

Recreational noise:

Impact and costs for disturbed residents in Milan and Turin

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ABSTRACT

European cities are experiencing a particular type of noise pollution originated by recreational activities located in the city centers, both anthropic noise, created by the presence of hundreds of people in the movida streets at night, and outdoor music due to events or simply related to public places. In spite of the annoyance experienced by the people living in these areas, the phenomenon has not been investigated yet. The paper presents the results of a self-selected Italian sample obtained through a questionnaire on line aimed at threading some light on the nature of the problem, in particular: individuation of the most concerned areas, characteristics of the people complaining and evaluation of economic, health and everyday life consequences. Phonometric measurements for environmental noise evaluation have been carried out in critical Turin and Milan areas with the aim to give a technical basis to a subjectively reported annoyance.

Keywords: Recreational noise, Movida, Costs

I-INCE Classification of Subjects Number(s): 52.7, 67.4

1. INTRODUCTION

Noise pollution adversely affects the lives of millions of people with serious consequences on their health. According to the World Health Organization in the Report “Burden of disease from environmental noise” (WHO-JRC, 2011): “*One in three individuals is annoyed during the daytime and one in five has disturbed sleep at night because of traffic noise. Epidemiological evidence indicates that those chronically exposed to high levels of environmental noise have an increased risk of cardiovascular diseases such as myocardial infarction. Thus, noise pollution is considered not only an environmental nuisance but also a threat to public health. The results indicate that at least one million healthy life years are lost every year from traffic related noise in the western part of Europe. Sleep disturbance and annoyance, mostly related to road traffic noise, comprise the main*

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burden of environmental noise”.

The more relevant sources of noise pollution, and consequently those which have been mainly investigated, are related to traffic and industrial activities. However, in the last three decades European cities have been affected by a particular type of noise pollution stemming from recreational activities generally located in the city centers, the so-called *movida*, which is the heart of the night time economy, seen by the local authorities as a means of revitalizing urban areas. It is a very complex phenomenon carrying relevant potentials in terms of social and economic benefits, but also problems related to the impact of alcohol on crime and disorders, coupled with public nuisance caused by recreational noise pollution.

In spite of its relevance, the phenomenon has been poorly investigated so far: recreational noise is not even mentioned in the EEA Report, Noise in Europe 2014, where environmental noise is defined as “unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport, road traffic, rail traffic, air traffic and from sites of industrial activity”.

The paper intends to address the issue studying the impact on people living in the affected areas by using two distinct means of analysis.

The first one presents the preliminary results of an original on line questionnaire whose aim is to analyze characteristics and problems experienced by residents disturbed by recreational noise in Italian *movida* districts, especially in Milan and Turin. It consists of questions on living conditions, life quality in the area, characteristics of noise annoyance concerning sources, time slots, intensity and frequency, self-reported health effects due to sleep disturbance, costs borne by people in the attempt to mitigate or solve the problem, estate devaluation, attitudes, reactions and general information on the respondents. Night noise affects sleep, everyday life, health, particularly cardiovascular and stress related disturbances. Estate depreciation and expenses to mitigate the problem are rather consistent.

The second part of the paper is aimed at giving a technical basis to the subjectively reported annoyance in the questionnaire. Phonometric measurements for environmental noise evaluation have been carried out in central areas, three in Milan (Navigli, Città Studi and Brera) and three in Turin (San Salvario, Vanchiglia, Piazza Vittorio) resulting as particularly critical from the questionnaire. The results show, accordingly to what declared by respondents, very high levels between 11 pm and 02 am, both with open and closed windows, especially considering that involved areas are characterized by low or no car traffic. Noise from music due to outdoor events (theatrical events, conferences, shows, concerts, festivals) or simply related to public places is discussed as well.

A final section discusses urban planning actions to deal with the *movida* challenge.

2. THE QUESTIONNAIRE

1.1 The sample

The paper presents the results of an unrestricted, self-selected survey, which gave rise to a non-probabilistic sample obtained through a questionnaire on line aimed at threading some light on the situation of residents disturbed by recreational noise. It can be seen as a snowball sampling, often used in hidden populations, as recreational noise presents, in fact, a very scattered situation which is difficult for researchers to access; the disturbance experienced by two neighbors may be very different, according, for instance, to the location of bedrooms or to the floor. (Fricker, 2008).

