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TRAFFIC NOISE IN THE CITIES AND COMPARISON WITH WITHOUT CAR DAY

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ABSTRACT
In the 22nd September 1999 carried out in about 90 Italian towns the " European Day: in city without my car", promoted in Italy by the Italian Environmental Ministry, with the purpose of sensitising citizens and administrators about problems connected to environmental pollution linked to traffic. During the day, between the 7:00 and 21:00, different zones of the cities chosen by local administrations were closed to private traffic. At the same time a campaign of noise monitoring was carried out, organised and co-ordinated by Environmental Agency System (ANPA-ARPA). The campaign had the purpose to estimate the benefits that are possible to obtain limiting in the city the circulation of private transport means and developing different kind of public transport means.

1 - INTRODUCTION

The surveys confirm that noise, which is linked principally to traffic, is one of the main causes of the worsening of life quality in the cities. So only actions on viability, reorganisation of the traffic flows, limitations to the heavy means or car in the city centre associated to public transit increase, the use of ecological means characterised by low emissions, appear the main solutions to reduce the acoustic pollution in the cities. These actions must be associated to information campaigns to sensitise citizen towards those changes in the human behaviours that can allow an improvement of the life quality.
In the 22nd of September 1999 the "European Day: in the city without my car" carried out in many Italian towns. This initiative was promoted by the Environmental Ministry, with the main purpose to sensitise citizens and administrators on the problems connected to acoustic pollution associated to traffic. During the day one or more zones of the cities, chosen by local Administrations, were closed to private traffic and at the same time a measurement campaign of acoustic pollution, beyond that atmospheric, was performed in specific sites chosen inside the free car area.
The Environmental National Agency (ANPA) and the Environmental Regional Agencies (ARPA) agreed the noise measurement methodology and the data collect.

National data were collected and elaborated by ANPA to delight the acoustic benefits due to the free car traffic in the cities.

2 - INITIATIVES PUT IN ACTION BY INVOLVED ADMINISTRATIONS

The European "free car day", promoted by Italian and French Environmental Ministry, carried out in the 22nd of September '99 in Italy and in France. In Italy 90 towns participated at this initiative and during the day one or more areas of each city (in total 7000 ha) were interdicted to private traffic from 7:00 to 21:00. In 40 cities traffic was interdicted also for scooters and motorbike.
During the initiative, in the limited traffic areas were authorised to work only public means and ecological vehicles such us electrical, GPL or methane fed.
In many cities during the day were organized promotional activities and actions such as increase of public transport and facilitation to their use with the creation exchange parkings, free or discounted buses, metro and taxi, facilitation for the use of bicycles, electrical vehicles, etc.
Moreover, during the day, cultural, musical, theatrical, expositive and sporting meetings were organised by different Administrations in order to call the attention of citizen, especially young people, and mass media.

3 - ACOUSTIC POLLUTION CAMPAIGN OF MEASUREMENT

During the European day an acoustic pollution campaign of measurement was organised inside a free car area. Measures were performed in meaningful positions, chosen near the most exposed receivers.
In particular, two different methodologies of measure were defined according to the type of instrumentation available to Administrations (supplied also by local competent bodies for environmental controls.

- *not assisted sampling system* characterised by continuous monitoring from 7.00 to 21.00 (duration time of the manifestation) during the working-days of the previous week and during the free car day (test day).
- *assisted sampling system* (characterised by the instrumentation use with the operator presence) that was performed with the execution of measures in two hour-bands of the days, 9:00-12:00 and 15:00-18:00. Measures were performed during the 3 working-days before the 22nd September, and during the free car day. The duration time of measures was 15' for the measures performed in the previous three working-days and 30' for the measures performed in the 22nd September.

The acoustic index used in order to quantify the ambient noise is the Leq, the equivalent sound level.
The Regional Agencies cured the diffusion of the measure methodology in the own towns. Moreover ARPA supplied to the collection of data and in the first processing of results. In the towns localised in regions in which the Regional Agencies are not totally operating the diffusion of the measure methodology to adopt and the collection of data was directly cured by ANPA, that, moreover, supplied also to the collection of data coming from each ARPA and executed the processing of total data.
Totally 53 towns distributed on the national territory carried out the acoustic measures.

