

ACOUSTIC TERRITORIAL ZONING AND NOISE ABATEMENT PLANS

Mr. Salvatore Curcuruto, Ms. Rosalba Silvaggio

APAT

Agency for Environmental Protection and Technical Services

Acoustic Territorial zoning

Legislative references

The Italian Framework Law on Environmental Noise n. 447/1995 established the competences of the government and the different local authorities.

Particularly, the **municipalities** have to:

- adopt the **Acoustic Territorial Zoning**
- provide the **coordination** with the town planning system adopted, (especially with plans regarding noise sources)
- adopt the **Noise Abatement Plan**

Acoustic Territorial zoning

Legislative references

DPCM 1 march 1991 Maximum exposure limits to noise in enclosed and open spaces

L. 447 26 october 1995: Framework law about noise pollution

DPCM 14 november 1997 Definition of the limit values of the noise sources

Acoustic territorial zoning was introduced by DPCM 1/3/91, then it has been confirmed by Framework Law on noise pollution and Decree 14/11/97.

Framework Law attributes the competences about the ATZ to the authorities, Districts and Municipalities and it introduces the different limit values.

Districts must define the criteria for the editing of the plan.

All the municipalities are obliged to define the acoustic zoning, which represents the most important act, considering the acoustic planning, able to manage the environmental noise.

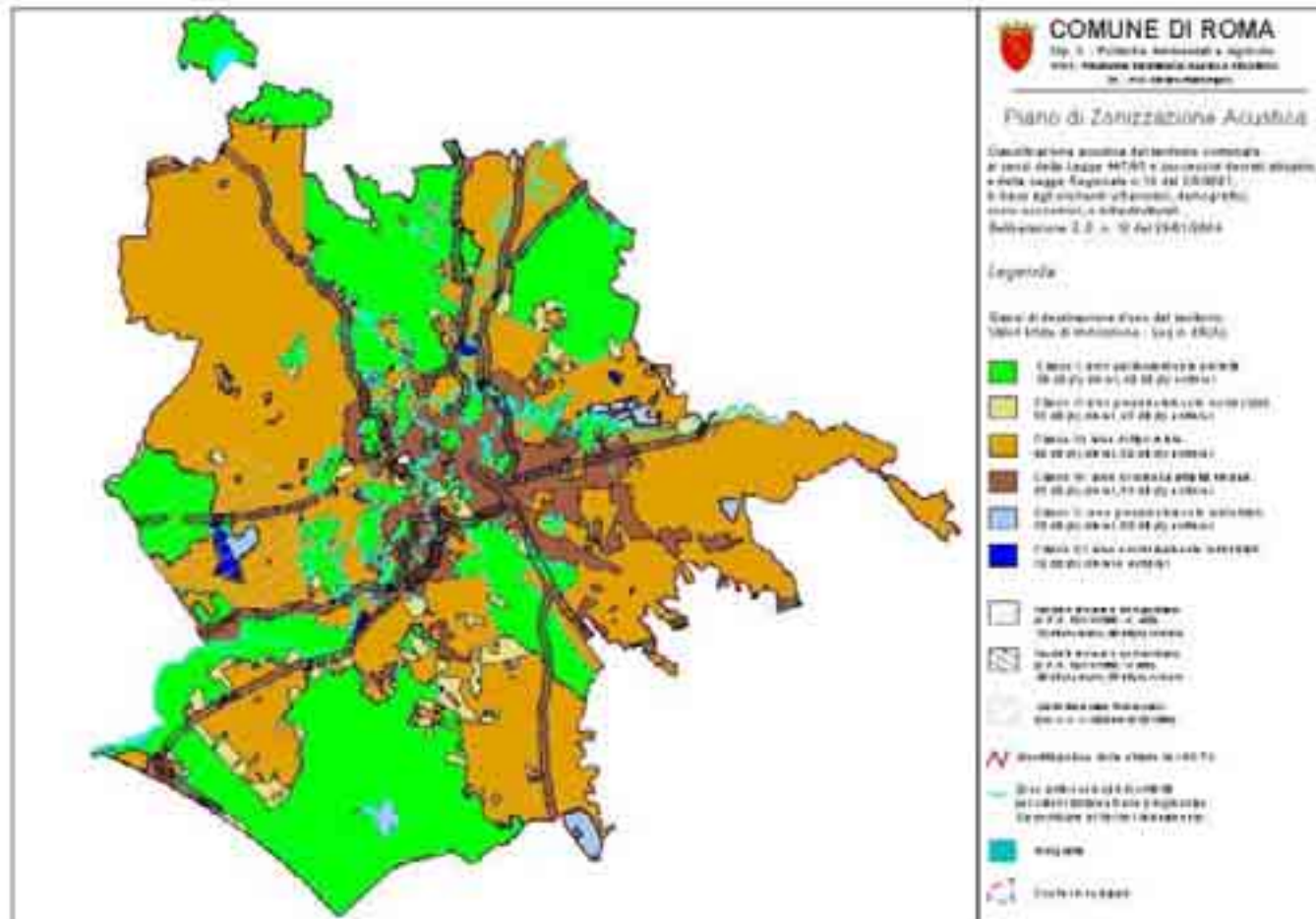
DPCM 14/11/97 defines the threshold of the different limit values

