



Quality of Life  
Health  
Development

# NORAH

## Knowledge No. 9

### NORAH Noise Impact Study

### Scientific Quality Assurance

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### Scientific Quality Assurance

“NORAH Knowledge” provides information on the methods and results of the NORAH noise impact study. The aim of this series is to communicate to as many people as possible what exactly NORAH researched. This is why there is an explanation in the glossary at the end for all terms marked “glossary”.

If you would like to receive further issues of “NORAH Knowledge”, please use the enclosed order form.

The NORAH Study investigated the effects of aircraft, road and rail traffic noise on humans.



NORAH (“Noise-Related Annoyance, Cognition, and Health”) is the most extensive investigation into the effects of exposure to aircraft, road and rail traffic noise that has ever been carried out in Germany. It was conducted by nine independent scientific institutes from all over Germany. The client was the Umwelt- und Nachbarschaftshaus, a subsidiary of the state of Hessen and part of the “Forum Flughafen und Region”. Alongside the state of Hessen, communities, Fraport AG and Lufthansa were also involved in the financing.

The NORAH Study examines the long-term effects of traffic noise on health, quality of life and early childhood development in the Rhine-Main Region. The initiator of the study is the Airport and Region Forum (ARF). The scientists were accompanied from the start by an external Scientific Advisory Board for Quality Assurance (WBQ). This is what distinguishes NORAH from similar, predecessor studies. The study addresses some of the most topical important issues currently being dealt with by international noise impact research. It also covers a wider range of investigation aspects than previous studies. In order to find out more about how human beings respond to traffic noise, the NORAH scientists also looked at the medical histories of more than one million people, and reconstructed the noise exposure at around 900,000 addresses in the Rhine-Main Region.

A total of five sub-studies form the core of the NORAH Study. Each one builds on the current international state of research. In addition to this, extremely complex and innovative techniques were used to calculate the acoustic exposure. In this edition of “NORAH Knowledge” we present the internal and external scientific Quality Assurance for the study.

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Further information on the NORAH Study is available on the Internet at [www.laermstudie.de](http://www.laermstudie.de). There you can also subscribe to the newsletter “NORAH Brief”.

### Contact

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## QUALITY ASSURANCE IN SCIENCE: WHY IS IT NECESSARY?

Scientific studies can influence political decisions. Researchers therefore have major responsibility – in particular when they conduct studies on socially relevant issues – because their results can sometimes have far-reaching consequences. But even when they do their work with the greatest care, expertise and methodological competence, errors can occur: from a simple measurement error right up to incorrect interpretation, with far-reaching consequences for the result. For this reason studies should always be subjected to external scientific control.

## NORAH has to meet the highest standards

Quality Assurance by an external body has been established as a basic principle in science. The necessity for a procedure in line with the scope and complexity of the NORAH Study was self-evident: all of the studies within NORAH are subject to internal and external Quality Assurance. In addition to this, the NORAH scientists will submit their results to scientific journals for peer review – but only after the results are published by the client. Neither the population nor the client would be able to wait until all the relevant journals completed their peer reviews. Furthermore, as a contract research project on the controversial issue of traffic noise, the NORAH Study has to demonstrate particularly clearly that its results are not interest-based, but in compliance with the highest scientific standards. Finally, the study design of NORAH also demanded especially complex and exhaustive Quality Assurance because the study enters new scientific territory in some areas. Therefore, it is especially important to make all steps secure and transparent.



Rules to secure scientific quality have been established themselves in all scientific disciplines.

# CRITERIA FOR SCIENTIFIC QUALITY ASSURANCE

Many areas of science have their own “guidelines on good scientific practice”. Parallel to this, other rules to secure scientific quality have been established in the various disciplines. NORAH is an interdisciplinary study. This means that it can be categorised under not only one, but several different scientific disciplines, including psychology, acoustics, medicine and epidemiology ([glossary](#)). Accordingly, NORAH uses various methods of research and Quality Assurance. There is, after all, a big difference between monitoring the quality of tests and their conduct in a classroom, and the derivation of acoustic data from the radar information of an airport. The module on health risks, for example, is an epidemiological study – accordingly, it is subject in particular to the “guidelines on good epidemiological practice”.

