

# Municipal approach of low frequency noise (LFN)

Nienke de Jong

DCMR Environmental Protection Agency Rijnmond, Schiedam, The Netherlands

Gea de Meer

Municipal Public Health Services (GGD Fryslan) Leeuwarden, The Netherlands.

Wanda Reen

Municipal Public Health Services (GGD Fryslan) Leeuwarden, The Netherlands

Henk Breukelaar

Municipality of Leeuwarden, Leeuwarden, The Netherlands

Gerard Hooiring

Frisian Environmental Protection Agency (FUMO) Grou, The Netherlands.

## Summary

Low frequency noise (LFN) is only audible for a minority of people. Municipalities, environmental protection agencies and the health services experience problems in the approach of LFN. In most cases the source noise cannot be found and while the annoyance can lead to (severe) medical issues. There is a need for a municipal approach for low –frequency noise sources that takes into account aspects of health, environmental judgment and spatial planning. For this purpose we investigated the needs and experiences of the professionals as well as the annoyed citizens. Recommendations of the project are the development of a municipal guideline LFN in which (risk) communication has a central role in securing the environmental and health-based assessment by a substantiated roadmap.

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## 1. Introduction

Low frequency noise (LFN) is a minor environmental problem, only a few people can hear or perceive the noise. But it is a major problem for those who suffer from the annoyance caused by LFN, because of the huge distress to the people who are sensitive to LFN. In contrast to ‘normal noise’ it is hearing the LFN that causes in the most cases nuisance. The severity of nuisance people experience depends on the loudness and specificities of the noise and also on personal and social aspects [1] [2]. The specificities of the sound are important in the way the LFN is experienced, most LFN is tonal and modulating. Most people describe LFN as humming, or throbbing sound like a washing machine or as vibrations or as pressure on the body. The effects that occur are stress, sleep deprivation, attention deficit; all which can lead to high blood pressure and heart disease because of the noise. The annoyance of LFN also depends on the (complex) relation between source and the annoyed citizen. In the case of wind turbines, for example,

annoyance is less in the case the annoyed persons are (partly) owner of the turbine.

There is no generally accepted dose response relationship for low frequency noise due to the small amount of sufferers and the special importance of personal and social factors in the perception. It is possible that in one household the husband can’t sleep and is very stressed because of the LFN to the extent that he even loses his job and his spouse hear or feel nothing.

Lacking a generally approved and agreed upon approach or regulations, results in large differences between municipalities in the way they handle complaints on low frequency noise.

During the handling of LFN complaints there is an exchange of information and opinions between individuals and institutions over the nature and the scale of the annoyance (risk communication) [3]. A transparent process, the gaining of trust, involvement, joint decision making and a clear understanding of the uncertainties and the abilities of the government are vital.

## 2. Project

The project “Municipal approach for LFN” is a study carried out in the three northern Provinces of The Netherlands [4]. The aim of the Dutch project is to develop a municipal approach for low frequency sources that takes into account aspects of health, environmental judgment and spatial planning. For this purpose we investigated the needs and experiences of the professionals as well as those of the annoyed citizens of The Netherlands. Particular goals are:

- Enhancing knowledge about the assessment of annoyance and making it accessible;
- Gaining an overview of and evaluating the current assessment and approach of annoyance due to LFN by the municipality, i.e. municipal environmental services, public health services and environmental protection agencies;
- Developing criteria for the assessment and approach of annoyance due to LFN.

The project will deliver a tool for municipalities for the assessment of reports of LFN in which we ensure the focus on the environmental and the health aspects.

### 2.1 Methods

The research is conducted in close cooperation with several municipalities, environmental services, health services and annoyed citizens of the three northern provinces of The Netherlands. A qualitative research method is used, as the aim is to gather information from the professionals and the annoyed citizens about the way they handle LFN complaints but also how they experienced this approach and what their opinions are about the approach. The professionals participated in a group interview and the annoyed citizens were interviewed individually. All interviews were based upon a ‘topic list’. The basis for the professionals was the handling process of LFN complaints: which comprises the phases of receiving and analyzing complaints, problem definition, examination of possible causes and the completion of the case. The topic list for the citizens focused upon (risk) communication and especially the confidence they have in the authorities according to trust, expertise and transparency.

