

Advancing the concepts of soundscapes and soundscape planning

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ABSTRACT

The role and application of the concept of the soundscape, *vis-à-vis* that of environmental noise management, needs elaboration. In noise control, sound is a waste product, managed to reduce the immision of sounds that cause human discomfort. The soundscape approach, by contrast, considers the acoustic environment as a resource, focussing on sounds people want, or prefer. *Quiet* is not a core requirement for acoustic preference in the outdoor acoustic environment. Core requirements include that soundscape and landscape are congruent, and that wanted sounds in a place are dominant over, or not masked by, unwanted sounds. Soundscape design, planning and management, based on this principle, augment environmental noise management approaches, expanding the scope of application of the tools of acoustic specialists.

INTRODUCTION

The concept of *soundscape*, in the couple of decades since popularised by Schafer (1977) and others, has had various applications. It has encompassed the recordings of the sounds of nature; compositions based on, or of, natural sounds; studies of the sounds heard in villages and rural environments; analysis of the way acoustic environments have been described in history and in literature; analysis and description of all types of acoustic environments; and the creation of artistic sound installations (Otsuka, 2009).

While cognizant of these many different perspectives of soundscape, this paper has a focus on the management, planning and design of the acoustic environment—primarily, but not exclusively, the acoustic environment of outdoor space. This clearly has strong links with the established field of environmental noise management. The distinction, and complementarity, between the two fields is valuable, and the tendency towards a devaluation of the term *soundscape* and its use as a synonym for *community noise* should be avoided. A community noise survey, for example, should not be labelled a *soundscape survey*; nor a map of urban noise described as a *soundscape map*.

The field of soundscapes also intersects, to various degrees, with other areas of acoustics such as sound quality, human acoustic comfort in buildings, and music—and also with non-acoustic fields such as wilderness and recreation management, urban and housing design, and landscape planning and management. Soundscapes involve diverse fields of practice, diverse approaches and diverse disciplinary interests (Hiramatsu, 2006; Lercher and Schulte-Fortkamp, 2003).

SOUNDSCAPE IS PERCEPTION OF THE ACOUSTIC ENVIRONMENT OF A PLACE

Central to the term soundscape is an individual's, or society's, perception and understanding of the acoustic environment (Yang and Kang, 2005; Truax, 1999, Raimbault and Dubois, 2005; Porteous and Mastin, 1985). Thus a soundscape exists through human perception—but always within the context of a particular time, place and activity. The

acoustic environment as perceived and understood, by people, in context is a definition of soundscape that may be adopted in a future acoustic standards (Axelsson, 2011). This perceptual construct of the soundscape allows it to be applied, not just to a place as it is experienced, but also to a place in memory (Ge and Hokao, 2003) or to abstract constructions such as musical compositions (Otsuka, 2009), or sound installations. Herranz-Pascaul et al. (2010) provide a good theoretical person-place-activity model for soundscape perception—firmly rooted in the psychological process of environmental experience—through which to understand and research soundscapes.

Various authors have drawn the useful analogy of soundscape as the auditory equivalent of landscape (e.g. Dubois et al., 2006; Anderson et al., 1983). The European Landscape Convention (Council of Europe, 2000) defines *landscape* as an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors. This is a good basis for an analogous *soundscape* definition. Substituting *place* for *area* because of the high spatial variability of the acoustic environment over any area, an effective definition of soundscape is obtained: *soundscape is the acoustic environment of a place (or area), as perceived by people, whose character is the result of the action and interaction of natural and/or human factors*. The Convention goes on to define *landscape policy*, *landscape planning* and *landscape management*. Again by analogy, this usefully leads to *soundscape policy* as the expression by the competent public authorities of general principles, strategies and guidelines aimed at the protection, management and planning of soundscapes—and similarly for *soundscape management* and *soundscape planning*.

Thus while the *soundscape* of a place is a perceived entity, soundscape management, soundscape planning or soundscape design, aim at management or manipulation of the acoustic environment of a place to change the way that its acoustic environment is perceived by humans.

The soundscape is perceived in a physical, often outdoor, area/space/location and that place also has certain visual and other properties associated with its natural, or human-made environment. The acoustic environment of that place can be

described by acoustical parameters such as type of sound sources, levels, spectrum, and temporal pattern. The place is also where people live or occasionally spend time and perform activities, and in which people interact with the physical environment and with each other. These contexts in which the acoustic environment is experienced (person-place-activity) is critical to soundscape perception.

