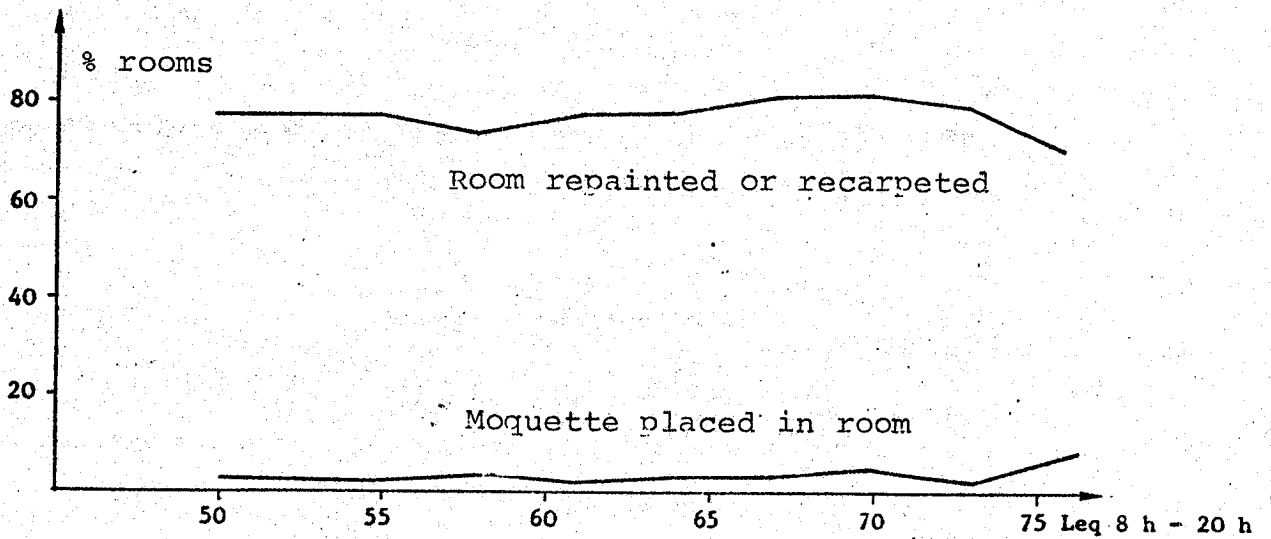


Graph no. 32

β - Home Insulation

/65

The graph below clearly shows how the percentage of insulated homes (double windows or thick glass) varies with the noise level.



Graph no. 33

Key: 1-Renter; 2-Owner.

Many factors affect this behavior. The analysis of the results of a data segmentation on home insulation (see table on next page) reveals the main factors:

-The noise level: it is the main incidental factor; this behavior is more distinguishable beyond 66 - 68 dB(A) (24% instead of 8%).

-The income level: this factor plays a role only below 66 - 68 dB(A); one may therefore conclude that the noise level (and its effects) is not high enough to warrant the cost of home improvements, except for households with high income levels (> 7,000 French francs). Above 66 - 68 dB(A), the noise level is high enough to warrant insulation "at any cost".

-The occupant's status: owners take more action than renters. The investment is therefore considered an unlost expense which may valorize the home (see graph 33). /67

-How long the occupant has been living in the home: finally, it seems that old households tend to soundproof their homes more than new ones. This is an objective reason to conclude that people do not get used to the noise.

II-3-4 - ESCAPING FROM THE HOME

The last area where we want to make an assumption on the impact of noise is escaping from the home.

More specifically, one wonders if an exposure to high noise levels makes an individual and his family find escapes from the home:

- either temporarily in the daytime for housewives - week-ends for the family, visiting friends;
- or permanently, i.e. the family moves to another home.

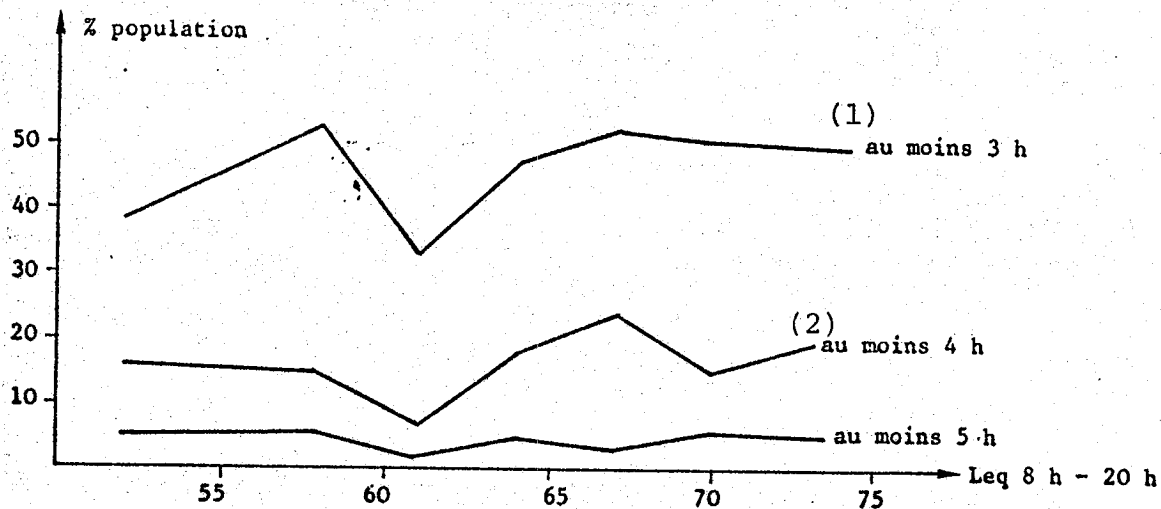
Temporary Escapes

Graphs 34 to 37 do not show any obvious (and significant) link between noise and this type of escape, no matter how long one is absent in the day, visits friends (which happens to be the same as visits from friends), week-end trips (two days) or Sunday excursions.

Graph 38 (result of an analysis of the main component) shows quite well the main factors which explain excursions away from the home: income - age - family situation.

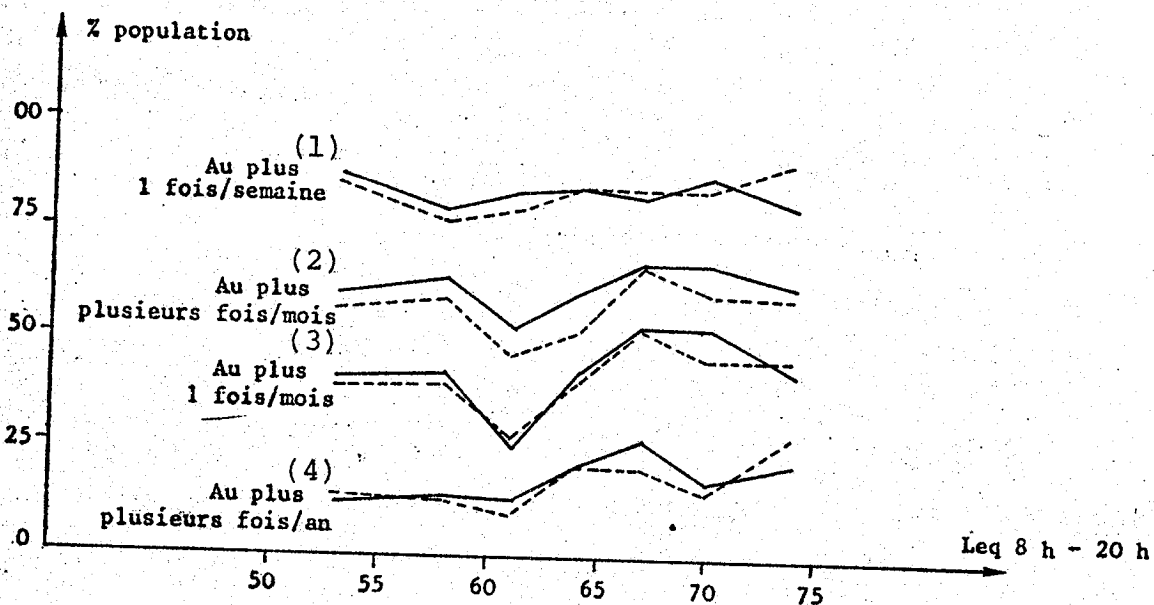
Moving Away or a Permanent Escape

Like most behaviors analyzed until present, noise is an incidental variable. /71



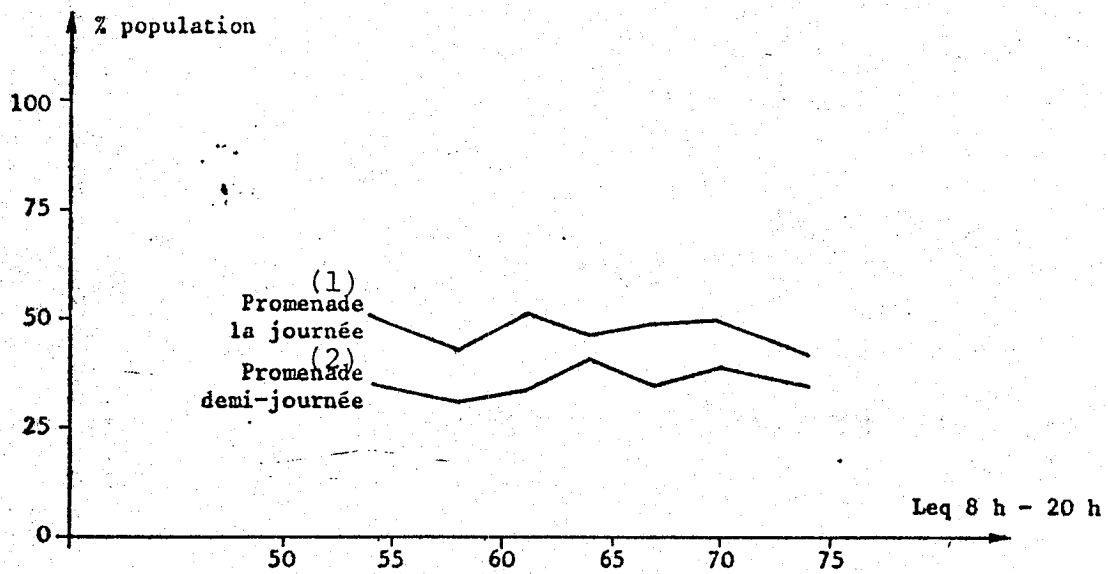
Graph no. 34: Afternoon Excursion

Key: 1-for at least 3 hours; 2-for at least 4 hours; 3-for at least 5 hours.

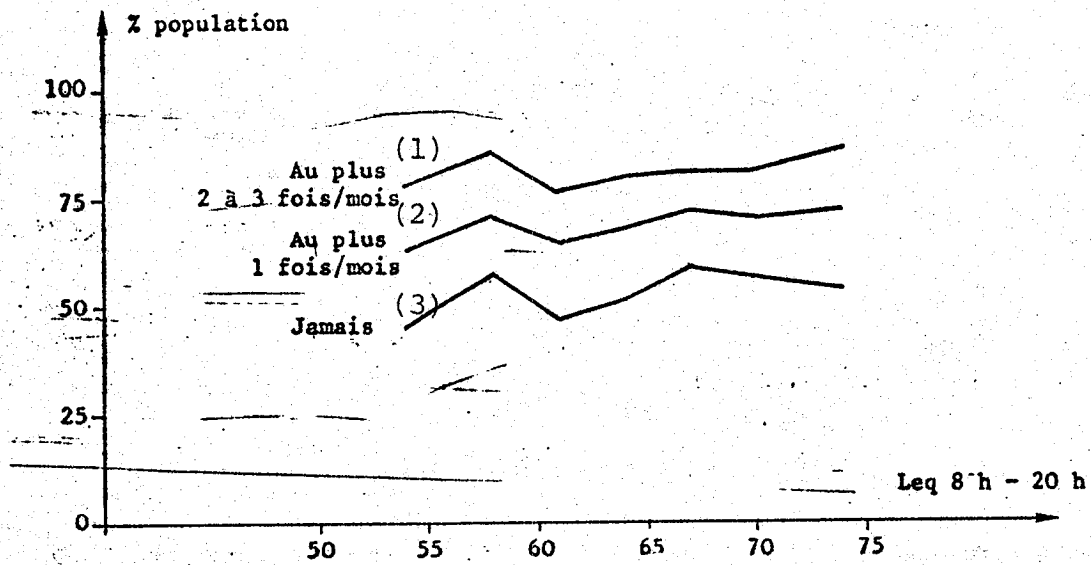


Graph no. 35: Visiting Friends

Key: 1-At least once/week; 2-Several times/month at the most; 3-Once/month at the most; 4-Several times/year at the most.



Graph no. 36: Sunday Excursions
Key: 1-All-day excursion; 2-Half-day excursion.



Graph no. 37: Week-End Excursion During the Summer
Key: 1-2 to 3 times/month at the most; 2-Once/month at the most; 3-Never.

• R > 9 000 F

18 - 24 years

5 000. < R < 7 000 F

25 - 34 years • 7 000 F < R < 9 000 F
single

week-end trip
summer winter

Sunday excursion

Does not like to stay home.

1/2 day week-end excursion

easily makes friends

often visits friends

4 000 < R < 5 000 F •

3 500 < R < 4 000 F •

35 - 49 yrs

married

• often goes out afternoons

• 50 - 64 ans

3 000 < R < 3 500 F

does not like to go out

• 2 000 < R < 2 500 F

• 2 500 < R < 3 000 F

Interested in family activities only"

1 500 < a < 2 000 •

yrs

• + 65

• R < 1 500 F

Graph no. 38

The table below (data segmentation) clearly shows the difficulties of analyzing this type of behavior. /71

However, it reveals the following main ideas:

-on the whole, it is the occupant's status which determines his behavior: it is easier for the renter to move (he does not have the problem of reselling his home), and he also has more obvious reasons to move (looking for a more suitable lodging - buying his own home, etc.);

-for renters, a low rent, and especially the uncertainty of being able to find another dwelling for the same rent, discourages them from moving;

-finally, noise has an effect (a quite noticeable one beyond 66 - 68 dB(A)): in this case the benefit of a relatively cheap rent is not enough to encourage the occupants to stay when the noise level is high; financial compensation no longer applies.

Finally, let us point out that the fact of having sound proofing in one's dwelling tends to considerably reduce the trend to move out.

We may therefore consider that these two behavioral patterns are sensitive in all cases up to 66 - 68 dB(A) and after which they tend to alternate.

II-4 - CONCLUSIONS

An analysis of the results of this study enables us to draw the following conclusions:

.Some cases are directly associated with noise: sound insulation - closing windows - transferring activities to less exposed rooms.

.Some are only indirectly associated with noise: moving out - drug consumption. /73

Thus, the behavioral patterns identified are more or less due to noise; in other words, there are a large number of parameters which affect them; two types may, however, be distinguished:

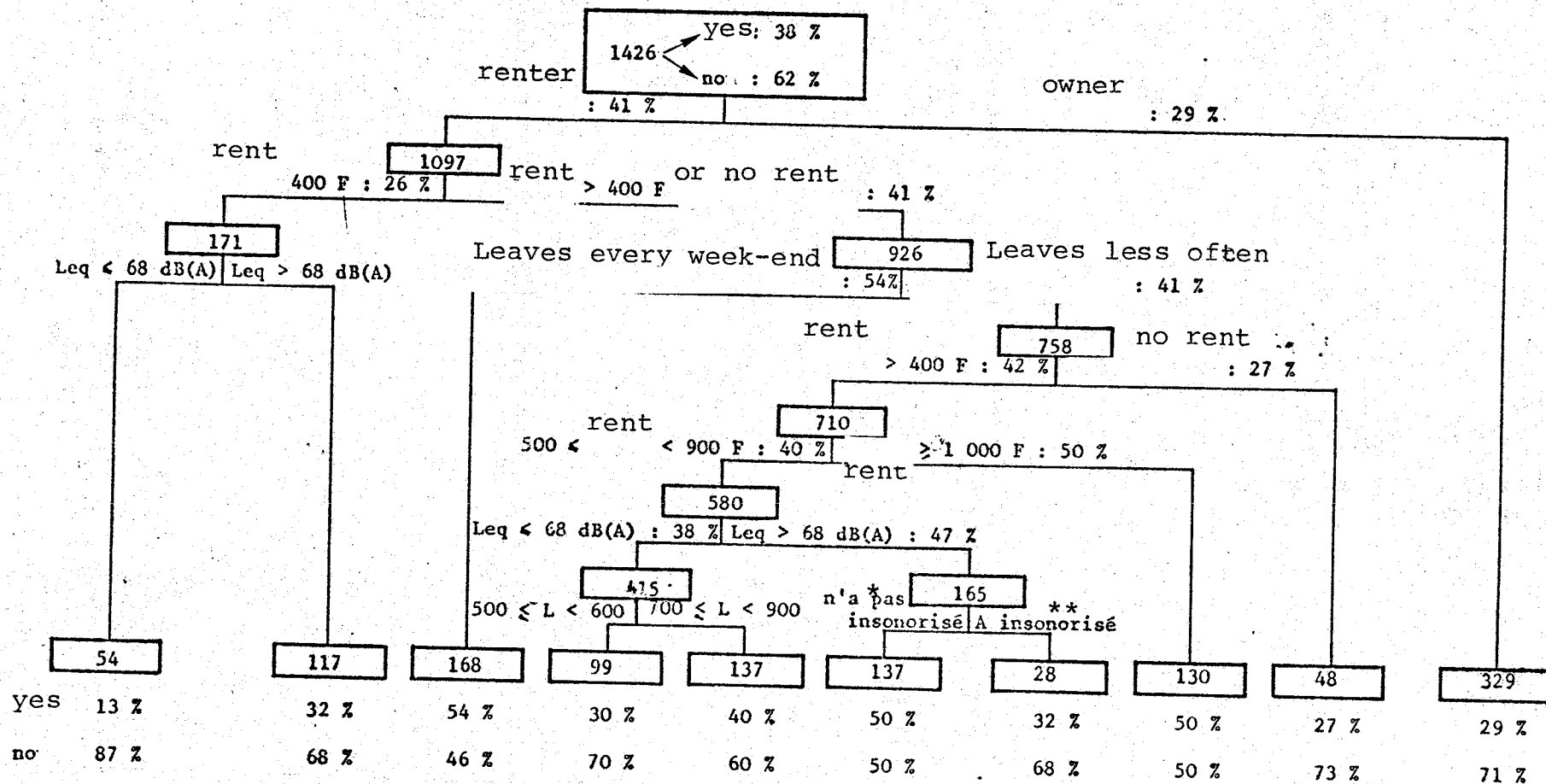
.individual parameters: age - sensitivity to noise - family status - occupancy status;

.limiting parameters which discourage individuals from reacting to noise are: income level - size of dwelling, for example.