#### 2.1.1 Professionals

In total 65 employees of municipalities, health services and environmental services were asked to participate in the project. The municipal

employees (23) who participated worked at spatial planning or at environmental departments. All three municipal health services and two out of the five environmental protection agencies participated. The knowledge and experience with LFN demonstrated significant differences between the participants. The employees of the health services and environmental services had all experience with reports of nuisance due to LFN. There was a large difference in the amount of reports the employees of the municipalities handled. One handled four or more reports per year and others had never had a LFN report since years. The extent of the LFN cases were also different, for example a gas production facility and a (household seized) boiler.

Eleven municipalities, two environmental services and three health services participated in the group interviews. Two group interviews were arranged. The members of the groups were as much as possible randomly chosen. In order to ensure an open discussion two criteria were defined, that is:

- every group comprises at least one employee of the health service and
- there is an equal distribution of the three provinces.

In the group interview an inventory was made of the approach of LFN complaints. The sub aim of the interviews was to create support for an integrated approach. The main questions/topics were the approach of nuisance reports and the requirements to come to an appropriate approach.

#### 2.1.2 Citizens

During the project the sound boarding group mentioned the need on the direction to take in the communication with citizens and the coordination between municipalities, environmental services and the health services in particular. Hereafter the project is extended with a study of the experiences and requirements of citizens regarding the communication as part of the handling of LFN reports. All the municipalities and public health services were asked for LFN reports from the period 2010 to 2014. They provided 36 cases, six cases were chosen to participate in the individual interviews. To ensure as large as possible variance in features and geographic distribution the following criteria were used:

- at least one case per province
- at most one case per municipality
- at least two cases where the source is found and technical measures were taken or

agreements were made with the owner of the noise source;

- at least one case where no technical solution was possible.

The interviews were held in a public place near the home of the participants. Later the data were supplemented during a phone interview.

### 3. Results

#### 3.1 Professionals

The protection of the citizens against negative health effects due to environmental stressors is a task of the government and in the case of LFN of the municipality (duty of care). Annoyance because of LFN can lead to negative impacts on health. Today's laws and regulations for environmental noise are not sufficient for evaluation of impacts from noises with mainly low frequency components.

In the interviews the environmental and health officials all claimed missing a standard approach. The current LFN approaches, the NSG guideline and the RIVM guideline for the public health services, are questioned. Due to insufficient rules and regulations it is unclear whether in a particular case there is an unacceptable level of annoyance. Specifically environmental officials often doubt where the duty of care ends. In many cases the treatment of the LFN complaint ends only when all possibilities are exploited. One of the participants even said "those people are in such a large distress. And when we don't do something about it, I feel partly responsible if they commit suicide because of it" [4] (translation). One of the questions asked by the participants was whether this is in the best interest of the annoyed citizens. During the interview there was a cautiously negative response, but the question when do you stop the handling of a annoyance complaint remained unanswered.

The approaches of the environmental and the public health officials are different. In the handling of the LFN complaint by environmental officials (of municipalities and environmental services both) the main goal is to find the noise source and in that way end annoyance. While the main goal of the public health official is to end or at least reduce annoyance itself, finding the source can be part of the process. In the interviews the public health officials said that in most cases they found that the source of the annoying noise couldn't be

found or that there was no noise found at all. In both of these cases searching for a noise source is only an extra burden for the already stressed people which can result in even more health issues. The reaction from environmental officials was that it is the obligation of the government to uphold the law and that therefore in every case an environmental investigation is inevitable. In the beginning there was a lot of discussion but at the end of the group interview it became clear that the goal of both environmental and public health officials was the same but the way to achieve it was different.

Most environmental officials mentioned that the health problems and the annoyance are secondary to the noise complaint. Only when they cannot find LFN or the noise source causing the annoyance limiting annoyance (effects) becomes part of the approach. Most of the environmental officials then refer the complainer to the public health service. According to the public health officials that is too late, preferring to become part of the team treating the complaint right from the beginning. Controlling annoyance in their opinion should start at the beginning and has to be part of the general approach of LFN complaints. Most of the environmental officials rejected the proposal because in this way the complaints could be misinterpreted and be seen as 'medicalization' of an environmental problem. As one of the participants said: "a lot of people are sent too fast to a doctor, while there is just a noise problem" [4] (translation). It would give the LFN sufferers wrongly the idea that their complaint is treated as a psychological issue and that they are not taken seriously. Most of the environmental officials had no idea of the contribution of the public health service could mean for the handling of LFN complaints. The trigger for more cooperation between municipalities and public health services is in the interest of the low frequency noise sufferers. Despite of this both environmental and public health officials said that more cooperation would benefit the handling of LFN complaints and the sufferers. The question in what way remained, because of the insufficient understanding of the effect of the way of handling on the annoyed citizens. This led to the extension of the project with a study of the experiences and requirements of citizens regarding the handling of LFN reports by municipality and the public health services.