At the same time there are some universal criteria for scientific Quality Assurance which apply to all disciplines and thus, of course, also to NORAH. Here are some of the main ones:

- ▶ **Study question or hypothesis** ([glossary](#)): It is decisive for the quality of a study that the scientists formulate clearly and precisely from the very beginning what they want to examine and how: “What do I actually want to know, and how can I achieve this knowledge?” Every NORAH sub-study has several concrete study questions that are expressed in hypotheses. The Quality Assurance ensures that exactly these questions are answered.
- ▶ **Data collection**: The core of any study is the collection or compilation of (new) data that form the basis for information and the discovery of new interconnections. NORAH uses a wide range of different methods to collect and compile these data: written and telephone surveys, interviews, tests, online surveys, use of existing data or technical measurements and records.
- ▶ **Data storage and management**: The data collected during a study – insofar as large data volumes are concerned – are registered and administrated in databases so that they can later be prepared and used for statistical calculations. The data management for the NORAH Study is very complex because there are huge amounts of personal data which are all either anonymised or pseudonymised ([glossary](#)).
- ▶ **Data analysis**: The analysis of the data should follow an analysis plan set out in advance. This means that the researchers establish at the study design ([glossary](#)) stage which statistical methods are appropriate to carry out data analyses that will help to answer the study question(s). This avoids a situation where the collected data are randomly subjected to various statistical procedures until an expected or apparently plausible result is reached.
- ▶ **Scientific publication of the results**: The scientific community is the best guarantor of quality in the long term because the different research communities are constantly discussing all the findings in their respective disciplines and comparing them with their own work. This is why all of the NORAH scientists have the contractually established right to publish their results for peer review at the latest six months after the release of the study reports.

## QUALITY ASSURANCE IN THE NORAH STUDY – OVERVIEW

All the members of the NORAH Research Consortium ([glossary](#)) are experienced and established scientists in their respective disciplines who can vouch for the quality and neutrality of the NORAH results. At the very beginning of the NORAH Study, independent scientists were also commissioned to examine the quality of the scientific work from the outside. The use of external quality advisors for third-party-financed studies is not unusual – but NORAH goes further than many other studies with its “Scientific Advisory Board for Quality Assurance” (WBQ).

## There from the very start

Even before the NORAH Study was tendered ([glossary](#)), the client was looking out for possible quality advisors. In an initial workshop, various experts gave the client ideas as to which outstanding research questions on the effects of traffic noise, specifically aircraft noise, the study should pursue. Before the actual study was tendered, there was a tendering procedure for the most suitable study design ([glossary](#)). By the time the NORAH Study was publicly tendered, there was already an expert committee in place with exclusive responsibility for the Quality Assurance of the study. The Airport and Region Forum (ARF) was later able to secure some of these scientists as WBQ members.

The NORAH Consortium and the WBQ meet regularly.  
Front right: Study Director Prof. Rainer Guski.







UNH / Schurtakow

WBQ and Consortium discuss very openly with each other. Here at a meeting: Dr Mark Brink from the ETH Zürich.

## Internal and external Quality Assurance

The procedure for Quality Assurance in the NORAH Study is subject to clear rules:

- ▶ The scientists carrying out the study have agreed to an internal countercheck by other researchers (more about this on page 10). The internal Quality Assurance examines the concepts and reports of the Consortium before they are seen by the WBQ.
- ▶ Then the WBQ discusses and comments on these. The WBQ is the external Quality Assurance for the NORAH Study (more about this on page 6). Two quality advisors are responsible here for certain sub-studies (reporting experts who prepare and coordinate the statements of the overall WBQ).
- ▶ The comments of the WBQ first go back to the Consortium, which revises its documents and sends them to the Umwelt- und Nachbarschaftshaus (UNH), the client of the study.

Working as a permanent scientific consultant to the ARF, the Öko-Institut supports the Quality Assurance process. It advises the UNH in scientific matters, and functions as an interface between the client, scientific Consortium and WBQ.

## Leading in noise impact research

Both the structure and the complexity of the Quality Assurance in the NORAH Study are unique in the field of noise impact research. "Quality Assurance here is not a seal of approval that is granted subsequently, but a process that accompanies the research team from start to finish," says Dr Bettina Brohmann from the Öko-Institut. "The particular conditions and the political context of NORAH have certainly contributed towards so much emphasis being placed on an independent and accompanying Quality Assurance."

