Noisy large events: overview of regulations in different countries.

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1. INTRODUCTION

Regulations for the control of noisy large events are often based on a balance between the interests of participants of these events and possible annoyance for neighbors of the venues where these events are held. Noisy large events can be divided in specific sport activities (all kind of motor sports such as car racing, motor cross, tractor pulling) respectively musical performances (pop concerts, dance parties). Especially musical performances often continue during late evening and night time.

The value of these events for society is commonly recognized. However, people unwontedly exposed to the involved noise emission often show a NIMBY (Not In My Back Yard) approach. Besides the noise effects all other consequences connected to the concentration of large amounts of people may influence the appreciation of these events in a negative way, such as traffic jam, parking problems and uncontrolled waste disposal. To minimize the annoyance on such events an integral approach of all these effects is necessary.

Large events are held in specific venues (sport stadiums, race circuits) or in open air facilities that are made suitable for that occasion.

This paper gives an overview of the way different countries deal with the noise aspects of noisy large events. Specific considerations for noise limits, such as disturbance of communication and sleep, are described. Also the way the noise emission has to be monitored will be discussed.

The paper gives recommendations for noise regulations for these type of events.

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2. General characteristics of noisy large events

Some general characteristics of noisy large events are:

- the noise emission is relatively high and cannot be reduced that much - with feasible and realistic provisions - that it will meet normal noise limits;
- they attract a large number of people;
- they occur only a limited times a year: in general 1 to 12 times on the same location;
- a duration time of (a part of) a day up to a couple of days after each other.

Furthermore, these events can be categorized as follows:

- musical performances, such as pop concerts and dance events in the open air or in a sports stadium with an open roof, see figure 1;
- sporting events such as sport car races on circuits, motocross, tractor pulling, see figures 2 and 3;
- events with a regular pattern regarding location and frequency (every year a couple of times on the same location) versus rather incidental and varying locations.

Figure 1 Dance event in Amsterdam Arena

Figure 2 Car race on regular circuit

Figure 3 Motocross

Local authorities tend to accept these events, considering the balance between the interests of participants and the commercial value for organizers of these events (and local companies that benefit from it too) versus possible annoyance to neighbors of the venues where these events are held. Considering that these noisy events occur occasionally, higher noise levels than for normal, non-incidental activities with a more continuous character are allowed.

3. General considerations regarding noise limits

N.B. Although attendants of pop concerts and dance events will qualify the acoustical exposure as sound (music), this paper consequently uses the word “noise” related to the emphasis on annoyance in the environment.

Possible criteria for noise limits might be:

- the number of (comparable) events at the same location per year;
- the part(s) of the day that the noise emission occurs, and the duration per part;
- the amount of people exposed in the vicinity of the venue;
- the special sensitivity to the noise for (a part of) the exposed people, for instance hospitals or psychiatric institutes;
- the character of the noise (for instance musical performances versus motocross noise);
- the acoustical character of the environment, for instance with high noise levels due to other noise sources, such as traffic or industry;
- exceeding in dB of the ambient noise (without the event);
- the technical or organizational possibilities to minimize or reduce the amount of annoyance in the environment;
- maintaining communication during day time and in the evening;
- prevention of sleep disturbance during night time.

It is well known that wind direction and wind velocity have a huge influence on the noise transmission to the environment. So a special consideration relates to the most dominant wind direction. However, if wind direction and velocity is very fluctuating from day to day, this should not to be considered. Events of the size that are dealt with in this paper are organized many months prior to the date of the event, so at that moment wind conditions are not known

for the date of the event. If wind conditions are constant and stable during most time of the year, this might influence the selection of the location of the event related to the location of dwellings.

4. Communication to people living nearby the venue

Within certain margins, adequate and timely communication to the local community about the duration of the event, and the time it starts and finishes, can help to reduce the amount of complaints, especially for incidentally occurring events that people are not used to experience. This is also true regarding the way the event is monitored in order to control the noise emission and to guarantee the event remains within the prescribed noise limits.

