



Annex 51

Acoustic Signatures of Heat Pumps

Final Report – Part 5

1.3 Regulations - Synthesis

Editor:
Roberto Fumagalli, Politecnico di Milano

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Heat Pump Centre
c/o RISE – Research Institutes of Sweden
Box 857, SE-501 15 Borås
Sweden
Phone +46 10 16 53 42

Website

<https://heatpumpingtechnologies.org>

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Preface

This project was carried out within the Technology Collaboration Programme on Heat Pumping Technologies (HPT TCP), which is a Technology Collaboration Programme within the International Energy Agency, IEA.

The IEA

The IEA was established in 1974 within the framework of the Organization for Economic Cooperation and Development (OECD) to implement an International Energy Programme. A basic aim of the IEA is to foster cooperation among the IEA participating countries to increase energy security through energy conservation, development of alternative energy sources, new energy technology and research and development (R&D). This is achieved, in part, through a programme of energy technology and R&D collaboration, currently within the framework of nearly 40 Technology Collaboration Programmes.

The Technology Collaboration Programme on Heat Pumping Technologies (HPT TCP)

The Technology Collaboration Programme on Heat Pumping Technologies (HPT TCP) forms the legal basis for the implementing agreement for a programme of research, development, demonstration, and promotion of heat pumping technologies. Signatories of the TCP are either governments or organizations designated by their respective governments to conduct programmes in the field of energy conservation.

Under the TCP, collaborative tasks, or "Annexes", in the field of heat pumps are undertaken. These tasks are conducted on a cost-sharing and/or task-sharing basis by the participating countries. An Annex is in general coordinated by one country which acts as the Operating Agent (manager). Annexes have specific topics and work plans and operate for a specified period, usually several years. The objectives vary from information exchange to the development and implementation of technology. This report presents the results of one Annex.

The Programme is governed by an Executive Committee, which monitors existing projects and identifies new areas where collaborative effort may be beneficial.

Disclaimer

The HPT TCP is part of a network of autonomous collaborative partnerships focused on a wide range of energy technologies known as Technology Collaboration Programmes or TCPs. The TCPs are organized under the auspices of the International Energy Agency (IEA), but the TCPs are functionally and legally autonomous. Views, findings and publications of the HPT TCP do not necessarily represent the views or policies of the IEA Secretariat or its individual member countries.

The Heat Pump Centre

A central role within the HPT TCP is played by the Heat Pump Centre (HPC).

Consistent with the overall objective of the HPT TCP, the HPC seeks to accelerate the implementation of heat pump technologies and thereby optimize the use of energy resources for the benefit of the environment. This is achieved by offering a worldwide information service to support all those who can play a part in the implementation of heat pumping technology including researchers, engineers, manufacturers, installers, equipment users, and energy policy makers in utilities, government offices and other organizations. Activities of the HPC include the production of a Magazine with an additional newsletter 3 times per year, the HPT TCP webpage, the organization of workshops, an inquiry service and a promotion programme. The HPC also publishes selected results from other Annexes, and this publication is one result of this activity.

For further information about the Technology Collaboration Programme on Heat Pumping Technologies (HPT TCP) and for inquiries on heat pump issues in general contact the Heat Pump Centre at the following address:

Heat Pump Centre

c/o RISE - Research Institutes of Sweden

Box 857, SE-501 15 BORÅS, Sweden

Phone: +46 10 516 53 42

Website: <https://heatpumpingtechnologies.org>

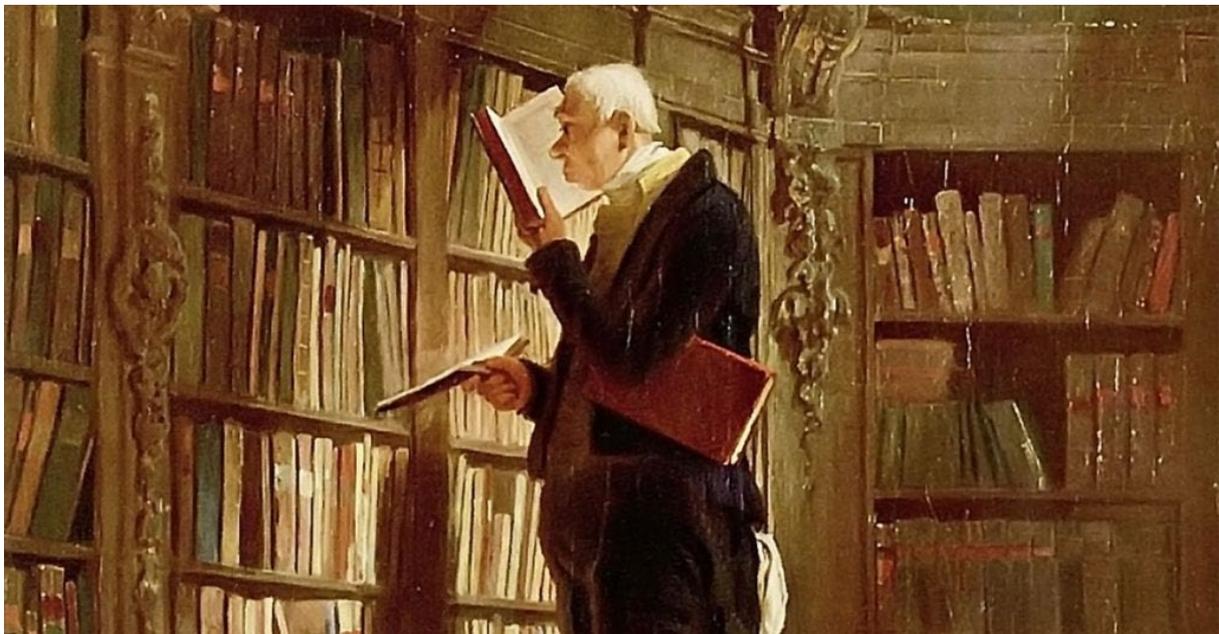


Acoustic Signatures of Heat Pumps

IEA HPT

Annex **51**

1.3: Regulations - Synthesis



(Karl Spitzweg – The librarian)

Roberto Fumagalli, Politecnico di Milano

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1 Introduction

The principal scope of this section is to try to make a systemic view of the legislative situation in all the countries described in section 1.2. This document attempts to summarize the national laws of all the countries investigated. First it was decided to focus on the countries participating in this study. Each participating country then took charge of another member country of the European community (in one case a non-member country such as Switzerland was chosen because its market is still relevant). In addition to these countries, data already collected in the past available to other states outside the European community are also considered.