This is why an analysis of these behavioral patterns is delicate and would merit further, more detailed studies.

2 - The behavioral patterns are more or less sensitive to noise, some occur early (average noise level) - others, subjected to certain

51



Plans to Move

*Has no sound insulation; ** Has sound insulation

constraints, occur later (higher noise level).

3 - Certain behavioral patterns alternate: sound insulation - moving out; others are associated with: moving - frequent week-end excursions.

The table below shows the noise thresholds which clearly demonstrate the main behavioral patterns identified as well as certain effects of noise on sleep, health and annoyance.

/74

	LEQ 8 H - 20 H		
60 - 62 dB(A)	63 - 65 dB(A)	66 - 68 dB(A)	69 - 70 dB(A)
	LEQ 0 H - 5 H		
50 - 52 dB(A)	53 - 55 dB(A)		

ANNOYANCE

- daytime and night:
- .%AG and TG
- .% TG
- clamour felt

-headaches

- EFFECTS ON HEALTH AND SLEEP
- Difficulty in falling asleep
 - Decrease in short time needed to fall asleep
 - Often awakens at night
 - Leg pains
 - Digestive problems

BEHAVIORAL PATTERNS

- Taking sleeping pills
- closing windows to:
- listen to TV
- read
- sleep

- transferring activities to quieter rooms
- planning to move
- sound proofing
- Taking heart medication

Beyond 65 dB(A) in Leq per day, behavioral patterns occur which may be considered extreme insofar as they considerably modify the lifestyle of individuals and translate quite well the social costs associated with noise.

The numerous interviews conducted and observations made during* the course of this survey were not initially focused on traffic noise, but on lifestyles and living conditions in the home (inside and out) and in the neighborhood. This fairly open approach seemed indispensable to be able to properly assess the impact of noise on all aspects of one's lifestyle. This procedure could have been distorted through interviews focussing too quickly on noise.

Five sites exposed to noise were retained in Lyon and Marseille.

All information gathered through interviews and observations allowed us to establish a topology of behavioral patterns which provides a plausible explanation of the highly diverse reactions expressed in regard to noise.

III-1 - GENERAL DESCRIPTION OF THE SITES AND THE POPULATION SAMPLES

The table below gathers the main information gathered for each survey site.

In fact, it was discovered that each site was a standard case in that it was distinguishable from the others by the following criteria:

- socio-professional category: worker - executive,
- occupancy status; owner - renter,
- when area became noisy: after or before moving in the home.

III-2 - THE STANDARD CASES OBSERVED

All interviews conducted (see appendix 1) showed that noise is one of the incidental factors for effective and social investments in the individual home.

It is therefore rarely the "first" criterion. For example, the relationship "in the home" where one lives, with the residential district in which the individual is found seems to be a fundamental factor in understanding attitudes toward noise.

An analysis of these interviews allows us to distinguish two cases of when the dwelling became noisy:

- the dwelling became noisy before moving in; this factor is then accounted for in the rent;
- the dwelling became noisy after moving in; this often means the house is devalued.

*Conducted by BETEREM for I.R.T.

SITE	TYPE OF DWELLING	NATURE	CONSTRUCTION DATE	OBSERVATIONS	POPULATION GROUP
A-St-Loup	Detached house (block)	Rental (Low-cost housing)	1927	29 dwellings very exposed to noise from the highway east of Marseille behind the block	Workers Municipal Employees
B - Beau Lieu Residence	R + 1 Villa	Owner	Beginning of land development in 1959	11 dwellings very exposed to highway noise north of Marseille before the development	lower salaried business executives
C - Chemin des Olives	Self-built homes R + 1	Owner	Around 1950	A façade moderately exposed to noise from Olive road (increasing traffic)	E.D.F. employee
D - Caluire AV. Général de Gaulle	Villa	Owner	-1946 -1973	One façade highly exposed to noise. Traffic increasing since 1973.	Lower executives Businessmen
E - Limonest	Detached home R + 1 Villa	Renting from brickyard	-1959	-2 façades highly exposed to noise between Highway A6 and N6. N6 existed, with N6 existing when homes were built, A6 backside of Highway A6 behind dwellings	Workers Retired or lower executives

For observed behavior, we find the same patterns as for those interviewed in the survey conducted by IR.RT in 1975, especially in the sites of Metz, Givors and Clermont-Ferrand (reference 14), namely:

-disturbance of certain activities:

- .TV - music listening
- .conversations
- .relaxation
- .sleep

-under-usage of certain parts of the dwelling:

- .transferring activities to less exposed rooms
- .losing pleasure in working in garden (abandoning leisure activities)

In certain cases, this under-usage devaluates the room:

- consumption of sleeping pills;
- investment in the home to preserve its market value (insulation, room improvements).

All of the observations thus gathered were structured into several standard cases which form the typology of behavioral patterns and attitudes toward noise.

This typology is undoubtedly not unique, but has the advantage of providing a better understanding of the verbal and behavioral reactions to noise.

From this we established 5 standard cases of behavior:

/79

- veiling the noise - valorizing the dwelling;
- unbearable noise - drop in home investments;
- adaptation to noise - restricting lifestyle;
- devalorization of home - undecided about noise;
- compromising with noise - valorization of home.

We can see right away that it is the overall role of the home, associated with many factors among which noise is rarely the essential one, that allows us to understand the verbal and behavioral reactions to a situation objectively characterized as noise annoyance.

II-2-1 - VEILING THE NOISE - VALORIZING THE DWELLING

An interpretation of this case and the reactions to noise associated with it find their source in what is fundamentally the individual home for a large part of the population.

In this regard, we extensively developed the Saint-Loup block, see appendix 1, as an association of 3 factors: individual dwelling in Marseille, modest rent, good social integration in a homogenous environment - leads to an generally positive judgment on a dwelling which is quite different from an apartment, and tends to develop a tacit acceptance of traffic noise which is outside this highly valorized system which the "social unity" block is.

The individual home seems like realizing a dream involving a lifestyle not accessible to everyone, but that one has reached. The individual home plays a role of separation with others and becomes a factor or social valorization index. One distinguishes oneself from those who live in apartment buildings presenting an image of "social melting pot", i.e. families with problems, delinquents, immigrants. Living in apartment buildings, one risks becoming associated with this image and being subjected to the intrusion of others. Living in an individual home means that one is not bothered, but also that one does not bother others. The absence of close neighbors amplifies the meaning of being at home. Traffic noise is also an outside factor and the annoyance it might cause is minimized, if not eliminated.

Of course, we could wonder why "eliminate" the noise? Why in all of these cases, as they are in highly exposed areas, do people not speak spontaneously of traffic noise? Even more, when the interviewer brings up the problem, they recognize the existence of noise, but immediately minimize it with respect to noise in collective dwellings. And why is this? Perhaps there is the desire to show the interviewer that one is happy with one's lifestyle and to emphasize the noise factor would be to show dissatisfaction. However, this interpretation is not enough, because this manner of "veiling the noise problem" also exists on the behavioral level:

- shutters and windows are easily open, sometimes even while sleeping;
- the garden is not simply used to garden, it is also used for relaxation, to take meals in and even to receive friends;
- the individual home fully plays a role of "vacation home" and week-ends are often spent receiving family members who live downtown;
- in some cases, the inside space is rearranged, but is never done so for the single purpose of blocking out noise. It is always an outside event (child leaves home, need for an office, new bathroom, etc) which is the reason for the rearrangement. Traffic noise appears among other factors (amount of sunshine in particular) in the decision to make improvements in certain areas.

These cases are misleading and the notion of "annoyance" does not seem very appropriate here. However, let us stress that these cases existed before noise became a problem, and nothing prevents us from thinking these are statistically marginal cases and that most families would have refused this location.

These installations prior to the existence of noise also made it possible for us to have access to a type of dwelling which would not have been the case without noise.

We can thus speak of a true financial compensation by the market which the buyer would benefit from by moving back to his home. This process would account for a certain overvaluation of the dwelling which would be "artificially" maintained by behavioral

patterns which become increasingly rigid the closer the owner arrives at the end of the residential curse.

III-2-2 - UNBEARABLE NOISE - REDUCING HOME INVESTMENTS

/81

Personal and affective problems may be the cause of one's detachment from the dwelling. It is an (affective) process of reducing one's investments in the home per se. The home which signifies "family unity" was disrupted by the history itself of the family. Let us briefly recall the case of this individual for whom noise reinforces a psychic and family dissatisfaction - death of his mother who devoted her entire life to the home, departure of her son-.

"...in my home, I have silence with good and bad memories... but this noise invades my privacy (...), so why I go away, I feel better..."

We encountered - in Saint-Loup also - another person who, like the one above, would like to leave his home and the block for "somewhere else". It is a permanently invalid man who has serious problems with his wife.

Noise in these two cases is presented and lived as a cause and aggravation of an illness and living conditions. The personal reasons of dissatisfaction are projected to home environmental conditions and noise is a major factor and reinforces the rejection of a situation which one wants to escape.

Investments, which have become impossible to make in the home, are spent "elsewhere". One individual invests in his work, others in an individual home somewhere else. Everything that goes on outside the home is positive and is opposite to the reality of the home. Whether a real or symbolic escape, it is a statement of discomfort in the home which has become empty of everything of value.

The role noise plays is not easy to pinpoint in these cases. We can simply say that noise is not the only cause, because these dwellings are not more exposed to noise than those of the preceding type ("the valorized individual"). To use modern language, let us say that it is probably the existence of personnel and affective problems which creates an environment which is conducive to very strong reactions to noise. In these psycho-affective conditions, noise can seem to be the cause of serious problems, even causing depression.

In these cases, noise is experienced as an unbearable element and surely increases the reductions in home investments.

As far as behavioral patterns are concerned, homes and gardens are abandoned (not kept up). The most common behavior pattern is to escape the home, as every moment spent there is considered unbearable, because of the noise problem.

Such behavior seems to be fairly typical of people who are rather passive toward the problems of modern life.

III-2-3 - ADAPTATION - RESTRICTION

/82

These cases correspond to tenants whose income levels are low.

For inhabitants of Cité du Mois housing complex, the future is precarious. First, the economic and political situation of the brickyard (new people are not hired after workers leave for retirement, rather, temporary workers are called in) makes their future unstable and uncertain. The "only certainty" for them is that they have to leave their home when they retire and will have to face a lower income and the difficulty of finding housing. Such a precarious situation makes any (affective) investment in the home impossible.

This situation of precariousness and (forced) passiveness toward the home makes one also have a passive attitude toward traffic noise.

- insulation cannot be put in for economic reasons;
- gardens are essentially used for growing vegetables (again, for economic reasons). They are not used for relaxation and rest "as was the case a few years ago" (before the highway was built);
- one cannot say that people escape the home (in the evening or week-ends). Where can one go and where does the money come from?
- windows are closed virtually all the time - on the side of the Nationale 6 highway - and even so, sleep does not help.

In all of these cases, noise is distinctly identified as a source of considerable annoyance and people's behavior toward noise may be characterized as "adaptation - restriction".

We want to stress that noise not only annoys certain activities, but it actually reduces the lifestyle outside the home, especially the social life which is not developed and is becoming non-existent.

III-2-4 - DEVALUATION OF THE HOME

/83

In this case, the noise problem appears after moving into the home. The annoyance felt is maximum.

New and increasing traffic is an element which disturbed this equilibrium. Noise is identified as disturbing and this is reflected in verbal reactions - opinions - as well as in behavioral patterns.

Noise is an annoyance which disturbs daily life and social life even more. Traffic noise is synonymous with unbearable noise as soon as reference is made to this in the presence of others. Within the home, the noise level is often judged on the basis of the opinion of the people received.

The noise that is heard and that others hear is antimonic of

the social image searched for. Paradoxically, adapting to noise by reorganizing rooms and installing double windows, if it is considered at all, is considered hard to do. The attitude is that a certain equilibrium which existed was broken by the arrival of traffic noise, and it is hard to adapt to a new unpredicted situation. The intrusion of traffic noise in the social project makes people's behavior incoherent and creates an intolerance to the annoyance.

In all of these cases, noise is perfectly identified as an annoyance, as a disturbing element, even if reactions range from adaptation to a desire to move away.

It is in these cases that the notion of discomfort seems the most pertinent because of noise, things are not done where they should be; noise in particular seems to alter the functions of outside space.

-the noble space of the garden in front of the house has taken on almost exclusively a role of decor and is no longer used for relaxation;

-people no longer eat out in the front yard, but in the most unpleasant part of the garden, in the back yard in a cramped area right next to neighbors;

-for family events (child leaves home) rooms are generally re-assigned on the basis of noise. This leads to a more limited use of rooms in the front of the house, and which are the most pleasant rooms.

As we have stressed, it is indeed in these cases where noise came on the scene after people moved in where discomfort is maximum, whether it be direct or induced. In this case, the feeling of being cheated or "trapped" is just as important as the discomfort felt and causes a real feeling of dissatisfaction.

III-2-5 - ADAPTATION - BREAKDOWN

/84

This case is very different from the others and is characterized by:

-a full awareness of noise as an annoyance before making the decision to move;

-a full awareness that despite the noise problem the dwelling has considerable advantages in terms of cost considerations;

-in these conditions, the decision made consists of selecting this type of dwelling (in the cases we saw: a true country home, near the city) and doing everything possible to reduce the noise problem.

At the behavioral level, an anti-noise strategy was developed to reduce annoyance without losing the benefits:

-As soon as people move in the home, it is restructured to

adapt as far as possible and to minimize the noise drawbacks without limiting the use of space. The whole house is gone over carefully to make the best use of its resources. The bedrooms are insulated and where possible are oriented away from the noise. Space is redistributed not only based on what a single family home "should be", but for maximizing its use in terms of the noise problem.

-The noise problem is the greatest for outside space, but here again, its use is maximized in terms of the annoyance it causes (adaptation to noise). This does not mean the most pleasant spaces are used, but those which are the best adapted to the activity desired. In this light, the entire terrain has a function: the vegetable garden is the closest to the traffic, eating or relaxation areas are the farthest away. In all cases, the use of space is optimized in terms of traffic noise.

It is hard in this case to speak of induced annoyance, i.e. if certain activities do not take place in ideal conditions, they would not exist at all without the presence of noise which made this lifestyle possible by its effect on housing costs.

III-3 - SYNTHESIS OF BEHAVIORAL PATTERNS

/85

By presenting this typology, which could not possibly be exhaustive, we may bring to light the variables which seem to explain people's behavioral patterns and attitudes toward noise.

We retained five of these:

-The date the noise problem started is one of the variables which conditions attitudes and behavioral patterns. A distinction should therefore be made of:

.cases where noise was a problem before people moved into their home;

.cases where noise became a problem after people moved into their home.

-The "individual capacity" to handle problems which arise, and the noise problem in particular. This allows us to class people into "active" and "passive" groups;

-Finally, other variables may be used to explain behavioral patterns, but it is hard to say which one explains more than the others. These are:

.occupancy status: the tenant will hesitate to insulate his dwelling - the owner will hesitate much less;

.the income level which conditions ways of reacting to noise problems (going away for week-ends, improving rooms);

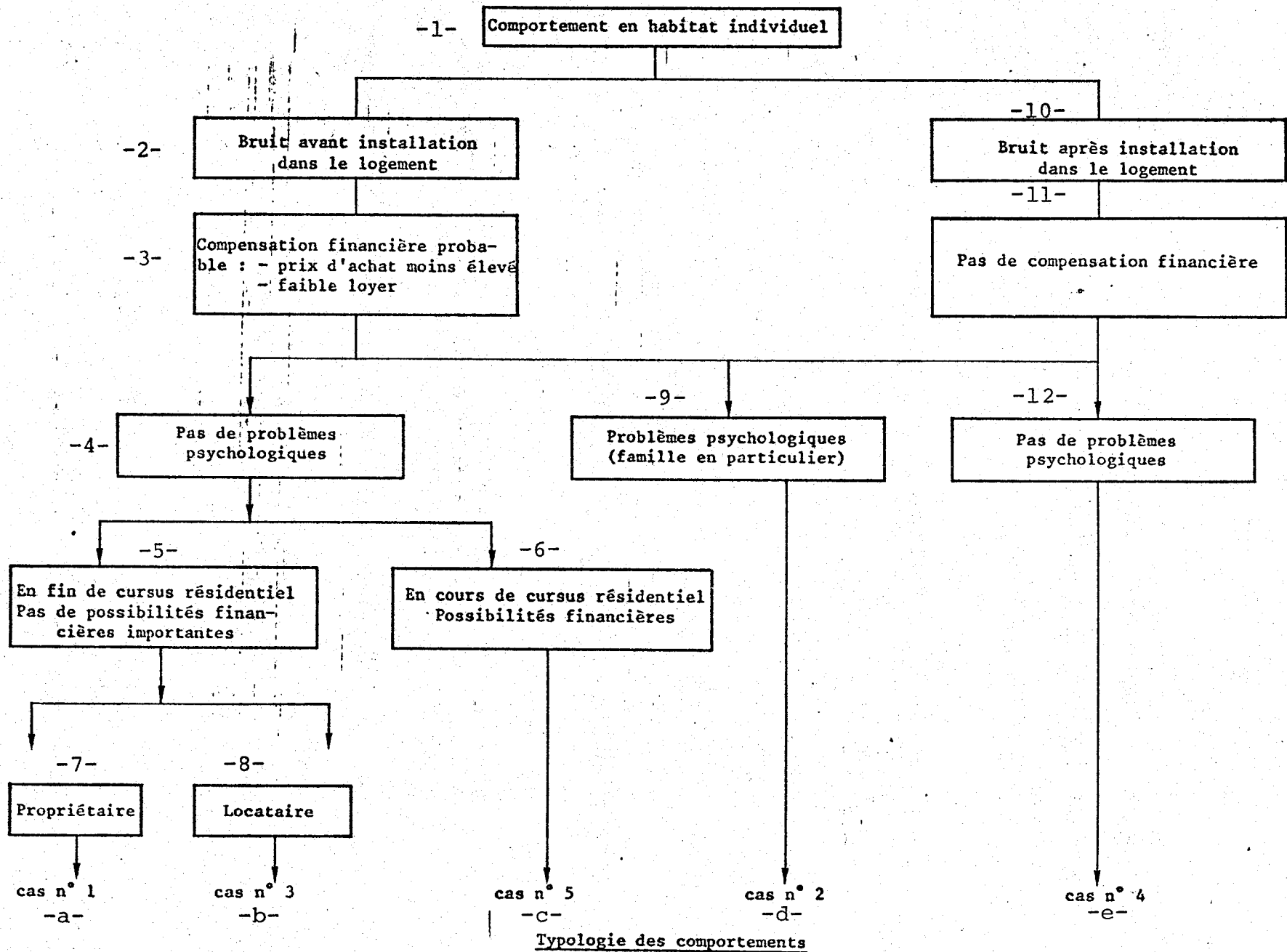
.it is hard for an owner, who invested considerably in his home, to start over again by moving or investing more to reduce the noise problem.