Acoustic Territorial zoning

The acoustic classification of the territory, or acoustic zoning, classifies the territory of the municipality in six areas, related to different city planning characterization, activities and conditions for the use of the territory.

The six homogeneous areas are characterized by different noise limit values, in $L_{eq}(A)$, on two temporal periods, referred to day period (06-22) and night period (22-06).

Acoustic Territorial zoning



Acoustic Territorial Zoning

definition of the areas

Territorial areas	day 6÷22 Leq dB(A)	night 22÷6 Leq dB(A)
Area I – Particularly protected areas: the areas belong to this zone are territories where the quiet represents a priority characteristics: hospitals, schools, areas dedicated to relax and recreation, public park, residential rural areas, more interesting urban planning areas, etc.	50	40
Area II – Areas mainly dedicated to a residential use: the areas belong to this zone are mainly characterized by local road traffic, low population density, low presence of commercial activities and absence of industrial and handcrafted activities.	55	45
Area III – Mixed areas: the areas belong to this zone are characterized by local and crossing road traffic, by media density of population, presence of commercial activities, offices, low density of handcraft activities and absence of industries; rural areas characterized by the presence of equipment	60	50
Area IV – Intensive human activities areas: the areas belong to this zone are characterized by busy road traffic, high density of population, high presence of commercial activities and offices, presence of handcraft activities; areas close to main road traffic and railway infrastructure; ports, areas with a presence of factories.	65	55
Area V – Mainly industrial areas: the areas belong to this zone are characterized by the presence of factories and a low presence of residential buildings.	70	60
Area VI – Exclusively industrial areas: the areas belong to this zone are interested exclusively by industrial activities and there are not residential buildings.	70	70

Territorial areas and related input noise limit values (L_{Aeq} dBA DPCM 14/11/1997)

Acoustic Territorial zoning

The limit values mentioned above are referred to the noise sources, excepted for the **transport infrastructures**: road, railway, airport, port, etc.

The Decrees on transport infrastructures establish the “**buffer zones**”: areas, with a defined width, where are in force specific limit values, related exclusively for the noise emitted by the considered infrastructure, usually higher then limits expressed by the Acoustic Territorial Zoning. Out of the “buffer zones”, the noise emissions of the infrastructure contribute to the limit values of the considered area.

Acoustic Territorial zoning

Rome,
 Buffer zones
 relating to
 railway
 infrastructure



Source: <http://elevation.it/ZONACU/servlet/zonacu.servlets.S NavigaMappa>

Acoustic Territorial zoning

Different Limit Values

The framework Law on noise pollution defines the noise limit values:

- emission limit value: maximum noise value emitted by the source, measured in proximity to the noise source, but close to spaces occupied by the public;
- input limit value: maximum noise value introduced into enclosed or outdoor spaces by the whole of the noise sources, measured close to the receptor;
- attention value: noise value that indicates a potential health hazard or a presence of risks for the environment;
- quality value: noise value to achieve in the future, in order to obtain the aims expected by the law.