The results highlighted in this paper do not, then, describe the overall situation in *movida* districts, but are intended to explore the relevant issues of disturbed residents: they will need to be supplemented with ongoing research based on probabilistic samples.

The questionnaire, promoted through Anti-Noise sites and associations of residents, is available on line at <https://is.gd/rumore>.

In fact, the questionnaire starts with general questions on the living conditions in the area in terms of safety, sanitary conditions, facilities, transportation, leisure, then gets to night noise disturbance. The results we report only consider people who answered affirmatively.

The questionnaire launched in January 2015 has reached 1100 households all over Italy: big cities with more than 800.000 inhabitants represent 66% of the sample, medium sized cities (100.000-200-000 inhabitants) 21% of the sample and small cities (less than 100.000 inhabitants) 13% .

Respondents are 55% women and 45% men. As for age groups, nearly 60% are in working-age between 30 and 65 years, whereas retired people account for 15% of the respondents. Average age group is 54. The average household size is 2.44. The education level of the sample is far above the average Italian education level: nearly 70% of graduate people without significant differences for gender or for city. This may be explained by multiple reasons: the digital divide caused by the on line questionnaire and social and economic factors due to the location of movida in city centers. Respondents are longtime residents as 37% have been living in the same house for up to 20 years so witnessing the transformation of the areas. Profession questions show a substantial equilibrium between employees and freelance, around 38% each.

The average number of late night bars and pubs around the residents' home is very impressive: 3.38 within 20 meters, 7.19 within 50 meters and 14.15 within 100 meters, giving a clear idea of the recreational districts' density, which does not significantly differ according to cities' size or in the comparison Turin- Milan.

An important discriminating question to evaluate annoyance due to recreational noise and to understand why some residents report annoyance and others don't, appears to be the presence of bedrooms exposed to noise at night, either street or courtyard noise. In fact, 85% of disturbed respondents are in such a situation. First and second floor inhabitants also appear to be more disturbed.

We mainly concentrate on the situation of Milan and Turin, with respectively 153 and 140 answers, where the most relevant movida districts are well represented: in particular Navigli, Città Studi and Brera for Milan; San Salvario, Piazza Vittorio and Vanchiglia for Turin.

1.2 Noise disturbance

Annoyance due to recreational noise is mainly dependent on loud music and squall coming from pubs, restaurants, clubs and discos, broken bottles, traffic at late night, spontaneous concerts.

We can enucleate three typical noise paths: noise entering through the building façade from the street, noise coming directly through the building structure because of poor sound insulation and poor limitation of the audio system and noise coming from the back of the building where often the service machinery is set. In the case of Movidia or outdoor music, the first case is the most frequent and has been worsened by smoking prohibition inside the premises. The other two paths are also present depending on many factors (geometry, local noise permit rules, type and age of building, etc.); low frequencies diffusion through the building structure is particularly serious when discos or late night pubs are located in the building itself.

Respondents were asked to indicate the degree of experienced noise annoyance in the previous twelve months for four different time slots: daytime, 07-19, evening, 19-23, night, 23-03 and late night, 03-07. The scale ranges from 1 to 5, where 1 means no disturbance and 5

maximum disturbance, which heavily interferes with current activities.

As the results in Table 1 show, recreational noise pollution starts with the happy hour, is really problematic between 23 pm and 3 am (63.3 % of the respondents indicate 5) and then decreases, but remains a serious problem even later in the night (nearly 40% considering 4 and 5 answers), especially in larger cities.

Table 1.

Noise disturbance levels (1 to 5) for different time slots (% in each class)

Time slot	1 Neutral	2 Slightly disturbed	3 Moderately disturbed	4 Considerably disturbed	5 Extremely disturbed
07-19	29.6	37.9	21.3	7.7	2.6
19-23	1,8	17.8	26	38	16
23-03	0.6	3.0	9.5	23.7	63.3
03-07	14.8	23.1	20.7	24.9	16.6

Table 2 provides the average disturbance levels in the four time slots in small, medium and large cities. Perceived disturbance is rather similar, just late night hours are more disturbed in large cities.

Table 2.