-the diagram on the next page shows a synthesis of this typology by distinguishing the various cases based on the pertinent variables retained. In each of these 5 cases, the observed or revealed behavioral patterns are shown: expression of annoyance - attitude toward home.

KEY TO DIAGRAM ON NEXT PAGE

- 1-Behavior in individual home;
- 2-Noise before moving into dwelling;
- 3-Probable financial compensation: lower purchase cost; low rent;
- 4-No psychological problems;
- 5-No considerable financial capabilities at end of residential cursus;
- 6-Financial capabilities during residential cursus;
- 7-Owner;
- 8-Tenant;
- 9-Psychological problems (family especially);
- 10-Noise after moving into home;
- 11-No financial compensation;
- 12-No psychological problems;

a-Case 1; b-Case 3; c-Case 5; d-Case 2; e-Case 4.



Typologie des comportements

TYPOLOGY OF BEHAVIORAL PATTERNS (continued)

Cases	No. 1	No. 2	No. 3	No. 4	No. 5
Attitudes & Behaviors					
Noise Annoyance	Recognized very little or not at all	Recognized and strong	Recognized and strong	Recognized and strong	Recognized and strong
Attitude toward home	Strong "artificial" valorization	Affective reductions in investments	Captivity home restrictions	Market devaluation	Actual Valorization
Behaviors:					
.Activities disturbed	Not many (TV - radio) normal window opening	Many (window closing)	Many (window closing)	Many	Many prior to anti-noise strategy
.Use of space -inside	Normal	Modifications in use of certain rooms	Normal (because double high exposure)	Activities transferred to rooms and to least exposed part of garden.	Voluntary re-assignment of rooms and re-organization of garden space.
-garden	Normal (rest-relaxation - visits)	Not kept up	Reduced to vegetable growing-No relaxation		
.Escape		Evenings/week-ends/planning to move	Impossible-no resources	} Great hesitation between moving and insulation	
.Investing (more or less)	Improving certain rooms	Rooms poorly maintained			Sound insulation of rooms
.Health		Depression/ drug consumption fatigue		Takes a few sleeping pills	

I - ANALYSIS OF INTERVIEWS IN A COLLECTIVE DWELLING

Our intention here is not to review each interview one by one, but rather to offer an analysis of several typical cases which, by the wealth of information gathered, enabled the main themes developed in the questionnaire to be exposed.

Case No. 1: H.L.M. (Low-Cost Housing) Tenant - Daytime Leq = 76 dB(A)

- .Parent age group 50 - 40 years
- .1 child 8 years
- .Profession: central heating installer, P.T.T. employee
- .Apartment F 4: - kitchen and living room exposed to highway
- 2 bedrooms on Morel Street

1 - Two years ago, the family wanted a larger apartment and requested F 4, rather than F 3, to have 2 bedrooms on Morel street. In their old apartment, they realized during the visit of a friend, that it was no longer possible to sleep in the living room along the expressway.

2 - Reactions to the Noise Problem

2a - The father complained of the highway noise. The first buses going by woke him up in the morning.

In the evening, he had a hard time falling asleep.

In the daytime, he had the impression of going to work tired, when he came back home after work, he had the impression of not being able to rest. On days he didn't go to work, he was not able to rest. He believes the situation cannot last, his nerves can no longer stand the situation.

He comes from a small rural city. He came to Lyon only 3 years ago. He did not get used to a big city. At work, he finds the sound annoyance less intensive. He worked in an apartment exposed to the vibrations of metro construction work, but found this was bearable. It is mainly bus, truck and motorcycle noise which bothers him.

He makes no or little mention of noises within his apartment or the apartment block, except for motorcycles within the block and bowl players in the summer. /90

2b - The mother also comes from a rural area, but came to the city earlier. She complains mainly of noise in the evening and at night. People who go away for the week-end or on vacation, travel at night. During the day, she says she is too busy to think of noise, although she does say the noise level in the daytime is higher than she first thought. In the morning, her husband makes noise and her son wakes her up. They turn on the radio or TV very loud to block out the highway noise. She plays the transistor less loud, but it is on while she is working, giving her a steady background noise.

2c - The child does not complain of the noise, "he is the one who makes noise" the parents say. He complains that he cannot listen to the TV like he wants. He has to turn the volume up, his parents often tell him to lower it. This is the main complaint against noise.

3 - Occupying the Dwelling: Pace of Daily Life

-The living room nook is virtually unused and has little furniture.

-The TV is between the living room and dining room.

-In the daytime, the mother does her work near the table of the dining room nook (sewing, ironing, etc.). She sits down near the kitchen door, and often works in the kitchen too. As she is always busy, noise doesn't bother her when she is working.

-When he wants to write or read, the father goes into the bedroom. The child does his homework in the living room. In the evening, the whole family watches TV in the living room. The volume is turned up a little to block out the sound of the highway. When the TV is turned on again, one is surprised by the sound intensity. Whereas the family lives in the living room, which is close enough to the kitchen where part of the household tasks are carried out, highway noise makes it difficult for family members to talk to each other. One has to shout to be heard. Family life is centered on the time spent in the living room, time for rest, leisure and communication. Noise from the highway is experienced as a communication handicap, a source of fatigue and sometimes conflict, a source of disinterest for any normal leisure inside the home: reading, listening to records. We find two phenomena occurring concurrently and which will be rediscovered in case studies of this site. /91

3a - The annoyance associated with highway noise turns off one's interest for a consumption mode, a type of formalized leisure within the dwelling and a more differentiated mode of occupying the dwelling. These are modes and types specific to the middle class, and are highly broadcasted by media masses. In this case, this disinterest is described at length by the household members interviewed. People don't buy furniture, except for the living room. The living room nook is empty: "we never go there", "we use it only for the telephone", "I put my ironing there". The living room carpet is not redone, but it is redone in the bedrooms. The kitchen was repainted. A desk was purchased for the child's bedroom for writing and reading. His mother fills it with papers in the daytime. His father rarely does. When he comes home at night, he is tired and goes to his bedroom. The parental bedroom is cluttered with new furniture (large bed and dresser). The only "cultural" activity is watching TV at night. Here again, this is a non-formalized consumption. No program is selected. It is turned on just before dinner. Yet, one would have preferred to read or listen to something really interesting, but this is not possible.

3b - Void of communication and affective exchanges, family intimacy has no place to be shared. Because of noise, the family stays together, but without speaking. To speak one often has to close windows first, which is not compatible with household activities, nor with the non-formalized aspect of communication. Only when someone comes from outside is the window closed to be able to speak (formalized communication). Traditional manners are therefore observed, but not to the usual extent (spontaneous intense exchanges escaping social constraint). Highway annoyance is experienced as something which shuts family members off from each other, which creates conflicts with those one expects most to share affection with, and also has a negative impact on socialization with neighbors.

This two-fold inhibition leads to a daily life carried out in a ritual manner in a hostile environment, involving in the long term a cumulative process and a saturation. "There is nothing we can do, we can't stand this any longer ... and fortunately the traffic is not as heavy as expected ... otherwise, I think we would go crazy".

4 - In the case of apartments at Mermoz-Sud, highway noise annoyance is even greater, because wall insulation is defective and floor heating is used. Annoyances caused by heat or cold, dust and wind blowing on shutters are added to highway noise. The window design does not make it possible to install joints to improve the insulation. A better insulation (sound and heat) would solve only part of the heat discomfort.

Living room and kitchen windows let cold air from the North winds pass through. When it blows, it is hard to remain sitting in the living room or near the working area of the kitchen. The family then closes the shutters, which are even noisy (flexible, wind-blown shutters which lock easily). In contrast, as soon as temperatures go up, since the heating is not adjustable, one has to open the windows and let the highway noise come in.

5 - Not many activities are bothered, because the lifestyle is not very formal. As we have seen above, noise from the highway is more of a constraint on the entire lifestyle and family communication.

The high noise level is noticed when waking up in the morning, however. It bothers conversations, the understanding of texts on TV, prevents people from reading (other than the newspaper or magazines) and from listening to records.

6 - Induced or Modified Activity

This refers to limited activity and a limited modification of the dwelling which is not done to change behavioral patterns. The family often visits parents in the country for the week-end; rest there is especially appreciated. The child divides his time between the school, the school yard where he is supervised by the baby sitter on holidays and the family apartment. His parents do not allow him to play unsupervised.

7 - Working in the building, the father inquired several times about insulation costs. He estimated that it would cost 5,000 French francs to insulate each of the three living room and kitchen windows. He described the techniques to be used. The fact of occupying an H.L.M. (low-cost apartment) made it impossible to consider taking on these costs, he thought. In contrast, he inquired several times about whether the joints could be installed. The installation of double curtains seemed warranted to him both for reducing noise and for protection from winds. He estimated that it would cost 1,700 - 1,800 French francs, but does not have the money now. For the time being, the family is hoping for a collective solution to this noise problem (installation of an efficient double window). For other problems, including noise emanating from within the apartment complex, the family believes that collective solutions may come about and have already been made for the youth and the cul-de-sac requested for Morel and Cote Streets. /93

8 - The noise constraint seems to have contributed, among other elements, to a reduction in social relations. This means the family has less desire to entertain friends, the father prefers to visit friends who live in a quieter apartment, rather than bringing them home. Collective life remains the last bastion of a sociability which at one time went much farther beyond it.

9 - The situation seems more and more unbearable for the father. Although they have not taken any steps, the two parents have different ideas: the father's project would be to find some land and to have a house built not too far from the city. He wife thinks that at present, they do not have enough money to consider such an endeavor and that most sites or land available in East Lyon are exposed to annoyances. She works downtown and would prefer renting an old apartment in a quiet street in this area.

These projects are solutions to flee highway noise. It is primarily a collective solution the family is waiting for. The projection of each spouse of owning a residential home can be realized only in a distant future, when the economic resources of the family will be less limited.

Case No. 2: H.L.M. (Low-Cost Apartment) Tenant - Daytime Leq = 76 dB(A)

- .Couple 52 to 50 years
- .Four children: 25, 21, 16 and 7 years
- .Profession: worker

1 - Selection of the Dwelling

The family moved into an F 4 apartment model in 1969. It is an apartment reserved for the 1% employers benefit. Before, the family lived in another apartment, also reserved by the employer. It was an F 3 on the 10th floor of the U.C. 8 de Bron-Parilly.

The old apartment was too small: the couple was expecting their fourth child. The family took the first large apartment free, among those of the company. When it left U.C. 8, it left a small /94 poorly heated apartment (the heating system was rebuilt 6 months later), exposed to the roar of the peripheral boulevard (future LY 1), but with a nice view of Lyon.

The new apartment was larger, had an extra bedroom, a double exposure over the inside area of the complex and from the living room, over Mermoz Avenue. Despite the presence of lights, the presence of trees, a large separation from the road, the noise seemed farther away, the roar had disappeared. The family was closer to downtown and the business center. Finally, the rent was not much higher.

2 - Reactions To Noise

The transformation of the avenue into a highway, the proximity of a bus stop and the presence of a sewer plate which flaps against the wheels of heavy-weight trucks and make their cargo knock, will introduce an extremely negative experience for 5 of the 6 family members. The sound annoyance, here, cumulates in the backfire noises, a virtually continuous rolling, very violent shock noises, and vibrations.

For the father, who was raised in the country, factory work completely changed his lifestyle. Finding himself living in an area exposed to noise, at an age of over 50 years, he feels trapped. It is a failure of a lifestyle where the father accepts unpleasant working conditions (along with another annoyance: noise) to insure safety and tranquility in the home. The home is the opposite pole of work. "People will come... We've had enough from all stand-points, look, at 50 years old one would like to have some peace, we had a child late ... we are tired, and we can't even rest peacefully".

This sentence is to be compared with that of another worker interviewed, declaring in a positive manner: "Four or five years from now, they should be able to make furniture we can rest on".

Noise in the home is therefore a very negative experience, inducing weariness caused by the accumulated fatigue of work. This experience results in reductions in investments in the home, a loss of initiative for any improvement. The noise persists, reinforcing the feeling of failing at home, a symbolic translation of social failure in a system of values dominating our society- "the sacrifice of the father" to allow the emergence of a certain standard of living for the family, a standard for which the two main dimensions are the home and the schools for the children. The noise which the dwelling is exposed to inhibits this process.

For the mother, the noise is dramatized. It is one of the cumulative causes of the weariness or nervous tension experienced by all members of the family, and of the medical, professional and scholastic problems. For her, it is the main cause of her physical state - she suffers from hypertension. "In the winter, I gain weight, ... in the summer, I go to the country, I do not hear all of these noises, the annoyance of all these noises, I lose weight. I asked a physician specialist, he told me" "You need not look farther, you are worn out by noise." /95

This dramatization goes as far as personifying the highway as deadly: "She said this highway will kill me and she was indeed killed on the highway. "My father, he said, the noise kills people and he said it. He had worked in a noisy factory and he said this wore away one fourth of his life. Oh, I am really sick of this".

"I am given tranquilizers for the heart and I am treated for hypertension and all, but since we have been living here, well, my situation has worsened to the point that I have to see a cardiologist every 3 months. You see this noise grinds on one's nerves without realizing it".

The elder son worked at night for awhile. During the day, his sleep was highly disturbed and he fell sick. The doctor at work prohibited him from working at night. During his vacation, he goes to the mountains, he is in love with silence.

The second son is 21 years old and is doing his military service in Germany. He failed his high school exam and was not able to find work afterward. He said "this is not possible, I cannot concentrate". When he returned from Germany, he said he could not sleep. On the contrary he never slept more than he did at the barracks. He has the feeling of wanting to be back in that quiet atmosphere. He would like to work in a park or in a garden where it is quiet.

The third is 16 years old. She sleeps in the top bunkbed above her 7 year old sister in the nook of the living room. For her, the noise experience is negative also. The noise aggression adds to the fact that she does not have her own space: any noisy activity in the home annoys her as much as the highway noise: the vacuum cleaner, the TV which the parents tend to turn on high. She is awoken by truck noise. To work, she often gets up at 6 am, because there is less traffic than in the evening until midnight. She asked her parents to insulate the nook she sleeps in with her little sister. To listen to music or English records, she goes into her parent's room. She often asks her parents why they don't move. They feel questioned. She had a lot of trouble at school and says that the noise is an extra handicap. She is revolted by the annoyances and constraints she is subjected to.

The last child, a 7-year old, does not seem annoyed by the noise. /96

She has a good appetite.

3 - Occupancy of the Dwelling

The apartment is small for the family's size. The two boys share the room next to the front door. They can thus receive their friends, go in and out without restriction or bothering the rest of the family. They sleep on bunkbeds, which gives them more room in their room.

The parents sleep in the second bedroom. The daughters come in to do their homework, listen to records in the daytime where it is more quiet. This room is too cluttered to put the TV in; Besides, moving the TV does not correspond to the cultural model of the family. As the third child said "It's not so much a question of TV, we have no family room, no bedroom".

Actually, the two smallest children sleep in the living room nook in bunkbeds. The living room nook is their bedroom, they spend their time there, but they are also exposed to the highway noise and to the noise of family activities. When they are present, there is constant interaction between their activity and that of the family which assembles in the family room. "Day before yesterday, we were hot, we had opened the window, she said, oh close it, I can't stand that infernal noise. Then she wanted to pull the curtains, but that wouldn't cool us off ... well, the soundproofing, the equipment should do this".

In this case, contrary to what one might believe, the family does not blame highway noise for the problems of interaction due to overcrowding in the apartment. It is in fact the noise which makes it impossible to establish a valid compromise. Actually, as we shall see below, a whole series of behavioral patterns were given up to make the family room relatively quiet (TV, window opening, vacuum cleaner. In an apartment not exposed to noise, this compromise would be enough. Here, the constant exposure to highway noise at times where each member is present and wants either to study or to talk, frustrates the household members who want to be able to use their family room "normally" and the girls who want to have their own space. This is especially important for the older daughter. The youngest does not require her own space as much because of her age (she is 7)..

One should also add that the space for the girls is also exposed /97 to the winter cold, along with part of the room closest to the highway. It is hard to stay there when the north wind is blowing.

At night, the highway noise (trucks, motorcycles, horns especially) awaken the older daughter; the cold bothers both of them.

The dining room area of the living room does not fulfill all the functions it used to for the family. One expects this less.

Except for moments of more intense exchanges (father returning home, around the dinner table at night), the father tends to stay in the bedroom more than in the living room. The eldest daughter thus does part of her school work and listens to records in the parent's bedroom.

The mother, who once appreciated resting in a chair near the window, gave this up and prefers taking a nap in the room at the beginning of the afternoon. She does her household chores in the living room. The need to open windows when she is cooking often causes conflicts. As the family has not given up spontaneous communication, it is hard to initiate it: one cannot hear between the kitchen and the bedroom. One has to shout. Finally, because members confine themselves to the bedrooms part of the day, this is considered a constraint, particularly since the insulation is not complete. The ideal, and this is not possible because of the noise problem, is to be able to rest quietly in the family room with the entire family. This was expressed in a negative manner by the mother: "But it's disappointing, life is disappointing and well... There are moments, I assure you, I say sometimes we would like to have some quiet, if I told you I lay down for two hours each day after the lunch, I go into the bedroom and close out everything, I close the doors, everything, and through these doors, the noise annoys me, gets me uptight ... and annoys my husband more than me, but for me, it gets me uptight".

The noise exposure of the living room makes this family use the space in the apartment in a way it normally would not choose. It frustrates the satisfactions the family would like to have.

4 - The highway noise annoyance is accentuated by the poor heat insulation. As soon as the north wind blows, one cannot remain sitting in the living room near the windows. The black dust would require intensive and daily maintenance that one doesn't have time for and that moreover creates even more annoyances and conflicts (noisy vacuum, need to open windows). This rapid contamination of black dust on window panes, glass, shutters, fish tank, expresses the weariness and displeasure of the mother who no longer finds any satisfaction, whereas before she introduced herself as a "housewife". "Moreover, I as a housewife, I like my home, but it's disgusting ... it is disgusting, I say it is disgusting from all standpoints, the noise and the filth it makes, I mean, one just gives up trying to clean. I clean the apartment because I have to keep it up, but really. Fortunately, we don't have a balcony, if we had a balcony on this side, it would be even worse". /98

These annoyances associated with the road, deprives the mother of satisfactions she has the right to expect in her role, a role she sticks to adamantly.

5 - Activities Affected

As we have seen, there are few activities which are not affected

by the highway noise. Let us mention:

- communication within the family (speaking),
- household chores - kitchen,
- TV, radio, record listening,
- reading, school homework,
- receiving friends (the door bell can't be heard when one is near the windows over the highway),
- sleep, especially that of the eldest daughter.

Above all, noise affects these various activities in a cumulative manner. It is harder to speak when working in the kitchen with the windows open and with the husband finding refuge in the bedroom.

