Management of noise in the case of infrastructure works

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Abstract

The Italian noise legislation is based on the principle of protection of the population exposed to several types of noise sources. The noise exposure, beyond the direct effects on the auditive apparatus, could cause sleep disturbance, speech intelligibility, psycho physiological effects, that generate important states of annoyance. The real goal of the noise legislation is to reduce annoyance. Such legislation, however, is not sufficient for particular types of noise sources, like those generated by infrastructure works. In these cases the law gives authorisation notwithstanding the provisions in force, exceeding the limit values, but without creating damage conditions. The local authorities should then manage these derogations by characterizing the parameters that could be used to take control of the noise, and then to avoid several states of annoyance. The purpose of this study is to take into account the parameters that have been identified and to set up guidelines aimed at establishing limit values for derogation for the infrastructure works. The first step will be to distinguish between the different noise produced by different types of infrastructure works. The limit values will then be different for a building or street yard and for great infrastructure works such as a tunnel or high-speed way construction. The main differences are the plants and the machinery used for the works, but in particular the duration of the work. The limits will then be more rigid for long term infrastructure works, which are often also active in the night, because of a longer population exposure. These guidelines will be finally discussed with the local authorities in order to manage the noise produced by the temporary infrastructure works and to avoid the worsening of the quality of life.

Keywords: noise, annoyance, infrastructure works, building yards, derogation.
1 Introduction

The environmental legislation in Italy has ruled many aspects concerning several types of sources of impact, in order to safeguard the population and the environment itself. However there are some particular cases which should be analysed and managed, since the law is still not able to guarantee the protection of the population.

This study belongs to the Communitarian issues of health and environmental protection, as expressed by DIR 2002/49/EC on the assessment and management of environmental noise [1].

In the Green Paper on the future noise policy (1996) the European Commission defines noise as one of the most environmental problems in Europe, with the necessity to take measurements and specific actions to contain it.

Noise exposure of the population to the different sources is calculated taking into account the medium equivalent exposure of the sound pressure level without taking into account other dynamics of annoyance nor the significant temporary sources.

The entity of the problem, in urban habitats, has reached and exceeded the values fixed for the annoyance, and is expanding towards rural and protected areas, not involved in this problem up to now. This last aspect is the most impacted on by the noise of infrastructure works, since it presents, before the event, a more delicate acoustic situation.

In Italy standard conditions are controlled by noise mapping, that represents the instrument put in charge for territorial acoustical management, and it is very important for containing noise pollution and for limiting future emissions, which could be generated by new sources. This instrument however is not able to guarantee the absence of the annoyance, for the temporary activities, normally managed with derogation.

Noise produced by infrastructure works is one example that should be better studied by the local authorities, since it could represent a critical situation, in particular depending on where the infrastructure work is placed.

The Italian legislation permits one to overcome the noise limit values, giving authorization notwithstanding the provisions in force if the noise does not exceed the damage conditions. This principle could be respected if all the sources of noise, belonging to a specific work, are temporary. In this way the exposure criteria is respected.

In an infrastructure work, if the effective time of work construction is longer than few months or the intensity of emissions provokes immediate damages, or if the polluting factor is “non dose dependent”, then the criteria of human health and different ecosystems protection are not respected and the derogation is not justified, since it wouldn’t be a derogation to the law parameters but to the safety conditions. This is true for many parameters such as dust, visual impact, induced transport, but for the noise, this is very significant, since noise has an immediate perception, generating annoyance to the exposed people.

The absence of people does not justify that in some areas the problem of protection does not exist.
In northern Italy there are several examples of great infrastructure works in urban areas, such as tunnels, public facilities and transportation systems, but there are also other examples in rural areas, characterised by high environmental quality. These areas are often crossed by infrastructure works and need to be protected, in order to pursue the principle of sustainability, instead of only the principle of compatibility.

This study is based on the principle of sustainability, then on the respect of the quality values, not only to safeguard the human receiver, but also for the protection of the environmental components.

The presence of an infrastructure work for a long period in a specific area, could generate a worsening of the environmental quality for that time, and then an irreversible damage.

It is necessary to carry out rules which show in advance and manage these particular events, not permitting derogation tout court but characterizing guidelines that would show, also qualitatively, the parameters on which the derogation can be granted.