Furthermore all feasible noise reducing provisions should be applied and also communicated to people.

5. Side effects

Other unwanted consequences of large events other than noise are often the cause of complaints, such as traffic jams prior and after the event, waste disposal, uncontrolled parking in urban areas and other forms of misbehavior of visitors. Also safety aspects related to the movements of large groups of people are important to consider. A well organized event will take into account these aspects, and may help to reduce complaints about noise.

6. Examples of regulations in different countries.

6.1 Austria

Document: Larmschutzrichtlinie fur Freiluftveranstaltungen (Noise prevention guideline for open air events), second version 2011 [1].

Descriptor: L_{Aeq} over the duration of the music performance in front of a noise sensitive object. Taking into account the informative content of music a noise level supplement of +5 dB has to be applied on the determined noise levels before comparing these with the noise limits.

Defined periods:

– Day: 06.00 – 22.00 hours
– Night: 22.00 – 06.00 hours

The daytime period might be extended to 23.00 hours under certain conditions, such as for weekends, to guarantee a sufficient rest time.

The guideline deals with musical performances as well as noisy sport events such as motocross and kart circuits.

Table 1 shows the proposed noise limits outdoors if no more than ten events occur per year and if these are not consecutive (to be regarded as rare events). With these noise limits daytime communication and falling asleep at night can be maintained in residential area assuming closed windows.

Table 1 Noise levels for rare events (no more than 10/year), outdoors in Austria

Period	Noise limit (L_{Aeq})
Day	70
Night	50

If it is expected that an event will cause higher noise levels than those in table 1 the number of event days in the calendar year has to be reduced. For one event per year a noise level (L_{Aeq}) of maximal 80 dB(A) is allowed. Table 2 shows the noise limits related to the number of events per year.

Table 2 Noise limits related to the number of events per calendar year

Noise limit (L_{Aeq})	Number of events per calendar year	
in dB(A)	End before 10.00 (11.00) pm	End after 10.00 (11.00) pm
80	1	0
75	3	0
70	10	0
65	30*	0
60	-	1
55	-	3
50	-	10

*this number of events is no longer defined as rare

N.B. This guideline provides interesting sound power levels of distinguished events (musical performances, motor sports, related to the size, number of people, type of motor sport) and sound transmission formula, to be used for prognosis purposes.

6.2 Belgium

Flemish regulations in Vlarem-II chapter 6.7 [2] relate to festivals and musical events. It states that for not-specified musical activities the noise limits of the Royal Directive dated 24-02-1977 are not valid; local authorities can prescribe specific conditions for the event regarding noise limits and duration, or forbid it at all.

Brussels region: No specific noise limits. High Court recommends not to exceed 80 dB.

6.3 Canada

No national regulations exist for noisy large events. Sounds from public events are governed mostly by municipal bylaws and by provincial regulations to a limited extent.

The City of Montreal, for example, has a comprehensive noise bylaw that contains the following requirements:

– overall sound levels measured inside bedrooms (with the windows open) must not exceed 45 dB(A) (L_{eq}) during daytime hours;

– overall sound levels measured inside bedrooms (with the windows open) must not exceed 38 dB(A) (L_{eq}) after 23.00 hours;
– exterior noise on balconies must not exceed 60 dB(A) in daytime or 50 dB(A) at night;
– 5 dB penalties are to be added for sounds containing impulsive noise, information bearing sound (speech or music) and audible pure tones.

Adjustments to the limits are to be applied depending on the level of the background noise and for the duration of the emissions.

Montreal hosts several international outdoor events, such as the International Jazz Festival, the Grand Prix, Fireworks Competition, special concerts, that are exempted from having to meet these regulations.