It is more difficult to do English homework when the parents are watching the news and have the volume on high to block out the highway noise.

6 - Induced Activities

We have seen that the highway noise forced the family to use the space of the apartment in a manner it normally would not, in a manner which does not satisfy and which it is resisting. The limited space of the rooms also limits their use as a quiet area: "there are six of us - we can't all seek refuge in the back bedrooms".

Economic, professional and health constraints limit the possibilities of escaping the site: "if we could get away every 8 days, we would ask for only that, but we can't. People who can get away every 8 days, they are doing the right thing. I tell the young people, take advantage, you have a car, go, take off anywhere. For us, we can't, we have a limited budget. I have to watch my pennies." The father's vacations and long week-ends are spent in Haute-Savoie where he was born. The sleep one gets there is a cure. The family avoids taking the highway, and takes it only to return home on Sunday night when they are in a hurry. /99

7 - The furniture and equipment in the home were bought a long time ago. The father does the emergency repairs or those which seem urgent. He recently redid the bathroom ceiling, but hesitates getting into more extensive work. The mother would like to redo the apartment, but she can't convince her husband. As we have seen, the eldest daughter wants to have her nook insulated, but that seems to be too much work. The installation of double curtains is being considered, but is also considered to be too expensive (estimated to cost about 1,800 French francs).

Several factors play a role in this refusal to engage in improvements which seem too extensive for the family, both in terms of cost and the amount of work to be done:

- the feeling that the essential constraint comes from the highway and that it is therefore incumbent upon Equipement or H.L.M. (low-cost housing administration) to provide soundproofing;

-soundproofing would make the heaviest expenses impractical (double curtains, partition);

-generally speaking, it is not fair to do work oneself which Equipment is responsible for and individual insulations weaken the collective action deemed necessary;

-the parents were hoping the boys would get married and settle down and free their room for the girls, but they don't go out;

-with these facts in mind, the present situation is likely to last a long time and the only rational solution would be to take an F5 apartment.

All of these facts made the family adopt a "low profile" in maintaining and improving the apartment, with the very strong feeling that without this highway noise, it would be pleasant: "You see, my husband redid the bathroom ceiling, but that (the noise) does not encourage us to put money into the apartment, because if our children were married... The two older sons don't date, but who knows (if we went away). We wouldn't be staying there just because of the highway, because I like the apartment, it's not unpleasent apartment, it's in one of these old court- /100 yards, but you know, my husband said the other day, well if they make a wall for insulation, at least we would see the wall, but we wouldn't hear the noise. I, (I said) would put in double curtains, we have the money to fix our apartment, to carpet it and everything, I'm fed up. We always say, are we going to stay, are they going to soundproof us? If they soundproofed us... its mainly in the summer when the window is open..."

The mother's dream is to have a home she likes. This is an apartment in which she can carry out her roles as housewife. Here, the highway noise prevents this from happening. The couple took action to adapt other constraints: furniture were fitted with felt pads to avoid aggravating the noise. Neighbors took similar precautions, and this made noise from neighbors tolerable. The youth have their activities, even if their socialization has been limited over the past two years. Inside activities, which could lead to conflicts, or those which could invade the privacy of the two girls, were limited. However, the highway noise made all of these compromises, and all of these tactics which could be considered normal restrictions in a large family, were useless. This is a good indicator to show the radical differentiation at this site between noise within dwellings and within the apartment complex which is accepted or not accepted, depending on one's social life and the "technical" noise of the highway. The latter is a massive constraint aggravating the other constraints and cancelling out any of the conventional steps taken to adapt to noise within the complex. Low income families exposed to high highway noise levels do not hesitate to restructure their lifestyle around this element, but they are the ones that have the least social, cultural and economic means.

8 - The family life is highly centered around the home. The mother defines herself as a housewife. The family has no plans to socialize as a means of acculturation. Emphasis is never placed on encounters as such. On the contrary: "We never go downstairs, I never let my children get used to going downstairs; they bothered us, but not our neighbors and you see, when they grew up, they were used to this". At the same time, there is a feeling of social homogeneity among the families living on the street (same lifestyle, same aspirations). The children on the street generally don't go downstairs either and each family accepts a certain self-discipline to avoid bothering others: "Sure, because when a kid comes downstairs, he comes with his shoes, takes them off, then one hears them drop "plop", "plop". They aren't unpleasant, you see, some people complain about this to their neighbors, but for us it is a noise we can all stand".

"We put felt under all furniture, when we move one, we are careful. We respect our neighbors. We never make noise. Never." /101

This reference to a homogenous group applies even to how much one hears the noise. If the family strongly complains about traffic noise at the beginning and end of week-ends, it is usually because the family is well off and goes skiing.

This behavior seems opposite to that of the family: people in these families think nothing of sounding their horns, roaring up their motors, trying to pass each other to leave or come back faster than their neighbors. It's not that the family doesn't want to go skiing too, it is that most skiers have a different behavioral pattern in automobiles than that of the reference group. In contrast, noise early in the morning is annoying also, but is noticed less, whether it be workers going to work or truck drivers "What do you want, the workers have plenty of time to make their trips".

To be subjected to the noise of a highway one cannot or avoids using, because it is too expensive and one doesn't "take-off" very often, to hesitate to move in order to take advantage of a low rent, which makes it easier to cope with everyday expenses and sending the children to school, reinforces the feeling of belonging to a given social group. Within this homogeneous social group, one has fewer, but less formal relationships. During the interview much reference is made to the way one looks at other people in the neighborhood. These relationships are considered to be those of "good neighbors". The family has always had good neighbors, i.e. casual relationships within a homogeneous group which do not question the lifestyle of each family member. An institutionalization or formalization of relationships would on the contrary be lived as a debut into a world of ostentatious sociality affecting the family's status. "We don't see anyone, everyone is fine, we never have bad experiences. Here, in the home, we get along with everyone, everyone says hi, and nothing more. In the home, we often ask for help, but nothing more, they could be my children".

Next to relationships with neighbors, which are more appreciated when they are less formal and have less pressures, this type of sociability leaves more room for close family relationships.

Noise is not an obstacle to people visiting each other, but visitors often say: "oh no, for that family normally comes to see us, they realize they have a noisy apartment".

Although the two older sons are still dependent on the family, /102 they have their own social life. Their problems are still associated with the constraints due to their exposure to noise and with belonging to the social privileges for the family.

For the household, the exposure to noise is a constraint associated with its social condition (worker class). By what it represents, it reinforces the type of household sociability which corresponds to a conventional worker sociability: casual relationships with neighbors and intense exchanges with the family - absence of social relationships and conspicuous consumption. "Noise is there constantly, constantly. We talk, sometimes we say, what use is it to talk, we are stuck there forever. If we had money, things would be different".

9 - The family has no residential strategy. It lives in a fixed situation. A higher rent would force it to cut into the daily budget: "We can't listen to TV because of the highway noise, for the noise it makes on my daughter there. We need an F 5, but I don't know if we can afford it. My husband has a normal salary, he doesn't earn 3,000 French francs per month".

Yet, simply having a larger apartment would help the family's situation. It would enable it to have a "normal" use (according to the family's value system) of its apartment.

On the other hand, the H.L.M. status, the constraint felt more and more by the older daughter, the amount of money to be spent ("she is madder than anyone. She's always asking when we're leaving, when we are going to weather-strip, because she's had enough". The possible departure of the older son makes it difficult for the parents to make definite plans: "I say, ever since that highway's been there, it's not very pleasant here. One invites friends, children can't go downstairs. It's impossible: the highway on one side, a road on the other. You can't open windows because its noisy. You know, basically it's not so much an apartment thats nice, its living in a quiet environment. Ever since the highway came, the apartments have been cold, unpleasant. Perhaps we should change the inside, I'm not sure .. my husband hasn't decided to repair, we should do it, but he hasn't decided yet ... he is discouraged, because he says, if we don't stay...".

Case No. 3: Co-Ownership - Daytime Leq = 73 dB(A)

/103

- .Household with 3 children
- .Profession: worker 3 x 8
- .Apartment F 5

1 - The family decided to buy the apartment in 1968. The

was one of the first to move into the building. The father has alternating working hours. What the family saw first was the affordable price and the type of apartment it was. Other aspects were accepted as drawbacks to having a valorized residential status.

2 - The Noise Experience

Although his working hours make it difficult for him to rest with unsynchronized alternating schedules, the father complains little about noise during the interview. He is more annoyed by the noise peaks and the noise within the home than noise from the highway. He is used to highway noise and finds that the elimination of stop lights and the conversion of the road into a highway improved the sound situation by eliminating the sudden braking sounds of trucks. The sound quality when one is sleeping depends on the noise peaks and the sound events in the home (noise of elevator doors, children, etc.).

His wife's opinion is completely opposite and finds that if the noise peaks disappeared, the noise is still there: "the braking sounds are attenuated, but not the noises".

Staying at home all day, the conversion of the boulevard into a highway eliminated the noises due to traffic lights.

The noise set in like a continuous roar whose only function seems to be to eliminate any possibility of real rest, any psychic and physical recovery. She herself complains little about the noise, but dramatizes the effect of its annoyance to other women living in the building: "We if look at Mrs. X, she's home all day long, her husband must have said: "We can't drive her nuts...". Its a lady who is home all day long and never goes out; her balcony is closed, but I make friends".

She describes herself as a woman without a profession, but trying to go out and always having something at home when she is there. What is the hardest is the saturation obtained mainly when fixing meals or doing housework, adding the highway noise with that of household apparatuses (vacuum cleaner, washing machine, etc.).

/104

3 - The noise has not caused changes in the functions assigned to the various rooms of the apartment. When noisy household apparatuses are on in the kitchen, the mother avoids staying there and closes the doors.

4 - In other households, the poor thermal insulation is given as the reason for closing the balcony. These are recognized here, but are secondary to noise.

For one of the families in the building the mask effect associated with residential status plays the smallest role. In many cases, admitting that one suffers from exposure to noise in one's home is to admit that reaching a socially "valorized" residential status is a symbolic or ideological, and partially mystified choice. "People who moved away from here, mainly left for the noise; they realized they were ill-at-ease and they tried to sell. This is normal and fair. It was a question of selling and finding a buyer. This is hard because of the noise, but especially because of the floor heating".

Even if the main annoyance for the family survey is noise, the magnitude of this annoyance does not seem to be recognized on the market and potential buyers are more sensitive to the disadvantages caused by heating modes than those associated with noise. If noise shocked the buyer, he always thinks he'll get used to it.

5 - 6 - Activities Affected

These are mainly household activities, mainly fixing meals in a kitchen exposed to highway noise, which is aggravated by noises from household appliances and heat problems, often making it necessary to open windows.

The inability to get a good night's sleep for the father is ascribed to noise peaks (motor bikes, horns) and noises in the house. Children are the most sensitive and do not complain about the effects of noise on their activities.

7 - Budget limits seemed to have delayed closing off the balcony which will insulate the living room, but will not solve problems in the kitchen. It is planned for this year.

Progressively, modifications improved the inside of the home: floors were redone, new furniture was bought, mainly decorative furniture for the living room which is used as a dining room entertainment room. The economic investment in the home is high.

8 - Noise seems to have little effect on the family's socialization model. This seems to copy fairly strictly the limited socialization model of average classes recently becoming co-owners, essentially centered on the life in the home lived as a functional space and a space representing their social status. The functional division of space and the equipment of specialized spaces are status symbols.

Home furnishings: the living room furniture, household appliances, kitchen equipment and insulation of the front side of the house often appear as compromise to the woman for her household work.

The mother surveyed tries to dissociate from this model

by making friends with other women living in the building, by participating in parent teacher associations, by following the action of associations, and encouraging her children to become more independent.

9 - The residential strategy of the household is to limit the noise effects little by little by insulating the home. This is seen less as a luxury and more as a necessity. The family does not plan to move out.

Case No. 4: Co-Ownership - Daytime Leq = 73 dB(A)

- .Family with no children
- .Profession: electrician - employee
- .F3 apartment

1 - Before moving in 1968, the family lived in a small apartment over a quiet yard (awakening to birds singing). During the day, the only sounds heard were children playing in the yard.

To buy a new apartment seemed a social promotion. The choice is made within financial limits and the apartment seemed to be the best one available for their situation. In 1967, the market was not as developed as it is now. On several points, the location among others, the apartment was not exactly everything the family wanted, but this was secondary to the fact of owning an apartment. "Finally, if my finances enabled me to have much more money, I wouldn't have settled here. But what we found was a small promotion of going into an apartment as co-owner. It simply lacked the best. We had a choice to make. It was not a choice of "I am going to choose the best building", but rather of "what is within our range". We landed here where there are quite a few flaws. /106

Before moving in, we didn't notice the noise and what a shock it was when we did, we felt like we moved into our own trap. Rather than being in a place where we recognize each other, where we have the impression of expressing ourselves and growing, the apartment suddenly became something we had to get used to, and kept us "hanging": "Every saturday we all went out ... Like everbody, it's like a kid who just got his first toy, by George, it was sort of our first toy. So, I saw everything except the noise! When I was able to move into this apartment, I still hadn't heard anything ... I looked "How pretty it is on this side, that's pretty, we can put that here, we can put that there".

"And the next day, when we moved, he was completely demoralized, he wanted to move out again".

"It was something, we took suitcases, moved out. What do you expect, we had to do something. You know, we are all trapped.

Owner? We are too small to pay for it, that's what we are. So, we had to make a decision. We had to get used to the noise".

This long quote is very strong, it shows how the drawbacks were minimized and the joy of buying an apartment was magnified: to live another wonderful childhood. The irruption of noise hits hard on (a) real childhood and on economic inferiority ("Owner? We are too small to pay ") and creates a certain despair: "We are all trapped", "what we found was hell".

2-3 - Living With Noise - Occupying the Apartment

/107

From the initial disappointment, there were two periods: before and after the peripheral boulevard was converted into a highway.

In the first phase, the couple tried to get used to the noise while limiting it: he used boules to sleep with, insulated the bedroom, closed up the balcony. The gain seemed small, but the conversion into a highway and the disappearance of peak noises make one think of an acquired habit: "I never thought I would get used to such noise! It was necessary to get used to it, little by little I did it, not very well, but I did it".

The couple no longer used the boules: "At the beginning, it was tough, I tell you, we had to use boules and little by little we removed them and were able to sleep just as well as before we came here. I don't know, maybe yes, maybe no, I don't know, I am able to sleep...".

Behind getting accustomed to highway noise, is the feeling that the highway noise has an insidious impact and that it is more difficult to get used to it than to the boulevard noise "It's not like we were told, every morning at 6 am, garbage trucks come. If it were a noise coming back every day, not, you see, I don't know how to say this, but it is a continuous noise. At night, the noise goes down, obviously, but not very noticeably. I can't say there is an exact time when there is an abnormal -noise, there always is noise if one wants to go over there".

Whereas now, we sleep, more or less, but we really don't know if we really sleep. There are times when we wake up for this, for that, maybe the noise woke us up without us knowing it".

4 - This insidious annoyance explains the feeling of fatigue and weariness which sets in, the feeling that one will never recover and on the long term, there is one solution: move out. The other drawbacks of the apartment, mainly the heating system and noises from neighbors, are accepted, because we knew about them when we moved in and their effects are more limited.

5 - Its the quality of sleep that seems to suffer the most from noise: feeling of not sleeping normally, of not being rested in the morning, and being awoken very eary - weariness for the father to leave a noisy work site for an apartment which is also noisy. Noise is heard in the evening and TV listening is disturbed by it.

The apartment is improved progressively. At the beginning, priority was given to insulation in order to "hold out", as no other solution was conceivable for the couple. The results of soundproofing the bedroom were considered disappointing. The balcony was then closed up. The total soundproofing does not seem to be a solution, because in the summer one cannot live closed up and the need to open windows makes all soundproofing expenditures impractical.

6 - A certain mutual aid and mutual information exchange were created between co-owners to deal with common problems: knowledge and know-how are shared for insulation work and inside improvements (tile or floor installations).

7 - Short term and medium term, the family is not planning to move. Leaving the city to settle in the country attracts the couple, but such an endeavor seems to involve moving and high costs. For awhile the family thought it would have a house built on a family plot in the Isère region, but the construction of an airport near there discouraged this idea. "So, we thought that when we would have a little money, we could have a small home built there to get away from the noise here, but we would only be moving to an air field!".

The couple continues to gather information about new constructions. It has the feeling that there is more choice now and that it might find an apartment similar to this one, but in a less noisy area. But this would require a greater financial investment which it doesn't have at present.

Several co-owners left the building because of the noise and resold their apartment. The couple does not have the impression of being pinned in by the need to resell. It would still be possible to resell the apartment because there are buyers who are not afraid of the noise problem, either because they are unaware of its long-term effects, or because they live in even noisier environments.

SYNTHESIS OF THE INTERVIEWS

We made the assumption that there are objective changes in the behavioral patterns of people in homes exposed to road noise. This assumption was extensively verified within the framework of this preliminary study.

In the H.L.M population studied, noise from the rapid expressway is an outside constraint on the inhabitants of the apartment building and all discussions with the people interviewed were focused on this point. The structure of this discussion is easily identifiable in that the noise effects weigh on all of the daily activities mentioned without being brought up by the interviewer.

The discussion of noises in the home was mainly induced by the interviewer. It is also very different, because it is not based on noise as an outside constraint, but upon the interviewee's value system. /109

Within the context of the H.L.M. population studied, the exposure to noise means:

-A constraint on all daily activities in the apartment:

- .preparing meals,
- .household activities,
- .family exchanges,
- .TV listening,
- .sleep and resting periods.

-An inhibition of social function in the apartment:

- .purchase of household appliances,
- .purchase of furniture,
- .repair and improvement work,
- .reading, writing,
- .listening to records,
- .personal professional training.

-A restriction on sociability or making sociability more difficult.

-A greater sensitivity to fatigue and sickness resulting in absence from work or in an increase in medical consumption (detection, analyses, medication).

-Increased scholastic problems.

Exposure to noise has never been the only incidental cause, it reinforces a cumulative process in which other factors play a role.

The discussion on noise may in this case serve as a refuge or, on the contrary, one may refuse any discussion of it.

Among co-owners, the exposure to noise resulted in an increase in consumptions for the home, and in particular insulation expenses. /110 During the discussions, one notes a very strong mask effect: i.e. an effort to minimize constraints caused by noise. The behavioral

patterns within the apartment are rigid and formal enough to be reproduced, despite the considerable annoyance.

In contrast, in the two population groups, the residential strategy is very rigid. Residential mobility does not seem to be affected by one's exposure to noise. Families move in and react to the noise (negation, getting used to it, insulation).

Generally speaking, the only families who move are those who can afford to, and they would do so anyway even without the noise problem.