Such parameters have already been identified (Clerico and Pizzo) [2] for the risk factor of noise and will be used to set up a regulation that would be presented to the city Councils, in order to show possible criteria to manage the noise in the infrastructure works.

The meaning of this regulation is not to show new limit values, but to express in an official document the parameters that, although exceeding the limit values imposed by law, allow one to respect the same, or greater, safety conditions.

The limit values of the law has been calculated by taking into account standard exposure time, with standard reference time and with sources of noise belonging to permanent installations.

According to the available data (Franchini et al.) [3], the environmental noise with $\text{Leq} < 50 \text{ dB(A)}$ are not able to cause annoyance to the population. The day level, continuous and stationary, should be $<55 \text{ dB(A)}$ to protect the majority of the population from being highly annoyed and $<50 \text{ dB(A)}$ to protect the population from being moderately annoyed, as expressed in the “Guidelines for Community Noise” (WHO) [4].

The annoyance conditions for non continuous and non stationary noise, for example the traffic noise or the infrastructure works, are estimated at 62 dB(A) (day) and 55 dB(A) (night).

At night the noise level should be 10 dB under the correspondent values for the day (Berglund et al.)[5].

If the infrastructure work is similar to a permanent installation, because of the dimension of the infrastructure or of the long time work, then there is no possibility to give an authorization notwithstanding the provisions in force and the parameters presented in the following regulation can not be applied.

If an infrastructure work is placed on the same area for a very long time (this is the typical case of a great infrastructure work) it is no longer considered temporary, but it becomes a stationary and continuative source for the damage and the annoyance to the population.
In these cases the protection of the population is possible by imposing the respect of the noise mapping Leq with no derogation.

2 Guidelines for a regulation on the management of the environmental noise produced by the temporary works

The following guidelines want to represent a reference scheme for the application of law requirements about temporary activities. Such a law prescribes that temporary activities, like building yards and open space manifestations, using noisy machinery and plants, must be authorised, even notwithstanding the provisions in force, if necessary.

Each city council must establish the necessary prescription to limit acoustic pollution.

The aim of these guidelines is to present to the city councils a possible regulation to manage the noise produced in the outside environment by the temporary activities, when they exceed the limit values established in the Noise Mapping.

The following guideline wants also to define the modality to give authorisation to the temporary activities.

The meaning of temporary refers to the activities being undertaken for a variable period, such as buildings and street yards, public works that involve wide or restricted areas, that can be authorised notwithstanding the provisions in force.

In this guideline, temporary activities such as musical and popular manifestations, public shows, Luna Park, and every kind of permanent activity, that are already regulated by law, will be excluded.

Temporary activities are automatically authorised if they respect the limit values of law, like emission and immission values of Noise Mapping, and differential limit values.

The following regulation refers to annoyance for a period defined by the city council, using the 2002/49/EC range periods of DENL (h.7-19; 19-23; 23-7).

2.1 Building and street yards

Building and street yards are typical temporary works characterised by period of time not that extended and dimension restricted to a limited number of years. Whether time and extension exceed the limits expressed in the regulation for buildings and street yards and if the city council decides that the noise produced by these works should be managed with particular criteria, it will be necessary to refer to the regulation of great infrastructure works and great building yards.

Plants and machinery used in the infrastructure works must be in accordance with the homologation and certification norms and must be placed in so as to limit the noise in the environment and the annoyance to the exposed population.

For machinery that is not considered in the norms, such as manual tools, it is necessary to reduce their noise or the annoyance in some way.
Sound signals should be used when it is not possible to use signal lights, always respecting safety norms.

The activation of noisy machinery and the execution of noisy works in the building yards exceeding the limit values established by law is permitted during the week in the following periods:
- from h.8 to h.13 and from h. 15 to h. 19 during the summer;
- from h.8 to h.12.30 and from h. 14 to h. 18 during the winter.

The activation of noisy machinery and the execution of noisy works in the street yards exceeding the limit values established by law is permitted in the week, from h. 8 to h. 20.

The activation of building and street yards exceeding the limit values of the law is not permitted near sensitive receivers (hospital, schools) or in the protected areas established by the Noise Mapping.

However, it is possible to activate building and street yards exceeding the limit value near the schools after the normal school time.