## Constructive collaboration

Thanks to the Quality Assurance, it was possible to precisely formulate certain aspects of the study at an early stage, so that the methodology of the data collection could be adapted accordingly in good time. The WBQ suggested, for example, switching to telemedicine ([glossary](#)) for the blood pressure measurement sub-study. The design of the questionnaires and the issue of the representativity of the NORAH results were discussed between Quality Assurance and the Consortium and subjected to strict controls. In the interpretation of the data, the WBQ was able to provide helpful professional advice on the question of the scientific analysis of the results. "Critical points are addressed and discussed openly at all meetings," says Prof. Rainer Guski, overall coordinator of the NORAH Study.

## EXTERNAL QUALITY ASSURANCE: THE “WBQ”

The Scientific Advisory Board for Quality Assurance (WBQ) is made up of national and international experts in epidemiology ([glossary](#)), sleep medicine, cardiology, industrial medicine, acoustics, psychology and noise impact research. Some of the members of the WBQ already checked the overall concept of the study as quality advisors in November 2010, i.e. before the scientific Consortium ([glossary](#)) had even been selected.

### Quality Assurance as teamwork

The WBQ has been meeting regularly since 2010. It passed its rules of procedure (see appendix) in the constituent meeting. The WBQ members have had a total of 18 official meetings with the Consortium over the course of the study. In addition to this, there were bilateral meetings with individual module directors, as well as internal meetings of the WBQ. The meetings take place as required: at least three times a year, at study conclusion – when there is more than usual to discuss – around every two months. At the joint WBQ meetings, which usually deal with one or two sub-studies, the sub-study directors first report on the current status, possible problems and issues that are to be discussed. Then the scientists discuss solution approaches and make suggestions. The WBQ members work in tandem: every NORAH sub-study has a designated quality advisor and a further scientific expert.

The WBQ is made up of international experts in epidemiology, sleep medicine, cardiology, industrial medicine, acoustics, psychology and noise impact research.

## Own statements

In concrete terms, the WBQ advises the Consortium on the selection of methods, checks work reports, and provides support for challenges and problems in the research process. On conclusion of the individual NORAH sub-studies, the WBQ examines the results reports of the scientists, and suggests, for example, further analyses where necessary. The WBQ also draws up its own statement on each concluded sub-study, which is made publicly accessible.

## Elaborating solutions jointly

Different expert opinions – perfectly normal in any scientific collaboration – are discussed jointly with consideration of all aspects until a scientifically feasible solution is found. The WBQ has no chairperson or official spokesperson. All of the members of the external Quality Assurance team have the same rights and obligations. They do not represent individual opinions to the outside, but rather the WBQ position reached by consensus. “This form of collegial cooperation – talking things through to arrive at a consensus – is not necessarily daily practice in science,” says Dr Bettina Brohmann of the Öko-Institut. “NORAH’s particularly dialogue-oriented approach demands a high level of personal commitment by the scientists in Quality Assurance.”



UNH/Schurtakow



## Members of the external Quality Assurance team (WBQ):



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### Dr Mark Brink

has been working for a long time on questions as to the impact on health of various noise sources as lecturer in the Department of Environmental Sciences at the ETH Zürich and as Senior Scientist of the Swiss Federal Office for the Environment. Dr Brink has also done work in relation to nocturnal aircraft noise in Switzerland (among other things he was involved in the discussion on the Zurich Aircraft Noise Index), and is very familiar with the situation in the Frankfurt region. He has already made his expertise available in various RDF events. Dr Brink is a consultant to the WHO in the area of noise impacts, and a member of the Executive Committee of the International Commission on Biological Effects of Noise (ICBEN).

**Responsible for:** *Quality of Life Study (principal responsible expert), Sleep Study (participating expert)*



privat

### Prof. Erland Erdmann

is emeritus director of the Heart Clinic of the University of Cologne,

which he also founded in 1995. In numerous training and research posts at home and abroad, Prof. Erdmann has become a proven expert, in particular in the field of cardiology. He was, for example, Fellow of the American Heart Association, Fellow of the European Society of Cardiology, Fellow of the American College of Cardiology and member of the New York Academy of Science. Prof. Erdmann has received numerous prominent awards and distinctions, including, for example, the Franz-Loogen Prize for his groundbreaking work in the field of cardiovascular research.

