

Technical Advice Note (TAN) 11: Air Quality, Noise and Soundscape

SUPPORTING DOCUMENT 1: SOUNDSCAPE DESIGN

compiled by the Welsh Government working with the Noise Abatement Society

DRAFT – NOT POLICY

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Foreword

The key to understanding the concept of soundscape design, as described in this document, is to first understand the difference between sound environment and soundscape.

The sound environment means what you might expect it to mean: all the sounds that may be heard in a particular place, at a particular time.

Soundscape, as defined in international and British standards, means something different. Soundscape refers to how the sound environment is perceived or experienced by people in context. The quality or appropriateness of the soundscape is determined by three equally important elements: the sounds themselves, the people hearing those sounds, and the context, taken in the widest possible sense, in which they are heard.

A composer can choose to write for whatever musical genre suits them, in the knowledge that there is likely to be a market out there for that kind of music. However, somebody making a decision about what (if any) recorded music to play in a shop, restaurant or public space at a particular time of day, where to place the speakers, and how loud to play it, needs to know more than just whether the music is any good. They need an understanding of the likely preferences of the people who will be present in that place at that time, how they are likely to perceive a certain kind of music played at a certain loudness in that context, how it is likely to affect their mood, their behaviour and the resulting sound environment, which includes the sounds made by those people. The composer is concerned with sound design, or possibly sound environment design (if composing with a particular type of performance space in mind). By contrast, the person deciding whether to play the composer's music in their shop or restaurant, and if so how loud to play it, is concerned with soundscape design.

Everything that follows in this document flows from understanding this distinction, and from giving full weight to the Well-being of Future Generations (Wales) Act's imperative to involve people in decisions that affect them.

The overarching message of this introductory guide is that when the scale and nature of a proposed development are such that involving local people in the design of their future sound environment is likely to result in better placemaking and a more appropriate soundscape, then those people should be involved, right from the start of the design process. And to provide structure to this community involvement in a development's design, the methods contained in international and British soundscape standards for assessing people's perceptions of their sound environment in a given context should be followed, to the extent that can usefully inform design choices.

Finally, it must be stressed that the level of effort expected in respect of soundscape design should be proportionate to the level of opportunity presented by a proposed development for such an approach to result in better placemaking. This will depend on the nature and scale of the proposed development, and on the local context.

1 Introduction

This introductory guide has been prepared to support Welsh national planning policy on noise and **soundscape**. It should be read in conjunction with:

- Planning Policy Wales (PPW) [1], which sets out the land use planning policies of the Welsh Government;
- Technical Advice Note 11: Air Quality, Noise and Soundscape (TAN 11) [2], which sets out planning policy guidance from the Welsh Government on air quality, noise and soundscape;
- Technical Advice Note 12: Design (TAN 12) [3], which sets out planning policy guidance from the Welsh Government on sustainable design and planning; and
- the Noise and Soundscape Action Plan (NSAP) [4], which sets out the Welsh Government's overarching policies for noise and soundscape management.

PPW sets out the Welsh Government's land use planning policy in respect of promoting sustainability through good design and planning for sustainable buildings. This includes the role of local planning authorities in delivering **good sustainable design**.

The Noise and Soundscape Action Plan (NSAP) 2018-2023 committed the Welsh Government and public bodies subject to the Well-being of Future Generations (Wales) Act 2015 ("the WFG Act") [5] to move beyond only managing noise through driving down decibels and more towards creating **appropriate soundscapes**, meaning "the right acoustic environment in the right time and place".

The revised TAN 11 expects certain applications for planning permission to include a **Noise and Soundscape Design Statement** (NSDS), to demonstrate to the planning authority that noise and soundscape have both been considered appropriately at the design stage.

Design and Access Statements are mandatory to accompany certain planning applications and listed building consent applications. Detailed guidance on Design and Access Statements has been produced by the Welsh Government and the Design Commission for Wales [6]. Where a Design and Access Statement is required, the NSDS would be expected to form a part of it.

The purpose of this guide is to equip those involved in design and development with advice on when and how to employ a **soundscape design** approach instead of, or in addition to, more conventional noise control or **acoustic design**. The purpose of this alternative approach would be to create and maintain appropriate soundscapes and achieve **better placemaking** in line with PPW, the NSAP and TAN 11. As far as possible, this guide aligns with the objectives of good design outlined in PPW and elaborated on in TAN 12 and associated guidance, and seeks to position, as appropriate, soundscape design as part of the overall design approach taken in TAN 12.

2 Key concepts

Sound	A physical phenomenon comprising vibrations that travel through the air or another medium and can be heard when they reach a person's or animal's ear and/or experienced physiologically even if they can't be heard (e.g. ultrasound or infrasound) [10]
Noise	Sound that is judged or perceived to be unwanted or harmful
Acoustic environment / sound environment	The sound received from all audible sound sources, as modified by the (outdoor or indoor) environment
Context	The individual and combined, acoustic and non-acoustic, physical and non-physical characteristics of a place that may affect the human perceptual response to those characteristics and setting and any changes resulting from a proposed development
Soundscape ¹	The acoustic environment as perceived or experienced and/or understood by a person or people, in context [7, p.1]
Acoustic design	An approach to design relating to the acoustic environment, the principal technical objective ² of which is to protect people from the unwanted and/or harmful effects of noise
Soundscape design	A participatory, people-focused approach to design concerning both the acoustic environment and any physical or non-physical non-acoustic factors that may affect how people perceive and/or experience sound in a specific context in accordance with BS/ISO soundscape standards [7,8,9]
Appropriate soundscape	The right acoustic environment in the right time and place (from a user perspective), which may be achieved through good acoustic design, good soundscape design or a combination of the two, depending on the situation
Acoustic factor	Something that has the properties, dimensions or physical characteristics associated with sound waves
Non-acoustic factor	Something other than an acoustic factor which nevertheless contributes to how people perceive and/or experience their sound environment [24,72]

¹ While the term "soundscape" is generally also used to describe the objective sound environment and/or sound art, for the purposes of this guide and TAN 11 the term is **only** used as defined in the BS ISO 12913-1:2014 standard [7]. Therefore, in this guide and the TAN, in accordance with the standard, the terms "acoustic/sound environment" and "sound art" are defined and used separately to (i.e. never synonymously with) the term "soundscape".

² For rooms such as classrooms, offices and indoor performance spaces, acoustic design may also have technical objectives relating to intelligibility, privacy and the quality of sound transmission within a room, in addition to the objective of noise control. Furthermore, it is recognised that **good** acoustic design, as described in ProPG, requires a holistic approach to achieve optimal acoustic conditions, which may involve consideration of the wider soundscape.

3 When to use a soundscape design approach

The aim of every NSDS should be to create and/or maintain an appropriate soundscape, i.e. an acoustic environment that is right for the people who are going to experience it. Sometimes the most efficient and effective way of achieving this universally desired outcome will be through a soundscape design approach, meaning a participatory, people-focused approach to design led or facilitated by a soundscape specialist. (Section 7 explains what we mean by “soundscape specialist”.) In other situations, the main issue may be unwanted or harmful sound (i.e. noise) obscuring the sounds people want to hear. In those cases the most efficient and effective way of achieving an appropriate soundscape may continue to be through a more conventional approach to design, centred on noise control carried out by an acoustician (an acoustic design approach). In some cases, a combination of both approaches may be needed.

The extent to which the soundscape design approach described in this document is applicable to a particular development will depend upon the extent to which the development offers opportunities for innovative, creative, participatory design. This will be determined by the scale, nature and context of a proposed development. When a soundscape design approach is to be taken, it will be because it offers an opportunity for achieving better placemaking as part of a holistic approach to design, and it is considered the approach most likely to achieve an appropriate soundscape.

The Association of Noise Consultants, the Institute of Acoustics and the Chartered Institute of Environmental Health have produced Professional Practice Guidance on Planning & Noise (“**ProPG**”) [12], intended for use in England. Where it is judged appropriate for the main focus of an NSDS to be on noise control, the content of the NSDS could be similar to that of an **Acoustic Design Statement** (ADS) as described in ProPG. The level of detail in an ADS required by ProPG is proportionate to the level of noise risk. At the time of writing ProPG applies only to new residential development.

A soundscape design approach should be required by planning authorities instead of, or in addition to, a conventional noise control or acoustic design approach, only when and to the extent that it is considered necessary to create an appropriate soundscape and is likely to result in better placemaking, as set out in Table 1. In summary:

- The level of detail required in an NSDS in respect of noise control through good acoustic design should be proportionate to the level of risk of noise exposure posed by the proposed development in context.
- The level of detail required in an NSDS in respect of soundscape design should be proportionate to the level of opportunity for better placemaking to deliver an appropriate soundscape through a soundscape design approach presented by the proposed development in context.
- In both cases, an NSDS will form part of the overall and holistic approach to design and, where appropriate, be contained in a Design and Access Statement.

Table 1 is taken from TAN 11. It outlines the triggers for action in relation to noise and soundscape when proposing new development by defining the nature of NSDS expected in various categories of noise risk and soundscape design potential.