6.4 France

Document: Decree 2006 – 1099 of the 31st of August 2006 on community noise control [8].
Descriptor: L_{eq} in dB(A)

Noise limits are based on the background noise. The noise due to the event shall not exceed the background noise with more than 5 dB during day time, respectively 3 dB during the night time. In addition it should not exceed 7 dB in the 125 and 250 Hz octave bands and 5 dB in the octave bands till 4000 Hz.

However, these regulations are valid for events in enclosed venues. New legislation is in preparation but not valid at this moment. So, in general local authorities apply specific regulations with higher noise limits for a limited number of events.

6.5 Germany

Documents:
- Freizeitlärmrichtlinie;
- TA Lärm.

Additionally regulations in the Bundesländer, for example in Nordrhein-Westfalen:
- Gesetz zum Schutz vor Luftverunreinigungen, Geräuschen und ähnlichen Umwelteinwirkungen – Landes_Immissionsschutzgesetz – LimschG, 18-03-1975, adapted 01-01-2007;
- Leitfaden zur umweltgerechten Durchführung von Volksfesten und ähnlichen Traditionsveranstaltungen (Nordrhein-Westfalen), 17-12-2009.

Descriptor: L_{AFTeq}, L_{AFmax}
Defined periods:

Monday-Saturday
- Daytime: 08.00 – 20.00 hours , period 12 hours
- rest hours 06.00 – 08.00 hours and 20.00 – 22.00 hours , period 2 hours
- Nighttime: 22.00 – 06.00 hours , period most significant 1 hour

Sundays
- Daytime: 09.00 – 13.00 hours and 15.00 – 20.00 hours, period 9 hours
- rest hours 07.00 – 09.00 hours, 13.00 – 15.00 hours and 20.00 – 22.00 hours , period 2 hours
- Nighttime: 22.00 – 07.00 hours , period most significant 1 hour

Noise limits depend on the kind of area. For instance for a general urban area (“allgemeines Wohngebiet”), outside dwellings:
- during day time on working days the noise limit is 55 dB(A);
- on Sunday and during “rest hours” (“Ruhezeiten”) the noise limit is 50 dB(A);

- during night time the noise limit is 40 dB(A);
- for incidental events (up to 10 times a year) 10 dB higher noise limits are acceptable if they dot not occur on two consecutive weekends; however, outside the “rest hours” the maximal allowable noise limit is 70 dB(A) and during the rest hours 65 dB(A) and for night time 55 dB(A). Peak levels shall not exceed the day time noise limit with more than 20 dB and the night time noise limit with more than 10 dB. Considering the interest of all involved parties (event organizer and people living around the venue) it is possible to deviate form the regulations as mentioned before including to proceed the event after 22.00 hours.
  Furthermore provisions have to be taken to reduce the noise emission to the surrounding dwellings a.s.o. This deals with an optimal orientation of the sound emission of speakers, clear rules about limiting the sound installation (if adequate: the application of a (sealed) noise limiter), during the most critical hours the emission of low frequency sound has to be reduced, a.s.o.

6.6 The Netherlands

There is no legislation with noise limits regarding events of which the noise emission exceeds standard noise limits for commercial companies. In general it is allowed that standard noise limits are exceeded twelve times a year due to a certain noisy activity. No legal noise limits exist for the amount these limits may be exceeded. A specific note of a provincial environmental inspectorate [3] is often used as background for noise limits, and it has been proved that it can withstand court procedures. Starting points are to preserve a certain speech intelligibility inside the home at all time, and prevent sleep disturbance during night time. From this an absolute noise limit of 50 dB(A) is recommended inside the home. Taking into account certain back ground noise levels and the sound insulation of the facade, nose limits are derived as summarized in table 3.