It is recognized that the acoustic and the visual (and other) components interact in human perception of them (Carles et al., 1999).

INSTITUTIONAL INTEREST IN SOUNDSCAPES

There is increasing interest in the soundscape concept. This includes:

- the European Environmental Noise Directive and its reference to “areas where noise quality is good” - resulting in attempts to define and map areas of *quiet*.
- “natural quiet” in national parks in the USA
- work on a draft standard in soundscape
- COST Activity in Europe
- various projects such as the Swedish “Soundscape Support to Health”, and French Ministry of Town Planning, Housing and Construction projects.

The Environmental Noise Directive and quiet areas

The primary thrust of the European Environmental Noise Directive (END) [*Council Directive (EC) 2002/49/EC*] has been in reducing noise exposure where it can induce harmful effects on human health. But it also refers to places such as *public parks or other quiet areas in an agglomeration and quiet areas in open country*. This requirement for identification of *quiet areas* is recognition that the acoustic environment has relevance for humans other than harmful effects. There have been various attempts to define and map these in Europe (e.g. Province of Gelderland, 2002). A review of available guidance on defining quiet areas (DEFRA, 2006) found that, while most definitions were currently based on specifying limit value of some energy-integrative measure (L_{den} , L_{eq} etc), with limits ranging from 40 to 55 dB, there was too little research information available to allow the identification of quiet areas purely on the basis of acoustical criteria. As will be demonstrated below, the notion of “quiet” has quite limited application to the identification of high quality soundscapes.

Soundscapes in public lands in the US

There has been some intersection of noise and soundscape approaches in investigations of the acoustic experiences of recreationists in wilderness (Andersen et al., 1983; Pilcher et al., 2009). The term *natural quiet*, defined (Sutherland, 1999) as *...the absence of mechanical noise, but containing the sounds of nature, such as wind, streams, and wildlife, as well as visitor generated self-noise...* has been applied to the management of national parks and forest lands in the US. The term appears to have had considerable utility in developing the concept of the soundscape as a resource requiring management in the contexts of wilderness and of recreation on public lands. It is suggested (Miller, 1999) that visitors to these areas have a clear and widely shared understanding of the concept, though the technical complexities of characterizing and assessing these soundscapes are significant. Natural quiet, interpreted as the absence of certain human-generated sounds, means that the latter should not be audible above the natural sounds—effectively an audibility criterion, but more pragmatically this has evolved into a “percent time audible”

or a “percent time above” concept, where the human-generated sounds should not be audible above the natural sounds for some specified percentage of a period of interest (Rossman, 2006; Miller, 2008). Natural quiet does not mean silence (Cessford, 1999) and there is a range of expressions (Miller, 2008) that are considered similar: *natural sound environment*, *natural sounds*, *natural ambient* and *natural soundscape*. A recent edition of *Park Science* by the National Parks Service (NPS, 2009-10) describes both the evolution of soundscapes as a management concern for the Service, and the growing body of research both in terms of the nature of soundscapes in parks, sound-based conflicts for visitors and for wildlife—from external transport sources or generated by visitors themselves—and management approaches.

Work on standardization

The increasing interest in soundscape approaches to the acoustic environment has led to the need for some standardization, at least in terminology and in minimum reporting requirements in soundscape assessments and studies. Work is proceeding within the International Organization for Standardization (ISO) on what may become a series of standards on the concept, evaluation and application of soundscape ideas. In 2008, a Working Group of ISO/TC 43/SC 1 was established to begin consideration of a standardized method for assessment of soundscape quality outdoors—such assessment being seen as not just a question of presence or absence of annoying sounds, but the positive aspects of sound environments as perceived by people. Matters that could be considered for standardization included methodology, questionnaire protocols, identification of sounds heard as part of the soundscape, ratings of human overall preference and of various perceptual dimensions of the soundscape, together with essential information to be recorded on the setting and on human activity.