Table 1 Noise and Soundscape Design Statement (NSDS) framework

Unacceptable noise risk	Do not proceed with development.		
High noise risk	<p>Achieve good acoustic quality through good acoustic design.</p> <p>NSDS to be at least equivalent to a Stage 2 ProPG ADS for medium and high risk developments (if residential development being proposed).</p>	<p>Achieve good acoustic quality through good acoustic design.</p> <p>Where practicable, use a soundscape design approach¹ to deliver enhanced outcomes.</p> <p>NSDS to include content at least equivalent to a Stage 2 ProPG ADS for medium and high risk developments (if residential development being proposed) and evidence that opportunities for good soundscape design have been taken where practicable.</p>	<p>Achieve good acoustic quality and a better soundscape through good acoustic and soundscape design.</p> <p>NSDS to include content at least equivalent to a Stage 2 ProPG ADS for medium and high risk developments (if residential development being proposed) and a soundscape assessment and evidence of good soundscape design¹.</p>
Medium noise risk	<p>Ensure good acoustic quality through good acoustic design.</p> <p>NSDS to be at least equivalent to a Stage 2 ProPG ADS for low risk developments (if residential development being proposed).</p>	<p>Ensure good acoustic quality through good acoustic design.</p> <p>Where practicable, use a soundscape design approach¹ to deliver enhanced outcomes.</p> <p>NSDS to include content at least equivalent to a Stage 2 ProPG ADS for low risk developments (if residential development being proposed) and evidence that opportunities for good soundscape design have been taken where practicable.</p>	<p>Ensure good acoustic quality and a better soundscape primarily through good soundscape design.</p> <p>NSDS to contain a soundscape assessment and evidence of good soundscape design¹ and any elements of a Stage 2 ProPG ADS considered necessary in addition to ensure good acoustic quality (if residential development being proposed).</p>
Low noise risk	<p>Ensure good acoustic quality through good acoustic design.</p> <p>NSDS to be at least equivalent to a Stage 2 ProPG ADS for low risk developments (if residential development being proposed).</p>	<p>Ensure good acoustic quality through good acoustic design.</p> <p>Where practicable, use a soundscape design approach¹ to deliver enhanced outcomes.</p> <p>NSDS to include content at least equivalent to a Stage 2 ProPG ADS for low risk developments (if residential development being proposed) and evidence that opportunities for good soundscape design have been taken where practicable.</p>	<p>Achieve a better soundscape through good soundscape design.</p> <p>NSDS to contain a soundscape assessment and evidence of good soundscape design¹.</p>
Negligible noise risk	No NSDS required.		<p>Achieve a better soundscape through good soundscape design.</p> <p>NSDS to contain a soundscape assessment and evidence of good soundscape design¹.</p>
	Low potential for better placemaking through soundscape design	Medium potential for better placemaking through soundscape design	High potential for better placemaking through soundscape design

¹ A suggested stepwise approach to soundscape design is outlined in Section 7.

Table 2 provides examples of what might sometimes be expected to fall into each category of NSDS, although what is considered appropriate for an area and/or project/scheme needs to be determined on a case-specific basis.

Table 2 Examples of what might be expected to fall into each category of NSDS

Unacceptable noise risk³	A noise-sensitive development in a location failing one of the site acceptability tests for noise specified in TAN 11, suggesting there would be a high likelihood of significant adverse impacts.		
	A noise-generating development whose scale and nature means it is likely to cause significant adverse impacts regardless of how well it is designed.		
High noise risk	A single new house close to a busy road ¹ .	A large housing development close to a busy road ¹ .	A large, novel, industrial, commercial or recreational development ¹ in a relatively tranquil area.
Medium noise risk		New industrial or commercial development or transport infrastructure ¹ within or close to an existing settlement.	An urban redevelopment project where incompatible uses already cause significant noise problems.
Low noise risk	A single new house in a low noise area ² .	A large housing development on a quiet brownfield site within an existing settlement.	An urban redevelopment project in an area currently experiencing no significant noise problems.
		New public buildings within an existing settlement.	(Such redevelopment may be categorised as medium noise risk if the stated aim is to create places that will be perceived as having a “vibrant” acoustic character.)
Negligible noise risk	Changes to an existing property that will result in no new noise emissions or exposure.		Creation of a significant new tranquil public open space.
	Low potential for better placemaking through soundscape design	Medium potential for better placemaking through soundscape design	High potential for better placemaking through soundscape design

¹ Where noise sources are also sources of air pollution, the NSDS should provide evidence that good acoustic design has been taken forward in such a way as to maximise synergies and minimise conflicts with measures designed to reduce people’s exposure to air pollution.

² A single new house in a low noise area is considered low risk only when basic good acoustic design is followed, for example to ensure that any heat pump associated with the property is located and installed so as to not to disturb other people living nearby.

³ Some proposed developments are simply unsuitable for certain locations due to either the noise that they generate or their noise sensitivity. They may be identified through the checks advised in TAN 11 and policies in local development plans. Such proposals are likely to be refused by local planning authorities and therefore alternative locations should be sought.

A local development plan may provide more precise criteria on the type and size of proposed developments that should be considered to have low, medium or high

soundscape design potential in a given area, and therefore a planning authority's expectations of the soundscape content of an NSDS in that area.

For developments with **high** potential for better placemaking through soundscape design, the applicant should either follow the soundscape design framework described in Section 7 of this document or else provide written justification for taking an alternative approach to soundscape design.

For developments with **medium** potential for better placemaking through soundscape design, the applicant should have regard to the soundscape design framework described in Section 7 of this document and, if an NSDS is required on noise risk grounds, provide evidence that opportunities for good soundscape design have been taken where practicable.

This guide is not intended to be the last word in good soundscape design, but rather an introduction. Other guidance [12,13,14,70,71], standards [7,8,9], and materials [15,16,53] incorporating emerging best practice may have relevance to specific topics or types of development. Soundscape is an emerging discipline which is rapidly evolving in both research and practice. As such, the necessarily minimal references contained in this document should be considered only as a starting point.

4 What do we mean by soundscape?

Soundscape is a concept that originated over fifty years ago [17,18] and is associated with a wide range of disciplines including, as appropriate but not limited to, acoustics, music, architecture, spatial planning, psychology, sociology, ecology, medicine, humanities, engineering and physics. In 2014, the term was standardised by the International Organization for Standardization (ISO), and adopted into British standards, for its use in the field of acoustics and urban planning [7]. As a consequence, soundscape in the context of PPW, TAN 11 and this guide is defined in accordance with the international and corresponding British soundscape standard series [7,8,9] as “the acoustic environment as perceived or experienced and/or understood by a person or people, in context” [7, p.1]. The acoustic (or sound) environment is defined in Part 1 of the standard series as “sound at the receiver from all sound sources as modified by the environment” and notes that “the acoustic environment can be actual or simulated, outdoor or indoor, as experienced or in memory” [Ibid].

Importantly, a sound environment only becomes a soundscape when experienced by people in context, and that experience will differ from person to person. This is a crucial point, because it means it cannot be said whether a sound environment is “right” or “wrong” for a particular place and time unless we know something about the people who will be present to experience it. Their experience and opinion of the sound environment will depend on a variety of acoustic and non-acoustic factors including the intended use of the space, the preferences of people, their expectations and their attitudes and sensitivity to the sounds that they hear.

The concept of soundscape for the purposes of this TAN relates solely to human perception as defined in BS ISO 12913-1:2014 [7]. Wherever sound levels may be so high in absolute terms or take such a form that they may have a significant adverse effect on either human health or the population health of one or more protected species, then a noise control approach following good acoustic design must be taken to bring exposure to acceptable levels. (See TAN 11 for further details.)

5 What do we mean by soundscape design?

Soundscape design augments traditional noise control practices by assessing the effects of the sound environment from the perspective of the user in context. Whereas traditional noise control approaches focus on predicting and/or measuring, assessing and reducing noise (i.e. unwanted or harmful sound), soundscape design focuses on understanding the impact of the sound environment on people's lived experience in a specific context. In other words, how the collective sounds of a place, together with any physical and/or non-physical non-acoustic factors (i) affect people's perception of those sounds, (ii) make people feel, and (iii) affect what they do [20].

Soundscape design also complements traditional design practices. Design is defined in PPW [1] as *"the relationship between all elements of the natural and built environment and between people and places. To achieve sustainable development, design must go beyond aesthetics and include the social, economic, environmental, cultural aspects of the development, including how space is used, how buildings and the public realm support this use, as well as its construction, operation, management, and its relationship with the surrounding area."* Soundscape design encourages a multisensory approach to design to support well-being and quality of life. This is important for planners, as how people experience a place is a key element of good placemaking.

A sound environment will change depending on how a space is used, and the soundscape (how that sound environment is perceived) will evolve as user requirements evolve over time. Therefore, the soundscape is not set in stone at the end of a construction project, and a development proposal should seek to enable/accommodate appropriate future soundscapes. A mature soundscape is the legacy of the soundscape design process, and the potential for future soundscape evolution should be considered alongside a place's immediate or short-term needs.

The human perceptual response in context

In soundscape design, assessing how people perceive the sound environment is paramount because people respond to sound via the limbic system in the brain where, among other functions, emotions are processed and memories are stored [20,21,22]. Subjective response to sound can then manifest through a variety of biological and psychological responses (e.g. increased heart rate, sleep loss, stress and anxiety) [19,23,24,25].

For example, in an urban park people may want areas in which to read a book, play games, enjoy a picnic with friends, walk or cycle through, or simply rest and be restored. While there, their experience of the sound environment from people, nature and traffic will affect the extent to which they may enjoy the park for the intended purpose of their visit.

If people are not able to enjoy reading, relaxing or talking easily with friends because of the loudness or masking effect of road traffic noise, they may feel annoyed, angry or upset, and have difficulty concentrating and retaining information. Conversely, if an area is devoid of sounds it may seem "too quiet" or "dead", lack ambience and feel uncomfortable and, therefore, neither attractive nor safe for recreation or relaxation.

The addition of natural sounds, or even allowing some low level of what would normally be considered “noise”, may help to address this.

Good soundscape design

Good soundscape design, as a prerequisite to good multisensory placemaking, requires a collaborative, creative, inclusive process of problem-solving and innovation in the planning process from the outset, as shown in Figure 1.