Since not all member states have been researched in the current version of this document and given that legislation is continuously evolving in each country, this document should not be considered as final and it will be subject to periodic review during the activities of the Annex51.

At the end of this document a questionnaire has been developed, useful for the permanent revision and extension of this work to those countries for which sufficient data have not yet been collected. If someone wish to participate in this survey and want to try to collect data using this tool personally or by submitting it to acoustic experts of some particular country, we would be grateful for the support, that would allow us to complete the summary of the data collected in this document.

For more detail about every single Country regulations please refer to *section 1.2: Regulations - Countries overview*

The data shown have been divided by main topics:

1. Environmental noise / noise pollution;
2. Building acoustics;
3. Safety regulations;
4. Existence of particular laws that regulate specific heating systems;

In order to summarize the data so that they could be easily consulted, it was decided to organize them in synthetic tables followed by a brief explanation comment.

2 Environmental noise (noise pollution in general)

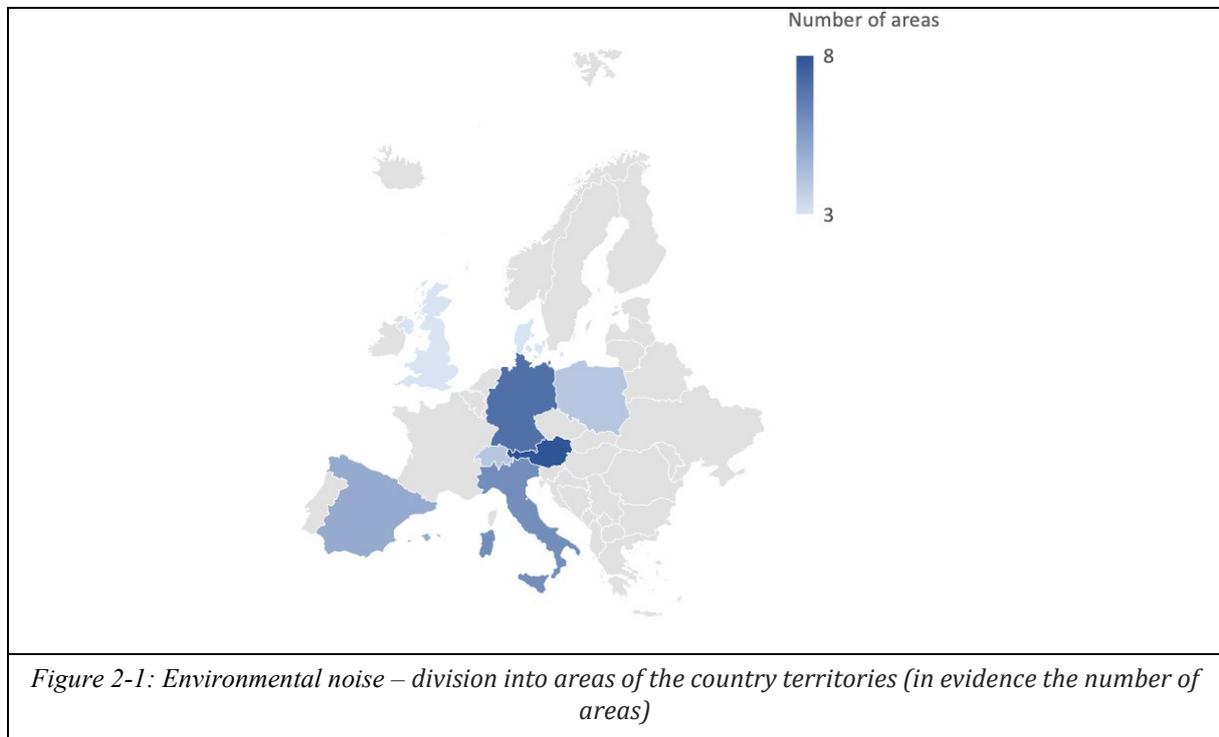
The laws regulating environmental noise are usually included in the "environment" for national legislation. This means that noise is treated as a form of pollution, to be prevented and regulated. Many countries for this reason are equipped with territorial planning documents with which they divide the whole national territory and, according to the intended use, introduce different noise limits in general. Often these limits are to be considered valid in general, in other cases the limits are valid only in environments where people are expected to stay. Sometimes explicit reference is made to indoor environments while in others there are no specifications.

A major discriminating factor on national legislation is the introduction and subsequent transposition of the European Directive 2002/49/EC. Nations that already had specific environmental noise laws prior to the arrival of this directive have maintained the original laws. The countries that did not have a specific regulation instead were inspired by the 2002/49/EC. Usually countries that promulgated laws after 2002/49/EC are distinguished from the others because instead of using only two reference periods, Day and Night, use a third period also for the Evening period, or use the L_{DEN} descriptor (o a derivation) introduced by 2002/49/EC.