However, there is a population group in H.L.M.s and among co-owners exhibiting residential mobility and it would be interesting to test the effects of noise on this mobility. This population group was not present at the sites we studied. However, there was one at sites very close to them (Bron-Parilly for H.L.M., co-ownership of Estressins at Vienne where qualified workers of the Lyon chemical industry and employees and middle-level executives beginning their residential career).

The cultural models governing the use of outside spaces next to the apartment also seem rigid, depending chiefly on the residential status and the exposure to noise causes only qualitative differences and not all or nothing type discontinuities. Even when exposed to noise, a balcony from the living room in a co-owned apartment has a more socially prominent nature than a garden in front of a single-family home. Even in a quiet area, an H.L.M. balcony can have various and socially undemonstrative functions. Qualitative differences cannot be discerned by extensive observation, but can be discerned by making comparisons between homogeneous sites or by collecting information through interviews with inhabitants about their aspirations.

II - ANALYSIS OF INTERVIEWS IN SINGLE-FAMILY HOMES

II-1 - THE SAINT-LOUP COMPLEX OR VALORIZATION OF A CERTAIN TYPE OF SOCIAL FUNCTIONING

This complex, built in 1927, is made up of 250 H.L.M. (low-cost housing) single family homes of type F 1 to F 4. The rent is about 220 French francs for an F 4. The socio-economic level of the population is homogeneous.

While all of these homes have two private areas, that on the street side may be simply a small terrace, but it serves as a screen. The main entrance to the homes along the highway opens directly to the street. /111

Two typical cases are presented here, one tending to minimize the impact of noise not only in terms of attitude, but also in terms of behavior, the other tending to correlate all individual problems to noise.

Case No. 1

Happy with his home and rent: "... I am comfortable here, both money-wise and because of the garden". Mrs. S is also happy about the surroundings and the location of her home in the complex: "I have no complaints about the surroundings, I am very satisfied".

She emphasizes and repeatedly says how quiet the complex is, the advantages of her home and vast garden: "Look, we eat there at noon and in the evening; we planted flowers and lawn... we have a barbecue, we are in the country and even on the highway, it doesn't bother us".

In regard to the highway, she will add: "it bothered us at first, because we weren't used to it, but now I don't pay attention. On the contrary I like the distraction, we are well located, because in front you don't see anyone go by..."

The highway noise doesn't seem to be a real annoyance here. The advantages of this new home (rent - single family home on floor level overlooking a garden) tends to make the highway noise tolerable.

The contrast (upper floor = neighbors)/single family = quiet) reveals the tolerance to an annoyance which becomes very secondary. Although the highway noise is heard, it does not "bother" people, whereas noise from other people will. Other people means noise, but also violation of the home, of the life at home.

Due to the advantages offered by the home, the positive status of the district and the type of relationships Mr. and Mrs. S make, the couple tends to play down the highway noise without denying it exists.

"... it took us 6 to 8 months to adapt, we weren't used to it, just think ... it makes a lot of noise, but you see, I didn't pay much attention ... we spoke about it because I hear it, but even at night ... I don't hear it and yet there is traffic at night..."

Their lifestyle is organized harmoniously with their home environment without behavioral adaptation to noise. They fully utilize the outside space when the weather is nice, rest in the garden, leave windows open on hot summer nights... /112

Although a little extreme in their manner of ignoring the noise, the case of Mr. and Mrs. S is very typical of the Saint-Loup complex:

- modest rent,
- nicer home (single family home in Marseille) than they could have elsewhere,
- good social integration,

-feelings about home are expressed in direct reference to H.L.M. apartment complex.

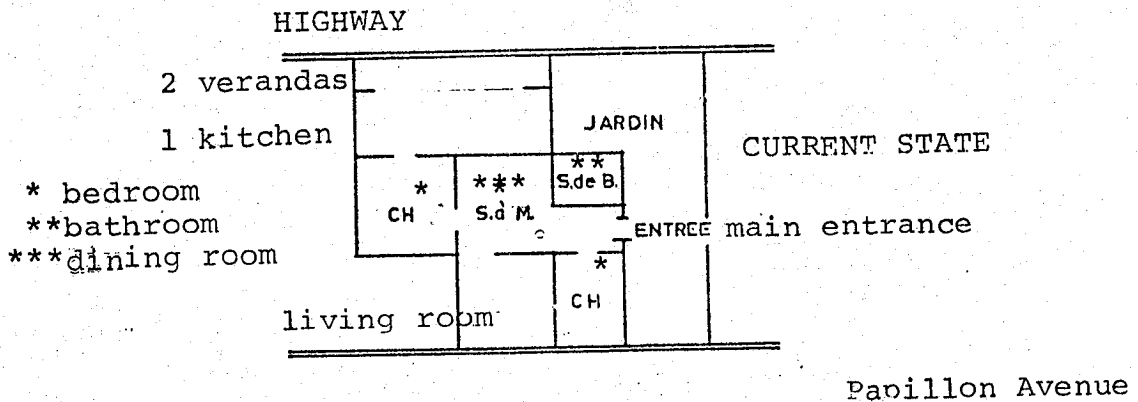
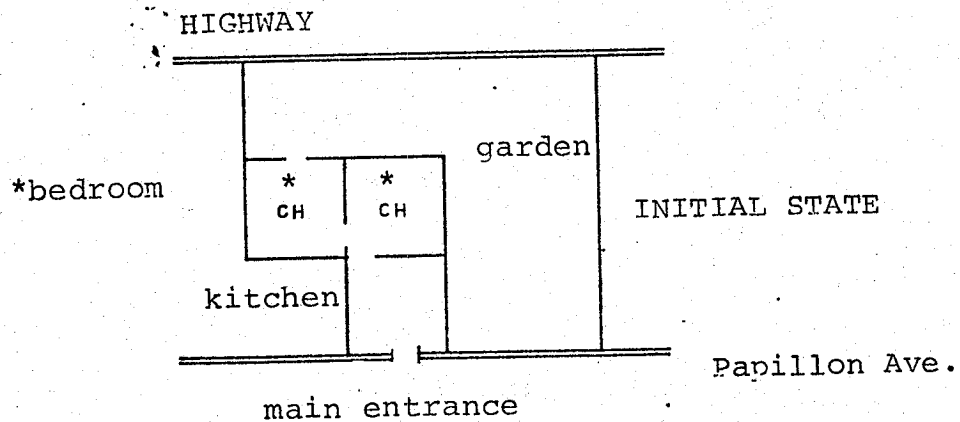
These features lead to very positive feelings about the home and the district. Perhaps the road noise is par with the price to pay? The overall result is so satisfying that this noise is accepted.

Many discussions of this type show us in the case of Saint-Loup, that the association of three essential factors: real single-family home, modest rent, good social integration, tends to develop a tacit acceptance of this noise from outside the complex.

Case No. 2

In the second case, we will elicit one of the two people who complained of highway noise at Saint-Loup.

Mrs. P., 52 years of age, was born in the complex and always lived in the same home, right from the beginning, in a T 2, now a T 4. Her husband did all of the improvements during his vacations and free time (see sketch below).



She is one of the rare people we interviewed at Saint-Loup who spontaneously brought up the subject of noise and its drawbacks and who recalls the opening of the highway.

"...the first day, I wondered where I was, this was impossible, now I am more used to it, but it was hell at first... I didn't realize it at first, but this noise wears down my nerves... there are times when I couldn't stand it...the kitchen was always open, I closed the veranda even when it was hot in the summer, I would like to have more fresh air..."

To understand Mrs. P's attitude toward noise, her intolerance and the changes in her home, one must consider the family conditions in which she lives: she has been taking care of her sick mother for 47 years - her older son left home. /114

The home seems to have no meaning; noise only reinforces her "discomfort" when she is inside.

"...there are days when I tell myself, what do I have, I am tired, I am not going to be able to work...I am getting ready, I will go away and since I am leaving my house, everything's o.k.... There is noise in the city, but it's not the same (...) you're busy with other things... in my house I live with the silence of good and bad memories...but this noise which invades me is there...it is very hard to detach myself...I am not able to, then when I do, I am better".

She wants to leave her dwelling.

"...for a place where I would be with people...where there would be no noise, but where there would be a life...where it would be alive, not alone (...) a life where there would be no noise which invades you, people are more relaxed and where you don't hear: you saw that guy, he died of cancer or this poor woman, her children put her into an "old people's house".

Without disregarding the importance of noise and the annoyance for Mrs. P, it seems that her need to leave her home is more associated with the death of her mother, the departure of her son. The noise annoyance reinforces her "discomfort" in her home. Her "insatisfaction" on the psychic and family plane is projected to noise which she blames for her nervous disorder.

II-2 - BEAUSOLEIL RESIDENCE. OR THE REAL SINGLE FAMILY HOME

This residence is made up of 27 lots 400 to 1,200 m2 which were put up for sale in 1969.

The population is mostly lower executives, businessmen, and craftsmen.

Except for a villa which is being rented, these are owners

which occupy the homes.

The gardens along the highway, are simply maintained and some have a vegetable garden. They become show pieces toward the inside and at the back of the residence where the noise is attenuated.

With the exception of one person (case no. 4), the highway noise is minimized, and even gone as we can see in case no. 3.

/115

Case No. 3

Mrs. W had a house built which represents the social status she is looking for: owner of a spacious, single-family home.

"...I appreciate having a home, of being in my own home. Obviously there is no comparison with an apartment; one can enjoy the pleasure of gardening.

Highly virulent in regard to living in an apartment with her children where noise is synonymous with social conflict with her neighbors, filth and damage to community areas, she expresses great tolerance to the highway and minimizes the drawbacks caused by noise.

"...of course if you want to watch a movie and there is a lot of traffic in the summer, I close the door on the highway side and I open the window on the other side... one manages to get by".

Besides this behavior to limit a specific annoyance, one does not see that she has any restriction in using her home because of noise annoyance. She often uses her garden to rest in and spends a lot of time gardening. In contrast, meals are for the time being eaten inside.

In fact, they are trying to enlarge the balcony on the first floor and to cover it and close it on two sides because it is too exposed to the sun, wind, but especially facing neighbors.

"...in the evening when it is hot I like to go outside... I can really relax and talk very late with my husband...".

Although we are discussing a population from another social level and the notion of social integration scarcely has any meaning in this type of living situation, these reactions to noise remind us of those of Saint-Loup: as soon as the dwelling becomes very valorized, one tries to reduce to a minimum an annoyance which might devalorize it.

Case No. 4

Now, let us examine one of the two cases of people who don't

want to stay in Gavotte. Mrs. U is the only person who spontaneously brought up the subject of the "enormous inconvenience of noise" from the highway and protested against the lack of anti-noise means.

The highway is an annoyance and discomfort on life in single family homes: this comes from the noise and the inconveniences associated with it both outside and inside the homes and from pollutions which destroy the nature it is very attached to.

Outside the home:

- its garden is maintained but very bushy and is not used for relaxation or rest, even during hot summer nights,
- meals are not often taken outside (even though there a table and chairs are there,
- noise annoys friends twice as much:

.it is fatiguing by its intensity and continuity,
 .it forces one to speak loud to make oneself heard, "it bothers conversations".

Within the home:

-the bedroom was equipped with double windows and reinforced shutters. This was an improvement, but did not soundproof the room. One's sleep is often disturbed,

-the living room windows were also modified to install thick glass.

The windows of these two rooms are not open when the family is home or when it is gone.

For this person, the single-family home is a matter of course and is not perfect, it was never heavily invested in and cannot be considered an ultimate goal. Nevertheless, noise is one of the main reasons for moving in the future (and this is the only case of this type that we encountered).

In most cases, the people interviewed valorized the single family home so much (in contrast to noisy apartment complexes) that this noise outside the home and the social life of the district is veiled to not blemish, in the eyes of others, the image of their "good choice".

In the case we have just seen, we may consider that noise existed before the home was bought (in Saint-Loup, this was not always the case, but in any case noise had been there a long time). One wonders if this is not the price to pay for a much nicer and less expensive single family home of equal quality than one could find in a quieter area. Noise makes it possible to live in a type

of home one could not afford otherwise.

II-3 - NOISE INTRUSION IN A RESIDENTIAL DISTRICT

These are villas with a living space of 100 to 150 m² located on Avenue Général de Gaulle in Caluire. They were built in 1956-1957 for the first batch and in 1970-1972 for the others.

Since 1973, traffic on this avenue considerably increased: numerous heavy-weight trucks and week-end traffic.

Traffic noise appeared after the people moved into their homes.

Case No. 5

Mrs. Y lives in a home with 150 m² living space on 100 m² of landscaped land: lawn, shrubs, tilework, etc.

When she bought the home, it had a higher social standing than her previous one: garden area, more spacious home, residential district... but the progressive increase in noise tends to devalue the social image she sought to obtain by buying the home which no longer is exactly what she was looking for.

"The house is better, it is larger, but I'm a little disappointed (...). I find that trucks should not be allowed to pass in a residential area".

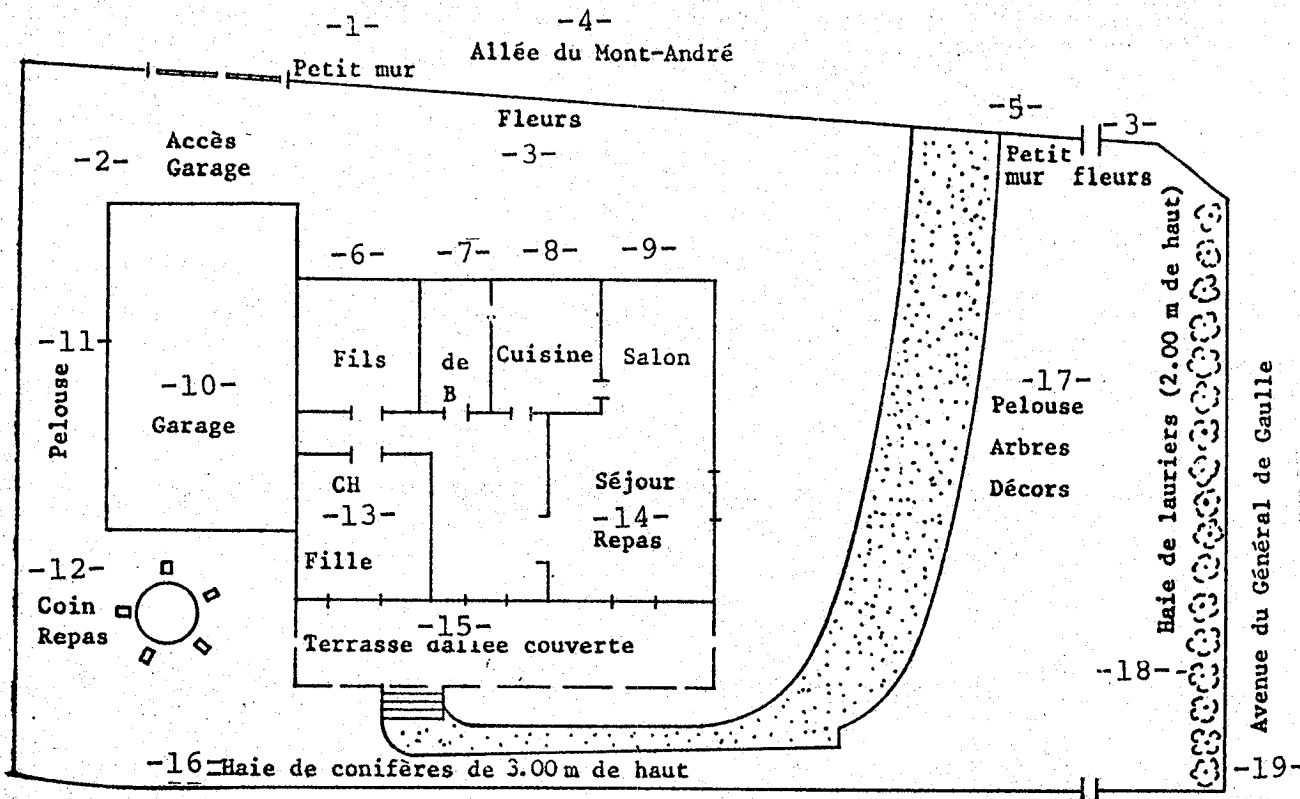
Noise is associated with the functional annoyance in the lifestyle implied by this type of home and especially within the home.

"...in my bedroom, if I want to listen to the transistor, I close (...) in the living room if one wants to watch TV with windows open, I think one would be bothered..."

What is interesting is the contrast and difference between noise alone and in the presence of others.

"...we are bothered when there are two of us, it is annoying to speak...when I am alone, I am not bothered... with friends, we go to the back of the house, it's o.k. there, but it's small".

It seems that she fears the negative judgment of her friends to which she was to display a certain social image. Noise is lived as a disturbing element in the standard she wants. It prevents her from using the noble part of the garden and limits the use of outside space to the back of the house. This area is small and close to neighbors - a situation which caused the people in the preceding case to leave the home (see location of eating nook on graph below). /118



Key: 1-Small wall; 2-Garage entrance; 3-Flowers; 4-Mont-André Drive; 5-Small wall; 6-Son's bedroom; 7-Bathroom; 8-Kitchen; 9-Living room; 10-Garage; 11-Lawn; 12-Eating corner; 13-Daughter's bedroom; 14-Dining room; 15-Tile-covered terrace; 16-Hedge of conifer trees 3.00 m high; 17-Lawn, trees, landscaping; 18-Hedge of laurels; (2.00 m high); 19-Général De Gaulle Avenue.

This case is fairly typical of the situations found in Caluire: /119

-buying a peaceful home - one can even say "home" in the sense it was not a temporary home, but a permanent home for life in the residential sector;

-this purchase is devalORIZED at all levels (financial, usage and social image) by the increasing traffic noise.

If the annoyance caused by noise was expressed in the preceding cases, in Caluire it was expressed twice as much. This was both in terms of opinions (noise is identified as an annoyance) and in terms of behavioral patterns (the noise intrusion modified certain habits).

Case No. 6

Now we will describe another case of Caluire where people are annoyed by the noise problem, but rationalize it.

In contrast to the previous case, Mrs. J is not disappointed, on the contrary she insists she has advantages in her home, while recognizing its drawbacks, essentially of an economic nature.

In this case, financial investments are still agreed to both in terms of buying the home and in improving it.

Noise is not described as an element which devalorizes or disrupts a project. It is at the most a source of discomfort in daily life, but this discomfort is quickly rationalized. When the family first moved in, it ate on the balcony over the street. For the past 10 years, this has no longer been possible. Now, it sometimes eat on the back balcony which is narrow and faces the kitchen. Family members don't eat on this balcony very often because of the weather and the noise annoyance.

Similarly, the traffic noise makes it necessary to take sleeping pills to sleep, but this is more associated with an intolerance to noise because of age than to the annoyance itself.

In this case, the noise problem is identified as an inconvenience, but one tends to "rationalize it to "protect" the financial and affective investment made to be able to buy this home.