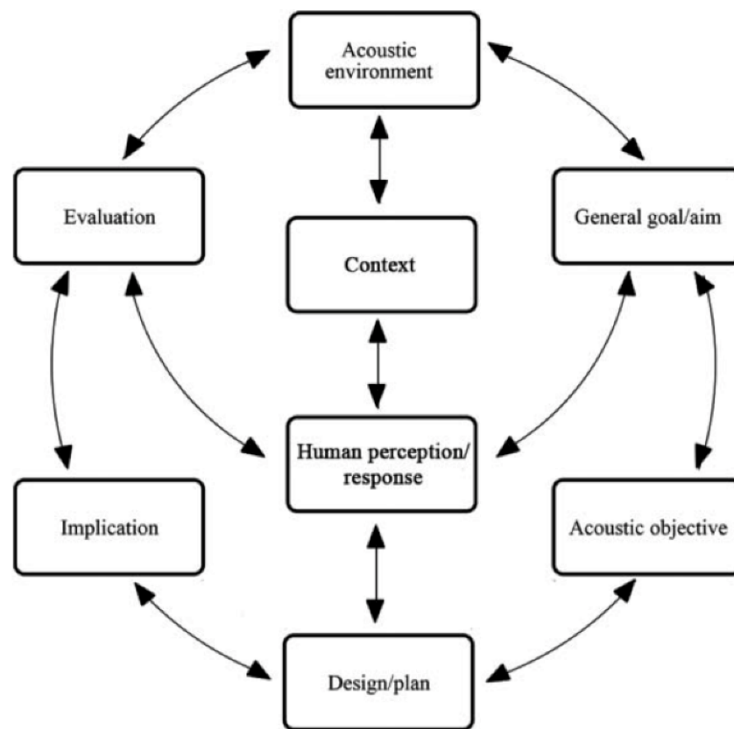


Figure 1. Theoretical framework of a soundscape planning and design process, derived from traditional planning stages, based on people as co-specifiers of planning goals and objectives. Image source: Xiao, Lavia, & Kang [26]

Good soundscape design considers the holistic impact on people of the sound environment in context, and keeps future needs in mind as well as immediate/short-term goals. This links with the objectives of sustainability, architecture, placemaking, public realm, landscape and infrastructure. Soundscape design should grasp any opportunities consistent with sustainable development to enhance the character, quality and function of an area, which if missed will have detrimental effects for existing and future communities.

To encourage innovation and creativity, everyone involved in the design process should focus from the outset on meeting a common set of objectives. The starting point for these should be the five key objectives of good design outlined in PPW and detailed in TAN 12: movement, access, character, community safety and environmental sustainability (see Figure 2). The design response will need to ensure that these objectives are achieved, whilst responding to local context, through the lifetime of the development, from design and procurement to construction through to completion and eventual use.

Figure 2 (adapted from PPW) illustrates the role that context plays in achieving good design generally, and applies equally to good soundscape design.

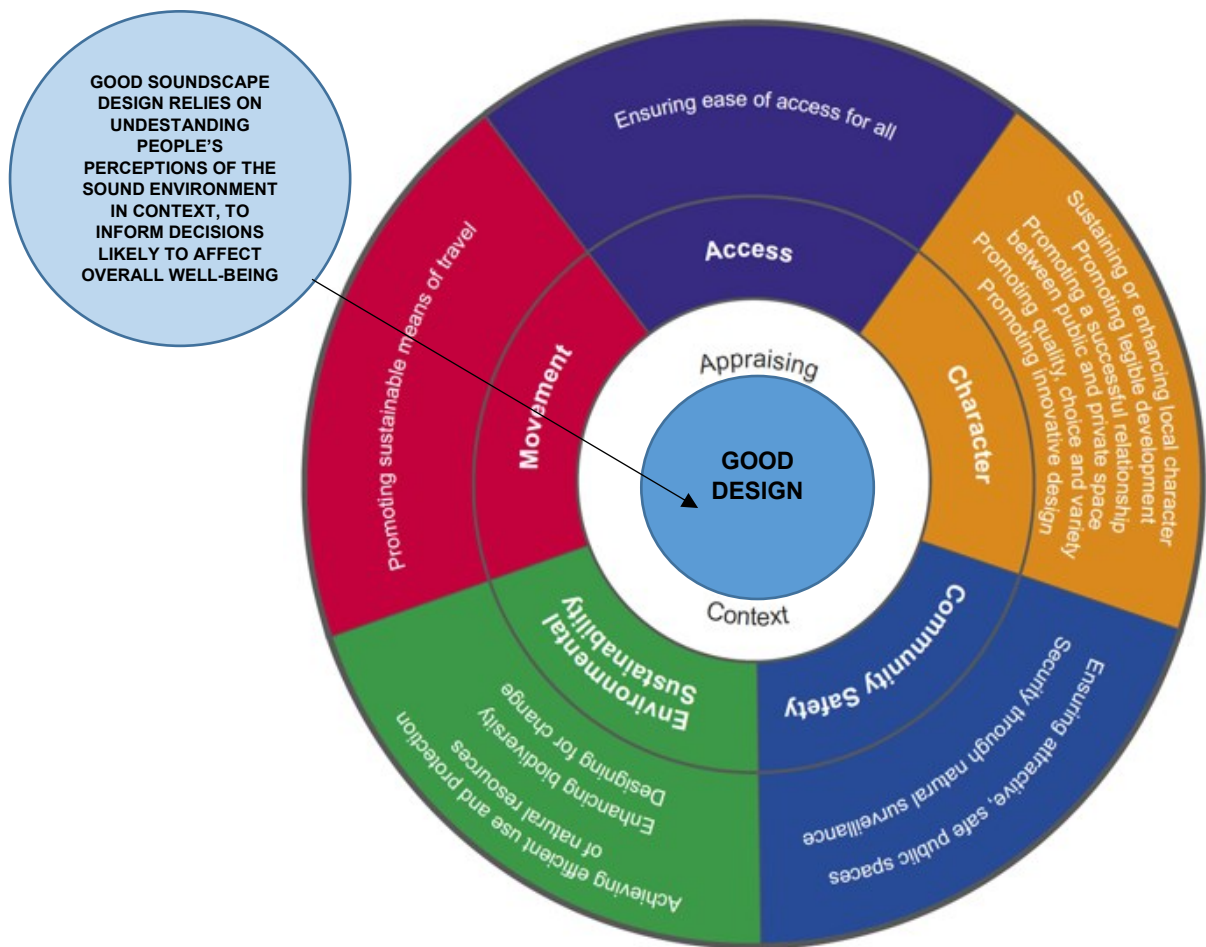


Figure 2. The key objectives of good soundscape design are achieved by embedding soundscape design holistically within the objectives of good design. Adapted from PPW [1].

The multisensory vision for a scheme that can be obtained through soundscape design can contribute, to a lesser or greater degree, to all of the objectives of good design. The resulting analysis and multisensory vision, including evidence of good acoustic design where traditional noise control plays a part¹, can either be presented in a standalone NSDS or incorporated into a Design and Access Statement, where one is required.

¹ As detailed in ProPG, for new residential development.

6 Key elements of good soundscape design

Good soundscape design is a creative process set within a robust methodological framework provided by international and British soundscape standards. As with design more generally it can contribute to health and well-being and help to realise innovation by adding value and enhancing the quality of the built environment.

This soundscape guide, intended to be referenced from the outset of a project, is complementary to TAN 12, and aims to highlight and expand upon soundscape elements that should be considered in the design phase of a proposed development. The remainder of this document provides further detail on how to achieve the key objectives of good soundscape design, reflecting the five objectives of good design set out in PPW and TAN 12 and highlighting the issues identified in TAN 12, Section 4: “Delivering Good Design” and Section 5: “Assessing Design Issues”, which are particularly salient for a soundscape design process which will enable problems and barriers to be identified and diagnosed and opportunities recognised.

Appraising context

The local context comprises the individual and combined acoustic and non-acoustic characteristics of a place that may affect the human perceptual response to those characteristics and setting and any changes resulting from a proposed development.

This chimes with TAN 12 (paragraph 4.3) which states that context “*includes the area’s natural and human history, the forms of settlements, buildings and spaces; its ecology and archaeology; its location and the routes and waterways that pass through it. Understanding the site and its immediate and wider context is the basis for a meaningful and sustainable design response, and is the responsibility of all those involved in the design process, particularly planning applicants and their agents and those formulating and implementing design policy and guidance.*”

Further guidance on appraising context, overall, can be found in the Site & Context Analysis Guide: Capturing the value of a site [27], and in TAN 12.

To complement existing design techniques there are a range of soundscape techniques which may be used to carry out context appraisal, including observation and site surveys, reviews of historical records, interviews, access auditing, analysis of statistics and information held by statutory undertakers and agencies. Further guidance on appraising the human perceptual response to the acoustic environment in context can be found in the ISO soundscape standard series [7,8,9].

In appraising context for a plan or a project, it will be important to refer to the objectives of good soundscape design and test how proposals reflect local policy requirements. In their NSDS, applicants can demonstrate how they have appraised the physical, social, economic and policy context of the development, and how their choice of soundscape design principles and concepts takes that context into account.

TAN 12 (paragraph 4.5) emphasises that “*in many cases an appraisal of the local context will highlight distinctive patterns of development or landscape where the intention will be to sustain character.*” Soundscape design should be capable of

identifying distinctive acoustic patterns resulting from existing development, both those that work and those that have failed to respond appropriately to context in the past.

Achieving soundscape design solutions

Where the potential for a soundscape design approach to impact positively on the quality of people's health and well-being is identified, good soundscape design as a means of delivering the best possible multisensory outcomes in a manner consistent with sustainable development becomes the responsibility of all those involved in the design process.