Table 3 Recommended noise limits in dB(A) for events, inside dwellings based on speech intelligibility and – during night time - sleep disturbance (1 minute equivalent values)

Period	Basic limit in dB(A)	Max. level in dB(A)	Facade insulation in dB(A)	Noise limit in dB(A)
day	30	50	20 – 25	70 – 75
evening	30	50	20 – 25	70 – 75
night*	25	45	20 – 25	65 – 70
night		25	20 – 25	45 – 50

* If a day off follows the event (weekend, public holidays) the evening period may be extended with 1 or 2 hours, meaning that the night period starts at 24.00 or 01.00 hours. The higher night time noise limit is then allowed for the period untill 24.00 or 01.00 hours. Otherwise the lower value is recommended.

If the sound insulation of facades appears to be (much) worse or better than assumed in table 3, the noise limit scan be decreased or increased by 5 to 10 dB.

As can be seen from table 3 the noise limit related to speech is 50 dB(A). In critical situations one could consider the use of PSIL (Preferred Speech Intelligibility Level) that is based on the arithmetic average of the sound levels in the 500, 1000 and 2000 Hz octave

bands, taking into account expected noise immission levels and realistic sound insulation of facades. Higher noise levels in the lower frequencies have less influence in this way.

6.7 New Zealand

New Zealand does not have one set of noise regulations that applies over the whole of New Zealand for outdoor events and concerts. Instead each local council (there are over 70 councils) has its own noise rules in its district plan. Many councils control outdoor events and concerts through rules for "temporary activities" or as a "commercial activity". These rules may or may not include noise rules. In addition there is a general duty to avoid unreasonable noise under the Resource Management Act (Section 16) and a duty to avoid, remedy, or mitigate adverse effects (Section 17).

If there is unreasonable noise the Council has the power to issue an excessive noise direction. If a person fails to comply with an excessive noise direction the equipment producing the excessive noise can be seized.

6.8 Norway

Norway does not have national regulations regarding large noisy events.

Documents:

– Guideline of the 5th of July 2010 (draft) [4]
– TA-2115 Handbook of 2005

Descriptor:

– $L_{p,A,eq30min}$: Nose level over 30 minutes
– $L_{p,AFmax}$: maximal noise level (fast)
– $L_{p,Aeq8h}$: equivalent noise level over 8 hours
– $L_{C,peak}$: C-weighted peak level

These values are determined outside the noise sensitive room/dwelling at 0.5 m outside an open window.

Defined periods:

– Day: 07.00 – 19.00 hrs
– Evening: 19.00 – 23.00 hrs
– Night: 23.00 – 07.00 hrs

For up to six times a year the noise limits of table 4 are valid; these values include sound checks. Those limits are recommendations only, based on recommendation from Oslo city's Health department. It's the Health department that can enforces the noise limits. Other cities tend to follow Oslo's regulation when they do not have anything of their own.

Table 4 Admissible immission levels, up to six events per year

Period	1 up to 6 events per year			
	< 2 hours/day $L_{p,Aeq30min}$ in dB(A)	> 2 hours/day $L_{p,Aeq30min}$ in dB(A)	$L_{p,AFmax}$ in dB	$L_{p,Aeq8h}$ in dB
Day	80	75		
Evening	75	70		
Night			55	45

If more than 6 events per year take place, the noise limits of table 5 are valid inside noise sensitive rooms.

Table 5 Admissible noise levels inside noise sensitive rooms for day, evening and night if more than 6 events per year

$L_{p,AeqT}$ in dB	$L_{p,AFmax}$ in dB	$L_{C,peak}$ in dB
25	27	47

If more than 1 event takes place, the noise limits are valid for the accumulated noise levels. The evening period can extended depending on the duration of the event.

The noise limits are valid for the whole event including the sound check.

6.9 United Kingdom

Document: Code of Practice on Environmental Noise Control at Concerts (CPENCC) [5].

Descriptor: Music Noise level (MNL): L_{Aeq} over 15 minutes determined at a distance of 1 meter from the facade of a noise sensitive object.

Defined periods:

– Day: 09.00 – 23.00 hours

– Night: 23.00 – 09.00 hours

Noise limits according to table 6.