Average noise disturbance levels (1 to 5) for different time slots in small, medium and large cities

	07-19	19-23	23-03	03-07
Small cities	2.24	3.82	4.41	2.76
Medium cities	2.60	3.40	4.48	3.2
Large cities	2.21	3.50	4.48	3.03

The disturbance, mainly originated by loud music and customers' yelling, is experienced by a majority of respondents nearly every day, even if weekend nights are busier. Summer period, especially in touristic cities, is more affected.

Noise pollution heavily interferes with sleeping hours, causing weariness and loss of concentration in daytime activities, both work and leisure. Behavior at home is altered in various ways: as windows cannot be opened at night, people, in order to rest, go to sleep in the

quietest part of the flat, usually the kitchen. They are forced to go away for the weekend, if they can afford it, and have to wear earplugs. Besides, they are in trouble if Saturday is a working or school day.

The usual cliché on disturbed respondents as old grumblers, is likely to be disproved by tables 3 A, B, C showing that reported noise annoyance levels do not seem to be significantly affected by gender, profession or age group.

Table 3. A. Average noise disturbance levels (1 to 5) for gender

Gender	Average disturbance (1-5)	Average disturbance (1-5)
	Milan	Turin
Female	3.87	4.27
Male	4.24	4.26

Table 3. B. Average noise disturbance levels (1 to 5) for age group

Age group	Average disturbance (1-5)	Average disturbance (1-5)
	Milan	Turin
19-30	4.17	4.50
31-50	4.29	4.38
51-65	3.70	4.24
Over 66	3.89	4.06

Table 3. C. Average noise disturbance levels (1 to 5) for profession

Profession	Average disturbance (1-5)	Average disturbance (1-5)
	Milan	Turin
Housewife	4.6	4.1
Employed	4.02	4.20
Retired	3.45	4.50
Student	4.00	4.80

1.3 Reported health effects

As the European Commission, 2004, states: “*Prolonged exposure to noise can lead to serious health effects mediated by the human endocrine system and by the brain, such as sleep disturbance, cardiovascular diseases, annoyance (a feeling of discomfort affecting general well-being), cognitive impairment and mental health problems. It can also cause direct effects such as tinnitus.*”

http://ec.europa.eu/environment/noise/index_en.htm

A specific section of the questionnaire has been devoted to investigate the relationship between sleep deprivation due to night noise pollution and health effects. In particular, the consequences on cardiovascular and stress related diseases are considered by asking if the respondent or some other member of the family is affected. The answers in Table 4 show a high prevalence of both cardiovascular and stress related diseases.

Table 4. Prevalence of cardiovascular and stress related diseases (% in each class)

	Tachycardia	Hypertension	Concentration problems	Insomnia	Irritability	Anxiety
No one in the family	57.2	63.7	39.6	11.3	18	19.9
One member in the family	33.3	27.8	36.5	47.3	42.9	47,1
More than one in the family	9.5	8.5	21.9	41.4	39.1	33

It is worth noticing that tiredness, irritability, as well as anxiety and stress, do concern more than one of the family components hit by sleep deprivation in nearly 40% of cases. Also reported by nearly 50% of the respondents are the prescriptions of anxiolytic, sedatives and hypnotics medications, because of sleep deprivation due to night noise pollution.

1.4 Costs

The European Commission states that:” *The effects of exposure to noise impact EU economies. They lead to a loss of productivity of workers whose health and well-being are affected by noise, put a burden on health care systems and **cause a substantial depreciation of real-estate value.***”

The adverse environment for an apartment located in a movida district will result in a lower market value as compared to an apartment with similar characteristics, except for recreational noise. This occurs because potential buyers reduce their demand, as they discount present value of the costs of annoyance, loss of tranquility, and possible health effects. A measure of the noise-induced damages is the difference between the market-determined values of the two apartments.

Some claim the average price of square meter of properties has increased after movida developed, at least in certain districts, which were previously dilapidated and where nighttime economy was seen as a means to restart an area. On the other hand, Patrigest, an Italian company specialized in Valuation and Advisory for real estate, conducted in 2011 a research in Rome and Milan reaching the conclusion that excessive noise, in particular because of nearby pubs and discos, depreciates the real estate’s value by 10 and 20%.

The two statements are not necessarily contradictory because we face a fragmented situation where two neighbors may report very distant night experiences, according, for instance, to the location of bedrooms. If bedrooms overlook a protected courtyard, the estate is rather quiet and inhabitants may not suffer from noise pollution, but enjoy the lively atmosphere at no environmental costs. Such scattered situation makes it difficult to study the problem and made us choose a self-selecting sample, despite the bias risks, to investigate the reasons of disturbed people.