Soundscape design objectives should normally be complementary to the wider objectives of the project. On occasions where contention arises between objectives this will need to be considered by the proposer of a project at the outset, and the weight attached to each of the design objectives may depend on local and national policy, circumstances and the nature of the proposed development. (See Section 8 for further discussion of this.)

As advised in TAN 12 (paragraph 4.17), *“those involved in the design process should consider how the following aspects of their development (from procurement to construction through to completion and beyond, i.e. the lifetime of the development) meet the objectives of good design and respond to local context.”* This analysis and the vision for the scheme should be presented in the NSDS, which in turn should be incorporated in a Design and Access Statement, where one exists.

7 A flexible approach to soundscape assessment and design

From the outset, the process driving the soundscape design of any development should consider the full life of that development and the evolving legacy outcomes to which it will contribute in the future. Various developments occurring over time in one locality may result in a diversity of soundscapes, and each individual development should be seen as contributing to how that place is experienced and perceived by people in the long term.

Early consideration of soundscape design, well in advance of any planning application, is essential to achieving the best multisensory experience for the end users of a development. At the outset, appreciation of a site's context, a multisensory "vision" and agreed soundscape design objectives must be established and remain central to the evolutionary design process, alongside visual and other key design objectives. Setting details in stone too early should be avoided because this may stifle creativity and innovation and close off routes to the optimal outcome, but a clear understanding of the long-term implications of design decisions is essential from the outset.

A multi-disciplined, collaborative approach and a shared ambition for quality are important in delivering good soundscape design and should be evident at each stage of the design process. This is best achieved by ensuring the continuous involvement of professionals providing expert advice, who may include planners, architects, urban designers, urban sound planners (i.e. suitably qualified acousticians), soundscape specialists (i.e. soundscape practitioners with expertise in soundscape engagement and other relevant disciplines), landscape architects or designers, transport engineers, access officers, designing out crime officers, local civic societies, local experts, economists and others², depending on the scale and nature of the proposed development. Engaging those who procure, promote and finance development early on in the process is also essential to assist a shared commitment to the multisensory "vision".

All this does not necessarily mean more people doing more work than they would have done previously. It will often mean the same people working in a more joined-up and collaborative way.

² Soundscape, according to the soundscape standards [7,8,9], is a multidisciplinary applied practice and what is considered an appropriate sound environment is decided by stakeholders in context. Therefore the relevant project stakeholders, and those suitably qualified to carry out the work, should be decided for each project based on the scale, impact and requirements of development in consultation with the local planning authority, guided by the framework set out in Table 1. "Suitably qualified" in this context may refer to those with relevant professional qualifications, experience and/or local knowledge (i.e. referred to in PD ISO/TS 12913-2:2018 as "local experts" [8, p.2 and p.14]) depending on the scale, impact and requirements of the development.

Related soundscape specialisms should be decided in consultation with the local planning authority, and include any relevant discipline, practice or local expertise necessary to meet the outcomes of the project depending on the scale, impact and requirements of the development, guided by the framework set out in Table 1. For example, in addition to soundscape engagement experts (i.e. separate from urban sound planning experts), related soundscape specialisms may include experts from the fields of acoustics, architecture, spatial planning, engineering, environmental psychology, sociology, human factors, human behaviour, medicine, communications, mental health, social work, auraldiversity [56] (e.g. autism and hearing loss), sound artists or other relevant non-acoustic specialisms depending on the nature of the development.

Particular attention should be focused on engaging local communities, businesses, end users (where they are known) and other stakeholders in the design process from the outset, and throughout the entire process, as a means of fostering a sense of ownership and consensus, which will be important to the long-term success of a project, as well as ensuring that the agent of change principle is implemented.

Suggested stepwise procedure for soundscape assessment and design, and suggested soundscape content for an NSDS³

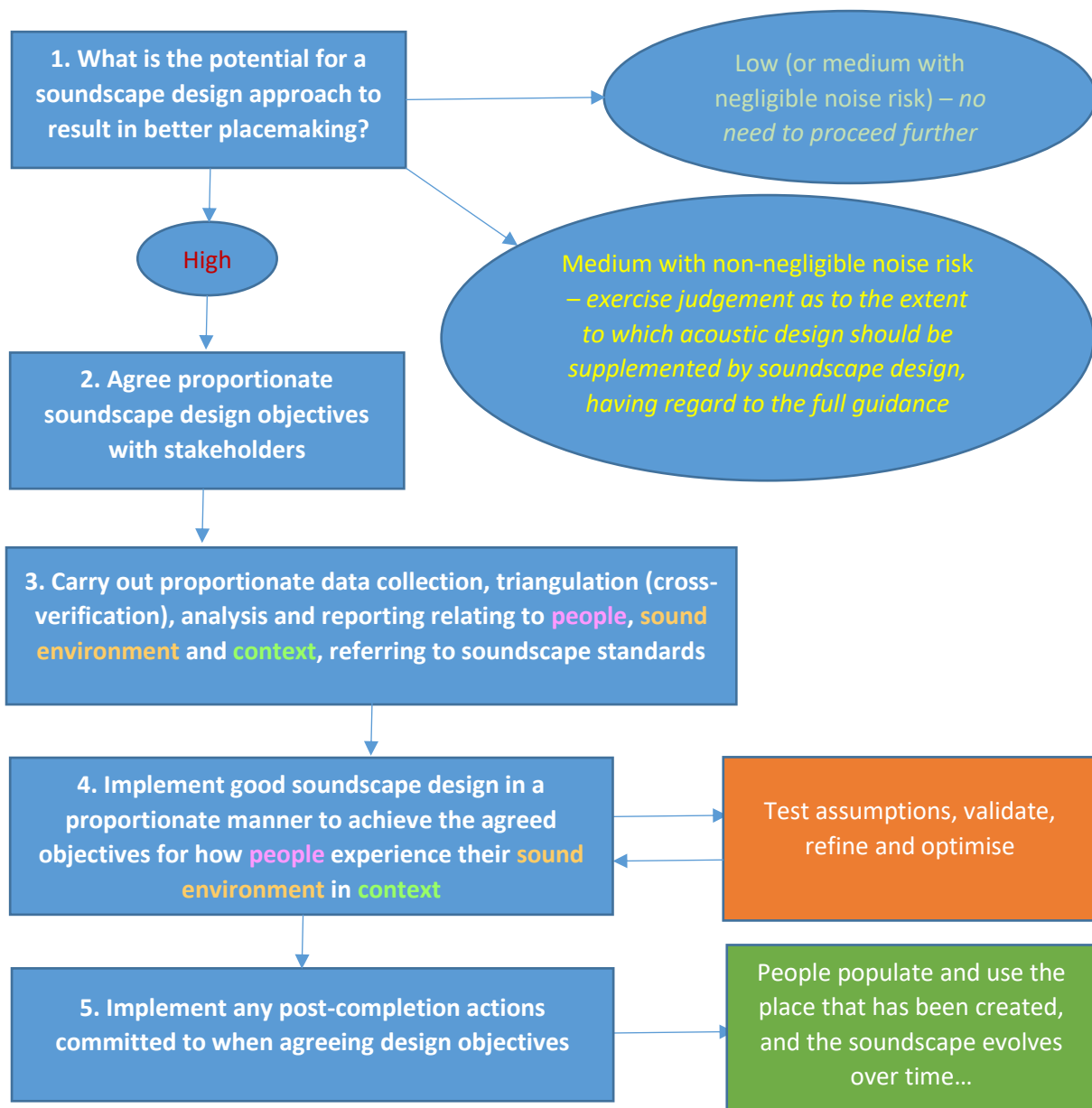


Figure 3. A suggested stepwise procedure for soundscape assessment and design.

³ This section describes a process for meeting the full soundscape assessment and design requirement referred to in the right-hand column of Table 1. Table 2 provides some examples of what types of development might be expected to trigger this requirement, although what is considered appropriate for an area and/or project/scheme needs to be determined on a case-specific basis.

Step 1: Assessing a proposed development's potential for a soundscape design approach to result in better placemaking – project commissioning and start-up

An initial assessment should be made of the potential for soundscape design to deliver better placemaking, as outlined in Section 3. *(This should take place as part of what is widely referred to as the “Strategic Definition” stage or “RIBA Stage 0”.)*

Soundscape design addresses the current and future **sound environment** from the perspective of the **people** who experience it, in **context**.

Two distinct groups of people need to be considered when making the initial assessment of the potential benefits of pursuing a soundscape design approach: people who already occupy the area and are likely to perceive changes to their environment, and people who don't yet occupy the area but are expected to be present once the proposed development has occurred.

The local context comprises the individual and combined acoustic and non-acoustic characteristics of a place that may affect the human perceptual response to those characteristics and setting and any changes resulting from a proposed development.

The applicant should consider the extent to which taking a participatory, people-focused approach when making design choices could deliver a better place for people, in terms of how they perceive or experience their sound environment, in context.

The initial assessment of the potential benefits likely to result from taking a soundscape design approach to a proposed development – categorised as high, medium or low – may be determined through a combination of expert judgement, to be supported by reasoned argument in the NSDS, and, if in doubt, consultation with the local planning authority, drawing upon their local expertise. The assessment should be guided by any local soundscape policy requirements set out in the local development plan, or other relevant documents such as supplementary planning guidance, a Place Plan or a local well-being plan. Generally speaking, the larger the development, the greater the scope for better placemaking to result from taking a soundscape approach to design, but this will not always be the case.

If the result of the initial soundscape design potential assessment is low, or if it is medium but the noise risk is negligible, then there is no need to proceed any further in terms of providing information on soundscape design within an NSDS⁴.