Acoustic Territorial zoning

Different Limit Values

Areas	Absolute input Limit values Leq dB(A)		Emission Limit Values Leq dB(A)		Quality Limit Values Leq dB(A)	
	day	night	day	night	day	night
Area I Particularly protected areas	50	40	45	35	47	37
Area II Areas mainly dedicated to a residential use	55	45	50	40	52	42
Area III Mixed areas	60	50	55	45	57	47
Area IV Intensive human activities areas	65	55	60	50	62	52
Area V Mainly industrial areas	70	60	65	55	67	57
Area VI Exclusively industrial areas	70	70	65	65	70	70

Acoustic Territorial zoning

The Framework Law prescribes, related to Acoustical territorial zoning, the prohibition of the direct contact of the areas characterized by a difference of the limit values higher than 5 dB(A) of L_{eq} measured.

If the respect of this duty is not possible, especially in urban areas, an Abatement Plan will be expected

Acoustic Territorial zoning

methodology

general criteria

- The priority aim of the ATZ is to achieve a correct and accurate interpretation of the effective urban planning characterizations of the different areas, through preliminary analysis, regarding the town planning tools,(especially the town-planning scheme), the road network of the city, the traffic regulations, the displacement of the activities on the territory;
- The ATZ must consider the future projections in the zoning regulations;
- The coordination with other town planning tools will be expected;
- An extreme subdivision of the territory must be avoided;

Acoustic Territorial zoning

methodology

general criteria

There are two main approaches for the project of ATZ and for the identification and evaluation of the different areas:

- **the qualitative approach**
- **the quantitative approach**

The qualitative approach is based on the direct and in-depth analysis of the characteristics of the territory involved in the ATZ planning, based on town-planning scheme

The quantitative approach is based on a computation of a set of parameters and indexes able to characterize the territory analyzed

Acoustic Territorial zoning

Methodology

identification of the areas

The classification of the territory of the municipality in homogeneous areas characterized by the noise limit values, is carried out by the identification of the six areas, through the main following parameters:

- **density of population**
- **presence and typology of road and railway traffics**
- **presence and importance of commercial, handcraft and industrial activities**
- **presence of “sensitive receptors”**: activities, and buildings where they are carried out, which have to be more protected (they belong to the Area 1)

Acoustic Territorial zoning

Methodology

identification of the areas I, V, VI

The first step for the characterization of the six areas is the identifying of the areas more easily identifiable: the I area, (particularly protected area), characterized by higher protection and lower limit values (40-50 Leq dB(A)), and V area (mainly industrial areas) and VI area (exclusively industrial areas), with higher noise values admitted (60-70 Leq dB(A)).

Acoustic Territorial zoning

Methodology

identification of the areas I

Belong to the Area I the zones where the quiet is an essential requirement for the activities carried out:

- hospital, home for the aged
- schools
- areas dedicated to relax and recreation,
- public park,
- residential rural areas,
- more interesting urban planning areas
- more interesting archaeological, architectural, artistic, environmental, landscape, cultural zones

Acoustic Territorial zoning



Rome, ATZ, Archaeological area

Source: http://elevation.it/ZONACU/servlet/zonacu.servlets.S_NavigaMappa

Acoustic Territorial zoning

Methodology

identification of the areas V,VI

Belong to these areas the zones interested by industrial activities.

Often the town-planning scheme identifies them.

The distinction due to the presence of residential buildings is very important: in the V areas there are a low presence of residential building, in the VI area there are not residential buildings.

Acoustic Territorial zoning

Methodology

identification of the areas II, III,IV

Belong to these areas the zones characterized, with different levels, by the presence of transport infrastructures, different density of population, different presence of commercial, handcrafted and industrial activities.

For the identification it is possible to use both the approaches mentioned before, **qualitative** and **quantitative**.