Respondents seem aware of the risk as 82% of respondent in Milan and 85% in Turin think that noise bears a negative impact on their dwelling. Even if nearly 70% had a certain point the intention to move house, only 8% in Milan and Turin really tried to list it, possibly because appraisal of the house, requested by 27.9 % in Milan and 35.2% in Turin, heavily highlighted the depreciation.

Costs incurred by disturbed residents in order to mitigate or solve the recreational noise problem are presented in Table 5: the reported average expenditure for each item takes into account only the households who really incurred that expenditure.

Table 5. Reported households' expenditures

	% of households reporting some expenditure Milan	Average Expenditure of households reporting some expenditure (euros) Milan	% of households reporting some expenditure Turin	Average Expenditure of households reporting some expenditure (euros) Turin
Soundproofing	28,8	7515	21,6	4906
Double -glazing	62,2	7913	53,6	5028
Renovation	9,5	9200	13	8800
Forced weekends	37,5	3875	42,7	2010
Legal action	19,7	3080	14,3	2696
Phonometric measurements	16,4	1059	7,2	1770

Because of noise pollution 72% of the households in the sample considered to sell the house, 35% had a real estate expertise and nearly 80% think that noise negatively affects the estate value.

Soundproofing and double-glazing are rather self-explanatory; renovation usually refers to the attempt to mitigate the problem by moving the bedroom in the quietest part of the apartment, usually in the kitchen. Forced weekends are invoked by a majority of respondents, but many say they cannot afford them, or at least not regularly.

The negative impact of recreational noise on residents' welfare, both on physic and psychological wellbeing, is quantified by the means of two approaches: the revealed preferences and stated preferences.

In particular, to evaluate the impact of noise in monetary terms, the starting point in environmental economics is the notion that welfare variations may be interpreted as utility variations. Two measures to read utility variations in monetary terms are used in economics: compensatory and equivalent variations. Quantitative variations may be expressed as the willingness to pay (WTP) or as the willingness to accept compensation (WTA). The WTP is the highest price an individual is willing to pay for some good or service, which, in our case could be represented by a marginal reduction in decibel level. The WTA is the lowest sum an individual is willing to accept in order to bear a cost, in our case an increase in the noise level.

In the questionnaire, willingness to pay of residents has been tested by asking: "if the local authorities proposed a credible and costly plan to reduce movida noise, would you agree to

contribute?"

Answers seem to confirm the view that citizens consider as fundamental and non-negotiable the right to sleep at night with refusals to contribute of 53.5% in Milan and 63.9% in Turin, and 24.4% and 18.1%, respectively, to contribute only if all citizens, even those non suffering the problem, would participate.

There was also a question testing the willingness to accept: "in case you were willing to file a civil suit for compensation of physical, moral and material damages suffered because of recreational noise, what would be the amount of damages requested?" Unfortunately, the answers were very emotional, declaring extremely high amounts, coherent with the position that the right to sleep at night is invaluable, as also expressed in the WTA question.

Asked about a reasonable closing hour of clubs, 82% of the respondents recommends midnight during the week, whereas during weekend nights 43% indicate 1 pm.

1.5 Solution strategies

The difficulty of the situation is well represented by Table 6, which enumerates the various strategies used by residents to react to the noise disturbance. The average number of steps is very impressive: 40 in Milan and 32 in Turin.

Table 6 – Adopted solution strategies (% in the sample)

	Milan	Turin
Contacts with customers	19.8	33.7
Contacts with managers	61.6	54.2
Local Police	71	82
Carabinieri or Police	34	52
Local authorities	31.4	45.8
Media	25	27.3
Legal Action	25	27
Citizens' Associations	58	72.5

Contacts with customers and managers appear to be the first action carried out by residents. Then local police, who reports that noise complaints are the first cause people complain at night.

Civil and criminal cases are undertaken by respondents either personally or in-group, for instance the members of the apartment building. Media are involved to publicize the problem. Interesting is the spontaneous creation of associations of disturbed resident against the excess of movida nights, at district and town level, which recently gathered in an Italian network. An

European network has developed in 2016, Réseau européen vivre la ville, which gathers citizens' associations developed for the same reasons in Italy, France, Spain, Portugal, Holland and Belgium.

