

Summary:

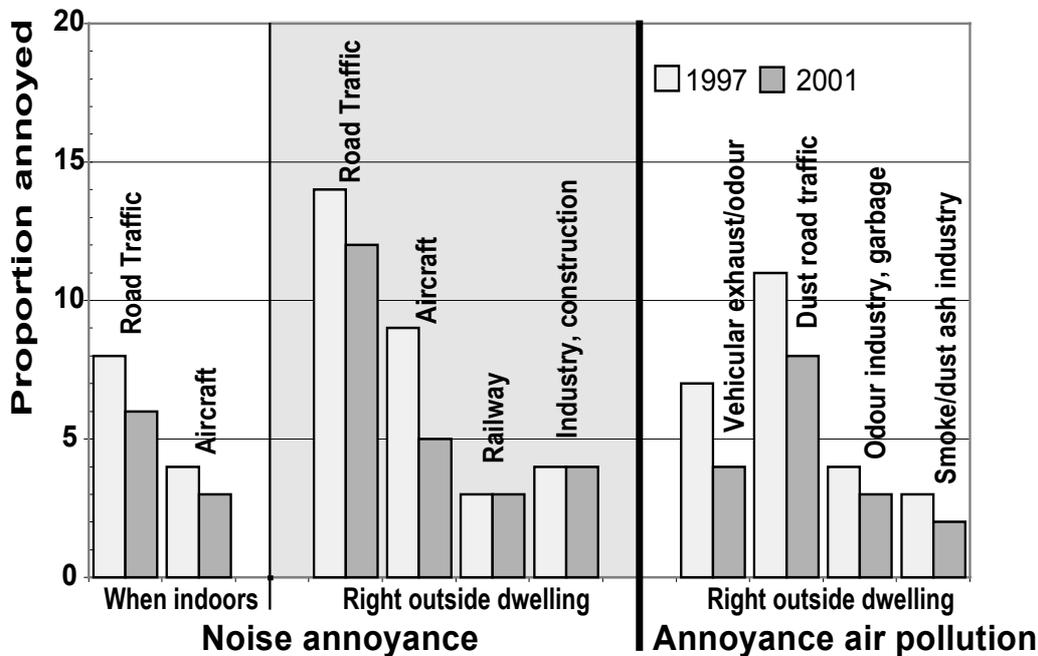
Environmental annoyances in Norway 1997 – 2001

The Norwegian Pollution Control Authority (NPCA) is interested in providing national figures for the population's exposure to environmental air pollution and noise and of how the population reacts to these exposures. In particular the NPCA is interested in the development of these exposures over time, and the changes in people's annoyances. People's reactions to the environmental exposures should be regarded as a question of the population's health and life quality. Knowledge about such reactions can supplement information on more narrowly defined health indicators. The national surveys of living conditions (NSLC) that Statistics Norway undertake every 4th year, can provide an overall picture of how many people in the population that are affected by the different environmental exposures, and how they react to this exposure. In this project data about people's reactions to environmental exposures is analysed and the data compared with previous surveys. In particular the 1997 NSLC is used to analyse changes in people's reactions.

1.1 Road traffic perceived as the major environmental problem

Most of the population are not exposed to the pollutants and noise sources that the survey contains question for. Depending on which of the environmental problems that is in focus, from 2 to 12 per cent of the population report that they are somewhat or highly annoyed.

The survey shows that road traffic is the most important source of the environmental problems that people in Norway suffer from – see Figure S.1. 12 percent of the respondents were somewhat or highly annoyed by road traffic noise when outside their dwelling. For aircraft noise the corresponding percentage was 5. A smaller fraction of the population (3-4 percent) were annoyed by railway noise and noise from industrial and construction sources.



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Figure S.1: Proportion of the whole population that are somewhat or highly annoyed by various environmental exposures. NSLC 1997 (N=3361) and NSLC 2001 (N=3250). Percentages.

People are more annoyed by noise when right outside their dwelling than when indoors. This is the case for both aircraft and road traffic noise. Outside the dwelling, noise is also perceived as more annoying than air pollution from the same source.

It is also of interest to analyse the level of annoyance with among those affected by an environmental exposure – see Figure S.2. Being affected means in most cases that people also are annoyed.

