# Perception and attitudes to transportation noise in France: A national survey

Jacques Lambert*, Chrystèle Philipps-Bertin

INRETS-LTE, 25 avenue François Mitterrand, F-69675 Bron, France

* corresponding author: lambert@inrets.fr

## INTRODUCTION

For a long time transportation has been a significant source of many adverse environmental impacts, in particular noise, air pollution, landscape and visual impact, and greenhouse gas emissions. The need for a better knowledge of the public views related to these impacts led INRETS to conduct a national environmental nuisances survey already carried out twice in the past (Maurin & Lambert 1990).

The aim of this survey was to identify or to assess:

- the current environmental concerns of the French population, particularly those related to transportation,
- the environmental nuisances (exposure – self-reported adverse effects) perceived at home (noise, vibrations, air pollution …) and also in other locations (during commuting, at workplace, in leisure areas ...),
- the behaviors adopted by individuals to minimise or to avoid these effects,
- the expectations of the population related to these environmental nuisances (information – public mitigation policies),
- the influence of socio-demographic and socio-economic variables on the opinions, attitudes and behaviors related to environmental issues.

This survey was conducted in France during fall 2005 amongst adults aged 18 or over. Over 2,000 people, representative of the French population, were interviewed.

The results reported in this paper focus only on noise issues.

## SURVEY DESIGN

The selected 3-stage sampling was close to a random sampling. It can be briefly described as follows.

- step 1: collection of 220 starting addresses within a national phone list (9 region categories x 7 agglomeration categories),
- step 2: collection of addresses from the 220 starting addresses using a random route method (the route chosen gives every household in the survey an equal chance of being selected). 6242 addresses were then selected for an objective of achieving 2000 interviews,
- step 3: selection of the individual to be interviewed within the household using the “anniversary method”.

To validate the structure of the survey sample, a comparison was made with the last available national population census data (1999). A weighting adjustment was then applied for the following socio-demographic variables: region – size of agglomeration – type of housing – age – gender – family size – profession.

The questionnaire was administrated at home by face to face interviewing using CAPI (computer assisted personal interview). It was divided into 7 parts (69 questions):

- 1: description of housing and immediate surroundings, including exposure/ transportation infrastructures,
- 2: environmental concerns and attitudes,
- 3: attitudes towards nuisances abatement policies in the transportation sector,
- 4: perception of environmental nuisances (home, other places) and adverse effects,
- 5: behaviors and attitudes to transportation,
- 6: information sources and expectations related to the environment,
- 7: respondent and household characteristics (including self-reported health).

The average length of the questionnaire was 47 minutes.

## MAIN RESULTS

### General noise concerns

Transportation is considered by the French population as the main sector at the origin of environmental problems (74.5 %), and secondly the industrial sector (65.5 %). Transportation noise (and vibrations) is considered by 56 % (Table 1) of the French population as an environmental problem (27.7 % as the main one), just after local air pollution.

**Table 1:** Environmental problems due to transportation

| Environmental problems | First answer (%) | Cumulated answers (%) |
|---|---|---|
| Local air pollution | 35.1 | 77.8 |
| Noise and vibrations | 27.7 | 56.0 |
| Greenhouse effect | 22.9 | 56.0 |
| Fauna, flora, landscape | 5.0 | 33.8 |
| Land consumption | 2.3 | 16.6 |
| No problem | 6.2 | - |
| No response | 0.8 | - |

** Basis: total survey sample*

Factors such as type of area (urban/rural) and age (young/old) have an influence on the perception of noise as an environmental problem.

Why is noise considered by the French population as an environmental problem? Firstly because of the effects of noise on the quality of life (49.7 %), and secondly because of the health effects (23.7 %), particularly in vulnerable people (16.7 %).

### Public expectations towards information on noise

13.1 % of the French population expect more (and better) information about noise exposure levels (through noise maps for example). This social demand is higher in large cities (14.6 %) than in small cities and rural areas (10.7 %). People who are very sensitive to noise are those who are the most interested by this information (18.2 %) in comparison to non-sensitive people (6.1 %).

Information about health effects of noise is also a public demand (17.1 %), particularly in very sensitive people (21.3 % against 12.8 % in non-sensitive people).

## Public attitudes and expectations towards noise abatement policies

The French population considers local authorities (46.9 %) as well as the government (44.3 %) as the main bodies that should take decisions aiming to fight transportation noise; and to a lesser extent (31.4 %) the transport industry (car manufacturers particularly). Is noise policy related to transportation considered as efficient in France? More than 75 % of the population say “No”. Therefore, what kind of measures should be decided and implemented to fight transportation noise? Table 2 provides clear elements of the answer.