Topic	Environmental noise														
	EU Country											Other Country			
	FR	UK	AT	IT	ES	DE	PL	DK	SE	FI	N	CH	KO	JP	CN
Implementation of 2002/49/CE				Yes	Yes	Yes	Yes								
existence of maximum limits for the national territory		Yes			Yes		Yes	Yes							
Number of zone		3	8	6	5	7	4	3				4		4	

Table 1: Environmental noise – division into areas of the country territories



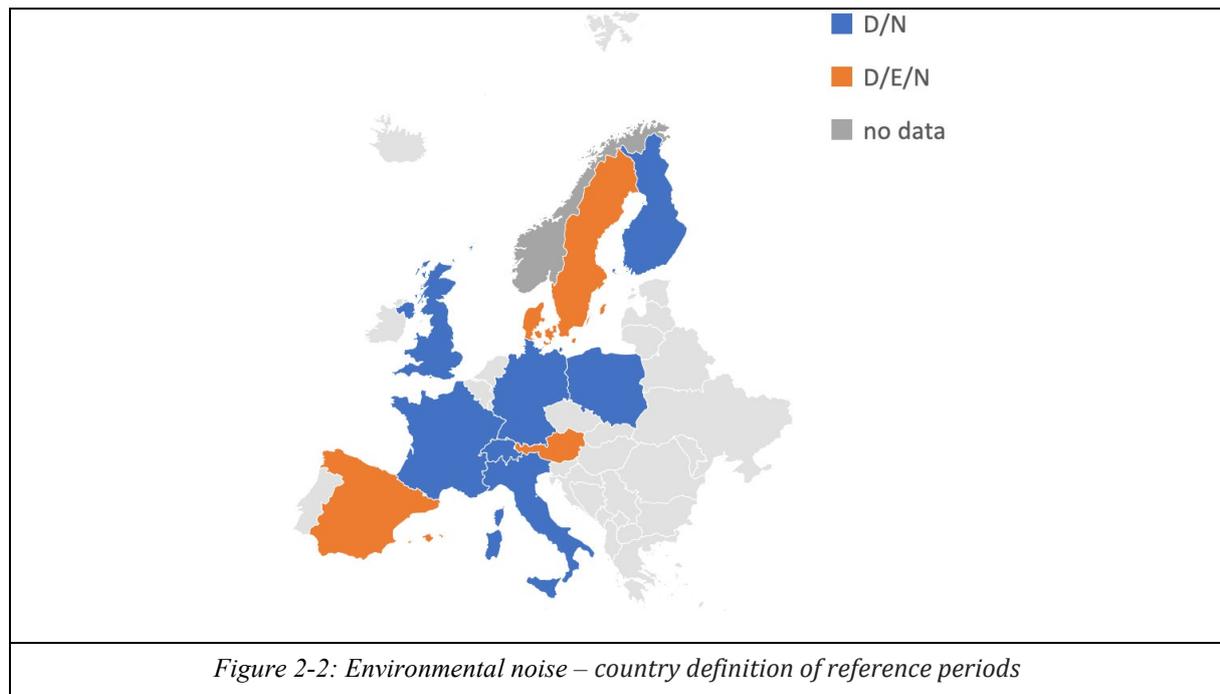
In Table 1 we can see the transposition status of the Directive 2002/49/EC and how the nations have dealt with the problem of environmental noise. Almost all countries have maximum limits valid for the national territory, which is usually divided into different areas according to the intended use (residential areas, industrial areas, etc ...). There is no uniformity in the number and type of areas indicated. In Austria, for example, zoning refers not to binding laws, but seems to come from recommendations of good planning practice and territorial planning. In Figure 2-1 I the countries that have a division into acoustic areas are shown on the map as well as the number of areas provided



2.1 Reference periods

Topic	Environmental noise - Reference periods														
	EU Country											Other Country			
	FR	UK	AT	IT	ES	DE	PL	DK	SE	FI	N	CH	KO	JP	CN
Different limits for Day/Night	yes	yes	Yes	Yes			Yes	Yes	Yes	Yes		Yes		4 period	
Day period interval	7-22	7-22 8-22(sunday)		6-22	7-19	6-22	6-22	7-18	6-18	7-22		7-19		8-19	
Evening period interval	-	-		-	19-23	-	-	18-22	18-22	-		-		19-23	
Night period interval	22-7	22-7 22-8 (Sunday)		22-6	23-7	22-6	22-6	22-7	22-6	22-7		19-7		23-6	