If the result of the initial soundscape design potential assessment is high, or if it is medium and the noise risk is not negligible, then the conclusions of this initial assessment should inform a proportionate approach to the selection of stakeholders, the scope of stakeholder engagement, early plans for post-completion soundscape testing and reporting activities, and the need for consultation with the local planning authority with regard to soundscape assessment and design.

⁴ Unless there is considered some merit in laying the way for a legacy benefit to improving the soundscape in the area, in which case this should be reported.

Where the potential for soundscape design to deliver better placemaking is only medium, it may not be considered proportionate to carry out the following steps in full⁵.

Step 2: Setting your soundscape design objectives

Soundscape design objectives should be proportionate to the soundscape design potential of the proposed development determined in Step 1, which in turn is likely to reflect the scale of the proposed development. *(This should take place no later than what is widely referred to as the “Preparation and Briefing” stage or “RIBA Stage 1”.)*

In the NSDS, applicants should demonstrate how they have considered the physical, social, economic and policy context of the development, and how their choice of soundscape design objectives takes into account the potential impact of the proposed development on people in that context. The starting point for setting the soundscape design objectives for a development should be the five key objectives of good design: movement, access, character, community safety and environmental sustainability (see Figure 2).

The soundscape design objectives for any large or high-profile development should be agreed in consultation with the local planning authority, considering where relevant any local design priorities or guidance, local development plan and/or local well-being plan.

Collaboration with all stakeholders regarding the soundscape design objectives and design process should be maintained throughout the project lifecycle. The soundscape design objectives may evolve or be modified after the project commissioning and start-up phase based on feedback received during later steps. (Indeed, they may continue to evolve beyond the end of the project, post-handover, and this should be borne in mind in terms of sustainable future planning.)

Any requirement for post-completion testing and reporting should be agreed with the local planning authority and project stakeholders at the same time as the soundscape design objectives, as should any ‘legacy’ objectives, which may be relevant to future owners/occupants.

Step 3: Specification of data collection, triangulation, analysis and reporting

As described in British standard PD ISO/TS 12913-2:2018 [8], the key requirements comprising a soundscape assessment are people, the sound environment and context. **Triangulation** for soundscape measurement is a technique that facilitates validation of data through cross-verification of these three components. It refers to the application and combination of several research methods in the study of a single phenomenon. For more information, see Annex E of Part 3 of the British standard series [9]. *(Like Step 2, this should take place no later than what is widely referred to as the “Preparation and Briefing” stage or “RIBA Stage 1”.)*

⁵ Although again, where there maybe some legacy benefit of doing so, which could be built on by future protects, then it may be justifiable to do so.

Data for these three components should be collected, analysed and reported in a format, level of complexity and level of detail proportionate to the soundscape design potential, scale and nature of the proposed development.

- a) People: Good practice engagement with local residents and all relevant stakeholders is an essential element for all soundscape projects (PD ISO/TS 12913-2:2018) [8]. Engagement should be carried out in accordance with the requirements of national planning guidance, together with any local requirements. In line with good practice survey methodology, the following stakeholder information should be collected and reported for soundscape projects: demographic information; how and why the stakeholders were selected; roles and type of stakeholders (e.g. resident, visitor, industry, policy-maker); relationship of each stakeholder with the proposed development; self-reported views of stakeholders obtained via questionnaires and/or interviews; and any other relevant information required by specific planning legislation and/or agreed with the local planning authority.
- b) Sound environment: Characterising the existing and proposed sound environment. This characterisation could be either actual or, where appropriate, simulated, and taken from either measured or modelled data. The scope of the characterisation of the sound environment may be agreed with the local planning authority during the project commissioning and start-up phase (Step 1). A variety of soundscape techniques (as described in Parts 1-3 of the soundscape standard series [7,8,9]) may be used to carry out the appraisal of the sound environment. These techniques may include, for example, observation and site surveys, reviews of historical records, interviews, access auditing, and/or analysis of crime statistics and information held by statutory undertakers and agencies such as passenger transport operators and retail research organisations. Data analysis should take account of any diurnal, seasonal or other temporal variation, where this is relevant.
- c) Context: Record how the data used to assess the human perception to the sound environment in context was collected and analysed. Soundscape practices use a combination of qualitative and quantitative methods to collect and analyse data. These methods and guidance are discussed in Parts 2 and 3 of the soundscape standard series [8,9]. A wide array of non-acoustic factors may influence the response to the sound environment including, for example, meteorological conditions, cultural preferences, attitude to the sound source, expectations, and temporal, spatial and other sensory factors (e.g. visual or olfactory) [24].

Step 4: Implementation, testing, validation, refinement and optimisation

Introduction

This step consists of an iterative process of soundscape design implementation, testing and validation, refinement and, where appropriate, the making of any changes necessary to deliver the best end product possible within the project constraints. It ends, for the purposes of the project in question, when the soundscape design choices for the proposed development are agreed, although in practice it may continue post-handover as the place evolves with use over time.

Soundscape design is wide-ranging and inclusive and offers an opportunity for multi-disciplinary working [53,54], including bringing together various fields of acoustics, engineering, psychology, medicine, social studies and the arts, to find creative and responsive solutions for the euphonic [55], or harmonious, sound design of places.

Unlike conventional approaches to managing the sound environment, good soundscape design is not primarily about reducing sound levels but focuses on whatever needs to be done to create appropriate environments that sound, look and feel right in a given context [57,58,59].

Good soundscape design is not necessarily a question of how loud certain sounds are, but rather what sounds are appropriate to, or belong to a place at a particular time. There is no one ideal sound environment, and what is deemed an appropriate soundscape can change over time to reflect the evolving needs and/or uses of an area [58].

Good soundscape design can involve conventional noise control measures being recommended, if reducing the prominence of certain undesirable sounds is the best way of allowing wanted sounds, including those that are considered euphonic, to be heard. But the starting point of a soundscape assessment does not assume that loudness is going to be the primary factor of concern, even if it is likely to be.

Creative design of the built environment to achieve places of high acoustic quality, whether tranquil or vibrant, to promote health and well-being

The overall aim of good soundscape design is to ensure that places support or enhance their intended use(s) from the perspective of the people using those places. The soundscape design objectives established in Step 2 should be used by the soundscape design team to identify and develop proportionate and appropriate good soundscape design solutions for the development in question. This should be done sustainably, in a way that will not cause future undesirable impacts.

To fulfil the aims of the local development plan or other local guidance, including the local well-being plan where relevant, good soundscape design looks beyond any required numerical noise criteria for the development (whilst still maintaining compliance with them) to achieve high-quality, acoustically diverse environments promoting health and well-being.

A complete description of the sound environment includes acoustic, psychoacoustic, spatial and temporal characteristics as well as features other than average or maximum sound levels in decibels and numbers of sound events. An assessment of the complete sound environment as perceived by people in context should be made in accordance with PD ISO/TS 12913-2:2018 [8]. This type of assessment is necessary, whether below or above any required noise management thresholds, to determine the extent to which those thresholds accurately account for people's likely perceptual response to the post-development sound environment.

The range of options available to achieve good soundscape design is virtually limitless, as the approach is one of design opportunities rather than one of pre-defined objective

limits. For example, good soundscape design solutions can incorporate a wide range of:

- operational measures (e.g. designing areas for noisy activities such as delivery, servicing and through traffic to occur in such a way that they do not compromise areas where people value high soundscape quality, or designing for activities that make areas sound vibrant and exciting, where so desired, without becoming perceived as threatening or chaotic);
- structural measures (e.g. physical design and siting of buildings to protect occupants from noise whilst at the same time taking care not to cut them off from restorative, invigorating or reassuring sounds of outdoor human activity and nature, tailored to the context and any known or likely user preferences/expectations); and
- behavioural measures (e.g. designing areas to encourage appropriate sound responses, for example avoiding the need to raise voices to be heard or communicate effectively with those close by, whether in outdoor or indoor spaces, or introducing calming measures, which may include natural elements, and which may be acoustic or non-acoustic, to defuse tension and improve levels of comfort, mood and behaviour, both vehicular and non-vehicular).

Acoustic diversity

A wide variety of design options are available to achieve a diverse sound environment. Generally speaking, this means promoting natural and/or human sounds appropriate to the context and user preferences/expectations, with as little interjection as practicable from mechanical and transportation-related sounds and unwanted human sounds.

For example, in would-be “vibrant” areas compromised by mechanical, transportation and/or unwanted human sounds, it may be possible to use the physical shape of buildings and other structures; materials (matching the acoustic properties of interior and exterior vertical and horizontal surface materials to create the desired soundscape effect); acoustic living walls (green walls covering acoustic barriers); space design (e.g. siting the most noise-sensitive areas away from the loudest mechanical and transportation sources); and/or attentional masking (e.g. designed water features or acoustically protected/treated seating areas offering opportunities for relative respite).

Some of these measures are common to both acoustic design and soundscape design. The key difference is that the success of acoustic design is judged by means of technical performance targets, whereas the success of soundscape design is judged by seeking feedback on people’s perception of the resulting sound environment from people occupying and using a space [68].

Maintaining and enhancing biodiversity and salutogenesis

The potential of good soundscape design to promote health, well-being and biodiversity is well documented in the literature, with experts recognising that all living species are affected by the quality of the sound environment [60,61,62,69], albeit in different ways. Acoustic diversity is an essential component of salutogenic (i.e. health-promoting) environments, and where soundscape design promotes natural over

anthropogenic (human-made) sounds, this can result in benefits to both wildlife and people.