**Responsible for:** *Blood Pressure Study (principal responsible expert), Study on Health Risks (participating expert)*

Umwelt-Campus  
Birkenfeld

### Prof. Kerstin Giering

teaches technical acoustics, sound and vibration control, mathematics and physics at Trier University of Applied Sciences. Her research focus for many years now has been in the field of traffic noise and the effects of different types of traffic noise.

**Responsible for:** *Acoustics (participating expert)*



IfADo

### Prof. Barbara Griefahn

is a doctor for occupational medicine, environmental medicine and social medicine at the Leibniz Institute for Labour Studies at the Technical University of Dortmund. One focus of her many years of research work is environment-related sleep disorders – including the effects of traffic noise.

**Responsible for:** *Sleep Study (principal responsible expert), Quality of Life Study (participating expert)*

Gemeinnützige  
Umwelthaus GmbH

### Prof. Jürgen Hellbrück

is a psychologist and professor for environmental psychology at the Catholic University of Eichstätt-Ingolstadt. Prof. Hellbrück has been working for over 30 years in the field of psychological acoustics. His work focuses mainly on the investigation of the effects of noise on perception and behaviour, in particular the effects of sound on cognitive performance. He has held guest professorships in Japan, is a Fellow of the Alexander von Humboldt Foundation, and was a Fellow of the Hanse-Wissenschaftskolleg (HWK) Institute for Advanced Study.

**Responsible for:** *Child Study (principal responsible expert)*



privat

### Prof. Wolfgang Hoffmann, MPH

is director of the Section Epidemiology of Health Care and Community Health at Greifswald University Hospital. As an expert in the fields of the epidemiology of chronic diseases and epidemiological methods, he advises in particular on the areas of epidemiology and health (e.g. cancer register) in various national and international committees.

**Responsible for:** *Study on Health Risks (principal responsible expert), Blood Pressure Study (participating expert)*



Phenotype2012

### Dr Irene van Kamp

works as a psychologist and epidemiologist at the renowned National Institute of Public Health and the Environment of the Netherlands – RIVM (for example in the RANCH Study). Ms Van Kamp advises the WHO and the EU on the issue of health and traffic noise. From 2003 to 2011 she was, among other things, chair of the International Commission on Biological Effects of Noise (ICBEN).

**Responsible for:** *Child Study (participating expert), Quality of Life Study (participating expert)*

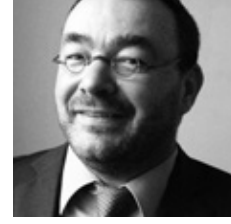


UNH/ Schurtakow

### Dr Georg Thomann

has been director of the Department for Air, Noise and Radiation in the Office for Nature and the Environment (ANU) of the canton Graubünden (Switzerland) for nine years now. For around 10 years before that he was director of a research group on the subject of aircraft noise at the Federal Laboratories for Materials Testing and Research in Dübendorf (Switzerland). His work up to now includes the calculation and analysis of the noise immissions of industrial and air traffic facilities (Zurich, Geneva, Frankfurt, military airbases). Within the framework of his expert and assessor activity, in 2008 he was, for example, involved in the elaboration of the Frankfurt Aircraft Noise Index and in the development of the Zurich Aircraft Noise Index (ZFI). He is also vice-president of the Swiss Commission for Noise Abatement (EKLB) and a member of the board of the Association of Regional Noise Protection Experts, "Cercle Bruit".

**Responsible for:** *Acoustics (principal responsible expert)*



privat

### Prof. Joachim Vogt

is director of the interdisciplinary research group Work and Engineering Psychology (FAI) at the Technical University of Darmstadt. He is a qualified psychologist (graduating in 1993 with a focus on quota approaches to the effects of aircraft noise), did his doctorate in 1998 (on the psychophysiological burden on air traffic controllers) and qualified as a professor in 2003 with research work on the sustainability of air traffic management. Between 2004 and 2009 Prof. Vogt worked on various subjects in research (Copenhagen University) and industry (German Air Traffic Control in the area of Human Factors and Single European Sky).