Table 2: Environmental noise – country definition of reference periods



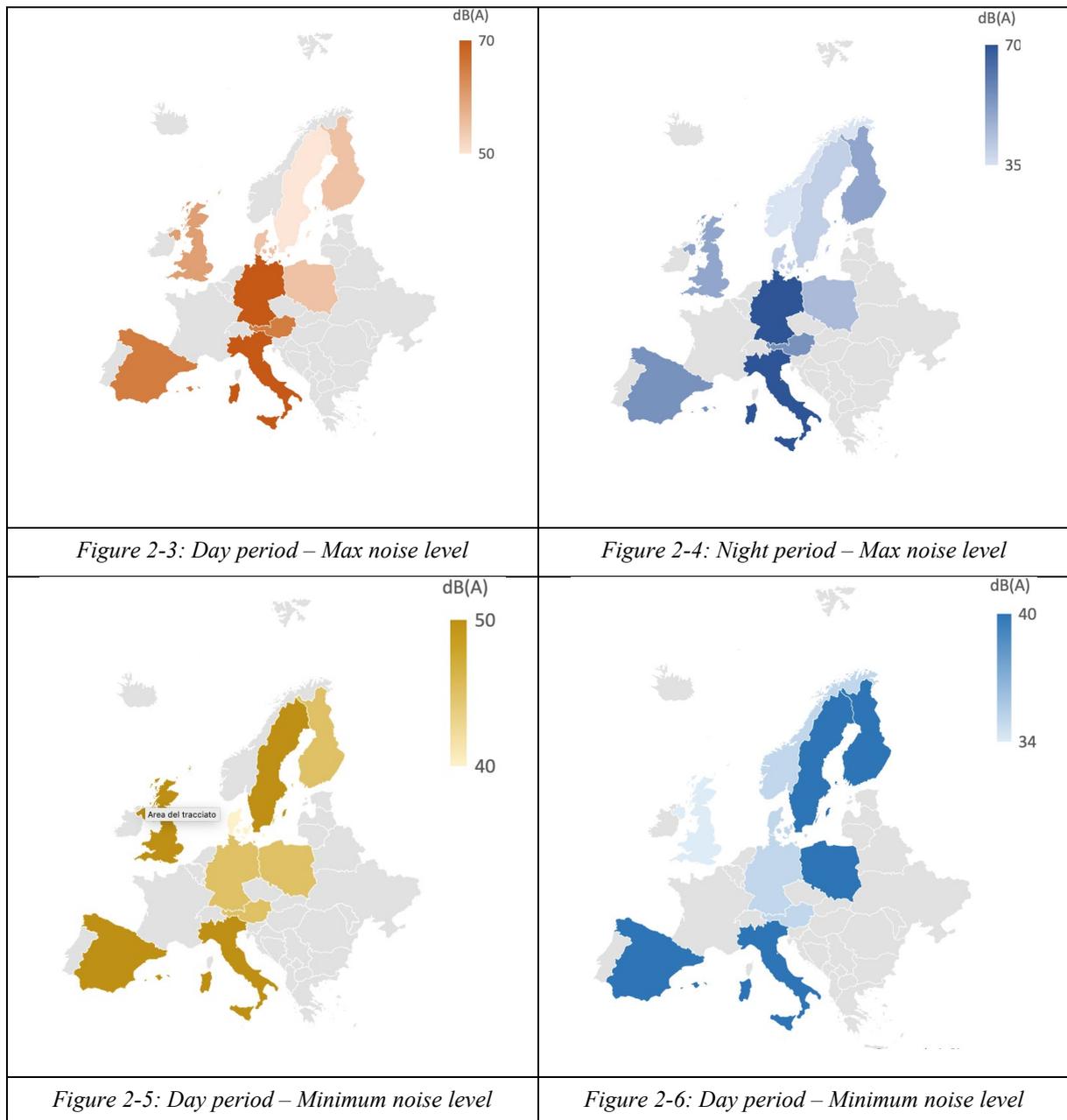
In Table 2 and in Figure 2-2 the reference periods adopted by the different countries are shown. The 24-hour day is usually divided into 2 or 3 reference periods: Day, Night in the case of two periods, to which the Evening period is sometimes added. The Japanese case is curious, which also adds a two-hour period during the morning. Almost all the countries distinguish only between day and night (and evening), while only some countries also introduce a differentiation on the day of the week: in these cases the hourly definition of the reference period can change accordingly. Also in this case among the various countries there is no uniformity in the times chosen to define the beginning and the end of the reference periods. This must be taken into consideration, for example, if you intend to equip the heat pumps with programs that vary the operating modes to reduce noise levels according to the time of day or even in some cases according to the day of the week.



2.2 Limits

Topic	Environmental noise - Limits											Other Country			
	EU Country											CH	KO	JP	CN
	FR	UK	AT	IT	ES	DE	PL	DK	SE	FI	N				
Max limit (day/night)		60/50	65/55	70/70	65/55	70/70	55/45	55/40	50/40	55/50	no/35			70/55	70/60
Minimum limit (day/night)		50/34	45/35	50/40	50/40	45/35	45/40	40/35	50/40	45/40	no/35			45/40	50/40
Minimum indoor limit (day/night)	30 dB(A) (in the Rooms)	42 dB(A) (at window)		50/40 dB(A) at window	35/25 dB(A)		40/30 dB(A)	35 dB(A) At property edge	30 dB(A)	35/30	28 dB(A)	35 dB(A) at window			
Absolute criterion for max noise low frequency									31,5-200Hz						
Different Regional or municipal limits	No	No	No	No	Yes	No								Yes	Yes
Different limit for Saturday and/or Sunday	No	Yes		-	-			Yes							
Differential criterion on background noise Day/Night	5/3 dB			5/3 dB					10/5 dB						

Table 3: Environmental noise – Noise limits





For each zone and for each reference period different maximum noise limits are attributed. For a description of each individual area and for a detailed list of all the limits, see the complete documentation given in section 1.2. Here, synthetically in Table 3, only the maximum and minimum limits for the most critical areas have been reported. In Figure 2-3, Figure 2-4, Figure 2-5 and Figure 2-6 there are also graphical representations of the maximum and minimum limits provided. Usually the maximum limits are referred to outdoor environments or indoor environments that reside in any case close to mainly or exclusively industrial complexes. The minimum limits instead refer to environments that need a particular quiet. Not having more detailed data on the distribution in terms of area or number of occupants of the various destinations of use (it would be very interesting, for marketing and statistical purposes, to understand if the areas that must be kept particularly silent concern 1% or less than the land or the population of a nation or invest 10% or more, but until now this type of data are not yet available), the minimum zone limits ones for products intended for the residential can be taken as reference data and the maximum limits ones for products for industrial use.

Some countries then have precise requirements to regulate the maximum noise present in indoor environments. Often this maximum allowable value depends on the type of indoor environment: the bedrooms are obviously the rooms with the minimum values allowed. In some cases it is specified how and where the potential disturbance is to be assessed, very often near the window, and some countries recommend to perform both open and closed windows checks.

Finally, some nations (such as Italy) use not only the absolute criteria on the noise level, but also the differential criteria. It is not sufficient that a source or a set of sources linked to an activity is lower than a pre-established limit level but, in the case of new installations, the noise source (if connected to a productive/commercial activity) must not modify consisting the acoustic climate present before its introduction. This is called differential criterion and consists in measuring the noise of the environment before and after the new installation. After installation of the new source the noise level should not rise by 5 dB in the day or 3 dB in the night.



