FINAL DRAFT
Technical Specification

ISO/DTS 16755-1

Acoustics — Non acoustic factors influencing the perception, interpretation and response to environmental sounds —

Part 1: Definition and conceptual framework

ISO/TC **43**/SC **1**

Secretariat: **DIN**

Voting begins on:
2025-02-12

Voting terminates on:
2025-04-09

Reference number
ISO/DTS 16755-1:2025(en)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Conceptual framework of non-acoustic factors **1**
4.1 General 1
4.2 Categories of non-acoustic factors 2
Annex A (informative) **Non-acoustic factors categories** **4**
Bibliography **5**

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

A list of all parts in the ISO/TS 16755 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Many countries already have regulations in place concerning the acceptability of environmental noise exposure, while others are likely to do so in the future. Such regulations often take into account relationships between noise exposure and noise-induced health outcomes, including long-term annoyance and sleep disturbance.

International standards have been developed for the measurements of certain characteristics of environmental sound. Two examples are ISO 1996-1[1], which contains details specifications about basic quantities and procedures, measurement of sound and guidance on the application of these data to set noise limits, and ISO 20906[2], which specifies criteria for unattended monitoring of aircraft sound in the vicinity of airports.

Other standards focus on the effects of sound on humans. Long-term annoyance is an important health effect attributable to environmental noise, both as a health outcome in its own right, but also as a potential risk factor to other clinical health outcomes.[3] ISO/TS 15666[4] provides a standardised specification for the assessment of noise annoyance by social and socio-acoustic surveys. This specification has enabled a more robust consolidation of the international evidence on noise annoyance, by ensuring consistency in the definition and measurements of this specific health endpoint[3].

It is generally accepted that human reaction to environmental sound is determined partly by the acoustic characteristics of the physical stimulus, and partly by factors that frame the sound exposure within a broader context.[5]to[9] Such factors are often referred to as non-acoustic factors in the noise and health literature.

In recent years there has been a growing interest in the soundscape approach. Whilst the term "soundscape" has seen widespread academic and popular adoption in various fields and applications (including urban, underwater and ecological contexts),[10] the most relevant definition for the purposes of this document is the ISO 12913-1 definition, which places an emphasis on how sound in an environment is experienced by a person and/or people in context. According to ISO 12913-1 assessing soundscape in context includes:

"the interrelationships between person and activity and place, in space and time. The context may influence soundscape through (1) the auditory sensation, (2) the interpretation of the auditory sensation, and (3) the responses to the acoustic environment."[11].

There is clear overlap between the concept of the "context" as discussed in the ISO 12913 series[11]to[13] and the term "non-acoustic factors" as used by the noise and health community. Therefore identifying, measuring and assessing non-acoustic factors is an important process of measuring and assessing soundscape in accordance with ISO 12913 series as well as assessing non-acoustic factors in noise and health research[5][7][8][30][31].

Multivariate regression analyses of socio-acoustic surveys suggest that known non-acoustic factors can account for up to one third of the variance observed in noise annoyance reactions.[6][14]to[17] These results have been further replicated in soundscape studies, with multi-level regression analysis indicating that non-acoustic factors can explain 35 % of the variance in pleasantness perception (i.e. the opposite dimension to annoyance) and 18 % of the variance in eventfulness perception[18].

There is clear evidence that non-acoustic factors offer significant opportunities in a) understanding the drivers of annoyance and soundscape appraisal and b) opening up new possibilities for reducing the health burden attributable to the sound environment. In fact, several projects have already explored how non-acoustic factors can be used to reduce noise annoyance (see for example the ANIMA project[19] for aviation noise and FAMOS[20] project for road traffic noise). Consideration of non-acoustic factors in policy and practice could also lead to more equitable health outcomes.[21] In business terminology, non-acoustic factors have the potential to significantly increase the return on investment in noise effects investigation and mitigation and soundscape design.[22] The WHO Environmental Noise Guidelines 2018 also acknowledge the important contribution of non-acoustic factors, and recommend that[23]:

> *"Future intervention studies … should use measures of moderators and confounders, including repeated measurements of situational and personal variables such as activity interference, potential confounders such as noise sensitivity, coping strategies and a range of other attitudinal variables."*

Despite the key role that non-acoustic factors play in both the health protection (noise control) and health promotion/improvement (good acoustic quality and soundscape design) approaches, to date, there is no standardised specification for the assessment of non-acoustic factors in social surveys and soundscape assessments. For example, the definition and standardisation of non-acoustic factors fall outside scope of ISO/TS 15666. This means that the extent to which non-acoustic factors are investigated in a particular study is limited by the specialist expertise within the study group, and different studies tend to develop project-specific survey instruments.

The aim of ISO/TS 16755 series is to help define, measure and interpret specific attributes of the context that help to better understand the human interpretation of, and response to a sound environment. The objective of this document is to harmonise the definition and conceptual framework for non-acoustic factors related to noise and soundscape data collection activities, such as via social and socio-acoustic surveys, soundwalks, questionnaires and guided interviews. This definition and conceptual framework form the foundation for data collection, analysis and interpretation covered in subsequent parts of this document.

ISO/TS 16755 series applies to any sound in the acoustic environment ("acoustic environment" is defined in ISO 12913-1:2014, 2.2).

When these specifications are met, it will be possible to identify, compare and pool survey results across studies in a methodologically robust way, thereby strengthening the evidence base and ultimately leading to a better understanding and application of non-acoustic factors to improve the health and quality of life of citizens across the globe. The data generated by the application of this Technical Specification series will be relevant to practitioners involved in all aspects of spatial planning and environmental public health including policy makers, planners, developers, regulators, researchers and environmental public health practitioners.

This document was developed with valuable input from the International Commission on Biological Effects of Noise (ICBEN) Team 6 - Community response to noise and annoyance.