**in the WBQ of NORAH for:** *Quality of Life Study (participating expert)*



Dr Georg Thiemann looking over Inse Warich's shoulder, Öko-Institut e.V. All of the WBQ members were fully committed to their task.

UNH/ Schurtakow

## “THE QUALITY OF RESEARCH IS OFTEN DETERMINED AT THE VERY BEGINNING.”

### Interview with WBQ member Prof. Wolfgang Hoffmann



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Prof. Wolfgang Hoffmann

Prof. Wolfgang Hoffmann graduated as a doctor specialising in epidemiology ([glossary](#)). Since 2012 he has held a professorship in “Population-Based Epidemiology of Health Care and Community Health” at Greifswald University Hospital. He is the director of the department of the same name as well as Executive Director of the hospital’s Institute for Community Medicine. In the WBQ of the NORAH Study Prof. Hoffmann is concerned with the scientific quality of the epidemiological methods in the various modules. He is a reporting expert in the Study on Health Risks and participating expert in the Blood Pressure Study.

#### Was there any hesitation on your part when you were asked in 2010 whether you would like to become a member of the WBQ?

No, none whatsoever. I was very interested in this task and helped as much as possible in shaping the study design ([glossary](#)). The quality of research is often determined at the very beginning. This is why I wanted to be involved from the start.

#### What is special about the Quality Assurance for the NORAH Study?

Not every study has a “scientific advisory board” for Quality Assurance. In no other study that I am aware of is this advisory board so intensively involved in the discussion as in NORAH. The WBQ is very deeply involved in the concrete scientific work, and its members support the NORAH scientists with great commitment. We are frequently in direct contact with the NORAH scientists, particularly in the phase of the data analysis and compilation of the results reports.

#### How would you rate the Quality Assurance of the NORAH Study compared with other aircraft noise studies?

Overall, the scientific quality has high priority in the NORAH Study. This has also developed over the years. The methodological quality is a major issue at every meeting of the scientists. The Quality Assurance goes beyond what it was possible to do in many other studies. Of course, there can be niggles sometimes if the Consortium ([glossary](#)) and WBQ are of a different opinion on a certain matter – this, however, is an inevitable consequence of serious Quality Assurance, in such a large study.

### Do you believe that the Quality Assurance process in NORAH will also be used in future studies?

Yes. Particularly in the case of studies relevant to health policy, we have to take more care that the results are based on suitable study designs and the best possible methods – and that they actually answer the original research question – because socially relevant decisions are often based on the results. The WBQ of the NORAH Study shows how such Quality Assurance can survey the whole duration of a scientific study. Many studies would profit from the kind of discussion processes we have in NORAH.

### You helped to develop the “Guidelines for Good Epidemiological Practice” (GEP), which also play an important role in the NORAH Study. What exactly are these guidelines?

The GEP list criteria that distinguish good epidemiological studies from studies that are not so good. They are observed in all epidemiological research projects. Roughly speaking, they describe how a study should be conducted and what principles have to be observed: for example that the questions have to be clearly formulated at the beginning, the appropriate methods have to be used in every area, and all work steps have to be carefully verified and documented.

### Alongside the Quality Assurance for NORAH, you also direct the “Epidemiology of Health Care and Community Health” department at the University of Greifswald. You also teach there. How do you find time for all that?

Quality Assurance is work – holidays and leisure time and, unfortunately, even family and friends sometimes have to take a back seat. As quality advisors we do not want to just criticise, but also to make concrete suggestions for improvement. In my opinion, the question as to possible health risks from traffic noise is currently one of the most important issues in environmental medicine, and the data situation is still not clear. The NORAH Study is an important step forwards in this area – this is why I am happy to commit myself to it.

## INTERNAL QUALITY ASSURANCE

The scientists conducting the NORAH Study also submit themselves an internal Quality Assurance process. These quality advisors accompany the researchers very closely in their work and examine their methods and results before they go to the WBQ and – later – to the client.