2.3 Parameters and corrections

Topic	Environmental noise - Parameters and corrections (penalties and bonus)														
	EU Country											Other Country			
	FR	UK	AT	IT	ES	DE	PL	DK	SE	FI	N	CH	KO	JP	CN
parameters used	LAeq		Lr; Lr,den	LAeq, Lc	LK;x; Ld; Le; Ln; Lden	Lr; LAFmax	Lr (LAeq,T)	Lr	LAeq,T; LA,max	LAeq,T	LAeq,T				
time period of evaluation of the parameters			1 Year	minutes, hours, days								1 Year			
Adjustment for type of source	-	-	Train -5; road 0; plants +5	-	-							HP: +5dB day, +10dB night			
Penalty for Impulsive noise				3dB	3dB	Yes	Yes	5dB	5dB	5dB	5dB	2,4,6 dB			
Penalty for tonale noise				3dB	3dB	Yes	Yes	5dB	5dB	5dB	5dB	2,4,6 dB			
Penalty for tonal noise in low frequency	No Penalty but taken into account			3dB	3dB										
Bonus for noise emissions in partial time period	from 1 to 6 dB			3 o 5 dB		Yes?									

Table 4: Environmental noise – Parameters and corrections applied

The Table 4 shows the parameters used for the evaluation of noise disturbance. They are usually based on equivalent levels or something very similar. It starts from the evaluation of an equivalent level and then often some corrections are applied. If the sound has particular characteristics that make it more annoying, this is taken into account by increasing the perceived sound with pre-established quantities. The characteristics that are usually considered concern the fact that the sound produced by a particular sound source has well-defined tonal components or that the impulsive components are identifiable. Sometimes (this is the case for Italy and Spain), if the tonal component affects particularly low notes in the audible spectrum (usually below 200Hz), another penalty is applied. On the other hand, if the disturbance is present only for a limited period of time with respect to the entire period, some countries provide a subtraction from the measured basic levels.

Some countries provide specific corrections to be applied to particular sound sources. There are two special cases that stand out: in Austria there are corrections to be applied in case of sources related to transport or industrial plants. This is in line with other nations that (as will be shown later) have introduced specific laws regulating the noise produced by roads, railways, ports and airports (sources related to infrastructure and transport in general). Given the nature strategic linked to the mobility of goods, materials, people, these kind of sources are believed to be sources that cannot be treated like any others (in particular in extreme cases these sources cannot be removed totally or partially). It seems that Austria has made the choice to treat railway sources differently than other sources. The other interesting case is Switzerland, which explicitly considers the sound sources related to heating, cooling and air conditioning as potentially more disturbing than others, by applying penalties from 5 dB up to 10 dB in the case of noise evaluation in the reference night time (and 10 dB are really a very high penalty). On the other hand, it should be remembered that other countries consider the maximum noise of the implants supplying services inside buildings under the laws that regulate the building acoustics (for which we will have soon in this document the opportunity to take this aspect from another point of view).

A big difference between the various countries concerns the reference period that must be considered for the evaluation of the acoustic parameter chosen. For some countries a very short reference period is enough for measurement with legal value, in some cases only a few minutes of measurement are enough for the evaluation of the disturbance to be considered valid (this is what happens for example in Italy). In reality it could depend on the type of source itself: for a single source it can really take just a few minutes. For more complex sources with airport



facilities, 3 weeks of appropriately chosen measurements must be provided. In some countries, on the other hand, the law establishes an observation time for a whole calendar year for the assessment of the noise level of environmental sound sources. This, for example, should be the case of Austria and Switzerland. This actually complicates the work of technicians and survey officers, who are forced to use other procedures and criteria, compared to those strictly indicated by the main laws.

Pay attention to France, where the reduction applied to the noise measurement due to its length (from 1 to 6 dBA) applies to indoor noise and not to external/environmental noise (in France there aren't acoustic zones).

2.4 Laws for specific sources

Topic	Environmental noise - Laws for specific sources														
	EU Country										Other Country				
	FR	UK	AT	IT	ES	DE	PL	DK	SE	FI	N	CH	KO	JP	CN
Are Specific laws for Road noise			Yes	Yes	Yes	Yes			Yes						
Are Specific laws for Rail noise			Yes	Yes	Yes	Yes			Yes						
Are Specific laws for aircraft noise				Yes		Yes									

Table 5: Environmental noise – Presence of laws concerning specific types of noise sources

As mentioned above and as visible in Table 5, some countries have specific laws regulating the noise caused by the main transport infrastructures.

3 Building acoustics / indoor noise

Noise in buildings is a widespread problem. Over the years, national legislations have intervened placing limits in terms of minimum isolation that the indoor environments must possess in respect of:

- airborne noise coming from outside through the enclosure;
- airborne noise from other neighboring indoor environments through the separation elements;
- impact noise from neighboring indoor environments that propagates through structural separation elements.

Often (Italy is an example), the same laws also regulate the maximum noise that can be produced by installations for continuous or discontinuous use. This is the case, for example, of heat pumps, which can be thought of as systems for continuous use.

Other nations, however, provide indoor noise limits in residences. These limits may depend on the type of room (in the bedrooms may be required more silence than in the kitchens) or the type of intended use of the entire building unit (residence, office, school ...). Also in this case a heat pump that could disturb the neighbor, is regulated by specific laws.

Unlike previous laws that regulate the environment, this type of laws is usually applied in disputes between private citizens and not between citizens and enterprise.