The qualitative method concerns of a direct and in-depth analysis of the characteristics of the territory

In the quantitative method the different degrees of the parameters chosen for the evaluation may be used to distinguish the different zones

Acoustic Territorial zoning

Methodology

identification of the areas II, III,IV

For each area analysed the following factors must be evaluated:

- density of population
- presence of commercial activities and offices
- presence of handcrafted activities or factories
- typology of road traffic (number of vehicles per hour)

Acoustic Territorial zoning

Methodology

identification of the areas II, III,IV

Focusing on a defined area (for instance, a block of houses) the factors mentioned above have to be quantified:

density of population	number of inhabitants per hectare (square measures)
density of commercial activities	area of the store/ total area
density of handcraft activities	area of the store/ total area
road traffic	number of vehicles per hour

Acoustic Territorial zoning

Methodology

identification of the areas II, III, IV

Classes of variability are defined for each parameter, for example: low, medium or high density, and scores are associated to the different classes.

The amount of the scores allow to define the identification of the II, III, IV areas

Score	Acoustic Area
$x \leq 4$	II
$x = 4.5$	II o III (*)
$5 \leq x \leq 6$	III
$x = 6.5$	III o IV (*)
$x \geq 7$	IV

(*) to be evaluated for each case

Source:

Linee Guida relative ai criteri per la classificazione acustica dei territori comunali. APAT, 2007, p.20

Acoustic Territorial Zoning

Transport infrastructures

The road and rail networks and their buffer zones are placed on the previous acoustic territorial areas identified.

In the buffer zones, described by national decrees, specific limit values, related exclusively for the noise emitted by specific infrastructure, are in force.

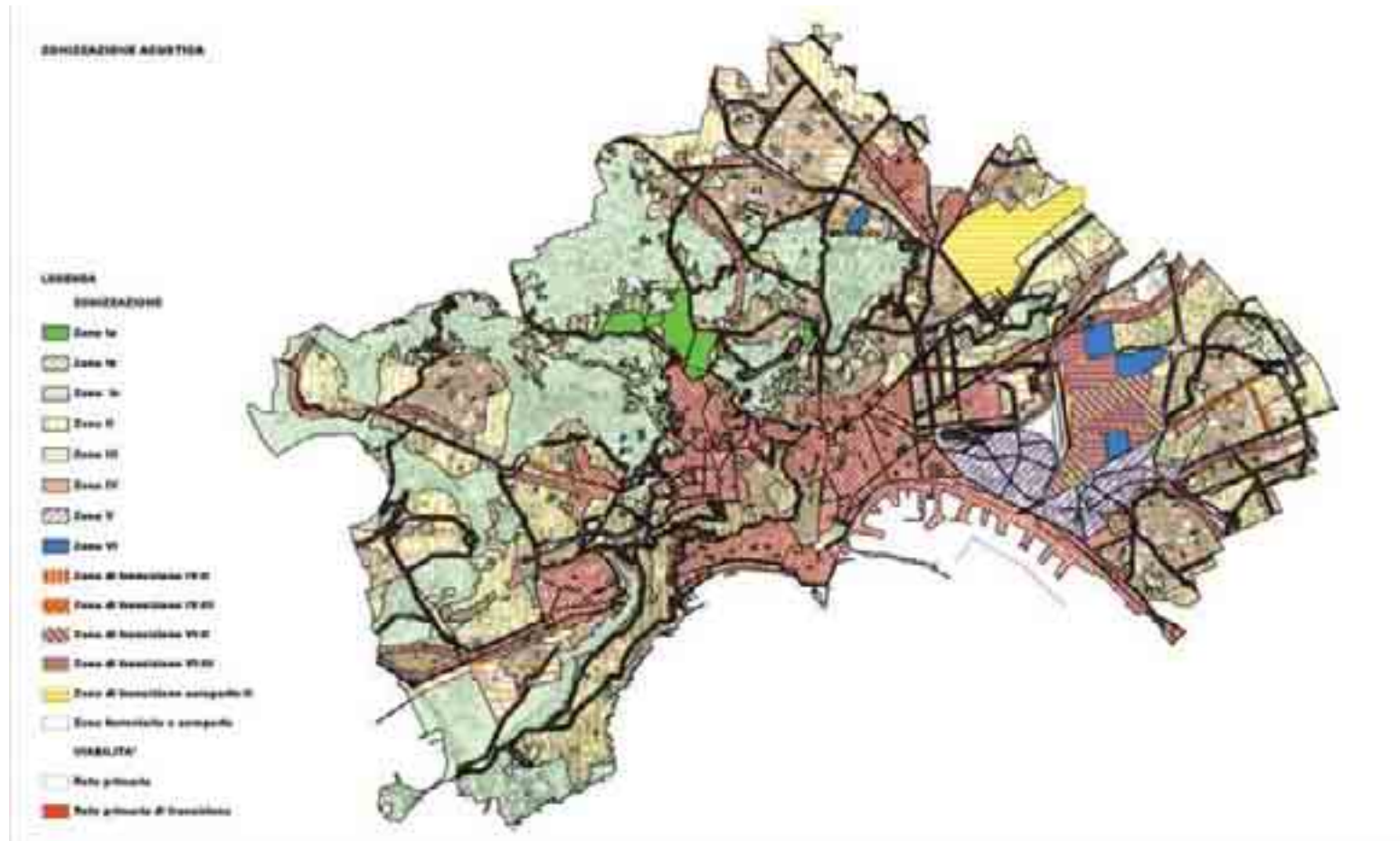
The acoustic characterization of the areas close to the airports is explained by national decrees, using a specific noise indicator.