#### 3.2 Citizens

The results of the six interviews show that it is important to have an open and interactive

communication between professional and citizen. The citizens expect a proactive attitude of the municipality and the public health service, in which they are informed about the handling of the case and solutions and new approaches that may come available during the case. In table 1 a summary of the results of the interviews is presented.

Four of the six interviewed citizens were satisfied with the handling of their complaint, two weren't. The results show that the satisfaction doesn't

depend on solving the problem. In only one case the source of the annoying LFN was found and measures were taken. As a result annoyance decreased though still is experienced by this citizen. In all the other cases there is still annoyance, but in three of those five cases the respondents were nevertheless satisfied about the way their complaints were taken care of. The citizens who are satisfied over the handling of their complaint by the municipality or public health service trust the responsible institution.

Table 1 Summary of the interview results [5]

	Effect handling		Proces			Trust	
	Satisfact- ion	Annoyance	Institution	Measure ments?	LFN?	Source found?	Measures?
1	+	Less	Municipality	Yes	Yes	Yes	Yes
2	-	Equal	Municipality	Yes	No	No	No
3	-	Equal	Municipality/ Public health service	Yes	No	No	No
4	+	Less	Municipality/ Public health service	No	No	No	No
5	+	Less	Municipality	Yes	Yes	No	No
6	+	Equal	Public health service	No	No	No	No

The satisfied complainers felt they were taken seriously. They were included in the process of solving the complaint and got information regularly and in time. That way they felt the engagement of the official. In two of the four cases no measurements were taken, so the conduction of measurements is no necessity in the handling of low frequency annoyance. The most important thing is that the respondent is content with the process and the results. One of the respondents (case 5) responded to the question "Are you satisfied with the approach even now the LFN still exists?" as follows "In fact yes, because I understand why the municipality can't do more." [5] (translation)

The two dissatisfied respondents said that there was no commitment from the municipality or the public health service. All the action came from the respondents themselves. They didn't feel heard,

and the effect is that they felt not being taken seriously. They also mentioned that the competence of the municipality on LFN is low. One of the respondents said (case 2) "You don't have to know everything, but at least go and look for information. Now I know more about source X than the municipality" [5] (translation). Due to the lack of interest, knowledge and respect for the respondents they lose trust in the municipality. Also the trust in the impartiality of the municipality decreases during the process as a result of the lack of open communication.

LFN cases are nearly always complex, due to the personal and social factors, the various interests, the limited experience and the lack of rules and regulations. The main conclusion is that the citizens who are content with the handling of their complaint trust the responsible institution even when the problem isn't solved. Professionals can influence that trust by showing dedication,

competence and by being transparent. Risk communication is a major factor in gaining trust, meaning active communication between the citizen, the municipality and the stakeholders is an important contributor. In open and transparent communication there must be attention for the differences in perception and interests and concerns and the complaints have to be taken serious. Solving the annoyance problem without trust of the people involved is only possible when the source is found and the noise has fully disappeared. In most cases of the low frequency annoyance is not completely solved. The analysis and examination of the complaint should fit with the annoyance. The respondents see mainly a role for the health services when there is a health impact due to the annoyance.

The respondents also said that there should be more information and research on LFN, noise and health and that there should be national attention for the growing problem of LFN and that a policy for LFN is necessary.

#### 4. Conclusions and recommendations

All respondents, local officials as well as the citizens, miss standards and a measuring protocol. Due to lacking standards for measuring and assessment, methods differ between municipalities and even amongst employees. In many cases no source can be found and it remains unclear where the duty of care of the municipality ends. The aim of both municipalities and public health services is the same, that is to diminish annoyance; however they follow a different approach. More cooperation between municipalities and the public health services would in most cases benefit the annoyed citizen, because next to finding the source of the LFN from the start the reduction of the annoyance would be an issue. All interviewed citizens report ongoing LFN nuisance. Nevertheless, four of the six citizens were satisfied with the treatment by the municipality and/or public health service. The respondents all reported to have experienced expertise, dedication and transparency in communication by the treating authorities, whereas disappointed citizens did not so.

The development of a protocol for the municipal approach of LFN should be more than a tool for municipalities for the assessment of reports of LFN in which we ensure the focus on the environmental and the health aspects. Important is the aspect of risk communication, because the

effect of the approach to the citizens next to solving the annoyance depends on good communication.

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