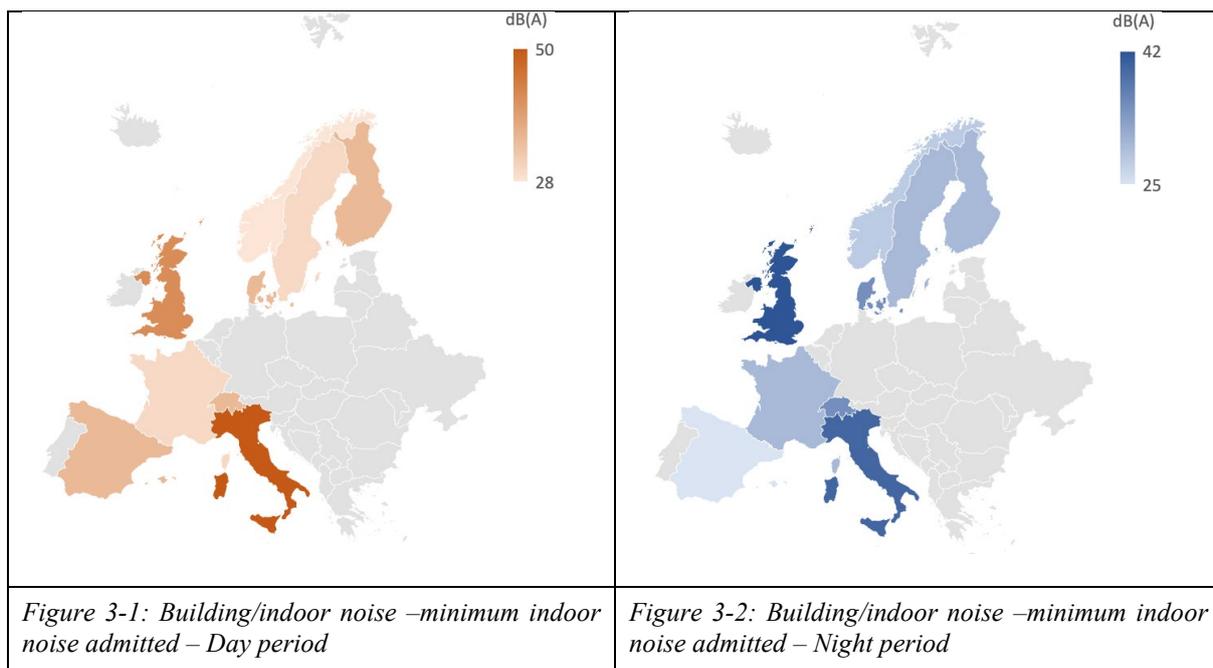
Furthermore, these types of laws aim to achieve good construction quality. They can not be applied to the vast number of existing buildings that existed before the adoption of this type of law (these laws by their nature are not usually retroactive).



Finally, laws that lead to quieter homes lead to greater attention to both: the sound sources owned by the neighbors and to the sound sources in own home: if a good window will make less noise come from outside, a lower background noise will make more audible and annoying the noise produced by the installation of fan coil or the indoor unit of heat pump.

Topic	Building											Other Country			
	EU Country											CH	KO	JP	CN
	FR	UK	AT	IT	ES	DE	PL	DK	SE	FI	N				
There are Buildings acoustic insulation Laws?	Yes	Yes	Yes	Yes	Yes			Yes	Yes		Yes	Yes			
passive acoustic requirements of buildings	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes			
Parameter used (insulation)	DnTw+C; L'nTw	DnTw+C; L'nTw	DnTw; L'nTw	R'w; L'nw; D2m,nT, w	DnTw+ C; L'nTw	R'w; L'nw	R'w+C; L'nw	R'w; L'nw	R'w+C; L'nw+C		R'w; L'nw	DnTw+C; L'nTw+C			
Different requirement for terraced house and apartment			Yes			Yes						Yes (rent/prop erty)			
Specific limit for HP or tecthnological services/installations in general				25 dB(A) or 35 dB(A)											
Parameters for services/installations				LAeq; LASmax											
Different limit for different indoor ambient				Yes											
Minimum indoor limit (day/night)	30 dB(A) (in the Rooms)	42 dB(A) (at window)		50/40 dB(A) (at window)	35/25 dB(A)			35 dB(A) At property edge	30 dB(A)	35/30 dB(A)	28 dB(A)	35 dB(A) (at window)			

Table 6: Building/indoor noise – Descriptors used and minimum indoor noise admitted



In Table 6, Figure 3-1 and Figure 3-2 it is possible to see how almost all the countries considered are sensible to the sound insulation of buildings and to the indoor noise. However, there are minimal demands for environments regardless of the sound sources that can cause them. For Italy are reported environmental limits; for residential buildings, for indoor noise caused by sources such as heat pumps belonging to neighbors, the limits of 25 dBA (L_{Aeq}) for continuous systems and 35 dBA (L_{ASmax}) for systems for discontinuous use are applied, while the jurisprudential criterion (max difference of 3 dB over background noise) described in the document “IEA HPT ANNEX 51 – 1.2 Regulations - Countries overview” remains valid.

Some requirements are very restrictive (28 dBA for Norway).



It should be remembered that these values are obtained both through a good design of the building components and by using silent sound sources (especially in the summer season when the windows are open and building insulation cannot be achieved).

