

Notification: Infrasound generation and observation

Organization: State Supervision of Mines

Reference: KEM-31 / 202001062

Purpose of the notification

The Procurement Office of the Ministry of Economic Affairs and Climate Policy is publishing this notification on behalf of the Dutch State Supervision of Mines (SSM). The purpose of this notification is to determine whether there are parties interested to perform the research as described below.

Background information

Ambient low frequency noise (LFN), being soundwave energy (also called microbaroms) travelling through the air with frequencies lower than 100 Hz, is a well-known phenomenon. Seismic waves in the subsurface or coastal waves in water fall into the same frequency range and can generate LFN (ref. 1).

Ambient LFN waves generated by natural events (earthquakes, coastal waves) have been observed at large (10-100 km) distances in the past (ref. 2, 4 and 6), also to determine the source. LFN generated by man-made systems (subwoofer sound, pipeline systems and machines) has been observed as well (ref. 3 and 4). The impact of LFN can be diverse to people (ref. 5); sometimes people are impacted, other people are not at the same moment and location. Besides that it cannot be measured empirically.

No systematic LFN impact assessment study of mining activities is available up to now. Also guidelines or best practices to carry out such an impact study are lacking.

The objective of this research is to identify methods, described in literature, how to assess the generation of LFN, sometimes called infrasound, by mining activities, in particular by gas production, transport and storage activities, as well as activities related to the production of geothermal energy and salt, in particular:

- A systematic inventory and characterization of generated LFN comprises both from induced earthquakes as well as the flow of gas and liquids through pipeline systems and processing facilities, as well as the potential impact of LFN on people and assets.
- A systematic inventory of methods how to use technical observational systems as well as observation by citizens or models for proper assessments of current or future infrasound generation and exposure to be expected.

Based on literature and observation possibilities a qualitative overview of potential impacts LFN may have on the environment and people and references to any safety norms are targeted for.

References:

1. Kamp, I. van, 2018, , Meldingen over en hinder van laagfrequent geluid of het horen van bromtoon in Nederland: inventarisatie, RIVM Briefrapport.
2. Yousef A. Selais, 2016, Seismo-acoustic characterisation of the ambient noise field, MSc Thesis, ETH, TUDelft, RWTH Aachen.
3. Evers, L.G., van Geyt, A.R.J. Smets, P., Fricke, J.T., 2012, Anomalous infrasound propagation in a hot stratosphere and the existence of extremely small shadow zones., *Journal of Geophysical research: Atmospheres*, Volume 117, Issue D6.
4. Gavreau, 1966, *Infra Sons, generateurs, Detecteurs, Propriete physiques, Effects biologique*, *Acousta* Vol 17, No 1.
5. Moller, H., Pedersen, C.S., 2014, Hearing at low and infrasonic frequencies, *Noise and Health*, Vol. 6, Issue 23, pages 37-57.
6. Mutschlecner, J.P., Whitaker, R.W. , 2005, *Infrasound from earthquakes*, *Journal of Geophysical Research*, Vol. 110, D01108, doi: 10.1029/2004JD005067.

Central research questions:

This research request consists of a literature based study by international LFN experts on assessment methods for the generation, detection and impact of LFN. Specific research questions are:

1. Which assessment methods exist and could/should be used to predict the generation of LFN from mining activities, specifically (1) man-induced earthquakes, (2) gas transport and processing facilities for gas, (3) geothermal energy and salt facilities, such as rotating equipment (compressors, turbines, pumps) and furnaces.

2. Which monitoring and/or measuring techniques and networks are available internationally and in The Netherlands and could/should be used to cost-effectively monitor or measure LFN generated by mining activities.
3. Synthesis including recommendations for establishing a trustworthy approach to LFN triggered by production, processing and transport in mining as referenced under 1 above.
4. Do norms exist internationally for the level of exposure of people or fauna to LFN, comparable to either sound norms at low audible frequencies?

Deliverables expected

1. Literature study report addressing research questions 1-3;
2. Discussion with Dutch experts in the field;
3. LFN risk management synthesis report, addressing research question 4.

All deliverables will be made public.

Expected use

The results of the project will be used:

- by the Ministry of Economic Affairs and Climate Policy , to decide upon the need for a specific approach/norms to infrasound, or adaptation of current approaches;
- by SSM, to advise the Ministry, responsible on LFN safety/health issues, to be addressed by mining activities and guideline for best practice;
- by operators and gas, geothermal energy and salt transport/processing companies to comment and use;
- by the public and scientific communities in the Netherlands.

Timeline

The duration of the project is estimated to be 9 months.

Required skills / experience / capacity

The multidisciplinary expert team should have a track record in:

- physics of infrasound;
- knowledge on infrasound generation by natural or man-induced, specifically mining activities with respect to induced earthquakes and gas transport and processing facilities;
- knowledge on detection methods and monitoring or inspection approaches;
- in sound safety regulation, inspection protocols, etc.;
- social impact of LFN.

Application

Interested companies / consultants, fitting the above mentioned requirements, are invited to respond to the Procurement Office of the Ministry of Economic Affairs and Climate Policy, to the attention of Ms. Marjolein Switzar by e-mail IUCEZteam5@rvo.nl.

You do not have to send documents, only an e-mail if you are interested.

Interested parties will receive the request for the tender by e-mail as soon as possible after the deadline for responding to this notification.

The deadline for responding to this notification is set at 6 March 2020.