II-4 - NOISE IS AN OPPORTUNITY TO HAVE SPACE

/120

This case is comparable to the case of Beausoleil Residence in Marseille in that the homes built along the highway are highly valorized. The similarity stops there, however: actually, in the two cases below, people's reactions to noise are quite different because the owners want to adapt to the noise.

Case 7

Mrs. R lives in a 210 m² home on 9,000 m² of land along highway A 6.

She explains how she minimized the noise effects when she visited this home. The annoyance it causes is very secondary to the space it offers and played no role in her decision.

"...yes, I heard the noise, but it didn't deafen me...and maybe it was subjective because I really wanted to have space... I said right away...it's that one and no other...".

In contrast, Mr. R had different motives. He heard the noise, when he looked at the house and established a situation of cause and effect between the price of the home and the annoyance:

"...my husband told me, this price is not surprising...listen to the noise...".

However for Mr. R two elements - in addition to his wife's pressure - made him decide to buy this house:

- the price: 240,000 French francs, down from the initial price of 350,000 French francs,
- the noise measurements he carried out.

"...I measured outside, inside, on the balcony and inside the Duchère apartment, at a friend's house at Ecully near the intersection, at a teacher's home above the highway...obviously, the noise was the loudest in the garden here (...), inside the Duchère living room it was the same as here (...) and then the house was a good buy: 240,000 French francs."

Mr. R. established criteria we may qualify as objective and rational before making his decision, but they did not substantiate his tolerance for noise.

H: "I had a hard time getting used to the noise, because our bedroom was downstairs in the front of the house...but as soon as we moved our bedroom upstairs and to the other side of the house, the noise didn't bother me anymore..."

/121

F: "it never bothered me...it never caused me discomfort".

We realize how much the investment in the home, the importance of owning space were such important factors for Mrs. R that they cancelled out the inconveniences due to noise, whereas for Mr. R, despite the financial benefits he was able to gain because of the presence of noise, this was not enough to cancel out the inconveniences caused in his home life.

"...on the ground floor, the noise is not a nuisance for normal circumstances...for discussion...conversation noise is louder. The only time I hear it is when I am listening to music... truck noise blocks out the music, even when the windows are closed..."

Mrs. R rationalizes the noise effects.

"...what the children lose with the noise, they gain back in other areas because they have room to play..."

This case is interesting on several points: Mr and Mrs. R have established a rationalization mechanism toward noise. He used financial and objective arguments, she the "better lifestyle". But their reactions to noise are different. For her, one can hear people talk clearly without annoyance, for him, despite the relative inconveniences associated with noise and the advantages they draw from this situation, he continues to feel annoyed.

"...there are many things we don't do, or that we don't do in the nice areas because of their exposure to the highway noise, that's a fact..."

He is referring to the eating area in the garden. For Mr. R, the nicest spot is in front of the house facing the highway. Because of the noise, they eat behind the house where they have no view. Yet, this adaptation in using the space of their property is not lived like a restriction, in that the front garden is still

used for other activities which noise bothers less. The space they gain makes the family tolerant toward what would theoretically be considered inconveniences.

What is interesting in this case is the attitude toward adapting to the noise. It is considered an element enabling them to buy a house in a park for the price of an apartment. In such a case, the expression of a direct annoyance has no meaning.

The real problem (especially for Mr. R) is to weigh the benefits against the shortcoming: noise. If this assessment is positive, noise is "accepted". This does not mean it is not identified as an annoyance...Mrs. and Mrs. R know that without the noise, they would never have been able to buy this home...". /122

Case No. 8

Mr. and Mrs. P moved into their home after inheriting it.

They did a number of improvements with help from an architect: the inside space was remodeled and sound insulation work was carried out.

Mr. and Mrs. P considered the following factors in their decision to live in this family home:

"...the nice element about this home made us overlook the unpleasant noise element...but the noise element is still a basic problem..."

Noise - the annoyance element - is the negative aspect of a system which is affectively and socially valorized. Without negating the disturbance caused by noise, Mr. P tolerates it because of the advantages the home offers:

- family home on a large piece of land,
- spacious dwelling in which their daughter can practice her violin (she is studying music) and where each member of the family is independent and has "his own room".

Despite the sound insulation work the trucks passing by on National Highway 6 are still an annoyance due to the vibrations they make.

It is obvious that the advantages and drawbacks of this home don't have the same weight. Noise is certainly an annoyance, but one can provide against this in the home and this type of home could not have been found elsewhere.

Financially: coming into ownership via inheritance.

Affectively: attachment to a home which was always used: childhood home, but also week-end and vacation home.

Socially: the improvements show a desire to live in a home which is like the one the family dreams of, while preserving the past.

In fact, noise is mainly an annoyance in the use of outside space. /123

In these two cases, noise is a major drawback to what was on the whole a good opportunity. Noise was recognized as an annoyance, but the family provided against it (insulation, changing rooms around) to minimize its "annoyance".

APPENDIX 2

PREPARATION OF THE QUESTIONNAIRE

/124

Based on the results obtained in the preliminary study conducted through interviews, it was possible to formulate a certain number of assumptions concerning people's reactions to noise and to define, for the activities studied, the information that will have to be gathered through questionnaires.

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I - ASSUMPTIONS RETAINED

Only the general behavioral assumptions are retained here without going into detail about their concrete application to activities or special situations.

They may be summarized as follows:

ASSUMPTION A: Escaping from a noisy home

A-1 - Escaping in terms of time (spending as much time as possible outside).

A-2 - Escaping in terms of activities

A-2-1 - Certain activities are preferably carried out outside the home.

A-2-2 - "New" activities are created outside the home.

A-2-3 - Certain activities normally carried out in the home are eliminated.

ASSUMPTION B: Organizing the home to minimize the annoyance

B-1 - Organization in time (changing the duration of certain activities is, changing the time they are carried out).

B-2 - Organization in space.

B-2-1 - Changing rooms around.

B-2-2 - Carrying out certain activities in rooms "away from the noise".

B-3 - Changing the type of activities carried out

B-3-1 - Abandoning certain activities highly affected by noise.

B-3-2 - Appearance of new activities "more appropriate for a noisy environment".

ASSUMPTION C: Exposure to traffic noise may be one cause of general fatigue

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ASSUMPTION D: Existence of a correlation between lack of socialization and exposure to traffic noise.

ASSUMPTION E: Exposure to traffic noise leads to overconsumptions

For each activity to be studied in this survey, the following information may be asked: whether or not this activity exists, its frequency, its duration, the area where it was carried out (inside or outside the home, if in the home: in what room), the time it was carried out.

Each of these data is not useful for each activity (see table pages 115 and 116). Conversely, each data item provides information only for one or two of the assumptions described.

More specifically:

-The existence of the activity essentially concerns assumptions A2 and B3.

-The frequency and duration of the activity essentially concern assumptions A1 and B1.

-Its location "in or outside" the home mainly concerns assumption A2 (scape from the home in terms of activities)... It may possibly concern assumption B2 in that the organization of the dwelling's space leads to (or is made possible by) certain activities outside...similarly it may concern assumption A1.

-Its location in the home concerns assumption B2 only.

-The time the activity is carried out concerns assumption B1

II - ACTIVITIES RETAINED

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The may be classed into 5 main groups:

1 - The first group concerns activities which are mandatory.

Factors such as family size, type of professional activity, cultural level, income level... may influence the total time spent on these activities, as well as how this total time is distributed among them.

Noise may influence the duration of some of these activities, their quality, possibly their location.

We are assuming that the impact of noise on activities such as sleep and intellectual work (children and parents) may be considerable, and is one of the important aspects of the survey.

Conversely, the impact of noise on professional activities, household work and child care is probably much smaller; it is still important to know the time spent on these activities, because this total time conditions the time "available" for the other activities we want to study.

2 - The second group consists of only two activities:

The use of TV receivers and radio stations. We created a specific group because it is for true institutionalized pastimes, which will be found in virtually all households surveyed, but which have an ambiguous status in regard to noise:

- .these activities may be disturbed by noise outside the home,
- .these devices may be used to "mask" the outside noise,
- .these devices are noise generators themselves.

3 - In the third group, we find activities corresponding to all excursions away from the home, and which do not allow something else to be done at the same time. These activities can be practiced during the week, or during week-ends, individually or as a family.

The activities retained in this group are the following: taking children for walks, "going into town", going "window shopping", going for a ride outside the city, going away for the week-end, practicing a sport, going to the movies.

4 - The fourth group concerns activities involving relationships with people outside the family; they are therefore directly related to the social engagement (or disengagement) of the people concerned. They are activities which may be practiced inside or outside. Living in a noisy home can cause conflicts in existing relationships.

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We have retained four activities: seeing parents, seeing friends, relationships with neighbors, group life.

5 - Other activities retained

In the fifth group we have "leisure" activities which are primarily practiced in the home: reading, listening to music, building models, collections, group games, odds-and-ends.

Some of these activities require a quiet environment. Others create noise themselves. The information to be obtained on these activities must aim to see whether the exposure to noise in the home limits the range of leisure activities (or rest) in the home or changes their nature...

III - PERTINENT INFORMATION FOR EACH ACTIVITY

The following table specified for each activity retained the pertinent information and the assumption concerned in each case, as well as a few observations on additional information to be obtained for each activity.

-1-

-2-

-3-

-4-

-5-

-6-

-7-

	ACTIVITES	EXISTENCE	FREQUENCE	DUREE	DANS OU HORS LOGEMENT	OU DANS LE LOGEMENT	MOMENT	OBSERVATIONS
a-	- Ménage, soins aux enfants					B ₂		-j- : évaluer le temps "consacré" à autre chose
b-	- Activité professionnelle	-q- Filtre		-r- Horaires A ₁	(A ₁)	B ₂		-k- du trajet. A ₁ avec hypothèse C
c-	- Sommeil			B ₁ C		B ₂	B ₁	-l- inguer sommeil principal et sommeil complémentaire (sieste)
		-s- Sieste B ₃				B ₂		-m- sons avec C. et E.
d-	- Travail scolaire			ds log B ₁ B ₃	A ₂	B ₂	B ₁	-n- is avec C (niveau scolaire) et (leçons particulières)
		Filtre -q-	B ₁			B ₂	B ₁	
e-	- Travail intellectuel parents au domicile	Filtre -q-	B ₁			B ₂	B ₁	
f-	- Télévision	Filtre -q-		(I) B ₁ B ₃		B ₂	(I) B ₁ B ₃	(I) - Durée de fonctionnement du poste - Durée d'écoute réelle
g-	- Radio	Filtre -q-		(II) B ₁ B ₃		?	(II) B ₁ B ₃	(II) - Période de fonctionnement du poste - Activités simultanées
h-	- Promenade des enfants	A ₂ B ₃	A ₁	A ₁			A ₁ B ₁	-o- inguer semaine et week-end
i-	- "Aller en ville" "lèche vitrine"	A ₁ A ₂	A ₁	A ₁			A ₁ B ₁	-p- inguer semaine et week-end inguer : déplacements pour achat promenade, lèche vitrine

Key to page 98:

1-Activities; 2-Existence; 3-Frequency; 4-Duration;
5-Inside or outside of home; 6-Or inside home; 7-Moment.

a-House cleaning, child care;

q-Filter;

b-Professional activities;

r-Time schedule;

c-Sleep;

s-Nap;

d-School work;

e-Intellectual work by parents at home;

f-Television;

g-Radio;

h-Taking children for walks;

i-"Going into town"

"window shopping".

j-Evaluation of time spent on something else;

k-Communting time. Al link with assumption C;

l-Distinction between main sleeping period and extra sleep (nap);

m-Links with C. and E;

n-Links with C (school level) and with E (private lessons);

(I) - Length of time station is on;

- Actual listening time;

- Listening during meals;

(II) - Length of time station is on'

- Simultaneous activities.

o- Distinction between week days and week-end;

p-Distinction between week days and week-end;

Distinction between displacements for buying, for walks, window shopping.

	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-
	ACTIVITES	EXISTENCE	FREQUENCE	DUREE	DANS OU HORS LOGEMENT	OU DANS LE LOGEMENT	MOMENT	OBSERVATIONS
a-	- Promenade hors de la ville	A ₁ A ₂	A ₁	A ₁				
b-	- Partir en week-end	A ₁ A ₂	A ₁					
c-	- Pratique d'un sport	A ₁ A ₂ D	A ₁	A ₁			?	-P- nguer semaine et week-end . Quel membre de la famille concerné . La famille accompagne-t-elle ?
d-	- Aller au cinéma	A ₁ A ₂	A ₁				?	-Q- nguer semaine et week-end
e-	- Voir des parents	Filtre -O-	B ₃	(I) A ₁	A ₂	B ₃		-r- es le week-end er chez parents ?
f-	- Voir des amis	B ₃ D	B ₃ D	(I)A ₁	A ₂	B ₂		
g-	- Relations de voisinage	B ₃ D			A ₂	B ₂		-S- r nature de ces relations
h-	- Vie associative	B ₁ D	A ₁ (I)		?			(I) Durée d'absence du logement
i-	- Lecture	B ₃		B ₁ B ₃ E	A ₂	B ₂	?	
j-	- Ecoute musique	B ₃	B ₃			B ₂	?	
k-	- Modélisme, collections ...	B ₃	B ₁ B ₃		A ₂			
l-	- Jeux de sociétés	B ₃	B ₁ B ₃				?	
m-	- Bricolage	B ₃	B ₁ B ₃			B ₂	?	

Key to page 99

1-Activities; 2-Existence; 3-Frequency; 4-Duration; 5-Inside or outside of home; 6-or inside home; 7-Moment; 8-Observations;

a-Going for a drive outside the city;

b-Going away for the week-end;

c-Practicing a sport;

d-Going to the movies;

e-Visiting parents;

f-Visiting friends;

g-Relations with neighbors;

h-Group life;

i-Reading;

j-Listening to music;

k-Model building, collections...

l-Board games

m-Odds and ends;

o-Filter

p-Distinction between week days and week-ends

.What member of family is involved?

.Does family join in?

q-Week-end visits

Does on stay all night?

s-Specify what type of relationship.

(I) How long away from home.

This questionnaire is the final version.

In the first phase, a pilot survey was conducted on a subsample (330 people) to test not only the understanding of the questions themselves, but also the pertinence of the basic assumptions formulated.

The execution of this pilot survey made it possible to:

- modify the questionnaire by purely and simply eliminating questions, or by modifying them,
- extract a certain number of results allowing us to discard or modify certain assumptions retained.

Key to page 101

- 1- QUESTIONNAIRE: URBAN NOISE;
- 2- Name of interviewer:
- 3-Site;
- 4-Building;
- 5-Entrance;
- 6-Floor;
- 7-in code; 7a-Interviewee; 7b-Head of family;
- 8-Small businessman, craftsman;
- 9-Liberal profession, higher executive;
- 10-Industrial producer, big businessman;
- 11-Middle executive;
- 12-Employee;
- 13-Contractor, qual. worker; *Wage-earner; **Self-employed
- 14-Operator; 20-If wage-earner
- 15-Miscellaneous; 22-Public sector
- 16-Pupil; Private sector
- 17-Retired; 21-If self-employed
- 18-Unemployed; 23-Number of wage-earners.
- 19-Other (inactive)

- A - What is your profession? State in clear terms
- B - What is the profession of the head of family?
- C - What is your age? years;
- D - Sex of interviewee - Man ..Y
-Woman..X
- E - What is your marital status? Married or living together ...1
Single2
Other (widow, diverced, separated).....3
- F - What is your relationship with I am head of family 1
head of family? Spouse 2
- G - What appliances do you have in your home. How many?
Refrigerator or freezer 1
Washing machine 2
Bathtub 4
Telephone 5
Typewriters 6
Washer-drier 7
None of the above 8
- H - Using this answer list, tell me what letter corresponds to the income lvel of your home, include all revenue, such as salaries, family allowances (from government), pensions, etc...
Give list letter
- I - Among these revenues, what letter corresponds to the salary of the head of family? letter
- J - How much do you pay for your monthly rent, including expenses? (or reimbursements) French francs;
- K - (if you have a telephone) What is your average telephone bill? French francs
- 24 - Interview Date: Day: M T W TH F SAT SUN
Place: Time:
- 25 - Interview atmosphere: Very good ... 1; Normal ... 2; Mediocre ..3;
- 26 - Name of family: Building: Tel. NO.: Entrance: Floor:

We are studying the living conditions in this housing complex.

A.1 - How long have you been living in this dwelling?

- at least one year 1 A.28
- from 0 to 3 years 2
- from 3 to 6 years 3
- 6 years or more 4

Q.2 - How many people live in this dwelling? | | individuals | | A.29

A.3 - Before living in this dwelling, were you already living in this housing complex?

YES...Y A.30

NO... X

Q.4 - Were you living in another city, in a small city or in the country?	-another large city .. 1
	-small city2
	-country3

Q.5 - How is your dwelling organized? Show your dwelling on a map of the residence and draw a quick outline to see how the various rooms are arranged.

INTERVIEWER: -Show where your dwelling is on the layout plan sketched on page 4 of the folder.

-Sketch a plan of the dwelling on the pages inside the folder specifying which sides of your dwelling face the streets.

-On this plan, write down on each room its main function (kitchen, bedroom, living room, dining room) and number the rooms (in any order) beginning with 1.

Q.6 - We are going to discuss the rooms of your dwelling in a little /134 more detail. Let us begin with ... give room numbered 1 and ask Q.9 to A.12 for this room. Then study room no. 2, etc.

Room Number	1	2	3	4	5	6	7	8
Q.7-Main function of room (several possible)	1 31	1 36	1 41	1 46	1 51	1 56	1 61	1 66
-kitchen...	2	2	2	2	2	2	2	2
--dining room.....	3	3	3	3	3	3	3	3
-living rm.	4	4	4	4	4	4	4	4
-bedroom...								
Q.8-Is this room -sunny.....	Y	Y	Y	Y	Y	Y	Y	Y
-not very sunny.....	X	X	X	X	X	X	X	X
A.9-Is it -very noisy								
.....	1 32	1 37	1 42	1 47	1 52	1 57	1 62	1 67
-fairly noisy	2	2	2	2	2	2	2	2
-not very noisy.	3	3	3	3	3	3	3	3
-not noisy at all	4	4	4	4	4	4	4	4
Q.10-Do outside vibrations ever come into this room?								
YES	Y	Y	Y	Y	Y	Y	Y	Y
NO	X	X	X	X	X	X	X	X
Q.11-When the window is closed is this room insulated enough from street noise?								
YES	1 33	1 38	1 43	1 48	1 53	1 58	1 63	1 68
NO	2	2	2	2	2	2	2	2
Q.12-Has this room been repainted or re-carpeted in the past 5 years?								
YES	Y	Y	Y	Y	Y	Y	Y	Y
NO	X	X	X	X	X	X	X	X
(reserved for codif: noise level)								
	35	40	45	50	55	60	65	70

Q.13-What rooms have: (several possible answers)	-a rug?	1 2 3 4 5 6 7 8	A.71
	-a thick curtain?	1 2 3 4 5 6 7 8	A.72
	-special joints on windows?	1 2 3 4 5 6 7 8	A.73
	-double windows?	1 2 3 4 5 6 7 8	A.74
	-very thick windows?	1 2 3 4 5 6 7 8	A.75

Q.14-Did you or your spouse decide to install this special insulating window? YES... NO.... A.76

Go on to Q.17

Q.15-In what year was it installed?