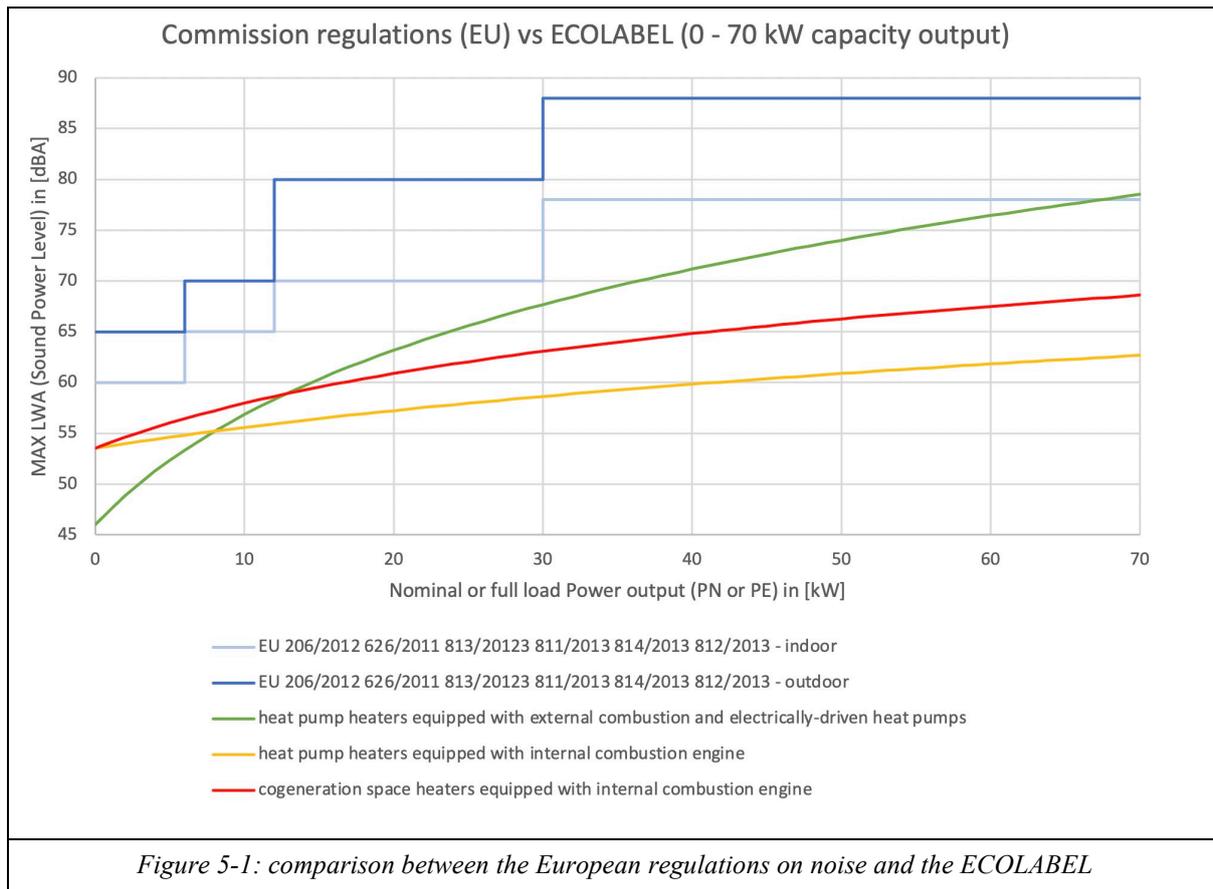
4 Safety regulations

All nations have laws that regulate workplace safety in terms of Acoustics but also in terms of Vibrations. Part of these laws also cover the risk of illnesses caused by exposure to high levels of sound pressures or vibrations over long periods. Normally these limits are very high and can rarely be a limit for heat pump installations in work environments. More than the risk of illnesses, it is possible that for certain activities that require high concentration, a silent working environment is required (although this has a negative effect on productivity, this aspect is not usually dealt with by specific laws).

5 European regulations on noise and ECOLABEL

European regulation on noise and ECOLABEL																
		Commission Regulation (EU) No 206/2012	Commission Delegated Regulation (EU) No 626/2011	Commission Regulation (EC) No 813/2013	Commission Regulation (EC) No 811/2013	Regulation n° 814/2013	Regulation n°812/2013	ECOLABEL								
Regards:		Ecodesign requirements for air conditioners and comfort fans		energy labelling of air conditioners		Ecodesign requirements for space heaters and combination heaters		labelling of products covered by regulation n° 813/2013		Ecodesign requirements for Heat pump water heaters		labelling of products covered by regulation n° 814/2013		EU Ecolabel for water-based heaters		
Apply to:		air conditioners below 12 kW		air-to-water and water(brine)-to- water heat pumps for space heating (so-called heat pump space heater) or for space heating and hot water production (so-called heat pump combination heater) with capacity not greater than 400 kW capacity not greater than 400 kW		air-to-water and water(brine)-to-water heat pump water heaters with a capacity not greater than 400 kW		air-to-water and water(brine)-to-water heat pump water heaters ... limited to 70 kW rated capacity		heat pump heaters equipped with external combustion and electrically-driven heat pumps		heat pump heaters equipped with internal combustion engine		cogeneration space heaters equipped with internal combustion engine		
LWA limits by rated capacity in dB(A)		0 - 6 kW	6 - 12 kW	12 - 30 kW	30 - 70 kW	0	6	12	30	70	PN or PE in kW	10+ 36 x log(PN+10)	30+20xlog(0,4xPN+15)	30+20xlog(P E+15)		
LWA = 60 dB(A) - indoor		LWA = 60 dB(A) - indoor		LWA = 60 dB(A) - indoor		LWA = 60 dB(A) - indoor		LWA = 60 dB(A) - indoor		0		46,0		53,5		
LWA = 65 dB(A) - outdoor		LWA = 65 dB(A) - outdoor		LWA = 65 dB(A) - outdoor		LWA = 65 dB(A) - outdoor		LWA = 65 dB(A) - outdoor		6		53,3		54,8		
LWA = 65 dB(A) - indoor		LWA = 65 dB(A) - indoor		LWA = 65 dB(A) - indoor		LWA = 65 dB(A) - indoor		LWA = 65 dB(A) - indoor		6		53,3		54,8		
LWA = 70 dB(A) - outdoor		LWA = 70 dB(A) - outdoor		LWA = 70 dB(A) - outdoor		LWA = 70 dB(A) - outdoor		LWA = 70 dB(A) - outdoor		12		58,3		55,9		
LWA = 70 dB(A) - indoor		LWA = 70 dB(A) - indoor		LWA = 70 dB(A) - indoor		LWA = 70 dB(A) - indoor		LWA = 70 dB(A) - indoor		12		58,3		55,9		
LWA = 78 dB(A) - outdoor		LWA = 78 dB(A) - outdoor		LWA = 78 dB(A) - outdoor		LWA = 78 dB(A) - outdoor		LWA = 78 dB(A) - outdoor		30		67,7		58,6		
LWA = 80 dB(A) - indoor		LWA = 80 dB(A) - indoor		LWA = 80 dB(A) - indoor		LWA = 80 dB(A) - indoor		LWA = 80 dB(A) - indoor		30		67,7		58,6		
LWA = 88 dB(A) - outdoor		LWA = 88 dB(A) - outdoor		LWA = 88 dB(A) - outdoor		LWA = 88 dB(A) - outdoor		LWA = 88 dB(A) - outdoor		70		78,5		62,7		

Table 7: comparison between the European regulations on noise and the ECOLABEL



In Table 7 a brief summary of the European regulations on the noise of heat pumps and of the characteristics of the ECOLABEL is shown. The limitations on the sound power level present in the European regulations, which are very similar to each other, are compared with the requirements of the ECOLABEL. On the other hand, it is possible to see in Figure 5-1 a graph with the limit sound power levels.