Table 6: Noise limits based on guideline CPENCC

Concert days per calendar year per venue	Venue Category	Guideline
1 – 3	urban stadia or arenas	The MNL should not exceed 75 dB(A) over a 15 minute period
1 – 3	other urban and rural locations	The MNL should not exceed 65 dB(A) over a 15 minute period
4 – 12	all venues	The MNL should not exceed the background noise level[1] by more than 15 dB(A) over a 15 minute period

[1] The value used should be the arithmetic average of the hourly L_{A90} measured over the last four hours of the proposed music event or over the entire period of the proposed music event if scheduled to last for less than four hours.

Guideline 3.4 draws attention to low frequency noise components in music, suggesting that: “a level up to 70 dB in either of the 63 Hz or 125 Hz octave frequency band is satisfactory; a level of 80 dB or more in either of those octave frequency bands causes significant disturbance.”

The local authority can impose conditions before allowing some of these events to go ahead; also local authorities are likely to impose different limits for festivals and events taking place at night.

Music due to events that take place between 23.00 and 09.00 hours shall not be audible in a noise sensitive room with open windows (for ventilation). If the noise limit stated in dB(A) is not adequate because of the low frequency components of the noise, the noise limits can be adapted for the lower frequencies.

6.10 Miscellaneous

Information about the policy regarding noisy large events for different municipalities in different countries are known as well. Some local authorities have described the way to deal with these type of events, regulating the number of events, the duration, end time and noise limits. In many cases exceptions are possible for special events with a certain prestige.

For musical performances (outdoor concerts, music festivals) noise limits for the evening between 65 to 80 dB(A) or even 85 dB(A) are applied, respectively for night time around 60 dB(A). Also regulations with no limitations regarding the noise emission occur, only a prescription of the finishing time. Sometimes the noise limits are so low that events can only take place at a large distance of dwellings.

For sporting events a similar approach is observed, except that in general these activities do not occur (or are not allowed to occur) during night time.

7. Some general observations

In most countries no legislation or regulations on a national level apply; noisy large events are regulated on a local level. However, some countries have general accepted guidelines that provides recommendations for these local authorities. Criteria are speech intelligibility and sleep disturbance.

Sometimes the ambient noise level is used as a criterion, that may be exceeded with a specific number of dB's. These can be so stringent that noisy large events are not allowed according to such rules, and local authorities apply less severe noise regulations based on other criteria, and related to certain boundary conditions such as the number of these rare events per year and the expected noise levels.

Sometimes a “penalty” of 5 dB has to be applied if the noise has an informative character (music, speech).

In most cases high noise limits for noisy large events are allowed for a limited number of events per year at the same location. Sometimes the value of the noise limit is related to the number of events: more events per year means lower noise limits per event.

Day time generally ends at 23.00 hours (in some countries at 22.00 hours) at which the event has to end; extension of this time limit is sometimes possible especially at the weekend and prior to national holidays. This relates to musical performances; sporting activities generally do not take place in late evening or night time.

Noise limits are generally expressed as L_{Aeq} values related to the duration of the whole or a significant part of the activity, or related to 1 minute or 10 minute values. Sometimes these are combined with limits to peak levels.

In many cases no obligation regarding the prognosis prior to the event or the monitoring during the event is prescribed.

8. Noise monitoring

Noise monitoring during musical events is important to prevent exceeding noise limits. This has its limitations as the sound crew will try to maintain – within certain margins – a specific sound level on the audience. So, prior to the event it should be proven that meeting the noise limits can be expected. During the event the noise emission can be reduced by the sound crew if necessary to respect the noise limits. It is obvious that an event will not be stopped because of the noise: the audience will not accept that interference by authorities causing more problems than one tries to solve.

For sporting activities noise monitoring can provide information afterward to prove that noise limits are respected or not. In general, the program of a racing day cannot be changed during the day itself. So also for these kind of activities it is important that at forehand it is determined that noise limits can be met.