**Table 2:** Priority actions for fighting transportation noise

| **Priority actions** | **% population*** |
|---|---|
| Strengthening vehicle noise emission standards | 20.1 |
| Strengthening vehicle noise emission inspections | 9.5 |
| Promoting public transport in cities | 14.4 |
| Banning new infrastructure construction in the vicinity of existing residential areas | 11.8 |
| Limiting road traffic in city centres by creation of pedestrian areas | 9.5 |

** Basis: population considering noise as an important environmental problem*

To sum up, reducing transportation noise at the source (emission standards and inspection program) is considered by the French population as the priority action. Measures aiming to promote public transport in cities or to limit construction of large infrastructures (highway – airport - train line) are the second and third priorities. On the contrary, measures aiming to limit car circulation (regulation – charges etc) are strongly rejected by the population.

## Noise perceived in the daily life

Almost 4 French people out of 5 (78.3 %) perceive noise coming from outside; moreover 41.6 % perceive noise often or all the time. The main noise sources perceived at home are as follows (Table 3): road traffic, neighborhood, neighbors and air traffic.

**Table 3:** Noise sources perceived at home

| **Noise sources** | **% population*** |
|---|---|
| Road traffic | 67.9 |
| Neighborhood | 35.9 |
| Neighbors | 19.3 |
| Air traffic (including helicopters) | 17.1 |
| Construction work | 9.7 |
| Industry | 7.9 |
| Rail traffic | 7.9 |
| Recreational activities (restaurant – bars etc) | 6.5 |
| Maritime and waterways transport | 0.4 |
| Others | 1.0 |

** Basis: population perceiving outside noise*

Transportation noise (road-rail-air traffic) is perceived by 59.4 % of the French population: around 80 % amongst this population perceived only one noise source (mainly road traffic), 17 % perceived two sources (mainly road and air traffic) and 2.5 % three noise sources (road-air and rail traffic) (Table 4).

**Table 4:** Transportation noise sources perceived at home

| Transportation noise sources | % population* |
|---|---|
| 1. Only one source | **80.3** |
| *- Road* | *70.2* |
| *- Aircraft* | *7.5* |
| *- Rail* | *2.6* |
| 2. Two sources | **17.2** |
| *- Road + Aircraft* | *11.9* |
| *- Road + Rail* | *4.7* |
| *- Rail + Aircraft* | *0.6* |
| 3. Three sources | **2.5** |
| *- Road + Rail + Aircraft* | *2.5* |

** Basis: population perceiving transportation noise*

Therefore, 11.7 % of the French population are living in combined transportation noise exposure situations.

## Noise annoyance

What about noise annoyance? 33.7 % of the French population are annoyed (% A) by transportation noise: 30 % by road traffic noise (12.5 % HA), 6.6 % by air traffic noise (2.8 % HA) and 2.2 % by rail traffic noise (0.8 % HA). What means of transportation annoy the French population (Table 5): passenger cars first, then motorbikes and trucks. Far behind come delivery trucks, buses, commercial aircraft and military aircraft.

**Table 5:** People annoyed transportation in France

| Transportation | % population annoyed by noise* |
|---|---|
| Car | 51.8 |
| Motorbike | 42.7 |
| Truck | 37.8 |
| Delivery truck | 18.3 |
| Bus - Coach | 16.5 |
| Commercial aircraft | 9.6 |
| Military aircraft | 7.3 |
| Helicopter | 7.1 |
| Leisure aircraft | 2.9 |
| Freight train | 3.7 |
| Passenger train | 3.9 |
| High speed train | 1.3 |
| Tramway | 1.3 |

** Basis: population annoyed (A) by transportation noise*

Who are the people highly annoyed by transportation noise? Rather young people (< 34 years), living in urban areas, with quite a low income. When are people annoyed? First during daytime and at a lesser extent during the night (Table 6).

**Table 6:** Annoyance vs. periods of the day

| Period of the day | **First answer** (%) | **Cumulated answers** (%) |
|---|---|---|
| Morning | 26.2 | 47.4 |
| Daytime | 24.6 | 48.8 |
| Evening | 23.4 | 57.0 |
| Night-time | 11.3 | 26.3 |
| All the time | 14.5 | 14.5 |

** Basis: population annoyed (A) by transportation noise*

Exposure to noise also leads to disturbed activities at home, particularly relaxation, rest and sleep (Table 7).

**Table 7:** Activities disturbed by noise at home

| Activities at home | % frequently disturbed |
|---|---|
| Relaxation, rest | 12.5 |
| Sleep | 8.7 |
| Conversations | 5.5 |
| School work | 2.2 |
| Use of garden, balcony | 8.4 |

**Basis: total survey sample*

In particular, people who are frequently sleep disturbed by noise are significantly much more annoyed than the others (Table 8): 6 times more highly annoyed people within frequently sleep disturbed than within not frequently sleep disturbed.

**Table 8:** Sleep disturbance vs. annoyance

| Frequently sleep disturbed | % annoyed (A) - % highly annoyed (HA) |
|---|---|
| Yes | 87 % - 61.1 % |
| No | 29 % - 10.4 % |

** Basis: total survey sample*

However no significant relationship was found between (self-reported) sleep disturbance and (self-reported) health status (Table 9).