2. PHONOMETRIC MEASUREMENT CAMPAIGN

Phonometric measurements were carried between 2014 and 2016, in the apartments of some of the people who answered the questionnaire and, for outdoor music, in apartments of people disturbed by noise.

In particular, we concentrated for the Movid noise on the cities of Turin and Milan: three measurements were carried out in Milan in three different movida districts (Navigli, Città Studi and Brera) and three in Turin (San Salvario, Vanchiglia, Piazza Vittorio).

The sound pressure levels (SPL) measurements started at 23.30 up to late night in order to verify the noise levels really experienced by people reporting a nighttime noise disturbance in the questionnaire. The sample measurements had duration of 15 minutes and were performed with open and closed windows on the street side of the building to characterize both the sound pressure level introduced in the apartment and the windows' insertion loss.

In all the situations, one or more public exercises were present in proximity (within 30 meters) of the building where the measurement was carried out.

For the outdoor music noise, many phonometric measurements were carried in large towns as also in little seaside villages very busy during the summer period.

2.1 Movid noise measurement results

Table 6 provides the results of measurements; "p.p". means "public place", "o.w." means "open windows" and "c.w." means "closed windows".

Table 6. Milan phonometric results.

Measurement situation description.	Floor Week day	Measured situation description	Nearest p.p. (m)	Laeq o.w. dB(A)	L90 o.w. dB(A)	Laeq c.w. dB(A)	L90 c.w. dB(A)
Bedroom, old window, new window glasses.	1 Frid	"Navigli" area, pedestrian street. People walking and talking and car far away.	5	58.5	54.8	34.4	31
Bedroom, old window	G Wed	"Città Studi", flat next to p.p., no sound insulation	2	--	--	38.8	34.5
Living room, old windows	1 Thurs	Brera pedestrian street. People walking and talking	5	59.9	56.5	40.9	37.2

Table 7. Turin phonometric results (Saturday night).

Measurement situation description.	Floor	Measured situation description	Nearest p.p. (m)	LAeq o.w. dB(A)	L90 o.w. dB(A)	LAeq c.w. dB(A)	L90 c.w. dB(A)
Bedroom, new windows, old rolling shutter box.	4	Pedestrian area in “Vanchiglia”. About 80 people talking, cars far away.	50	60.7	57.8	38.6	36.2
Bedroom, double window.	2	Narrow street in the “Vittorio Square” area. About 60 people talking and cars	15	66	61.6	23.6	20.3
Bedroom, old window with new window glasses.	3	“San Salvario” area. About 100 people in a little square and few cars.	35	64.1	60.9	43.1	49.3
Bedroom, old windows.	1	Vittorio Square.	5	70.2	n.a.	53.4	n.a.
Bedroom.	1	“San Salvario” Area.	20	64.7	n.a.	n.a.	n.a.

2.2 Movida Noise Measurement result analysis.

Measured levels with open windows are very high, especially considering that they refer to areas with low or no car traffic and in a time period between 11 pm and 02 am. Some measurements were carried out outside the weekend days to make possible a comparison with the peak days (Friday and Saturday).

Registered values show sound pressure levels at the first floor varying between 58.5 and 70.2 dB (A). The inhabitants specify that noise level grows between 10 and 12 pm, then stabilization follows until 02 am followed by a slow decrease up to 04 am.