Attention: there is no total overlap between the products covered by the various regulations indicated. Despite this, it may be interesting to verify the differences in the requests expressed in terms of noise limits.



6 References

IEA HPT ANNEX 51 – 1.2 Regulations - Countries overview



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ANNEX: QUESTIONNAIRE FOR COLLECTING DATA

9 ANNEX: QUESTIONNAIRE FOR COLLECTING NOISE REGULATIONS, LAWS, STANDARDS, CERTIFICATION SCHEMES AT COUNTRY LEVEL

If you wish to contribute with information about a specific Country please contact Roberto Fumagalli at Politecnico di Milano (Italy): roberto.fumagalli@polimi.it

9.1 NOISE REGULATIONS

9.1.1 ENVIRONMENTAL REGULATIONS

Are there any laws that regulate the maximum limits of sound “immissions” or “emissions” (environmental noise/pollution in general)?

If so:

- Indicate Name of regulation and issue date .
- Which indexes/descriptors are used to evaluate the noise/annoyance?
- Is the focus on indoor and outdoor noise?
- Shall the noise be assessed primarily in the external environment?
- Do the laws divide the national territory into different classes/zones with different limits for maximum SPL (sound pressure level)?
 - Is the division of territory into zones (maps) delegated to local administrators? (e.g. Municipalities/Cities/Counties/Regions)?
 - Is there a local autonomy to define different zones with different limits?
- Are there different limits for different periods of the day? (day/night or day/evening/night) What are the times of different periods?
- Are there any penalties applicable to particular types of noise? For example for:
 - Impulsive noises (how are defined, when penalty applies and how much is the penalty? Are there any exceptions?)
 - Tonal noises (how are defined, when penalty applies and how much is the penalty? Are there any exceptions?)
 - Low frequency tonal noises (how are defined, when penalty applies and how much is the penalty? Are there any exceptions?)
 - Other types of penalties? (how are defined, when penalty applies and how much is the penalty? Are there any exceptions?)
- Are there any reductions in the measured noise level if the noise source is active only for a limited period of time (for example less than an hour, or less than 15 minutes or more)?



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- Are there specific laws that indicate how the measurements should be carried out and which measurement techniques shall be used?
- Are there specific laws for noise produced by road infrastructures (roads, railways, airports, ports)?
- Are there specific laws for particular classes of sources? In particular: are there specific laws for the "heat pump" source class?
- Are the criteria and limits included in the regulations only absolute or also "differential"? "Differential criterion" means that in the noise evaluation of a sound source the variation that this source (new or existing) brings/adds to the context is considered. Typically the noise is evaluated first with the source turned on and later with the source switched off. Usually, for the assessment of differential criterion the arithmetic difference between the two precedent value of sound pressure level is considered.
- Are there any differences in the case where the source of disturbance belongs to a private citizen or comes from a production plant, from a company or from a public utility plant?
- Has the analyzed country implemented or transpose the European Directive 2002/49/EC?
 - In which year? (before or after other noise regulations?)
 - In which way?

9.1.2 BUILDINGS REGULATIONS

Are there any laws that regulate the minimum acoustic insulation for buildings?

If yes:

- Indicate Name of regulation and Date of Issue.
- Indicate the main topic and a summary of the content.
- Which parameters are applied?
 - Facades insulation? (D45, D2m,nt,w, others?)
 - Air isolation between different room (R'w, D, others?)
 - Impact noise insulation? (Ln, L, others?)
 - Noise of continuous and discontinuous technological services? (LASmax? LAeq? Other?) (ALSO HEAT PUMPS are considered, as technological service?)
- Are there any other laws that limit the maximum measurable noise within the buildings regardless of the source of the noise?



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9.1.3 SAFETY REGULATION

Safety at work, assessment of risks related to workers' noise exposure (since heat pumps may be present in the work environment):

Are there any laws that limit the noise of the work environment?

If so:

- Indicate Name of regulation and Date of Issue.
- which descriptors and procedures are used to evaluate the risk?
- Indicate the main topic and a summary of the content.

9.2 CERTIFICATION SCHEME

Are there any certification schemes at country level specific to heat pumps?

If so:

- Indicate Name of the scheme
- Define the nature of this certification: voluntary or obligatory
- Indicate by whom it is managed: government or private organization
- On which kind of products does it refer to?
- Which are the minimum requirements for granting the certification? Are they defined both in terms of minimum energy performance and in terms of maximum sound power level?

9.3 QUALIFICATION FOR INSTALLERS

Are there any specific qualifications for Heat pump installers that take into account also the noise aspects?

If yes:

- Indicate Name of the qualification.
- Does the qualified installer release a certificate that assure the quality of installation in terms of noise?
- Does the quality of the heat pump installation allow the end users to benefit from specific incentives?



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9.4 JURISPRUDENCE/JUDGMENTS

- Are there any examples of judgments concerning private cases in which the disturbing source was a heat pump?
- Are there any examples of judgments concerning causes between public administration and citizens in which the disturbing source was a heat pump?
- Are there any examples of judgments concerning causes between individuals and owners of industrial or production facilities where the disturbing source was a heat pump?

9.5 OTHER SPECIFIC OR PARTICULAR LAWS CONCERNING NOISE, ANNOYANCE, ACOUSTICS?

Are there any other laws that concerning acoustics and noise topics not considered above?

- Indicate Name of regulation and issue date .
- Indicate the main topic and a summary of the content.



Heat Pump Centre

c/o RISE - Research Institutes of Sweden

PO Box 857

SE-501 15 BORÅS

Sweden

Tel: +46 10 516 5512

E-mail: hpc@heatpumpcentre.org

www.heatpumpingtechnologies.org

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