**Table 9**: Sleep disturbance vs. health status (11-point scale)

| Frequently sleep disturbed | Mean health value | SD | 50 % percentile | % < 5 |
|---|---|---|---|---|
| Yes | 7.3 | 2.0 | 8.0 | 7.0 |
| No | 7.5 | 1.8 | 8.0 | 5.0 |

** Basis: total survey sample*

People are also annoyed by noise in other places than at home, particularly when moving and at the workplace (Table 10).

**Table 10:** Noise annoyance in specific situations

| Places and activities | % annoyed* |
|---|---|
| In the vicinity of the workplace (outside) | 35.3 |
| When traveling by car | 7.0 |
| When traveling by bike | 5.3 |
| When traveling by public transport | 22.3 |
| When traveling by foot | 21.8 |
| When walking in public parks | 16.7 |

** Basis: total survey sample*

## Behavioral actions

To avoid or to limit the effects of transportation noise, many people react by adopting protection behaviors, particularly insulating their home, closing their windows and to a lesser extent changing the use of the rooms of their dwelling (Table 11).

**Table 11:** Behavioral actions against noise

| Protection actions | % population* |
|---|---|
| Insulation | 58.4 |
| Closing windows | 34.6 |
| Changing the use of rooms | 7.4 |

** Basis: total survey sample*

Insulation is not strongly linked to noise exposure (or annoyance), but principally with the necessity to save energy. As observed in the past (Lambert et al. 1984; Lercher & Kofler 1996), the two other behavioral actions are highly linked to noise exposure and annoyance (Table 12).

**Table 12:** Behavioral actions and annoyance

| Protection action / Annoyance | **Insulation** | **Closing windows** | **Changing use of rooms** |
|---|---|---|---|
| Extremely/Very | 54.0 % | 74.7 % | 20.7 % |
| Moderately | 63.9 % | 46.8 % | 9.8 % |
| Slightly | 61.0 % | 30.4 % | 5.1 % |
| Not at all | 49.8 % | 9.8 % | 5.2 % |

** Basis: total survey sample*

## Comparison with the 1986 survey

As in the 1986 survey, noise remains the main environmental nuisance due to transportation. In particular road traffic remains the main origin of this pollution. However, compared to the 1986 survey, a high increase of the French population annoyed by transportation noise was observed in the 2005 survey (Table 13).

**Table 13:** French population annoyed (% LA) by transportation noise

| **INRETS survey** | **Road traffic noise** | **Rail traffic noise** | **Aircraft noise** |
|---|---|---|---|
| 2005* | 45.3 % | 4.7 % | 11.3 % |
| 1986** | 18.9 % | 2.1 % | 1.9 % |

* at least slightly annoyed; ** at least a little annoyed

This huge difference is partially explained by:

- the type of survey: multi-topic survey in 1986 – environment survey in 2005,
- the wording and the scale of the annoyance question (4-point scale in 1986 – 5-point scale (ICBEN scale) in 2005 survey).

But also explained by the strong increase in traffic volumes (road, rail and air) between 1986 and 2005, leading to more exposed people:

- increase of 50 % in the national vehicle fleet (number of vehicles), of 25 % in the road network length (km), and consequently an increase of 68 % in the road traffic (veh.km),
- increase of 105 % in the air traffic (number of movements),
- but only an increase of 3.9 % in the rail traffic (train-km).

And probably by the higher sensitivity of the French (and European) population to the environment as observed in recent surveys carried out in Europe (EC 2008).

## CONCLUSIONS

In France, transportation noise still remains one of the major environmental concerns for citizens and the major daily environmental nuisance for residents despite noise policies implemented over the last 20 years, which are perceived as inefficient by the majority of the population. One main reason of this deterioration is the continuous increase of the traffic, particularly road and air.

Transportation noise is perceived by the French population as an adverse effect to quality of life and to health. Road traffic is the main source of noise annoyance, be-

fore aircraft noise. However, a significant part of the population is annoyed by combined noise sources (particularly road + aircraft). Behavioral actions (linked to the degree of annoyance), such as closing of windows and changing the use of rooms, are often adopted to limit annoyance and other adverse effects (sleep disturbance). To fight transportation noise, the social demand highlights the strengthening of vehicle noise standards as well as of noise emission inspections and to a lesser extent the promotion of public transport in cities and the banning of new infrastructure construction close to existing residential areas.

## ACKNOWLEDGMENTS

The INRETS 2005 survey was commissioned and funded by ADEME (French Environment and Energy Management Agency).

## REFERENCES

EC, European Commission (2008). Attitudes of European citizens towards the environment. Special Eurobarometer 295, final report, March 2008.

Lambert J, Simmonet F, Vallet M (1984). Patterns of behaviour in dwellings exposed to road traffic noise. J Sound Vibr 92: 159-172.

Lercher P, Kofler WW (1996). Behavioral and health responses associated with road traffic noise exposure along alpine through-traffic routes. Sci Total Environ 189/190: 85-89.

Maurin M, Lambert J (1990). Exposure of the French population to transport noise. Noise Contr Eng J 35: 5-18.