Acoustic Territorial Zoning

For a correct and effective outcome of the methodology it is important to use both the approaches, adapting them to the requirements of the characteristics of territory.

To achieve the objective of an “acoustical planning” of the territory, able to control noise emissions, cooperating with the existing “planning system”, it is also important to avoid the excessive subdivision of the zoning, the breaking up of the territory into small areas.

Acoustic Territorial Zoning









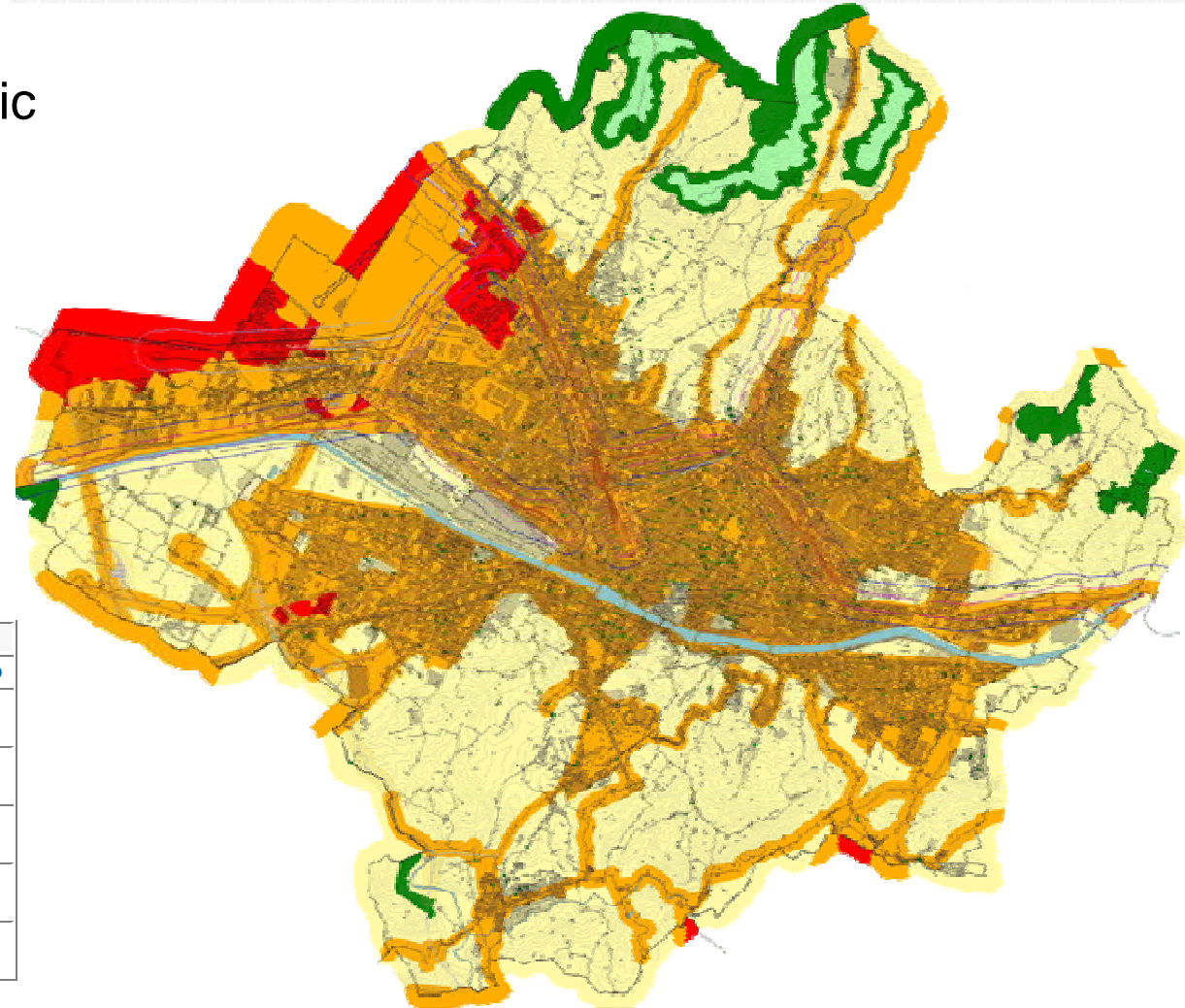
Naples, Acoustic Territorial Zoning

Source: <http://comune.napoli.it/zonizzazione-acustica/intro.htm>

Acoustic Territorial Zoning

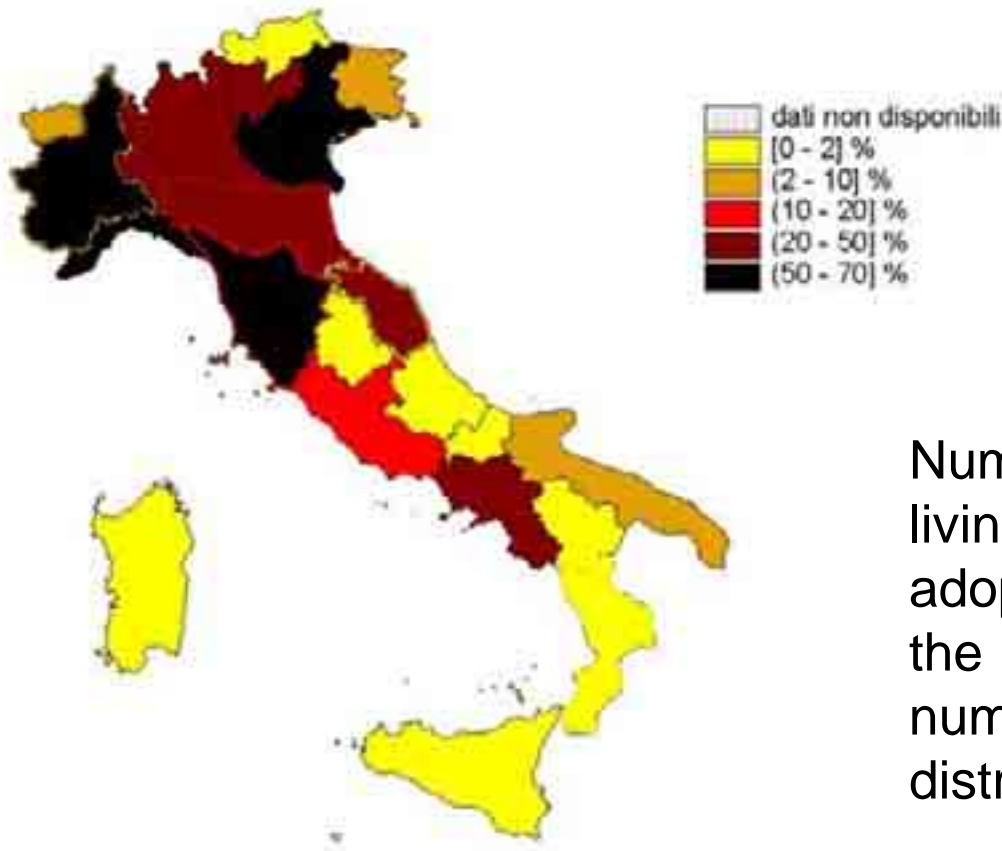
Florence, Acoustic Territorial Zoning

Classificazione acustica	
	Spettacoli all'aperto
	Classe I 50-40 dBA
	Classe II 55-45 dBA
	Classe III 60-50 dBA
	Classe IV 65-55 dBA
	Classe V 70-60 dBA



Source: http://www.comune.firenze.it/servizi_publici/ambiente/tutela_ambientale/map_rumore.htm

Acoustic Territorial Zoning



Number of people, in percentage, living in municipalities that have adopted acoustic classification of the territory, related to total number of people living in the district.

Source: Environmental Data Yearbook 2007 – APAT

Noise abatement plan

Framework Law n. 447/95 on noise pollution prescribes the adoption of an Abatement Plan in the following situations:

- when the attention limit values, established by the law, indicating a potential health hazard or a presence of risks for the environment, are exceeded