### Members of the internal Quality Assurance team:



privat

#### Prof. August Schick

founded the psychological hearing, sound evaluation and noise impact research at the University of Oldenburg in 1974. It is within this framework that the ten volumes of reports of the interdisciplinary “Oldenburg Symposia on Psychological Acoustics” appeared. From 1991 to 2000 Prof. Schick was deputy spokesperson of the interdisciplinary DFG Graduate School (Deutsche Forschungsgemeinschaft) “Psychoacoustics”. From 1992 to 1996 he worked on behalf of the Deutscher Arbeitsring für Lärmbekämpfung (German Noise Abatement Association) as editor in chief of the *Zeitschrift für Lärmbekämpfung* (magazine for noise abatement). From 1985 to 2005 he was a member of the interdisciplinary working group for noise impact issues at the Federal Office for the Environment in Berlin.

**Responsible for:** Quality of Life Study and Child Study



privat

### Dr Rudolf Schuemer

is a psychologist and worked before his retirement as a scientist at the Distance Teaching University of Hagen. Dr Schuemer's special fields are environmental psychology as well as research methods and statistics in psychology and the social sciences. As a noise impact researcher since the 1960s he was involved in the first German aviation noise impact study (the "DFG Aviation Noise Study"), as well as in various road and rail traffic noise studies since the 1970s.

**Responsible for:** *Quality of Life Study*

Universität  
Magdeburg

### Dr Enno Swart

is research fellow and director of the Faculty of Epidemiology ([glossary](#)) at the Institute for Social Medicine and Health Economics of the Otto von Guericke University in Magdeburg since 1993. For around 20 years now, one of his research focuses has been the collection and scientific use of secondary data ([glossary](#)). He is engaged as a co-spokesperson for the working group for the collection and use of secondary data (AGENS) of the German Society for Social Medicine and Prevention (DGSMMP) and the German Society for Epidemiology (DGEpi). Dr Swart

is also a member of the German Society for Medical Sociology (DGMS).

**Responsible for:** *Study on Health Risks*



privat

### Dr Berthold M. Vogelsang

works in the Ministry for the Environment of Lower Saxony in the Department for Immissions Control Protection ([glossary](#)), where he is responsible for facility and area-specific noise control. Dr Vogelsang is an expert in, among other things, the measurement, calculation and assessment of air traffic noise, and made a decisive contribution towards the elaboration of the necessary calculation and measurement principles. He is chairman of numerous DIN committees, as well as a member of international and national working groups on acoustic immissions control.

**Responsible for:** *Acoustics, specifically calculation of air traffic sound*

Leibniz Institut -  
BIPS GmbH

### Prof. Hajo Zeeb

worked for several years as a doctor before going to work at the German Cancer Research Centre (DKFZ) in Heidelberg, and then at the University of Bielefeld as a researcher in the field of vocational and radiation epidemiology. After that he worked at the WHO in Geneva in the Department of Public Health and Environment, before switching in 2006 to the Institute for Medical Biometry, Epidemiology and Informatics (IMBEI) of the Mainz University Clinic. Prof. Zeeb has been director of the Department for Prevention and Evaluation at the Leibniz Institute for Prevention Research and Epidemiology (BIPS) since January 2010, and works there on environmental risks and social-epidemiological issues, among other things.

**Responsible for:** *Study on Health Risks*

## APPENDIX

Excerpt from the “Rules of Procedure of the Scientific Advisory Board for Quality Assurance of the NORAH Study”.

(...)

### § 3 Resolutions

All members of the WBQ decide jointly on the affairs of the Advisory Board. This also includes the contents and evaluations in their statements. The objective is to achieve unanimous decisions. If, despite exhaustive discussion, this is not always possible, deviating positions of the WBQ will be represented and reported accordingly. Decisions are reached autonomously and in accordance with the independent scientific conviction.

(...)

### § 4 Enquiries to the WBQ

(...)

The WBQ can also take positions based on its own expert assessment on aspects which are not brought expressly to the board if it believes this is expedient for the achievement of the study objectives.

The WBQ forms working groups with specific focus themes. The abovementioned enquiries should, as far as possible, be answered by the working group responsible for the specific area concerned.

### § 5 Communication

(...)

All conclusive statements of the WBQ on interim and final reports of the Consortium will be made accessible to the public along with these reports or published immediately when they are available in their final form.