The bibliography [6] indicates for street yards a maximum length in time of 20 working days. For longer time periods it is necessary to refer to the regulation for great infrastructure works and building yards.

For building yards the length of the works is not the administrative length, that could be several years, but the summary of the working days per year. Depending on the territory, the city council has to decide the number of working days to give an authorisation notwithstanding the provisions in force.

For lengths more than 30 days per year the city Council can decide to manage the building yard noise authorisation as a great building yard.

The maximum emission limit during the day is 65 dB Leq (A).

During the day the differential limit value is not important.

Further permissive limits can be permitted by the city council, depending on the characteristics of the territory, for limited periods of time (i.e. emission of 80 dB(A) for 1 hour per day [7]).

The companies that lead the works for maintenance of the streets and sub services have to ask the local authorities for an authorisation notwithstanding the provisions in force, if necessary, that will be valid for the entire length of the work and containing:
1. the limit values to reach towards the annoyed receivers;
2. a declaration that the machinery used for the works will respect the noise emission limit values established by the national and international legislation.

When for the programmed works it is seen to exceed the limit values established in the general derogation, the companies have to present the same documentation for the authorisation of the great infrastructure works and building yards.

2.1.1 Authorisation notwithstanding the provisions in force
Temporary derogation on noise authorised by the city council must contain the necessary indications for reducing the annoyance and the temporal and spatial limits of the authorisation.
The city Council saves a schedule of the derogation authorised on each area. The emergency works are always authorised: the city Council can indicate particular disposals for the companies that work for public emergencies.

The demand to obtain the authorisation notwithstanding the provisions in force must be made 45 days before the beginning of the works to the local authorities, that can require specific noise monitoring plans.

For building and street yards in urban areas not in proximity to schools and hospitals, it is possible to ask for a simplified authorisation notwithstanding the provisions in force.

The demand for this simplified authorisation and the relevant documentation, must be presented to the local authorities 15 days before the beginning of the work.

To obtain the derogation for exceeding particular limit values in a restricted period of time, established by the city council, the company must add a programme underlining in which periods the noisy machinery would work. The eventual variation of the programme must be immediately communicated to the local authority.

The activities that do not have the characteristics for the simplified authorisation notwithstanding the provisions in force, or that cannot respect the conditions, will refer to the derogation for great building yards.

Buildings and street works with lengths between 5 and 30 working days must present the following documentation to obtain the authorisation notwithstanding the provisions in force:

1. a report to show the conformity to the national and international law of noise;
2. a list of the noise emission levels of the machinery that will be used and that need acoustical certification;
3. a list of the technical devices and procedures that will be used to reduce the annoyance;
4. a detailed plan of the area with the indication of the civil buildings.

Such documentation must be produced by an acoustical competent technician.

Building and street yards shorter than 5 days must present just a communication to the local authorities instead of the demand for authorisation notwithstanding the provisions in force.

During holidays and night periods the possibility to ask for an authorisation notwithstanding the provisions in force is excluded.

The emergency works for restoration of public services (electric plants, drain ducts, potable water, gas, transport system), for dangerous situations for the population or the environment, can be done without any noise authorisation.

2.2 Great infrastructure works and great building yards

The great infrastructure works are represented by the infrastructure, building and city planning intervention, of public interest that require particular authorisation notwithstanding the provisions in force.
The directory of the great infrastructure works and great building yards that must be subjected to this regulation will be discussed and approved by the city Council, during the public works planning.

Infrastructure works that exceed the noise limit values established for the area in which the works take place are not permitted in proximity to hospitals, schools and sensitive receivers in general, or in the protected areas established by the Noise Mapping, without an authorisation notwithstanding the provisions in force.

Great infrastructure works must respect the limit values established by the Noise Mapping and the differential limit values established by law.

The city council can identify further acoustical indicators (i.e. number of events, Sound Exposure Level (SEL)) to manage the noise produced by the infrastructure works and building yards.

It is moreover necessary to define day and night SEL value. Since UE did not establish such reference values nor defined further indicators other than the Leq to manage the annoyance, it will be up to the scientific community to propose future values and indicators aimed at managing particular events.

Great infrastructure works and great building yards generally endure for long periods, so this regulation can then be applied to all the works that have indefinite lengths of time, or in general endure for more than 30 working days.