Besides that, the noise emission of individual motorcycles or cars can be checked by pass by measurements: to noisy engines can be disqualified from taking part in the race.

Noise monitoring has to be done at adequate locations, not to far from the venue to prevent the influence of changing wind conditions and disturbing ambient noise.

If a combination of musical performances take part at the same time, a specific noise monitoring system can be used as described in [6], see figure 4.

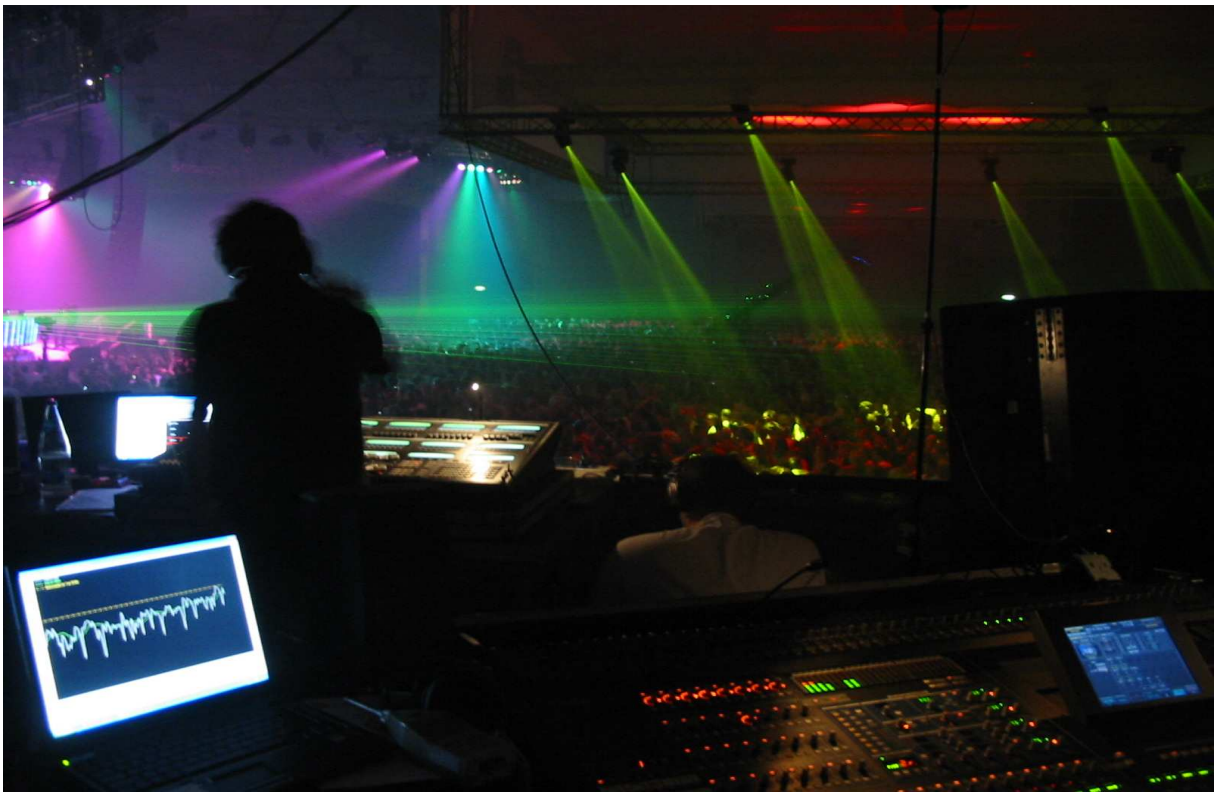

Figure 4 Noise monitoring during North Sea Jazz Festival in Rotterdam

9. Recommendations

It is recommended to investigate that noise limits can be met prior to the event. If during the event this appears not to be the case, police authorities will be very reluctant to stop this event considering the negative reaction of the audience. This prognosis of noise immission levels can be done using some general applicable values of sound power levels of different events and global noise transmission formula. Some guidelines provide a kind of standard noise maps to be able to globally calculate noise levels in the surrounding area of the event (see for instance [1]). Also other literature provides this information [7, 8].