The design team should consider net benefit for both biodiversity and human health and well-being when identifying and developing proportionate and appropriate soundscape design solutions for a proposed development, and how this might be built upon in the future by others as part of the project's legacy outcomes.

Protecting valued and/or iconic sounds and good quality vibrant sound environments

Analogous in concept to visual landmark, a "soundmark" is a prominent, distinctive sound that is specifically associated in people's minds with a particular location or area, such as the waves on the sea, street vendors, specific bird species, unique cultural sounds, including music and other types of audible performance, fog horns, bells, clocks or chimes, agricultural or industrial sounds, or wind on a mountainside. The term was used by R. Murray Schafer [37] who suggested that, given their unique quality, soundmarks should be protected and preserved, similarly to valued landscapes and landmarks. Valued and/or iconic sounds can create a strong sense of community, link people to places and evoke heritage and cultural identity [63].

Where it is determined by a local planning authority that specific valued and/or iconic sounds need to be preserved and protected, then these requirements need to be reflected in the soundscape design of the area in question.

Good soundscape design will have regard to the need to support, protect, preserve, enhance or even sometimes create or recreate valued soundmark(s). This could be through planting and/or establishing green areas or water features to support specific types of natural sound, promoting outdoor performance spaces, or commissioning sound installations to recreate or reintroduce iconic sounds intrinsic to a place and/or people's cultural identity.

Creating, protecting and enhancing areas of tranquillity

Tranquillity means different things to different people, but it is generally understood to refer to an untroubled state, characterised by peace and calm and free from unwanted disturbances. This may refer to either a state of mind or the quality of a particular environment, which may include its being quiet, or at least free from unwanted sound. Tranquillity can be quantified either in terms of the absence of unwanted intrusions or by a balancing of positive and negative factors.

Areas that are intrinsically quiet (i.e. have very low sound levels) may also be areas of high acoustic quality (i.e. calming, restorative and euphonic). However, some quiet places are uninviting and unpleasant. Excessively high noise levels where human beings are present are a problem to be avoided or addressed regardless of an area's other qualities, but quiet on its own does not make an area good, or a soundscape appropriate. If a space open to the public is ugly or feels unsafe, then relatively little benefit will be felt from its being quiet. And some areas may be valued as being tranquil [64,65,66] despite not having very low sound levels, because of their particular visual attributes. It may sometimes be possible to use design to improve people's sense of tranquillity by bringing the sound environment into line with a place's visual attributes.

Natural landscapes prized for their visual beauty but affected by anthropogenic noise present particular opportunities for soundscape interventions.

The presence of nature within towns and cities provides a welcome contrast to and relief from the built environment. An area may offer peace and quiet, or a tranquil sound environment where natural sounds such as flowing water, birdsong, the wind in the trees and human conversation are more prominent than background traffic noise. However, the benefits of such qualities of place may be fully realised only when they coincide with visual beauty, a sense of security and ease of access. Areas where these qualities all exist side by side (for example, Green Flag Award-winning sites) should receive protection from noise intrusion or any other detrimental change that would risk compromising the place's overall sense of tranquillity.

An area may possess a soundscape considered to be tranquil but require specific improvements in terms of landscape, nature, safety or access in order to maximise its potential benefits to society. In such cases, addressing those deficiencies may be just as beneficial in terms of bringing tranquillity benefits to people as seeking to quieten a noisy space.

Healthy, resilient and diverse urban green infrastructure that is valued for its contribution to tranquillity will deliver the widest range of benefits to current and future generations in terms of natural capital. Such benefits include soaking up water from rainstorms, trapping air pollution particles, reducing the effect of heat waves and providing places for healthy exercise and/or opportunities for restoration and connecting with nature. Tranquil urban green spaces or accessible water features can therefore make an important contribution to all seven of Wales' national well-being goals, and should not be seen just as providers of respite from excessive noise, but as part of an overall sustainable approach.

Tranquil areas (including those formally designated urban "quiet areas") are not necessarily determined by scale. A single park bench or a rest area near a fountain could be recognised as providing a tranquil experience to its users, and therefore be identified for protection because of its relative tranquillity in the context of the local area.

Where it is determined by the local planning authority that a place needs to provide a tranquil experience to its users but will not be quiet, a soundscape design approach must be taken. The soundscape design objectives and resulting interventions (e.g. water features, play and sports areas, or non-mechanical and non-amplified sounds made by people) should reflect local policy needs.

Step 5: Post-completion testing, reporting and sharing lessons learned

Any post-completion testing, reporting and lessons learned for a development should be carried out to the extent and in accordance with the techniques agreed when setting the soundscape design objectives (Step 2).

Where this occurs, it should consist of:

- assessing and analysing the impact of the development based on its perceptual effect on people in context, compared with the expected outcomes;
- reporting and sharing lessons learned to inform future projects, maintenance and redevelopment/renewal plans where applicable, and where local or national mechanisms have been established to facilitate such reporting; and
- setting out the legacy outcomes and potential opportunities for building on the current soundscape to help inform future projects, encouraging and enabling an appropriate and diverse evolving soundscape going forwards.

Soundscape design and planning is an empirical science and good soundscape quality is judged by stakeholders in context. Therefore, for large developments, and those with high impact (regardless of size), it is desirable that post-completion testing be carried out, to assess and analyse the success of the soundscape design measures that have been implemented based on the perceptual effect of the development on people, compared with the agreed, expected outcomes identified for the project.

A key aim of any post-completion testing, reporting and lessons learned should ideally be to contribute to a knowledge base for local and national use, to support and improve good soundscape design going forwards.

The post-completion testing, reporting and lessons learned for the development should realistically reflect the lived experience of the people using a place, against what was the original design intent. This should be considered carefully when specifying the timing and frequency of the post-completion activities. Importantly, to contribute to building a strong evidence base and enable analysis and comparability between projects, the survey methods used should incorporate those recommended for noise and health and soundscape data collection in the relevant standards. For noise and health surveys, PD ISO/TS 15666:2021 “Acoustics – Assessment of noise annoyance by means of social and socio-acoustic surveys” [67] should be used, while for soundscape quality surveys the relevant standard is Part 2 of PD ISO/TS 12913-2:2018 [8].

8 Specific issues to consider when carrying out soundscape design

This section deals with specific design issues where the implications of soundscape design choices may be particularly significant in influencing whether the objectives of good soundscape design are achieved. The emphasis for each issue is on finding sustainable soundscape design solutions.

TAN 12 (paragraph 5.1) advises that “*the concept of sustainability must inform all aspects of design. As with all forms of development, these issues should be considered in the context of the broader advice on the design solutions.*” In some cases, choices will need to be made if solutions which are optimal for some soundscape design objectives conflict with other design objectives. These choices should be informed by local and national policy, considering site-specific factors such as the perspectives of the people who will be directly affected by the decisions being made. They should also consider future legacy objectives, and how design decisions taken today may affect any longer term benefits being conferred on those people.

The NSDS provides an opportunity for developers to demonstrate how they have considered the soundscape design issues discussed in this section.

Overarching issues

Inclusive design

TAN 12 (Section 5.3) contains advice on inclusive design. Attention should be given to the needs of all sectors of society including older people, children, and disabled people including those adversely affected, physically and/or mentally, by sound [25]. This principle applies to the soundscape design of the public realm, to public transport infrastructure and to the location, design and layout of public leisure facilities as well as to the soundscape design of all buildings intended for use by the general public, from hospitals and doctors’ surgeries to educational establishments, museums, performance spaces and restaurants.

Good practice for all involved in the soundscape design process will be based on the those principles outlined in paragraph 5.3.5 of TAN 12, where physical barriers to access will include acoustic as well as visual factors and non-physical barriers will include social or perceptual barriers.

Climate-responsive development and sustainable buildings

TAN 12 (Section 5.4) contains advice on climate-responsive development and sustainable buildings. The design implications of climate-responsive developments and sustainable building must be considered at the earliest opportunity in the design process, as detailed in TAN 12. They should be delivered through consideration of a range of environmentally sustainable design solutions, incorporating good soundscape design appropriate to the development. This means, for example, designing buildings in such a way that noise will not deter occupants from having windows open in hot weather, and locating noise sources such as heat pumps where they will not annoy people in nearby buildings. This may mean going beyond the

requirements of permitted development for individual units and considering the cumulative effect of multiple units on local sound environment quality.

Practice Guidance – Planning for Sustainable Buildings [28] provides guidance for local planning authorities and developers on how sustainable building design can be incorporated into development proposals.

Temporal variability

The sound environment is determined primarily by what things are happening in any given moment. It can change entirely from one minute to the next as sound-generating activities start and stop with no residual sound trace indicating what was there previously. While the visual appearance of a street or other location may be relatively insensitive to what people are doing in it at any given moment, the prevailing sound environment is more variable and dynamic, and more sensitive to sound-generating activities. People's expectations and preferences are also time-dependent, so in theory a soundscape may be different at different times of day, or on different days of the week, even if the same sounds are being heard.

What is perceived and experienced may be considered appropriate in a given place during certain hours, but may be inappropriate at other times. For example, loud music played long into the night can affect people's ability to sleep, whereas it may be considered acceptable during the day, or even during the night for limited periods.

Predictability is often desirable, so that people know when their sound environment will be busy and vibrant, and when it will offer tranquil respite, and they can plan their own lives in an informed way according to their preferences. This presents an opportunity to create a diverse, layered soundscape, accommodating diurnal and the seasonal variations, including planned respite periods.

For the reasons outlined above, temporal variability should be afforded much greater consideration when carrying out soundscape design than when assessing the visual impact of a new development, which is likely to be relatively static by comparison.