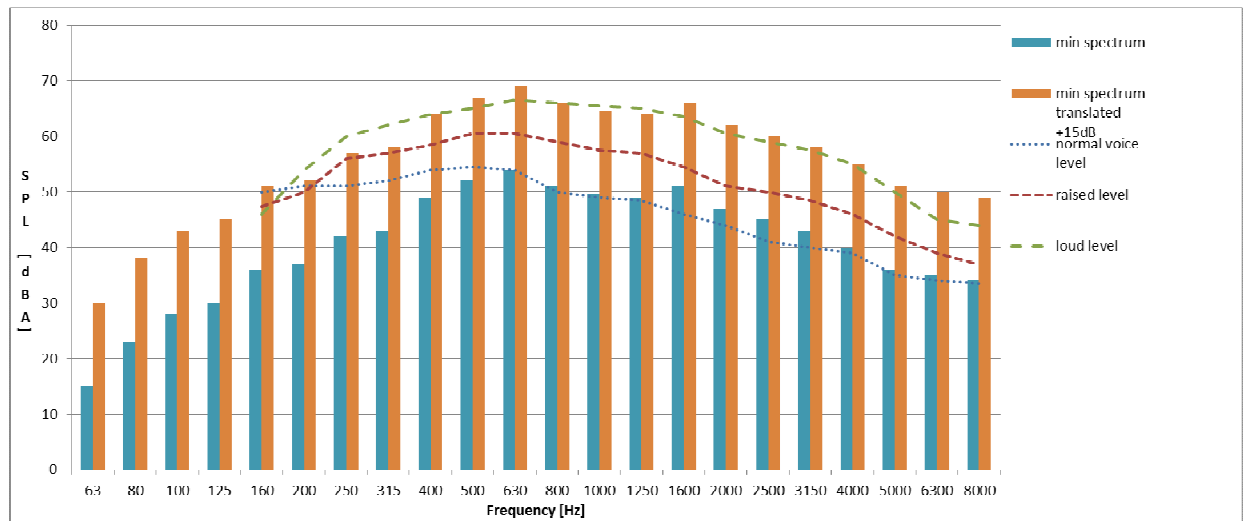
The areas interested by the measurements in Milan and Turin, according to the municipality noise plan, belong to the classes III (mixed type areas) and IV (intense human activity areas) of the acoustic zoning. The nighttime absolute limits by the Italian administrative law DPCM 14/11/97 are 50 dB (A) for the 3rd and 55 dB (A) for the 4th, meaning that the measurements always exceed the allowed levels, even by considering sound energy on the entire night reference time (8 hours). Many of them even exceed the levels of a 5th class (predominantly industrial Area) equal to 60 dB

(A) on the nighttime period. The administrative decree also sets that, inside the receiver buildings, the noise level during the night period should not be higher than 3dB as compared to the residual noise (L_{Aeq} background level without the annoying noise). The open windows measurements easily show that both criteria are disregarded: movida districts are de facto outlaw zones within the city.

Anthropic induced noise is a very annoying signal. When the traffic component is absent and only the human one is present in the street, we notice that even in the open window measurements the sound spectrum of the measure minima has always the maximum energy between 500 and the 4 KHz, as shown in fig. 1. It is quite interesting how the minima spectrum shape in frequency very well fits the ANSI reference spectrum of loud voice (green line, for a better shape comparison we gave +15 dB gain to the minima level – this measure is with open windows at 6 m from the street on a busy night).

Observing the percentile levels we can notice that the difference between L_{Aeq} and the L_{90} (the sound pressure level exceeded for the 90% of the measurement time), even in a short measurement time of 15 min, is no more than 4 dB: this confirms the presence of very compressed noise energy and defines an almost constant noise level.

Figure 1. Min spectrum with human noise only.



2.3 Considerations about sound levels with closed windows

Such high external sound levels create problems with traditional façade insulation technologies. The windows normally present in old residences in Italy today were retrained in the last 20 years by changing the glass: such windows have an insertion loss ΔL that varies between 20 and 24 dB (see tables 6 and 7). Such values of ΔL lead, inside the flats, sound pressure levels with closed windows that vary between L_{Aeq} 35 and 50 dB (A), as confirmed by

our sample measurements. These are still very high levels, especially because they are caused by human noise (voice, music, impulses caused by furniture moving, flatware etc.) and therefore more annoying. A thorough medical study is needed, but it is important to remember that traffic noise annoyance studies set a $L_{ASmax} > 35$ dBA for noise induced awakenings caused by a single drive-by (Hurtley 2009). It is obvious that these values prevent sleep, forcing many people to undertake renovation, moving the bedroom to the inside of the house or, at least, as far as possible from the noise source.

This means that costly actions are necessary, devoting sufficient attention to the laying and the selection of the windows and to all the connected technologies (i.e. rolling shutter box, double windows).

In a preceding paper (Rizzi, Nastasi, 2013) an average Italian nighttime background level with closed windows was calculated in $L_{Aeq} = 29$ dB (A), in situations of light traffic and recent windows without acoustic certification (with an insertion loss close to what was observed in this investigation). Comparing such average level with the results of this short measurement campaign, it is possible to estimate a differential level above the ‘normal’ Italian urban situation in the absence of ‘Movida’ for a closed window state between 6 and 21 dB confirming the annoyance.