Noise monitoring is recommended to be able to control continuously during the event whether the noise limits tend to be exceeded, so that noise levels can be reduced via the sound system. This can be part of the prescripts in the permit. Also other measures can be part of the permit such as a certain loudspeaker configuration (directivity, orientation) and / or sound screens to minimize the noise emission to the (main part of) nearby dwellings.

Monitoring positions should be selected that governs the total emission of the event the best as well as the major part of the most noise exposed dwellings.

In general noise limits relate to L_{Aeq}-values for the total duration of the event or for specified measurement periods. Sometimes additionally high peak levels that might be experienced as extra annoying are prevented by prescribing specific limits for noise levels during shorter periods of time, for instance 1 minute equivalent noise levels.

To create formal certainty for the organizer of the event and people living nearby specific noise limits for specific locations regarding the event are recommended. Noise limits that are based on the existing background noise are less certain.

For different reasons noisy large events (music, sports) are generally accepted. However, conditions have to be applied to prevent unendurable annoyance by surrounding citizens.

These conditions have to relate to the following subjects:

- Noise limits at specific locations, depending on the time of the day. For events that continue during night time more severe noise limits are recommended. Outdoor L_{Aeq} values up to 75 dB(A) or even 80 dB(A) during day time and the evening seem appropriate to maintain communication within the house (it can be defended that the sound insulation of the facade in closed condition could be used as starting point for calculations).
- Based on noise limits at the facades of dwellings the noise limits should be prescribed (for instance in a noise permit) on locations relatively close to the venue, otherwise the actual noise immission levels would depend to much on wind direction and wind velocity (or temperature inversion effects); it is well known that at distances of 1 kilometer or more these meteorological influences, even in down wind situations, can change noise immission levels (without changing the sound power of the activity) with 10 dB or more.
- The starting and finishing time of the event has to prescribed. In general a finishing time of 23.00 hours is appropriate, to be extended to 24.00 or even 01.00 hours, for instance if a free day follows that night so people can still have enough rest.
- The methodology by which the noise limits are to be determined and guaranteed: as prognosis prior to the event (to show that it is feasible that the noise limits can be met) and during the event; noise monitoring on optimal locations relatively close to the venue (see also above) is recommended.
- prescriptions of the acoustical and/or organizational provisions that are feasible to reduce the noise emission in a reasonable way, and that are needed to be able to fulfill the noise limits; this relates to orientation of the sound system and certain noise barriers if practicable;
- the number of events that are allowed on a yearly base on the same location;
- the way the public (not meaning the attendants) are informed about the noise-relevant issues of the event, as well as the way people can contact the responsible parties in the case of serious complaints during and after the event; also the promise to report the measured noise levels after the event can improve the acceptability of the event.

Besides these conditions it is obvious that urban planning regarding venues is essential. The venue should be as far as possible from urban areas to minimize the amount of people that might be annoyed by noisy large events. However, in many cases the locations can not be selected freely because of the existing and necessary facility demands (space to receive large number of people, parking possibilities, public transportation facilities nearby, safety conditions a.s.o.).

10. CONCLUSIONS

Noisy large events are generally accepted for a limited number per year, allowing relatively high noise levels at the facades of dwellings in the vicinity of the venue.

Specific maximal noise limits are recommended to prevent unendurable annoyance by people living in the vicinity of the venue. These limits can be based on speech communication and sleep disturbance.

Prior to the event it should be proved by an adequate prognosis that noise limits can be met.

Noise monitoring during the event can prevent exceeding of noise limits, and provides adequate accountability to the exposed people living in the adjacent environment.

11. REFERENCES

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