Context

Landscape and townscape

TAN 12 (Sections 5.5 and 5.6) contains advice on Landscape and Townscape and the Historic Environment. The distinctive settlement patterns, diversity of landscape and topography in Wales and the way in which development relates to its urban, rural or seascape context will be fundamental to the soundscape design process. The design advice in these sections of TAN 12 will be directly relevant to a soundscape design approach [29].

In areas recognised for their landscape, townscape, architectural, archaeological and/or historic value, such as National Parks, Areas of Outstanding Natural Beauty, World Heritage Sites and conservation areas, the objective of sustaining character is particularly important and context appraisals should reflect this [30].

Historic and cultural characteristic sounds and soundscapes are recognised by the United Nations Educational, Scientific and Cultural Organization (UNESCO) under its Convention for the Safeguarding of the Intangible Cultural Heritage [31] and multiple sites, traditions and practices from around the world have been awarded [32]. In the UK, an example of the application of this Convention is set out in the Scottish Government's Intangible Cultural Heritage Policy [33]. The five main domains of intangible cultural heritage (ICH) are:

- oral traditions and expressions, including language as a vehicle of intangible cultural heritage;
- performing arts;
- social practices, rituals and festive events;
- knowledge and practices concerning nature and the universe; and
- traditional craftsmanship.

More information about these domains and the kinds of practices that fall under them can be found on the UNESCO website, in the section entitled "Dive into intangible cultural heritage!" [34]. ICH Scotland have an online database [35] of local ICH examples of the historic and cultural characteristic sounds and soundscapes of Scotland. In Wales, whether formally recognised or not, these types of sounds can be highly valued and desired by communities and should be identified for protection within local soundscape design policies.

In areas included on the Register of Landscapes of Historic Interest in Wales, a methodology exists for assessing the significance of the impacts of proposed developments: Assessment of the Significance of the Impact of Development on Historic Landscapes (ASIDOHL) [36].

Specialist skills are needed to achieve accurate soundscape assessment of areas of architectural or historic character. In the soundscape design of alterations or extensions to listed buildings, professional expertise is essential to assess the soundscape elements that make up the special interest of the building and achieve a balance between sensitive change and maintenance of integrity. More information on the design process for the Historic Environment can be found in Section 5 of TAN 12: Design.

Urban regeneration

TAN 12 (Section 5.7) contains advice on urban regeneration, which is relevant to a soundscape design approach. Realising the potential for taking a soundscape design approach in existing urban areas to deliver appropriate soundscapes, and thus better placemaking, will be an important addition to achieving successful regeneration schemes. This is particularly relevant where there is a need to promote growth and change and to address the relationship between density of development and compatibility of uses, so as to achieve sustainable development outcomes.

An urban soundscape design framework or masterplan can help to give urban regeneration visions a multisensory aspect and can usefully form the basis of Supplementary Planning Guidance (SPG) or other design advice to guide development. While examples of the application of these types of soundscape are

limited at the time of writing, examples of what a local area soundscape plan could consider can be found in relevant literature and from selected cities.

In soundscape design terms, a mix of uses adds diversity to the townscape and the activity generated adds vitality. TAN 12 (paragraph 5.7.3) advises: *“Good design and construction techniques are essential to ensure that practical issues such as noise abatement and privacy are addressed but also to ensure that mixed uses relate well to one another physically and offer opportunities for visual interest and originality”*

Those involved in the soundscape design process need to recognise existing urban qualities and find ways of ensuring that new development strengthens or complements these qualities, including "soundmarks" that are part of the character of the area, which may enhance social identity and cohesion. There are multiple benefits in this approach, in terms of enhancing local soundscape distinctiveness and “soundmarks”⁶ [37, and see also Section 7] linking component parts of urban areas, creating green corridors and areas for both nature conservation and leisure use, and reducing car dependency.

Rural areas

TAN 12 (Section 5.8) contains information on the design considerations for rural areas. The special qualities of the rural landscape and coastline of Wales should be recognised. These qualities should be enhanced through conservation of the soundscape character of the countryside, and by delivering appropriate soundscapes through new development in a way that deepens a sense of place for future generations, without causing harm. The design considerations in TAN 12 will be relevant, and while examples of the application of these types of soundscape are limited at the time of writing, examples can be found in relevant literature.

Benchmarking or establishing a baseline of the quality of the sound environment in areas of outstanding beauty or tranquillity can help to identify areas requiring protection, or where improvement may result in the restoration of natural capital for future generations.

Transport (road and rail)

TAN 12 (Section 5.9) contains advice on the context provided by transport and movement. Good soundscape design can play an important role in achieving a wider choice of more sustainable modes of travel, including the promotion of active travel and a reduction in the amount and speed of vehicular traffic and the number of short-distance motorised journeys made. A close working relationship should be established between the design team, soundscape specialists, environmental health practitioners, planners and highway engineers. This is considered essential to achieve environmental quality through the better transport planning, to avoid sound from current and future vehicles becoming harmful to health and well-being, allowing people

⁶ Derived from “landmark”, “soundmark” is a term used in soundscape studies to refer to a “sound which is unique to an area or possesses qualities which make it specially regarded or noticed by the people in that community” [37, p.10]. A soundmark is highly symbolic because it evokes immediate association to the location upon being heard. Soundmarks, therefore, are of cultural and historical significance and merit preservation and protection [37].

to enjoy appropriate soundscapes where they can open their windows and connect to the world around them. The advice in TAN 12 will be relevant to the soundscape design process.

TAN 18: Transport [39] sets out how the transport assessment process can assist in analysing travel demand and impact. This process should contribute to the soundscape design of transport infrastructure for any large development and result in the production of a transport implementation strategy to manage movement to, from, around and within the site boundary. Such assessments should be referenced in any NSDS.

Particular consideration should be given to the impact of the resulting sound environment on pedestrians, cyclists and people spending time within an area, in terms of the sense of safety that is created, the ability to hear and react to traffic, and personal comfort.

The needs of physically and mentally disabled people, children and older people, including people with sensory impairments and adverse reactions to external stimuli, should be given particular attention and, in the interests of inclusive soundscape design, should be considered from the outset.

Public buildings

TAN 12 (Section 5.10) contains advice on the design of public buildings. The public sector has a responsibility and an opportunity to set high standards in achieving good design in its own buildings and this extends to good acoustic and soundscape design. The design considerations in TAN 12 will be relevant to the acoustic and soundscape design process.

In the design of schools, hospitals and other buildings and infrastructure intended for use by the local community. Good acoustic design should be applied to achieve the optimal acoustic conditions for each intended use, in an inclusive way. The soundscape design process can add value to wider considerations such as fitness for purpose, value for money over the whole life of each building, and secure a positive impact on the well-being of both its users and the surrounding area.

Housing design and layout

TAN 12 (Section 5.11) contains advice on housing layouts and built form. Achieving more sustainable residential environments is dependent in part on appropriate soundscape design of housing to establish a sense of place and community, integrated with the movement network used to enhance these qualities, and to incorporate features of environmental sustainability. The Welsh Government and Design Commission for Wales have endorsed Building for Life 12 Wales [40] as an industry standard that can be a useful tool in achieving better urban design quality in residential development and in complementing the requirements of national planning policy, which can be integrated with design quality. These design considerations and those contained in TAN 12 will be relevant to soundscape design, including the value of existing soundmarks. Regard for the guidance contained in ProPG will also be expected to inform design and layouts consistent with good acoustic design.

Employment and commercial areas

TAN 12 (Section 5.12) contains advice on the design of employment and commercial areas, including gyms and entertainment venues. The soundscape design of employment areas is important, as high quality soundscape design can add value to commercial property, help increase occupant productivity [41], health and well-being, support the image of modern businesses and encourage further investment. Early consideration of the need to embrace high quality soundscape and environmental standards is essential to ensure the most sustainable outcome across all design objectives. The design considerations contained in TAN 12 will be relevant to the soundscape design process and what may constitute good acoustic design in each case, based on the intended use.

Biodiversity

TAN 12 (Section 5.13) contains advice on biodiversity, in addition to PPW, TAN 5: Nature Conservation and TAN 11 itself. Local planning authorities have a duty to consider the maintenance and enhancement of biodiversity (a net benefit) and the resilience of ecosystems in their planning policy and development management decision-making processes. This will also involve satisfying requirements associated with the Habitats Regulations [42]. Where members of the public have access to an area or site, good soundscape design can contribute significantly to maintaining or enhancing its wildlife interests, using the sounds of nature to reconnect people with biodiversity in a way that restores a balance with the natural world.

Designers should be aware that noise can hamper the breeding success of certain species, for example where it masks their calls, and that people can perceive features of wildlife interest as part of the desired soundscape of an area. Examples of this include sites with little or no noise pollution in an area of unmanaged open land within a housing estate, or a hedgerow that is rich in a variety of wildlife. Identifying and maximising opportunities to maintain and enhance biodiversity as part of the soundscape design process can be complementary to the inclusion of other features of environmental sustainability through design.

The soundscape design and related long-term maintenance should be based on sufficient understanding of ecosystem resilience to ensure that features of biodiversity interest can be sustained in the long term. In situations where protected habitats and species are involved, appropriate specialist advice must be sought [43].

Public realm

TAN 12 (Section 5.9) contains advice on how a high quality public realm can make a unique contribution to a stimulating environment and can provide a focus for community activity. It will be the case that the form and soundscape design of spaces and routes comprising the public realm are critical to its success. Carefully developed soundscape design solutions will also include imaginative use of surfacing, changes in level, enclosure, lighting, street furniture and planting to enhance and define the overall soundscape, environment and sense of place and assist wayfinding. The

design considerations contained in TAN 12 will clearly be of equal relevance to the soundscape design process.