The whole length of time of the noisy work, and the relevant timetables, must be communicated to the population by public warnings in the area of the works.

2.2.1 Authorisation notwithstanding the provisions in force

When the person responsible for the infrastructure work thinks that, for important motivation, it is necessary to exceed the limit values of this regulation, he has to ask for authorisation notwithstanding the provisions in force, 45 days before the beginning of the work. The local authorities examine the documentation and give authorisation notwithstanding the provisions in force, that could contain prescriptions, as the prohibition to use at the same time noisy machinery, or the compulsory use of sound absorbents and/or an insulating shell on the border of the site or as protection from the noisiest machinery.

In the contest for contracts for great infrastructure works and great building yards the obligation for the companies to obtain authorisation notwithstanding the provisions in force, according to the legislation and to this regulation must be included.

The authorisation is divided into two different steps:

a) a general part that can be obtained by presenting a form containing:
   1. a general report describing the activity, written by a competent acoustical technician with an indication of the limit values to reach towards the annoyed receivers;
   2. a procedure of acceptance written by the director of the infrastructure work containing:
      - the characteristics of the machinery that can be accepted on the site,
- the name of the responsible person for such decisions,
- the procedure of testing the suitability of the machinery,
- the procedure of registration of the accepted machinery and its identification;

3. the individuation of the access path to the site.

b) a detailed part for each phase of the work, where the company must present:

1. a list of the procedure that will be adopted to limit the annoyance and its description
2. a detailed layout of the area with the identification of the annoyed buildings;
3. a report to show the conformity to the national and international law of noise, and a list of the noise emission levels of the machinery that will be used and that need acoustical certification. The report must define:
   - the length of time of the work,
   - the timetable of the several activities,
   - the limit values that the company want to be authorised and the relevant motivation, for each of the activities.

The period in which the infrastructure works can operate is defined by the city council, using the 2002/49/EC range periods of DENL (h.7-19; 19-23; 23-7). The choice could be to exclude every noisy activity, not permitting derogation, during the holiday and the evening/night periods (from h.19 to h.7), but the city Council, depending on the specific territory, can decide to use more restrictive periods (i.e. from h.19 to h.8).

Another choice could be to exclude every activity in these periods.

Those not respecting this regulation are subjected to the administrative sanction established by law and to the suspension of the activities by local authorities.

The population can communicate annoyance to the local authorities by using appropriate procedures of request.

3 Conclusions

According to the principles of health and environmental protection expressed by DIR 2002/49/EC on the assessment and management of environmental noise, it is necessary to take into account the different noise sources with important annoyance effects on the population.

The noise source due to temporary works is an issue that, in urban habitats, has reached and exceeded the values fixed for the annoyance, and is expanding towards rural and protected areas, not involved in this problem up to now.

The Italian legislation is nowadays not sufficient to manage these particular types of noise sources, since the law gives authorisation notwithstanding the
provisions in force, exceeding the limit values, generating possible annoyance conditions with a general worsening of the existing environmental quality.

The guidelines that have been set up are aimed to help the city councils to manage the noise produced by temporary works.

Such temporary works should be managed by distinguishing between the noise produced by building and street yards and great infrastructure works and great building yards.

The main difference is the duration of the work. The limit values and the relevant authorisation should then be more rigid for works of longer duration, because of a longer population exposure. According to this, the great infrastructure works and the great building yards should respect the limit values established by the Noise Mapping and the differential limit values established by law, while for the building and street yards the maximum limit during the day is represented by the maximum limit values established by the Noise Mapping and the differential limit value is not considered. The city council can decide to adopt different parameters to manage the noise produced in particular by great infrastructure works and great building yards.

In holiday and night periods great infrastructure works can be activated if they respect the limit values given by the Noise Mapping, but the city council can decide to adopt more restrictive periods of time, using the DENL periods.

The authorisation given notwithstanding the provisions in force will be more rigid for the great infrastructure yards and for the great building yards than for the building and street yards, including detailed information on the procedure used to reduce the noise.

These guidelines represent a technical instrument to manage the noise produced by temporary infrastructure works and will be finally discussed with the local authorities in order to maintaining the standard of environmental quality reducing the annoyance on the population.

References