- related to Acoustical territorial zoning, there is the prohibition of the direct contact of the areas characterized by a difference of the limit values higher than 5 dB(A) of L_{eq} measured. If the respect of this duty is not possible, especially in urban areas, an Abatement Plan will be expected

Noise abatement plan

Noise Abatement Plan must include:

- the identification of the noise emissions (type and entity) and noise sources belong to the areas that must be reclaimed
- the identification of the actors that are responsible for the editing of the plan
- the identification of the priorities, methods and times of the plan
- the valuation of the costs
- the possible precautionary measures in case of emergency, in order to protect human health and the environment

Noise abatement plan

A Noise Abatement Plan will be characterized by different measures and actions:

- administrative provision (suggestions for the planning activities)
- legislative measures (set of rules and regulations about road traffic or buildings or health)
- financial measures
- the plan with the technical measures for the noise abatement

The NAP will be a system of different well-coordinated actions devoted to the progressive noise abatement

Noise abatement plan

The basic element for the drafting of a Noise Abatement Plan is the analysis of the noise pollution caused by the transport infrastructures (road, railway, air, sea, river traffic), by the factories and industrial stores, by the productive activities, therefore it's essential a study of the noise sources, carried out using different criteria:

- noise sources survey
- monitoring noise levels system
- national noise observation system
- land register of the noise sources
- noise mapping

Noise abatement plan

The acoustic characterization of the territory may be carried out by mathematical models, or using a monitoring system, through noise pollution testing stations, or a combination of both tools.

The END 2002/49, European Noise Directive relating to the assessment and management of environmental noise, introduces the “**noise mapping**”, related to a specific noise source and the “**strategic noise map**”, concerning the global assessment of noise exposure in the area considered.

Noise abatement plan

The comparison between the Acoustic Territorial Zoning and the Noise Map underlines the critical areas or noise situations existing

The factors considered for the identification of the priorities for the achievement of the noise abatement plan may be:

- number of people exposed to noise levels;
- zoning area considered;
- degree of the overcoming of the noise limit values;
- economic costs
- effectiveness of the actions established

Noise abatement plan

Technical actions and strategies for the noise abatement may be distinguished into:

- **preventive measures:**

- information on environmental noise available to the public;
- improvement of noise data reports;
- adoption of a management plan

- **passive actions:**

- soundproofing measures on buildings;
- insulating barriers

Noise abatement plan

Tecnichal actions and strategies for the noise abatement may be distinguished into:

- **active actions:**

- town planning measures;
- porous road surfaces
- noise reduction measures in the road traffic sources (soundproofing, reducing speed, increasing public transport);