TAN 12 (paragraph 5.14.6) suggests: *“Those involved in the design and management of the public realm should be aware of the potential for noise generation in their proposals and the impact this may have on neighbouring amenity. Opportunities to minimise ambient noise, such as traffic, should be explored and reflected in the layout and detailed design of the public realm and by use of low-noise surfacing materials and natural or man made barriers to noise.”* However, care should be taken to ensure that any less pleasant sounds being masked by traffic noise are controlled or attenuated through good acoustic design at the same time, so that they do not gain prominence as the traffic noise is reduced. Further guidance in this area can be found in the Design Manual for Roads and Bridges [47].

The absence of appropriate long-term maintenance is a major factor in the deterioration of soundscape, environmental and aesthetic standards in the public realm. Good maintenance is also vital to ensure an accessible environment and appropriate soundscape for all. Like any measures affecting the environment, soundscape design proposals that focus on improvements to the public realm must incorporate management strategies and funding for the continued maintenance of these areas. The NSDS should reflect the need to minimise maintenance liability, including whatever may need to be done to maintain an appropriate soundscape, without compromising on soundscape design quality.

Public sound art

TAN 12 (Section 5.15) contains information on public art more generally. Sensitive and appropriately situated, public sound art can play an important part in creating or enhancing individuality and distinctiveness, and in raising the profile of our towns, villages, cities and urban and rural landscape. However, any decision to recommend public sound art should come from the soundscape design process. Public sound art should only be used, where appropriate, as a type of soundscape design response. Public sound art should not be used as a substitute for other feasible, practicable, noise control or soundscape design measures.

While public sound art can provide innovative and creative dimensions to the good soundscape design of an area, the unintentional consequence of it being viewed as noise pollution by some who hear it, resulting in community annoyance, should be avoided. Any adverse impacts must be minimised and the overall impact of the intervention on local communities must be positive if it is to gain approval. The type, scale, features and situation of any public sound art should be determined in collaboration with local people as part of the development of the NSDS.

The integration of the skills or work of soundscape design specialists and a professional sound artist can add value and can also be employed at key locations to enhance safety, legibility and the public realm. There is scope for integrating public sound art into the townscape, ranging from the dramatic to the subtle, from sound sculpture, commemorative works and smaller incidental interventions, to integrated works using contemporary and interactive media. The innovative soundscape design of street furniture or other functional objects can also be considered, and increasingly,

imaginative design of flooring, railings, lighting and signage can be used to give everyday objects a unique appearance and appropriate sound identity, which may be helpful for wayfinding and inclusive access to place. Through a considered choice of location and use of materials, public sound art can and should be made accessible to all, whilst not itself compromising general accessibility.

Public sound art can add a social and cultural dimension to a town centre visit and may also enhance the cultural economy and support cultural tourism, as well as providing a stimulating environment where shoppers and visitors can linger, with obvious benefits to local traders. Implicit in achieving this is a commitment to quality in concept, soundscape design, appropriate application within the context (so as not to be perceived as noise or disrupt the intended use of the area in which it is situated), craftsmanship and materials, in all artwork commissions.

The unique role of public art generally, and public sound art in appropriate contexts, as a regenerative tool has long been recognised in Wales and internationally, and the production and adoption of public art strategies by a number of local planning authorities has been helpful in this regard. There is considerable precedent and potential for private sector sponsorship of public sound art projects, particularly where large developments are proposed. Innovative, well-considered and contemporary approaches can also attract contributions from dedicated trusts and foundations, as well as adding substantial publicity and marketing value.

Any public sound art should be considered early in the soundscape design process and be integral to the overall soundscape design of a building, public space or place. The choice of sound artists and the nature of subsequent work should be the subject of full collaboration from the outset between the artist, the local community and soundscape professionals involved in the soundscape design process. Engendering a sense of local ownership and public responsibility for sound artwork is critical to the long-term success of public sound art projects. Public sound art professionals should be consulted as early as possible in the soundscape design process to identify appropriate opportunities and provide professional advice to local planning authorities and developers. In Wales, the Arts Council of Wales promotes best practice through a range of schemes and partnerships and provides advice through its website [48].

Safety

TAN 12 (Section 5.17) contains information on the design considerations for safety. How people respond to their local sound environments is directly linked with feelings of safety and security [22]. Local authorities (including National Park Authorities) are required to have due regard to crime and disorder prevention in the exercise of their functions under Section 17 of the Crime and Disorder Act 1998. Consideration should be given to practical ways by which the soundscape design of development can help reduce appetite and opportunities for crime, disorder and anti-social behaviour.

Community Safety Partnerships in Wales [49] are required to undertake regular strategic assessments of crime and disorder and substance misuse issues in their areas and produce annual three-year rolling Community Safety Plans. The soundscape design and security of all developments should reflect the strategic aims

of such plans. Soundscape design measures should be commensurate with identified risks and good practice, and with development plan policies.

The concept of “designing out crime” requires full consideration by everyone involved in the soundscape design of development. The soundscape design of physical features such as the arrangement of infrastructure and buildings, the choice of surfaces and materials, and plantings can also impact on incidence of crime. While examples of the application of these types of soundscape are limited at the time of writing, examples can be found in relevant literature [50,51,52]. More information on the design considerations for safety can be found in Section 5 of TAN 12: Design.

9 Recommendations for local planning authorities

This section should be read in the context of a recognition by the Welsh Government that soundscape design is a relatively new and unfamiliar field for public bodies in Wales at the time of writing, and capacity to participate actively in this area is expected to develop over a period of years rather than materialise overnight.

Taking a soundscape design approach fits well with the five ways of working prescribed by the WFG Act, namely long-term thinking, integration, involvement, collaboration and prevention. The NSAP states Welsh Ministers' expectation that public bodies subject to the WFG Act, including local planning authorities, should follow the five ways of working when carrying out noise and soundscape management.

Local planning authorities have a dual role to play in promoting the wider uptake of the five ways of working beyond those bodies subject to the WFG Act, by promoting good soundscape design: firstly by ensuring effective stakeholder involvement in developing local soundscape design policies and guidance, and secondly by providing advice and information to assist with specific soundscape design issues. Local planning authorities should help applicants and potential applicants to respond effectively to the challenges of adopting a soundscape (and therefore multisensory) design process, through an advisory as well as a regulatory role. Pre-application discussions and advice on preparing a soundscape design statement will help to create clarity for applicants.

Local policies and development plans

Local planning authorities are encouraged to prepare soundscape design advice for their areas that both takes account of national policy and guidance and also reflects local context and issues.

These policies should set out the planning authority's soundscape design expectations. They should reflect the objectives of good soundscape design and ensure that it is applied to the local context, to maintain and enhance local distinctiveness and achieve appropriate soundscapes, either as a legacy outcome of a scheme, or as part of development plans covering a number of schemes. Such advice should be disseminated through development plans and through a wide range of SPG.

In preparing this advice, local planning authorities should identify the user group or individuals at whom the advice is aimed and work collaboratively to ensure that the content, format and type of advice is most appropriate to meet those users' needs now and in the future. Local planning authorities should also examine how in the exercise of their statutory functions they can ensure they are responsive to local soundscape concerns raised by members of the public. This may mean exploring new ways of achieving meaningful participation in policy formulation and SPG preparation by both practitioners and the wider public. The level of community involvement in these processes should be sufficient to allow adequate evaluation of the needs and concerns of end users, local communities and business interests at each step of the soundscape design process.

Pre-application discussions

One aim of pre-application discussions, where they occur, should be to identify the key soundscape design issues arising from a development proposal at the outset and the potential for that development to contribute to appropriate soundscapes of the future as a legacy outcome. The basis for discussions on soundscape design will have been set by relevant national and development plan policies and SPG. Pre-application discussions should focus on meeting the objectives of good soundscape design and cover the topics to be addressed in the NSDS. Issues of detailed soundscape design would not normally be addressed until later in this evolving process.

For large or complex proposals, a pre-application draft NSDS could be presented to the local planning authority and stakeholders for consideration. Local planning authorities may wish to make specific reference to this practice within their “notes for guidance” accompanying planning application forms.

Skills

It is important that local planning authorities have access to professional soundscape design skills. This could be through employing staff with those skills, sharing skills with other local planning authorities, or the use of suitably qualified consultants. Local authorities may even wish to establish “in-house” soundscape design teams where relevant expertise exists. However, it is recognised that local authorities will have to prioritise the distribution of resources in relation to local needs. Whatever approach is taken, the aim over time should be to raise skills and soundscape design capacity among officers and to raise the soundscape design awareness of elected members.

Local planning authorities could consider the use of independent soundscape design advisory panels to encourage the development of skills in this field. Such panels may include soundscape engagement specialists, architects, urban designers, urban sound planners, acoustic and psychoacoustic specialists, acoustic ecologists, engineers, spatial planners, environmental psychologists, building control specialists, energy specialists, sustainability specialists, designing out crime specialists, access officers or economists, whose skills could be utilised as the need arises. Soundscape design advisory panels could prove valuable not only when assessing contentious planning applications but also in the preparation of soundscape design policies and guidance.

List of acronyms

ADS	Acoustic Design Statement
ASIDOHL	Assessment of the Significance of the Impact of Development on Historic Landscapes
ICH	Intangible Cultural Heritage
ISO	International Organization for Standardization
NSAP	Noise and Soundscape Action Plan
NSDS	Noise and Soundscape Design Statement
PPW	Planning Policy Wales
ProPG	Professional Practice Guidance on Planning & Noise
RIBA	Royal Institute of British Architects
SPG	Supplementary Planning Guidance
TAN	Technical Advice Note
UNESCO	United Nations Educational, Scientific and Cultural Organization
WFG	Well-being of Future Generations

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