(...)

The uppermost objective of all involved in the WBQ, Consortium and UNH/Öko-Institut is to ensure with the aid of the communication procedures that the aims being pursued by the ARF in the commissioned study are achieved, i.e. to receive scientifically valid results on the effects of traffic noise in the region and their interconnections and causes. The influencing of later investigations through interim results becoming known in advance must be avoided under all circumstances. This is why the WBQ and the other parties involved will discuss in each case how the need for information and transparency can be fulfilled as far as possible without endangering the validity of the study.

### § 6 Evaluation criteria

In the commentary and assessment of the work of the Consortium in the conduct of the NORAH Study, the WBQ applies the following criteria:

1. Can it be assumed that the procedure of the Consortium is in accordance with the jointly defined targets in the tender and in the further course of the study? Were the specified methods used and were the agreed interim targets achieved?
2. Does the procedure of the Consortium correspond to the current state of science?
3. Are any modifications appropriate and convincingly substantiated?
4. Is the representation of the results consistent in itself and is the derivation adequately verified?
5. Does the WBQ believe that, in view of these questions, the Consortium needs to carry out a revision? If yes, how should this be roughly implemented?

You can view the full Rules of Procedure here:

[www.forum-flughafen-region.de/monitoring/laermwirkungsstudie-norah/wissenschaftlicherbeirat-qualitaetssicherung](http://www.forum-flughafen-region.de/monitoring/laermwirkungsstudie-norah/wissenschaftlicherbeirat-qualitaetssicherung)



# Glossary

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You will find further explanations in the glossary at [www.laermstudie.de](http://www.laermstudie.de).

## **Tender**

A tender is a special procedure for generating competing offers from different bidders looking to obtain an award of business activity in works, supply or service contracts. In a public tender, a state or a community or authority declares a certain need, and calls on potential providers to make an offer.

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## **Epidemiology**

Epidemiology is the study of the distribution of risk factors and diseases in populations. It contributes towards a better understanding of the cause of disease. Epidemiology develops measures to prevent disease or its spread. It also helps to develop strategies for the treatment of diseases.

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## **Hypothesis**

A hypothesis is an assumption or a supposition. Empirical science consists largely in the examination of hypotheses. Scientists set up their research in such a way that they can test their hypotheses. As long as the hypotheses are not refuted by the research, for example by measurement values or survey data, the scientists continue working on the basis of the hypotheses.

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## **Immissions control**

Immissions include noise and other environmental effects on humans. Immissions control refers to the totality of attempts to limit immissions to a tolerable level in the long term for humans and the environment.

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## **Consortium**

The Consortium for the NORAH Study is made up of the scientists conducting the study as a team.

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## **Pseudonymisation**

The Federal Data Protection Act defines pseudonymisation as “substituting a person’s name and other identifying characteristics with a label, in order to preclude identification of the data subject or to render such identification substantially difficult.” In other words: features that can identify the individual person – for example the name – are substituted with a code, for example a randomly selected number. Other personal details (e.g. date of birth, address, telephone number) must be encoded in such a way that it is not possible to identify a person.

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## **Secondary data**

Secondary data are data that were already available before the current research project because they were originally collected for other investigation purposes. The NORAH Study on Health Risks is based partly on secondary data – in this case on pseudonymised patient data from health insurance companies.

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## **Study design**

In order that a scientific study actually investigates what it is supposed to investigate, careful planning is essential. Scientists call this the study design. It includes, for example, the method of data collection and the type and extent of the data.

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## **Telemedicine**

Telemedicine allows the measurement of body functions and in certain cases also the support of diagnoses and therapies, even when doctor and patient are spatially separated. In everyday clinical work it can be used, among other things, for the registration and transmission of vital data such as pulse, blood pressure, blood sugar or lung function. The information is transmitted using the Internet, telephone networks or satellites. In the Blood Pressure Study the scientists used telemedical sets consisting of an upper-arm blood pressure measurement device with Bluetooth® function and a mobile phone. The measurement devices transmitted the blood pressure values to the mobile phone, which then sent them in encoded form via a protected data line directly from the house of the study participant to the database of the NORAH scientists.

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**Concept, text and design**

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