1.2 Half the population is affected by at least one type of exposure

People’s reaction to an environmental exposure depends on whether they also are exposed to other environmental exposures. In 2001 near half the population were at least a little annoyed by one or more environmental exposures. 16 percent are a little somewhat or highly annoyed by one problem, 12 percent by two, and the remaining 15 percent of the population are at least a little annoyed by three or more environmental exposures. When these percentages are applied to the whole population we find that 2 million people were annoyed by one or more environmental problems where they live – see Table S.1. Road traffic is the dominant local environmental problem. About 1.5 million Norwegians annoyed by either noise or vehicular air pollution. The corresponding figures for industry and construction were 600 000 people. The biggest challenge confronting the efforts to improve

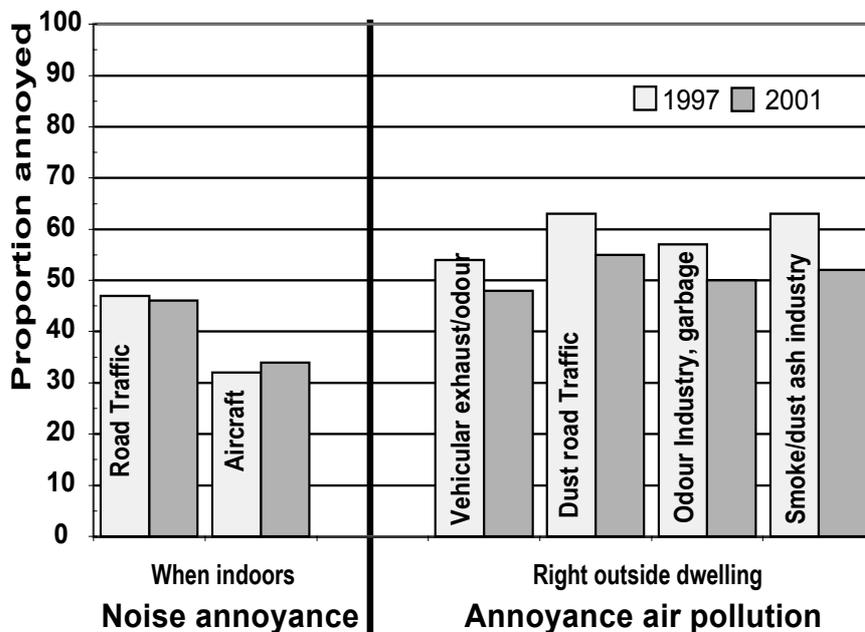
the local environmental conditions is undoubtedly the problems associated with reducing the contributions from road traffic to environmental noise and air pollution.

Table S.1: Number of adults and of the whole population that are annoyed by various combinations of environmental exposures. Estimated figures based on NSLC 1997 and 2001. In 1000.

Measures of total environmental annoyance	Adults > 16 years	whole population
	A little, somewhat or highly annoyed	A little, somewhat or highly annoyed
Total: Annoyances by road traffic	1.145	1.453
Total: Annoyances by industry/construction	495	628
Total: Noise annoyance indoors and total outdoors	1.027	1.303
Total annoyance: Noise indoors, noise	1.596	2.026

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Figure S.3 illustrates the fraction of the population that are annoyed by different combinations of exposures. Also in this case noise experienced when outside the apartment is perceived as more annoying than noise experienced indoors and air pollution when outside the apartment. Noise experienced when outdoors is a main contributor to the overall annoyance level in the population. Excluding noise, the level of total environmental annoyance is reduced from 45 to 29 percent.



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Figure S.2: Proportion of respondents affected by a problem that are somewhat or highly annoyed. Various environmental exposures. NSLC 1997 (N=3361) and NSLC 2001 (N=3250). Percentages.

1.3 Environmental annoyances reduced since 1997

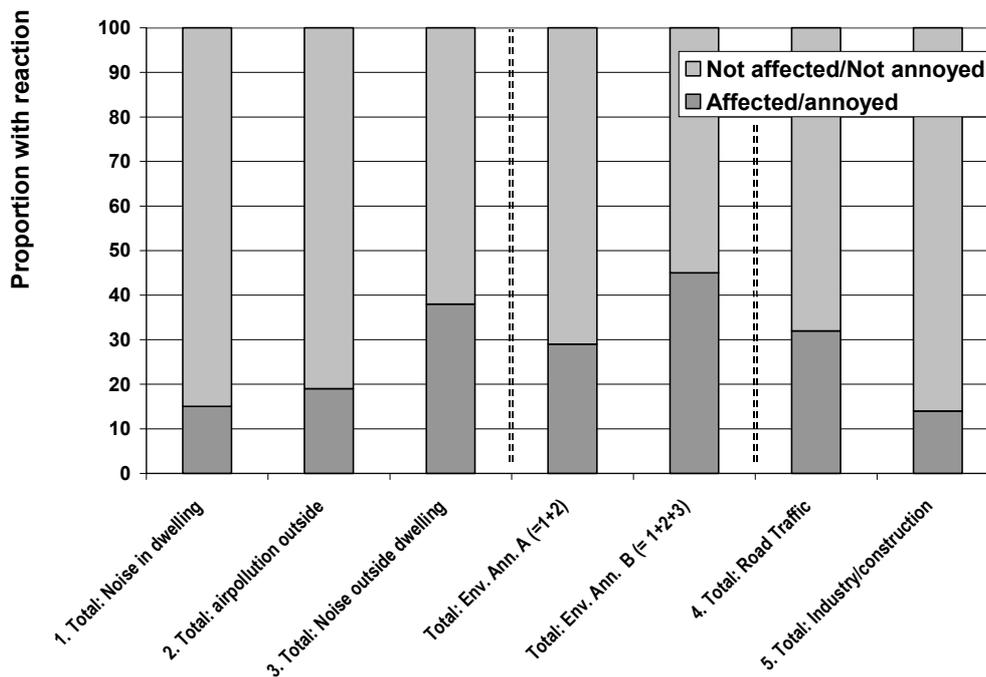
From 1997 to 2001 the level of annoyance experienced by the Norwegian population was substantially reduced. Aircraft noise annoyance is reduced by half -- see Figure S.1. Annoyance from vehicular air pollution was reduced by 43% while there is no change in the annoyance from railway and industrial sources. The reduction is not isolated to particular regions or to only the larger cities, but affects most of the Norwegian population. However, the picture varies: In some areas and regions more people were annoyed in 2001 than there were in 1997.