As a side note, we remind that when the disturbing p.p. is situated in the same building of the receptor, such façade insulation works always cause an increase in the perception of the noise propagating from the p.p. through the building structure. The only solution that can be adopted in this case is designing and carrying out important insulation works in the p.p. property and limiting thoroughly the audio system.

2.4 Noise from music outdoors

Referring to recreational noise the authors must stress the impact of music, which represents a complex topic that will deserve further studies. In case of outdoor music, the noise energy at low frequencies is always higher than in the typical cases of movida we discussed, when the noise is mostly produced by people speaking.

In these cases, façade problems give higher closed windows levels because of a common poor insulation capacity of the windows at low frequencies.

Many measurements were performed by the authors in noise litigations caused by p.p. with external music: Table 8 shows examples of SPL measurements in different situations: little touristic villages, street artists with loudspeakers, big concerts.

In such cases, with open windows the differences between L_{Aeq} of the noise and L_{Aeq} of the background noise easily exceed 15 dB. Single events are generally not a problem but in case of events performed twice or three times a week for two, three months in the same place during summer period (i.e. music festivals or in case of street artists that daily perform in the same streets with amplified music), this could be a serious problem for the inhabitants’ welfare.

In the following table, some results of measurements we performed in the last three years using the administrative differential method that is generally officially waived by the municipality for special noisy events, are presented.

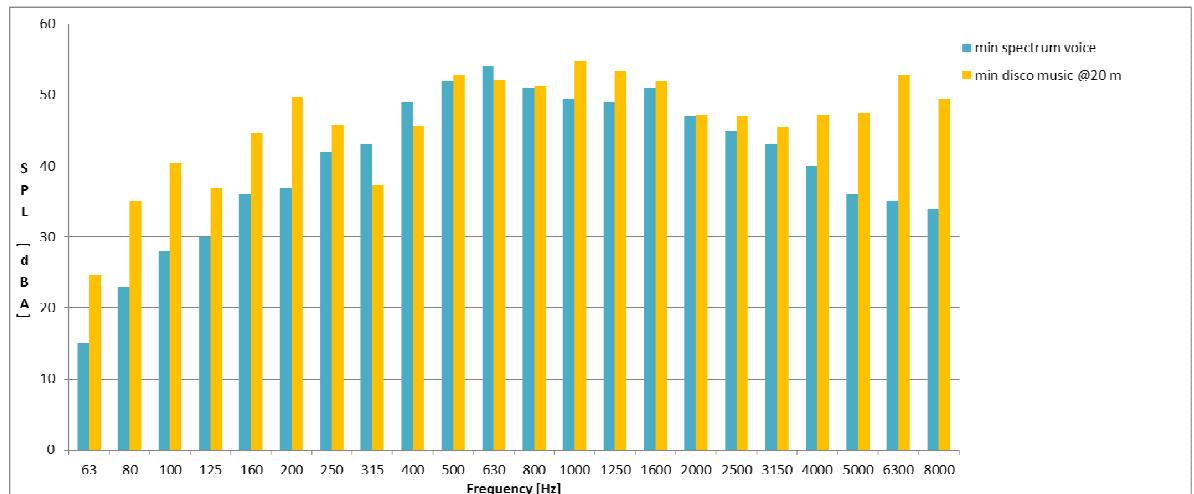
In the frequency domain, we see how amplified music always has a very strong low frequency content, which worsens the annoyance and makes noise control more difficult.

In this case as a first analysis (figure 2), we can still compare the minima values of a measurement in frequency. In the next figure, we see how in the case of a nearby p.p. with loudspeakers playing dance music at a distance of about 20 m all the values under 250 Hz are higher; these are much harder to stop even with modern windows.

Table 8. Outdoors music measurements

Event Type	Number of events	Laeq without event noise	Maximum noise allowed / Laeq of the measured noise dB(A)	Difference Laeq noise – Laeq without event noise dB(A)
Jazz Festival, large town	Five consecutive evenings from 22 to 00.30	61	73/ from 73 to 81	From 12 to 20
Summer events in a seaside village	3 or 4 events a week for two months, all in the same little square.	43.5	55/ From 63 to 81	From 19.5 to 37,5
Street artists in a high frequented street of a large town (high residual noise)	In the week end for many hours	56.8	70 / 67,7 at the 4 th floor	10,9 dB(A)

Figure 2. Min spectrum with human noise vs dance music.