1979	1	A.77
1978	2	
1977	3	
1976	4	
1975	5	
Earlier (specify).....	6	



Francs 79

Q.16.-How much did it cost in all?

Interviewer: if there is no loggia, veranda or balcony, go to 11 B
 on to Q.21, if there is one, go on to Q.17 to to 11 B
 Q.20 for each of them

Q.17-You told me you had a balcony from room
 number(s)
 (See plan and note room number or
 rooms with access to balcony)

1	2	3	4	13	1	2	3	4	19	1	2	3	4	25
5	6	7	8		5	6	7	8		5	6	7	8	
Y				B.14	Y				B.20	Y				B.26
X					X					X				
0					0					0				
1					1					1				
2					2					2				
3					3					3				
4					4					4				
5					5					5				
<input type="checkbox"/>				B.15	<input type="checkbox"/>				B.21	<input type="checkbox"/>				B.27
<input type="checkbox"/>				B.16	<input type="checkbox"/>				B.22	<input type="checkbox"/>				B.28
<input type="checkbox"/>				B.17	<input type="checkbox"/>				B.23	<input type="checkbox"/>				B.29
<input type="checkbox"/>				B.18	<input type="checkbox"/>				B.24	<input type="checkbox"/>				B.30

Q.18-Is this area:
 -completely open.....
 -partially closed.....
 -or totally closed by an added window.

Q.19-Do you usually use it for:
 -planting flowers.....
 -raising small animals.....
 -putting out your laundry.....
 -a trash area.....
 -for odds-and-ends.....

Q.20-When the weather is nice, how many
 times a week do you go out there to:
 -have a drink or eat your meals.....
 -take a nap, rest, sunbathe,.....
 -read, sew.....
 -chat with friends.....

Q.21-In the daytime, do you consider the
 traffic noise to be:

-very annoying....1 1 B.3
 -fairly annoying..2 2
 -not very annoying3 3
 -not annoying at all 4

Q.22-In your home do you notice
 vibrations:

	YES	NO	
-on windows.....	1	X	B.3
-on floor or walls..	2	X	
-on furniture.....	3	X	

Q.23-(If no vibrations are
 noticed, go on to Q.24)
 Do you consider these
 vibrations:

-very annoying..... 1 B.33
 -fairly annoying..... 2
 -not very annoying... 3
 -not annoying at all.. 4

Q.24 - Do you want to change your dwelling:

YES..... 1 B.34
 NO..... 2

Q.25-Why?

Q.26-In how long did you think you will leave your dwelling: -in less than one year..1 B.36
 -in 1 or 2 years.....2
 -longer.....3
 -NSP.....4

Q.27-Are you a tenant, coming into ownership, or do you own your dwelling? -tenant.....1 B.37
 -coming into ownership..2
 -owner.....3
 -other.....4

Q.28-I am going to show you two opposite attitudes you can choose from. If you agree with the attitude on the right, your rating will be a number to the right. If you agree with the attitude on the left, your rating will be a number to the left. If your attitude is somewhere between, you may choose numbers somewhere between the left and right to express how strong your attitude is. Show questionnaire.

Dwelling well designed 1 2 3 4 5 dwelling poorly designed B.38

1	2	3	4	5
---	---	---	---	---

Dwelling is quiet dwelling is noisy B.39

1	2	3	4	5
---	---	---	---	---

My relations with neighbors are good my relations with neighbors are poor; B.40

1	2	3	4	5
---	---	---	---	---

Shopping is close shopping is far away B.41

1	2	3	4	5
---	---	---	---	---

The district is nice the district is bad B.42

1	2	3	4	5
---	---	---	---	---

(if tenant) my rent is cheap my rent is expensive B.43

1	2	3	4	5
---	---	---	---	---

I am happy with this dwelling on the whole I an unhappy with this dwelling on the whole B.44

1	2	3	4	5
---	---	---	---	---

Q.29-When you are in your dwelling, do you hear your neighbors: -a lot.....1 B.45
 -sort of.....2
 -not very much..3

Q.30-When the weather is nice, do you often practice the following activities with the window open? YES NO B.46
 -housecleaning, cooking, etc..... 1 X
 -eating meals..... 2 X
 -sleeping..... 3 X
 -watching TV..... 4 X
 -reading..... 5 X

Q.31 - Would you like to be able to open your windows more often than you normally do? -YES..... 1 B.47
 -NO..... 2

go on to Q. 33

Q.32-Why don't you open your windows more often? B.48

Q.33-For each of the following activities, when you have the windows /137 closed, do you find that traffic noise is:

Show list	Very annoying	Fairly annoying	Not very annoying	Not annoying at all	
-household activities, meals.	1	2	3	4	B.49
-sleeping.....	1	2	3	4	B.50
-watching TV.....	1	2	3	4	B.51
-reading	1	2	3	4	B.52
-eating your meals.....	1	2	3	4	B.53

Q.34-We are going to speak of your daily life during week days. What time do you personally get up in the morning?

| | |
54-55

Q.35-Do you have a professional activity outside your home:

YES	Y	B.56
NO	X	
go on to Q.38		

Q.36-Do you ever work at night?

YES.....	1
NO.....	2
go on to Q.41	

A.37-When you work at night, what room do you sleep in in the daytime.

1 2 3 4 5 6 7 8 B.57

Q.38-Do you usually go out in the afternoon during week days:

-every day or almost1 B.58
 -1 or 2 times per week...2
 -1 or 2 times per month...3
 -less often or never.....4

Q.39-When you go out, how much time do you spend outside your home?

| | |
60

Q.40-What do you generally do when you go out?
Be specific

-take children for walk.....	1	B.61
-shopping for household items...	2	
-going for walk, taking a break.	3	
-other reason (specify).....	4	

Q.41-Do you ever take a nap?

-very often.....	1	B.62
-often.....	2	
-from time to time.....	3	
-rarely or never.....	4	

go on to Q.43

Q.42-In what room do you ususally take a nap? 1 2 3 4 5 6 7 8 B.63

Q.43-Generally speaking, in what room do you eat your evening meal, during week days? 1 2 3 4 5 6 7 8 B.64

Q.44-When you have a letter to write, or papers to fill out, in what room do you generally do this? 1 2 3 4 5 6 7 8 B.65 /138

Q.45-What equipment do you have in your home?	-radio.....	<u>YES</u> Y	<u>NO</u> X	1	2	3	4	5	6	7	8	<u>B.66</u>
	-electrophone.	Y	X	1	2	3	4	5	6	7	8	<u>B.67</u>
	-Hi Fi channel	Y	X	1	2	3	4	5	6	7	8	<u>B.68</u>
	-tape recorder	Y	X	1	2	3	4	5	6	7	8	<u>B.69</u>
	-TV.....	Y	X	1	2	3	4	5	6	7	8	<u>B.70</u>

Q.46-What room are they most often used in? _____ ↑

Q.47-If you have no TV, go on to Q.50. Is the TV on without anyone watching it? -very often..... 1 B.71
 -often..... 2
 -from time to time.... 3
 -rarely or never..... 4

Q.48-In general, how long is the TV on each day?
 _____ | | |
 hours and minutes 73

Q.49-How much time do you personally watch TV during a week-day?
 _____ | | | |
 hours and minutes 75

Q.50-How much time do you spend reading each day? (books or newspapers?)
 _____ | | | |
 hours and minutes 77

Q.51-What room do you usually read in? 1 2 3 4 5 6 7 8 B.78

Q.52-How long is the radio on each day in your house?
 _____ | | | |
 hours and minutes 80

Repro col. 1 to 11 | 3 | C.12

Q.53-Are you able to make yourself comfortable for listening to music? YES1 C.13
 NO2
 go on to Q.56

Q.54-How much time to you spend on this activity each week?
 _____ | | | |
 hours and minutes 15

Q.67-Does your spouse have a professional activity outside the home?

	YES.....1	<u>C.68</u>
	NO.....2	
	no spouse.....3	
go on to Q.73		

Q.68-What time does your spouse usually leave to go to work in the morning? _____ | | |
70

Q.69-What time does your spouse return from work in the evening? _____ | | |
72

Q.70-Does your spouse come home at noon? YES....Y C.73
NO.....X

Q.71-Does your spouse do any professional work at home?
-very often.....1
-often.....2
-from time to time....3
-rarely or never.....4

go on to Q.73

Q.72-What room does your spouse prefer doing this work in? Room No.: 1 2 3 4 5 6 7 8 C.74

Q.73-Besides your family, do you have friends in the residential complex or in the vicinity, not counting simple neighborly relationships? -YES....Y C.75 /140
-NO.....X

go on to Q.76

Q.74-How often do you visit them on the average? _____ times per

Q.75-How often do they visit you on the average? _____ times per C.76

Q.76-When people come to see you, what room do you receive them in most often? Room No. 1 2 3 4 5 6 7 8 C.77

Q.77-On Saturday or Sunday, do you ever go for a drive in the country or, when the weather is nice, do you go all day long? -very often.....1 C.78 1 C.79
-often.....2 2
-from time to time3 3
-rarely or never..4 4

Q.78-...do you ever go for part of the day? (specify) _____ ↑

Q.79-On the average, how often do you go away for the week-end
(Repro col. 1 to 11)

4
D.12
D.13
D.14

...in the summer? _____ times per _____
...in the winter? _____ times per _____

Q.80-Ask this question if less than once a month.

-Why don't you go away on week-ends -I don't have a car..Y D.15
more often? -week-ends are expensive....X

Show list

- I like to stay home.....0
- I rest on the week-end.....1
- I do shopping, house cleaning on week-ends.....2
- certain family members have activities which tie them down to the city.....3
- my children are too small..4
- other reasons (specify).....5
- no answer.....6

Q.81-When you go away for the week-end, do you usually spend the night:

- at a friend's house.....Y D.16
- with parents.....X
- in a week-end home.....0
- in a hotel.....1
- in a mobile home.....2
- somewhere else (specify)...3

Q.82-In general, which of these kinds of places do you like to go to on week-ends?

- quiet.....1 D.17
- lively.....2

Q.83-Let's go back to the daily life in your home, and speak of your sleeping conditions. /141

What room do you sleep in Room no. 1 2 3 4 5 6 7 8 D.18

Q.84-What time do you usually go to sleep during the week?

_____ | _____ | D.19-20
hours minutes

Q.85-When the lights go out, how long does it usually take you to go to sleep?

_____ | _____ |
hours minutes

Q.86-Do you have a hard time going to sleep?

- very often.....1 D.23
- often.....2
- from time to time.....3
- rarely or never.....4

GO ON TO Q.88

Q.87-Why do you have a hard time falling asleep? D.24

(specify)

Q.88-What do you usually do to sleep better? -go to bed later..... Y D.25
-read before going to sleep. X
 Show list -take sleeping pills..... 0
-take "sleepy time tea"..... 1
-try to drink less coffee... 2
-use hot water bottle..... 3
-close shutters..... 4

 -other (specify)..... 5
-do nothing..... 6

Q.89-Are there nights when you wake up? -very often..... 1 D.26
-often..... 2
-from time to time..... 3
-rarely or never..... 4

go on to Q.92

Q.90-When your sleep is interrupted like this, how many times to you wake up on the average? -1 time each night..... 1 D.27
-2 times each night..... 2
-3 times each night..... 3
-more than 3 times per night 4
-varies..... 5

Q.91-What wakes you up at night? (several answers possible) -children..... Y D.28
-worries, nervous tension.. X
-traffic noise..... 0
-noise in building..... 1

 -other (specify)..... 2

Q.92-At night, do you find that traffic noise is: -very annoying..... 1 D.29
-fairly annoying..... 2
-not very annoying..... 3
-not annoying at all..... 4

Q.93-If your family or friends come to spend a few days with you, what room do they sleep in?
 Room No.: 1 2 3 4 5 6 7 8 D.30

Q.94- At night, do they in general find the traffic noise: -very annoying..... 1 D.31
-fairly annoying..... 2
-not very annoying..... 3
-not annoying at all..... 4
-N.S.P..... 5

Q.95-Aside from your children, yourself and your spouse, are there other adults living in your home? YES..... Y
NO..... X

go on to Q.97

Q.96-What rooms do they sleep in?
(several answers possible)

Room No. 1 2 3 4 5 6 7 8 D.32

Q.97-When you wake up in the morning
do you generally feel? -rested..... Y D.33
-or tired..... X

Q.98-When you wake up in the morning
do you usually drink coffee or
tea? YES. 1
NO.. 3

Q.99-In all, how many times do you
drink coffee or tea in the day? -1 or 2 times..... 1
-3 to 5 times..... 2
-more than 5 times. 3
-never..... 4

Q.100-Do you smoke? YES NO D.35

Q.101-How many cigarettes
do you smoke per day?

Q.102-do you ever smoke within 30 minutes
after waking up? -very often... 1 D.36
-often..... 2
-occasionally. 3
-rarely or never. 4

Q.103-Do you ever use the following medication?
very often often occasion- rarely
ally or never

-stomach medicine	1	2	3	4	<u>D.37</u>
-heart medicine	1	2	3	4	<u>D.38</u>
-sleeping pills	1	2	3	4	<u>D.39</u>
-tranquilizers	1	2	3	4	<u>D.40</u>
-aspirin or similar	1	2	3	4	<u>D.41</u>

Q.104-Ask for each medication used "very often" or "often":
How long have you been taking:

-stomach medication....	_____ months	_____ years	<input type="checkbox"/>	<u>D.42</u>
-heart medication.....	_____ months	_____ years	<input type="checkbox"/>	<u>D.43</u>
-sleeping pills.....	_____ months	_____ years	<input type="checkbox"/>	<u>D.44</u>
-tranquilizers.....	_____ months	_____ years	<input type="checkbox"/>	<u>D.45</u>
-aspirin or similar....	_____ months	_____ years	<input type="checkbox"/>	<u>D.46</u>

Q.105-on the whole, do you consider your health to be:
-good..... 1 D.47
-fairly good.. 2
-poor..... 3
-very poor.... 4

Q.106-Do you ever have	very often	often	occasional-ly	rarely or never	
-headaches.....	1	2	3	4	<u>D.48</u>
-leg pains.....	1	2	3	4	<u>D.49</u>
-digestive disorders.	1	2	3	4	<u>D.50</u>

Q.107-When you do your house work, do you tire easily?

-YES.....	1	<u>D.51</u>
-NO.....	2	
-don't do house work.	3	

Q.108-Which of the 2 statements applies to you the most?

-it is easy to relax at home.....	Y	<u>D.52</u>
-it is impossible to really relax at home.....	X	

Q.109-Do you or your spouse belong to any groups, clubs, associations, unions?

-YES.....	1
-NO.....	2

go on to Q.111

Q.110-How many different groups do you belong to?

-yourself?	_____	<input type="checkbox"/>	<u>D.53</u>
-your spouse?	_____	<input type="checkbox"/>	

Q.111-Aside from your work, on the average, how many times do you go into town? _____ times per _____ /144

Q.112-I am going to make a few statements and you will tell me if you personally agree or do not agree with them.

	Agree		Do Not Agree	
-When I don't have to go out, I like to stay home.....	Y	<u>D.56</u>	Y	<u>D.57</u>
-I don't relax easily.....	X		X	
-Generally speaking, I am rather nervous..	0		0	
-I generally make friends easily.....	1		1	
-One can't trust anyone.....	2		2	
-One has no control over one's life.....	3		3	
-There are many interesting things in life besides the family.....	4		4	
-If necessary, there isn't just the family one can rely on.....	5		5	
-I'm really not interested in anything outside the family.....	6		6	
-When I don't have anything special to do I like to go out.....	7		7	

Q.113-What is the last school level you completed?

- Primary school.....1
- Secondary school before diploma, technical school before teacher's diploma.....2
- High school diploma or technician's diploma.....3
- College.....4
- Never went to school.....5

D.58

N.E.