With the exception of indoor annoyance by aircraft noise, fewer people affected by the environmental exposures were also annoyed. Lacking exposure data, we are unable to ascertain whether this is caused by a reduction in the actual noise levels or whether other factors play a part in these changes – such as attitude changes, experiences, or changes in the media coverage of environmental problems. That a higher proportion of people affected by aircraft noise also are annoyed, can be a result of the relocation of Oslo airport from

Fornebu to Gardermoen. The previous location right outside Oslo meant that many inhabitants were affected by aircraft noise – most of them at lower exposure levels.

With regards to air pollution emissions, NPCA and Statistics Norway provide an annual inventory of different pollutants. The main tendency is a reduction in emissions since 1997 and that the urban air in 2001 is less polluted. This is the case for most pollutants having an effect on the urban environments. Though individual exposure data is lacking, it seems safe to say that the reduction in annoyance from air pollution is caused by real exposure reductions.

We do not know how the noise exposure levels in Norway have changed since 1997. However, several types of measures have been undertaken in order to reduce noise levels. It is therefore reasonable to presume that the reduction in annoyances can be associated with corresponding reductions in noise exposure. The relocation of Oslo Airport to Gardermoen, relieving the population in Oslo from aircraft noise, would account for a major part of the reduction in aircraft noise annoyance.



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Figure S.3: The proportion of the population that are annoyed (a little, somewhat, highly) by different combinations of environmental exposures. NSLC 2001. Percentages

1.4 815 thousand were annoyed by noise when outside their dwelling

Noise is the environmental exposure affecting most Norwegians. Based on the survey one can estimate that about 815.000 Norwegians were somewhat and highly annoyed by noise when outside their dwellings, while 360.000 are annoyed when indoors – see Table S.2. Road traffic is the noise source associated with most of the noise annoyance, and is further a source of vehicular air pollution in the form of exhaust/odour and dust/grime (Dust particles are also produced by the use of studded tires during the winter season). About 870 000 persons were in 2001 affected and annoyed by air pollution when outside their dwelling. About half a million were at least a little annoyed by dust/grime. Of these about 340 000 were somewhat or highly annoyed. The number of people somewhat or highly annoyed by industrial air pollution emissions were substantially fewer, about 188 000 persons. The national target for reducing noise by 25 percent

before 2010 is associated with an indicator SPI. This indicator is calculated as the sum of scores attached to each individuals degree of annoyance. The scores are calculated according to a method developed by TNO in Holland. The SPI number can also be calculated on the basis of NSLC 2001. Depending on the scores attached to the different annoyance categories, we find that the total noise annoyance from all noise sources sums up to 1.0 – 2.5 million SPI units.

These numbers are somewhat higher than the number NPCA have calculated on the basis of national noise exposure figures. Their number is about 570 000. However, this should not be taken as evidence that the two figures are different, as the calculation methods differ. In particular it should be mentioned that the NPCA only takes into account annoyance for people exposed to noise levels exceeding the current noise level mapping limits.

Table S.2: Number people in the Norwegian population that are annoyed by various environmental exposures. Estimations based on NSLC 2001 results.

Environmental problem	NSLC 2001, whole population	
	Somewhat & highly annoyed	A little, somewhat & highly annoyed
Road Traffic Noise annoyance		
When inside dwelling	270	506
When right outside dwelling	540	1.275
Aircraft Noise annoyance		
When inside dwelling	130	286
When right outside dwelling	229	639
Annoyance other noise sources outdoors		
Railway noise	98	266
Noise from industry, construction	148	363
Vehicular air pollution		
Exhaust/odour	183	320
Dust/grime	342	543
Air pollution Industry		
Odour/smell	140	265
Dust, smoke, ashes	92	166
Total: noise annoyance when indoors	360	686
Total: noise annoyance when outdoors	815	1.721
Total: outdoor pollution	532	869

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