4 - RESULTS

Since two different kinds of sampling were used, the processing of data was conduct maintaining separated assisted and not assisted sampling data.
As expectable in the 22nd September (test day) inside the several free car areas, a general abatement of the acoustic pollution was recorded, evidenced by the decrease of the equivalent sound levels (Leq) in the test-day compared with that recorded in the working-days.
A comparison between the noise levels recorded inside the free car areas of the cities during the test-day and the working-day, for the not assisted systems, shows an abatement of noise levels between 0 and 5 dBA, while, for the assisted systems, the decrease is greater, comprised between 5 and 10 dBA.
Moreover, considering the "delta Leq" as the difference between the equivalent sound level recorded during working-days and that recorded during the test day, for not assisted sampling systems, the 60% of the cities recorded a "delta Leq" comprised between 1 and 3 dBA, while, for assisted sampling systems, nearly the 20 % of the cities shows a "delta Leq" of 5 dBA and the 38% of the cities shows a "delta Leq" upper than 7 dBA.
On the basis of the assessments developed by OECD and reported in the Green Paper of the European Commission on the effects of exposure to environmental noise it appears that a Laeq of 55 dBA can be considered as an acceptability limit for the individual exposure. In fact in the document are reported three thresholds for noise nuisance as follows (Leq in day-time):

- at 55-60 dBA noise creates annoyance,
- at 60-65 dBA annoyance increase considerably,
- above 65 dBA constrained behaviour patterns, symptomatic of serious damage caused by noise arise.

Concerning the acoustic monitoring campaign, it is interesting to observe that the 88 % of the monitored cities shows noise levels, recorded during the working-days, upper than 65 dBA and only the 12 % of these cities shows noise levels lower than 65 dBA and however upper than 55 dBA. During the test day the percentage of the cities in which noise levels recorded is lower than 65 dBA, but upper than 55 dBA, goes up 53%, even if a large number of the cities (47%) shows noise levels always upper than 65 dBA.
For a probing of the results, the cities involved to the acoustic measurements campaign were divided into three belts according to the number of inhabitants: A belt comprises the cities with more than 300,000 inhabitants, B belt regards cities with a number of inhabitants comprised between 80,000 and 300,000, C belts corresponds to the cities with a number of inhabitants lower than 80,000.
During the test-day the 30 % of the cities comprised in the A and B belts shows noise levels (LAeq) lower than 65 dBA, while for the C belt cities this percentage increases considerable up to 81%.
This fact demonstrates that noise levels abatements strongly depends on the city size. In the 22nd September, the free car day, the most of the cities of the C belt, those with less than 80,000 inhabitants, showed noise levels in the thresholds of nuisance indicated in the Green Paper of the European Commission, while only in a small number of the bigger cities, related to the A and B belts, noise levels are comprised in such thresholds of nuisance.

5 - CONCLUSIONS

The results of the measurement campaign of the acoustic pollution carried out in the 22 September 1999 have shown a meaningful improvement of the environmental quality in the free areas. In fact during the test-day a general noise abatement was measured in comparison with the measures carried out during the working-days.
The different results of acoustic pollution abatements recorded with the two monitoring systems are linked to the different characteristics of the methodology adopted. In fact the measures performed with the assisted sampling systems were carried out during two temporal intervals, ($9.00 - 12.00$ and $15.00 - 18.00$) in which noise in largely influenced by traffic. So the results well represent, in terms of acoustic quality, the effectiveness of the traffic limitation actions during the test day. Otherwise the measures performed with the not assisted sampling system give a mean acoustic data related to the diurnal period from 7:00 to 22:00 and therefore, during this wide temporal period, the noise levels recorded during test day are in general less influenced by the traffic flow.
The executed survey permitted to monitor the noise levels in the cities during the working-days and during the free car day (test-day).
For the 88% of the sampled cities, the levels of noise during the working-days results upper than 65 dBA, while during the test-day the percentage of cities with acoustic pollution values upper to 65 dBA is 47%. So this confirms that in the examined areas exists noise pollution, but formerly closing traffic actions can lead to acoustic benefits: in fact, the percentage of the cities with noise levels upper than 65 dBA goes down to nearly 40%, passing from 88% to 47%.
Moreover the closing action was not complete inside the city areas and in some of these the circulation of scooters, taxis, beyond that of public means (bus, shuttles), and of ecological means (electrical, methane, GPL), that sometimes were powered in number, has determined a limitation in the noise abatement effects.
The acoustic benefits depend on the dimensions of the cites. In fact during the test-day only the 30% of the biggest cities comprised in the A and B belts (more than 300,000 and comprised between 80,000 and 300,000 inhabitants) records a noise level during the test-day lower than 65 dBA, while such percentage go up to 81% in the smaller cities with lower than 80,000 inhabitants (C belt). In fact, in the small towns the traffic kind is less complex and diversified and so the traffic closing action has involved smaller problems of control and effectiveness. Moreover, it is important to consider that in a city area of small dimensions a demonstration of this type involves smaller management problems, a greater citizenship attendance and a better answer from the population.