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APPENDIX 3

DESCRIPTION OF SITES: TWO EXAMPLES

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SITE NO. 2

/146

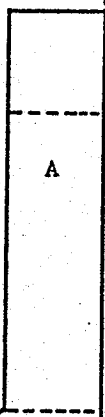
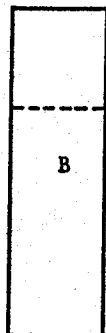
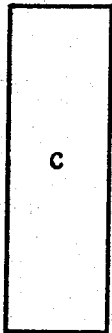
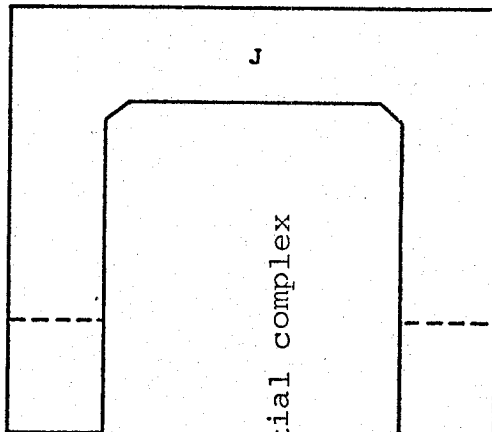
AMBROSINI H.L.M. (Low-Cost Housing)

ARNAVAUX DISTRICT

MARSEILLES

Port Gate

Rue de la Maison Blanche (street)



Cité Ambrosini
Ambrosini residential complex

Entrance
Entrée

Rue du Capitaine Gèze (street)

D

Boulevard Danielle Casanova (boulevard)

← Marseille

Autoroute A 7

Highway A 7

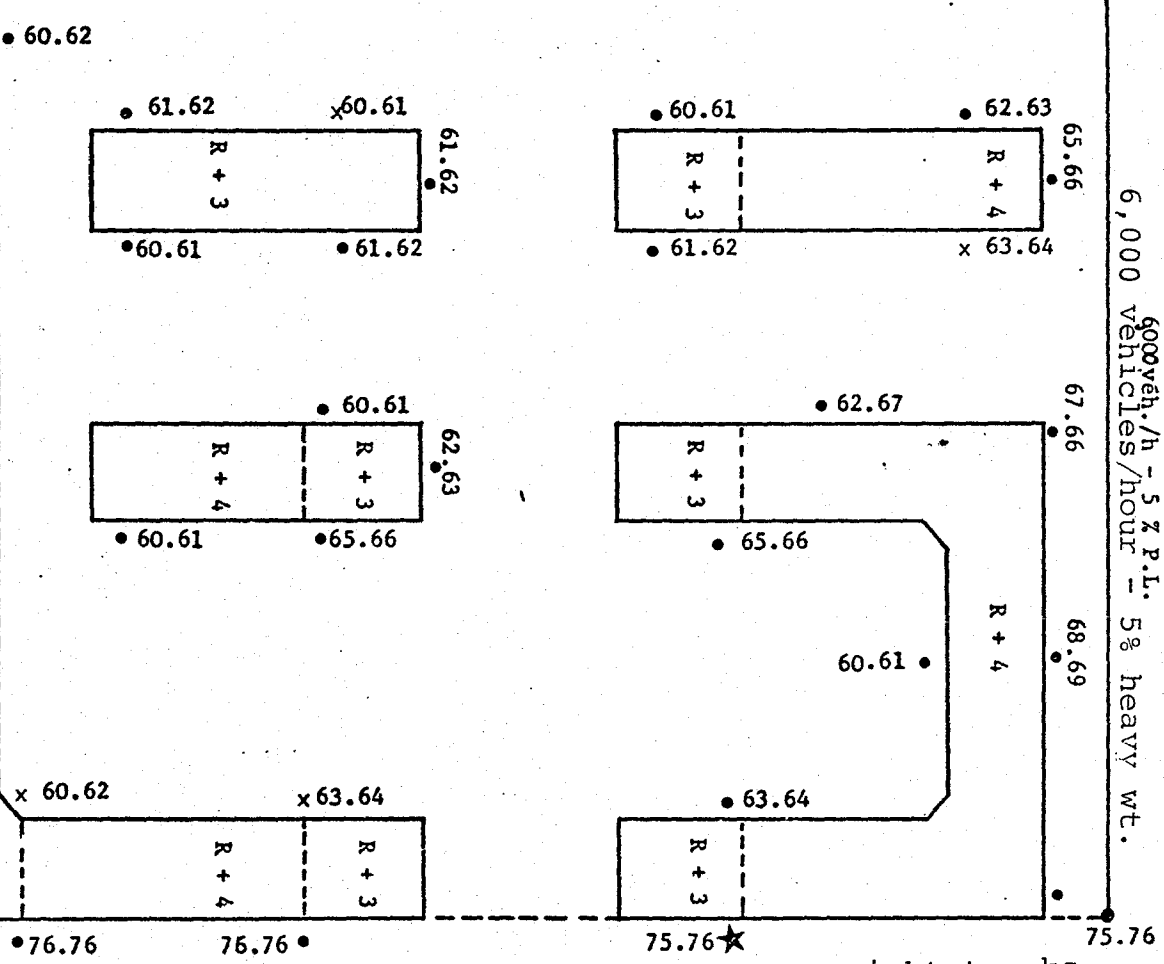
Lyon →

SITE NO. 2 - Building Plan

600 veh./h - 11 % P.L.
600 veh/h - 11% heavy st. trucks

70.73
650 veh/h - 5 % P.L.
5% heavy wt. trucks

6,000 veh./h - 5 % P.L.
5% heavy wt.



1,850 vehicles/hour 30% heavy weight trucks
1 850 véh./h - 30 % P.L.

SITES N° 2 : Leq 8 h - 20 h

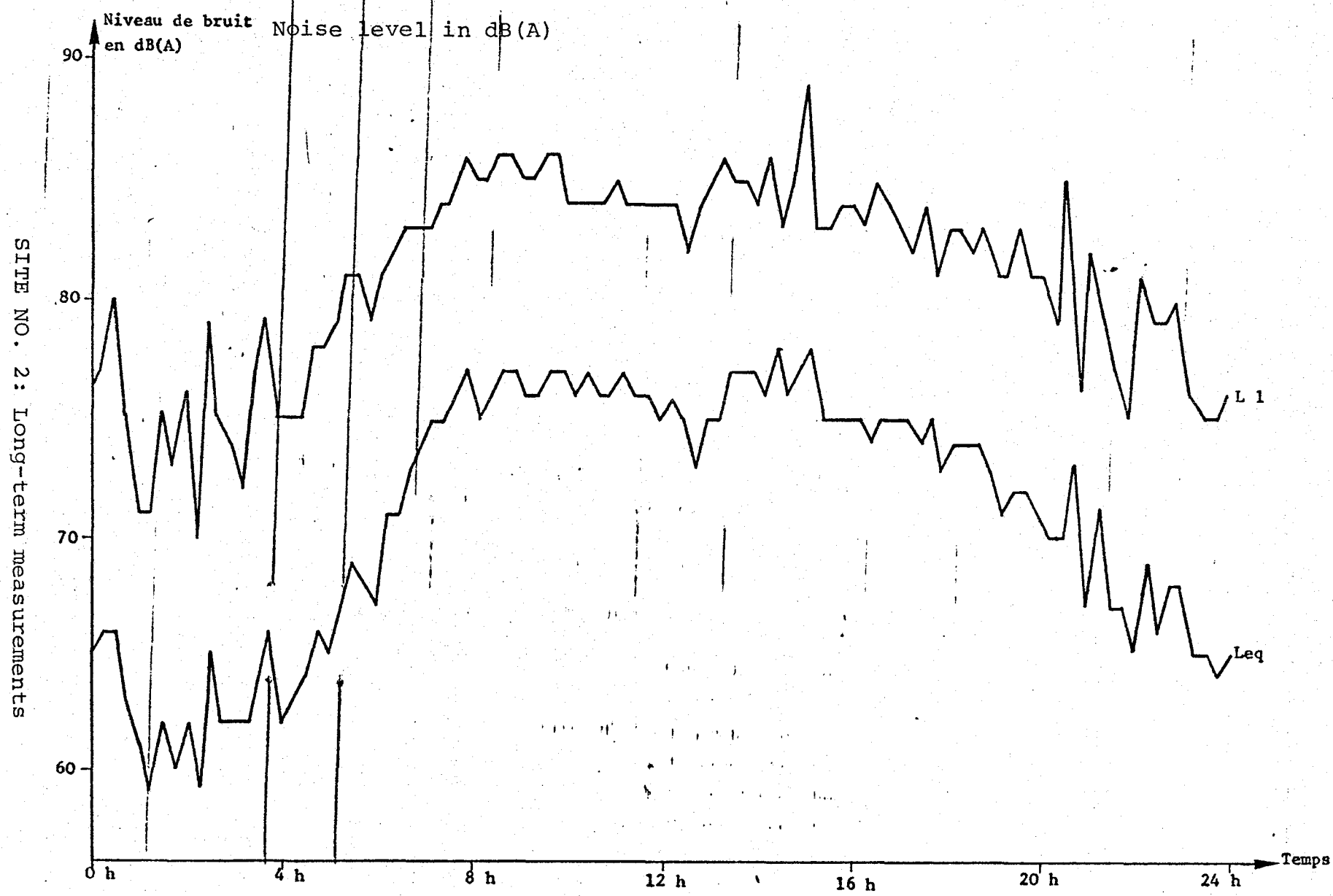
•
★
x

Noise program
long-term measurements
short-term measurements

Niveau de bruit noise level
en dB(A) in dB(A)

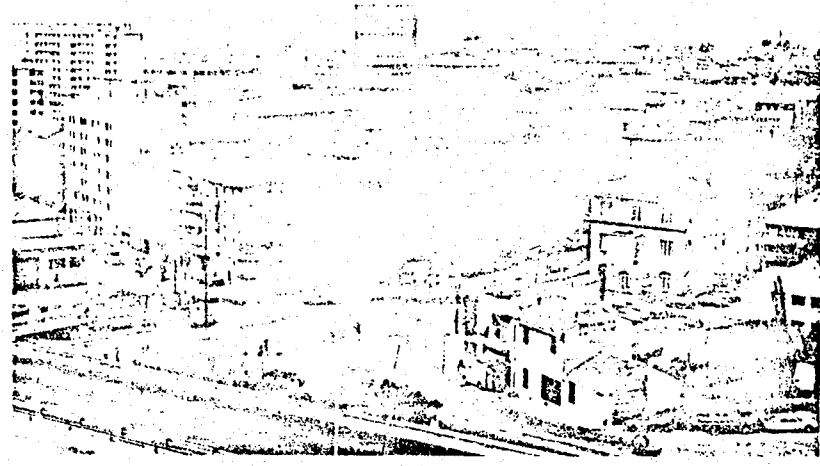
90

- Noise program
- ★ long-term measurements
- x short-term measurements

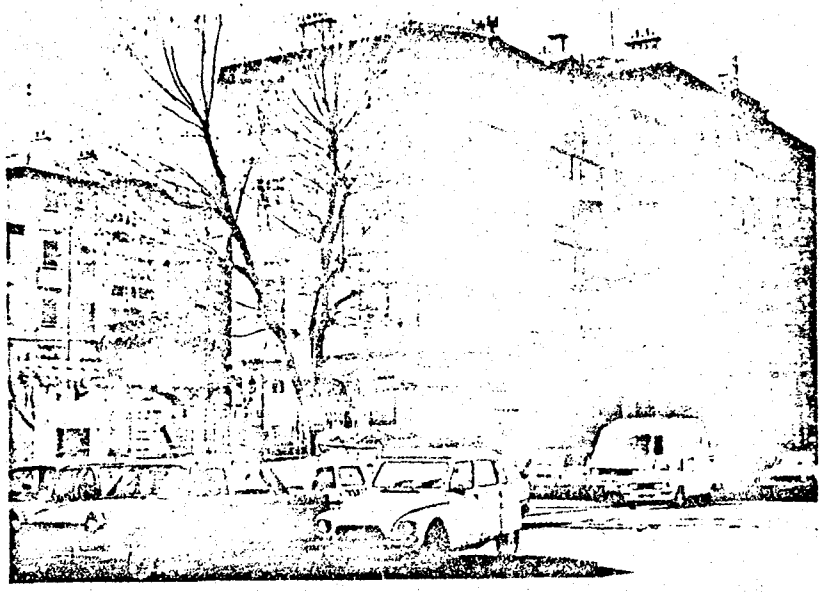


122

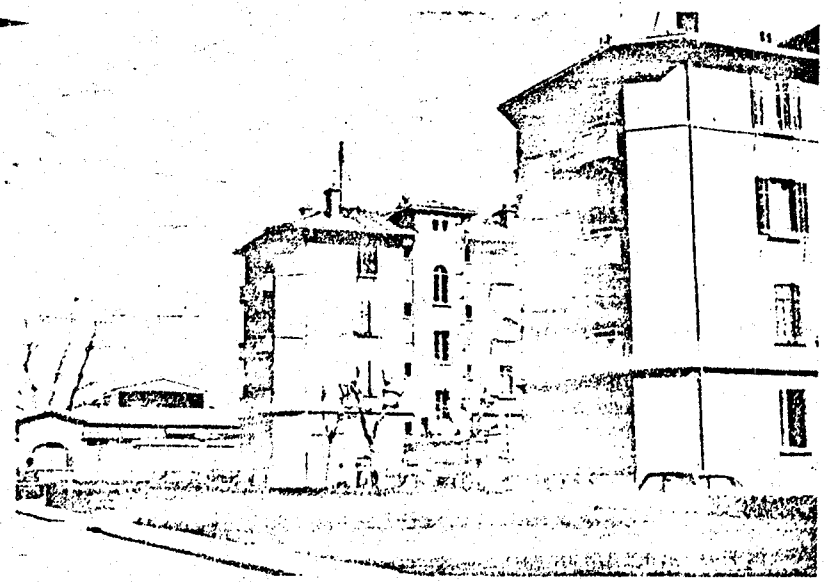
General view of site



Entrance to residential complex.
Capitaine Geze Street



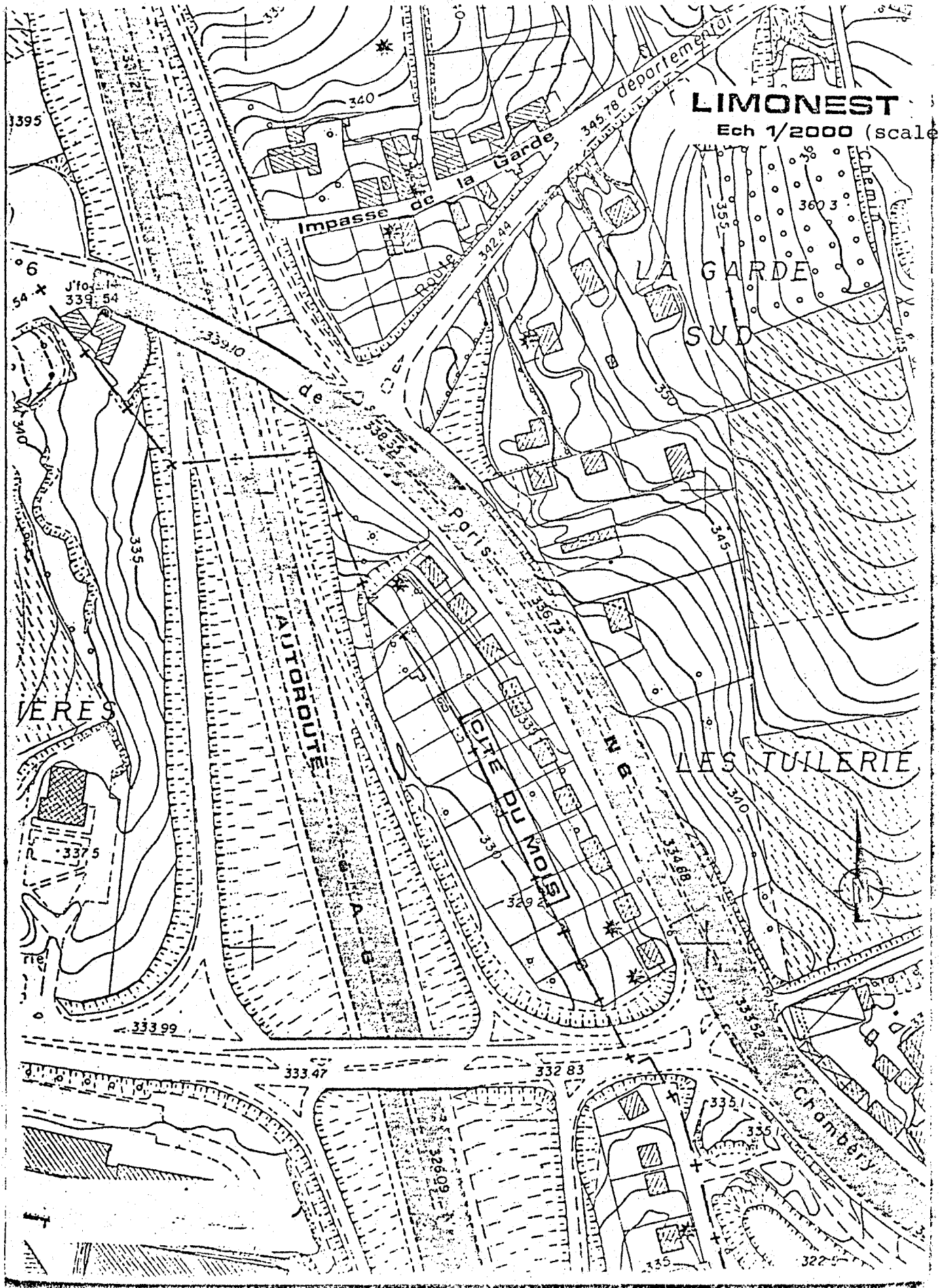
Within complex



SITE NO. E
CITE DU MOIS (MOIS RESIDENTIAL COMPLEX)
IMPASSE DE LA GARDE (STREET)

LIMONEST

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I - TRAFFIC DATA

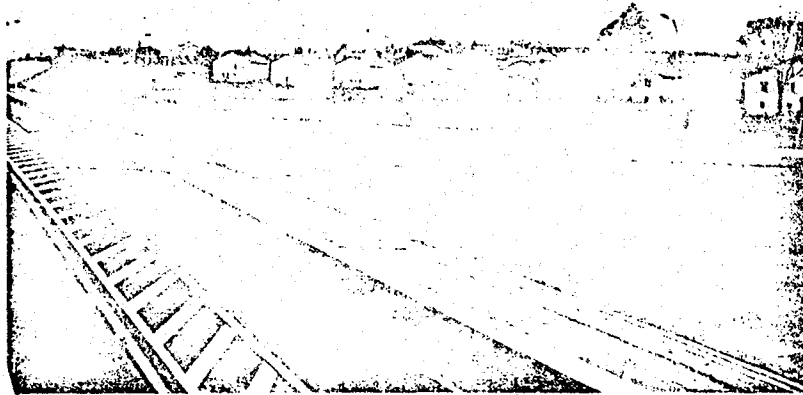
Individual countings available at C.D.E.R. of D.D.E of Rhone indicate the following traffic patterns for the year 1978:

- Highway A6: 27,000 vehicles/day, including 14% heavy weight vehicles.
- N6 (Champagne in Mont d'Or): 19,300 vehicles/day, including 9% heavy weight vehicles.

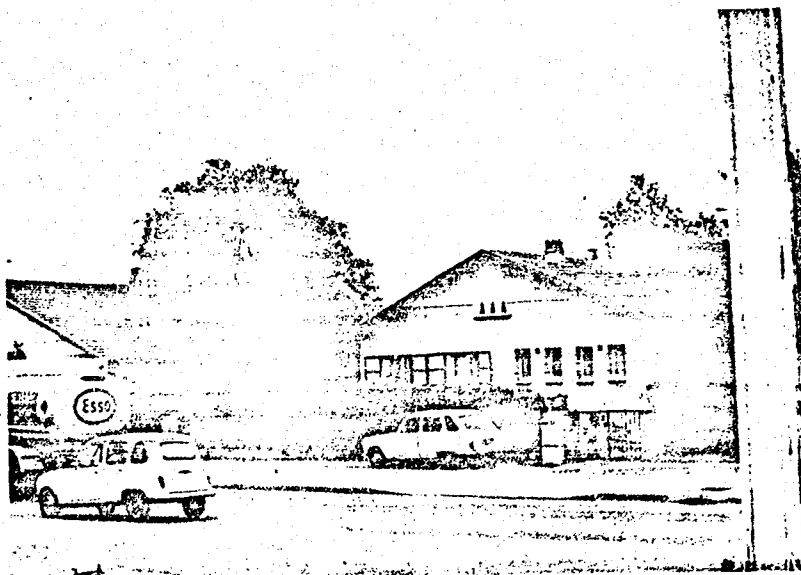
II - NOISE LEVELS

For front sides of homes exposed to Highway A6, the calculated noise levels rise to 65 0 68 dB(A) in leq per day.

In regard to front sides of homes exposed to highway N6, the calculated noise levels are on the order of 72 dB(A) for the closest homes (Cité du Mois housing complex).



Cité du Mois - Next to Highway A6



Cité du Mois - Next to National Highway 6

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