2.5 Urban planning actions to deal with the movida challenge

As the 2014 EEA Report states “Noise pollution has long been recognised as affecting quality of life and well-being. Over past decades it has, in addition, increasingly been recognised as an important public health issue.” Municipalities have to decide how to protect their own citizens’ well-being, including sleep, a task that should be one of the reasons they were created for. Various alternatives, already practiced in major cities in Europe, can be envisaged. (Rizzi, Nastasi, 2014).

The first drastic solution is that, beginning from 11-12 pm, night recreational activities compulsorily move from the central-residential areas to peripheral ones with completely different characteristics: offices areas, ex handicraft or industrial zones, ex railway yards. Tax breaks and facilitations should be available to the p.p. opening new businesses in those zones, simplified conditions for live music and free shuttles will create a virtuous circle for everybody: the managers of the p.p., the participants of the movida, and the residents of the involved districts. This solution will decrease the global social costs related with the movida-generated noise and give rise to relevant economic and social opportunities.

Whether the town administrations are willing to maintain numerous p.p. in the residential zones, the choice is forced and already successfully experienced in many European cities: allowing openings of new p.p. in not inhabited buildings and forcing all the p.p. (new and already existing) to conform with precise sound impact evaluations, compulsory acoustic testing, heavy use of true electronic limiters on the audio systems, obligation to the residents to allow access for insulation studies. Unexpected controls from the township acousticians should be the norm, not necessarily following petitions for noise annoyance.

Proactive solutions should always tend to limit this complex problem and create an advantage to the p.p. owners: heavy insulations should be de-taxed, the use of smart technologies and low-cost SPL measurement devices allowing a rapid control to the p.p. owner himself and giving a register of the situation.

A problem, present in Italy, is that noise control studies are asked right at the time of the premise opening, and only on an estimated basis: it is important to ask also a trial with SPL measurements after the premise has worked for a few weeks, better if accessing the flat of a close-by resident. An awareness campaign should be addressed to the movida population and the p.p. owners implying clear solution-oriented guidelines.

The Italian existing tax allowance for insulation works is very important: first for the p.p., but also stimulating façade retraining by the residents. Windows retraining in the disturbed buildings should be paid by the p.p.; this is in contrast with the fact that by the Italian law noise levels must be respected always with open windows. Such tax allowances in Italy are already confirmed by the Stability law 2017, but they are almost never used by the disturbed residents or by the annoying activities. Besides there is rarely an acoustic project that technically analyzes the problem in its entirety.

Outdoor musical events should be carefully planned authorizing very few events in each location, requiring a specific time scheduling (the best acts are always the noisiest), or selecting special locations very distant from residential areas.

3. CONCLUSIONS

Although recreational noise has become a constant in European cities' evenings and nights, as city centers are increasingly transformed in touristic zones, as well as the first reason citizens complain at night with local police, the negative externality suffered by passive movida users, that is to say by the residents, has not been analyzed in its environment, economic and health effects

The questionnaire sheds some light on the nature of the problem by examining the situation in some Italian cities. Answers report a picture of really troubled nights in movida districts, with very loud anthropic noise until very late, sleep deprivation, health effects, house depreciation and high costs to mitigate the problem. Besides respondents highlight degradation and safety problems as well as viability and parking difficulties.

Phonometric measurements, carried out in Milan and Turin in movida districts, in order to

provide a technical basis to the subjectively reported annoyance by the questionnaire respondents, confirm the presence of very high, illegal levels within the resident's homes, both with open and closed windows, especially considering that involved areas are characterized by low or no car traffic and the time period was between 11 pm and 02 am, even in no weekend days.

Cities' nighttime with their backlog of noise pollution should be faced by local authorities in a systematic way implying an active city planning with solution-oriented guidelines, necessary to rethink the role of city centers reduced to urban holiday resorts for short stay tourists.

Cost-benefit analyses utilizing economic evaluations concerning the external costs of noise pollution, required by the European Environmental Noise Directive, should apply to recreational noise as well.

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