The COST Action on soundscapes

Further international cooperation in soundscapes is occurring through the European COST *Network on Soundscape of European Cities and Landscapes*. The Action now has over 30 participants including seven partners outside Europe including USA, Canada, Australia, Japan, Korea, Hong Kong, and China. The network covers many disciplinary areas: acoustical, social, psychological, physiological, linguistic, historical and architectural. The main aim of the Action is to provide the underpinning science for soundscape research and to assist in moving the field beyond the current state-of-the-art by harmonising research methodologies so that studies across the world can be compared and contrasted, avoiding duplication of work, and encouraging multi-sectoral collaboration, not only between researchers, but with practitioners and policy makers too. It also will attempt to promote soundscape into current legislation, policies and practice, aimed at improving/preserving the acoustic environment. The focus of the COST Network is on:

- Understanding and exchanging:
 - Fostering interdisciplinary exchanges
 - Exchanging technical know-how on an international/interdisciplinary basis
 - Examining cultural differences.
- Collecting and documenting:
 - Gathering soundscape data to be reanalysed from inter-disciplinary perspectives.
- Harmonising:
 - Reviewing and harmonising current methodology
 - Developing a standard protocol

- Laying the foundations for future European/international standards.
- Creating and designing:
 - Providing practical guidance and tools for the design of soundscapes
 - Providing guidelines for preserving architectural heritage sites.
- Outreaching and training:
 - Creating awareness among general public, stakeholders and policy makers
 - Providing training for early-stage researchers.

DIFFERENT FOCI OF SOUNDSCAPES AND ENVIRONMENTAL NOISE MANAGEMENT

Truax (1998) describes two distinct approaches to the external acoustic environment: the *traditional, objective energy-based model of the acoustic environment* (environmental noise management) and the *subjective listener-centred model* (soundscape approach), and argues that an integrated model is required. How the two fields differ, and how they extend and complement each other, warrants further examination.

The different foci of the two approaches are shown in Table 1 (Brown, 2010).

Table 1. The different foci of environmental noise and soundscape approaches

Environmental Noise Management Approach	Soundscape Approach
sound managed as <i>a waste</i>	sound perceived as <i>a resource</i>
focus is on <i>sounds of discomfort</i>	focus is on <i>sounds of preference</i>

In the environmental noise field, sound is conceived as a waste product that, as with all wastes, is to be reduced and managed: at source, in the propagation path, or at the receiver. By contrast, the soundscape field regards sound largely as a resource—with the same management intent as in other scarce resources such as water, air and soil: rational utilization, and protection and enhancement where appropriate. Resource management has a particular focus on the usefulness of a resource to humans and its contribution to the quality of life for both present and future generations. The concept of soundscape as a resource has been recognized in national park management (by the US National Park Service) as described above.

The other fundamental distinction lies in the human outcome of interest. Almost exclusively, the environmental noise field operates where there are adverse outcomes for people (or sometimes other species) from the acoustic environment. That is, it deals with *sounds of discomfort* (Augoyard, 1998): sleep disturbance, annoyance, adverse physiological effects, interruption to communication or cognitive processes etc. By contrast, soundscape studies often examine the acoustic environment where the sounds produce outcomes that enhance, enable, or facilitate human enjoyment, health, well-being or activity. The focus in soundscape studies is more likely to be on *sounds of preference*—though not exclusively so. Interest in sounds of preference in environmental acoustics have previously been restricted to building acoustics (say preferred ambient levels for rooms, or preferred reverberation time in halls for speech and music) and to the sound quality of products. Genuit (2002) argues that sound quality concepts should

also have environmental application. Environmental noise and soundscape approaches are distinguished by their focus on quite different *human outcomes*—more so than any differences in the sources of sound that are involved. The centrality of human perception in soundscape studies has sometimes been described as a fundamental contrast between it and the environmental noise field. However, this is not the case—much work in environmental noise is also perceptually based as in the measurement of annoyance. The real distinction between the two fields is the different human outcomes of interest.

PREFERENCE FOR WHAT OUTCOME?

Soundscapes may be studied intrinsically, examining the systematic relationship between humans and the acoustic environment (*soundscape ecology*) but much work deals with soundscape quality, human preference for different soundscapes, or human acoustic comfort (Kang, 2006). Longer term objectives include the creation, or improvement, of the soundscape of a place (*soundscape planning or design*) or its management. In different places and in different contexts, a person’s preferred outcome with respect to the acoustic environment may differ markedly. The preferred outcome could also be multidimensional. Table 2 lists a wide variety of potential outcomes that could be associated with human soundscape assessment.

Table 2. Different outcomes which might determine preference for the soundscape in different places and contexts. From Brown et al. (2011).

acceptability	identification of place	relaxation
appropriateness	importance	safety
clarity	information	satisfaction
comfort	liveliness	sense of control
communication	naturalness	solitude
enjoyment	nature appreciation	tranquility
excitement	nostalgic attachment	uniqueness
happiness	peacefulness	variety
harmony	place attachment	well-being

For example, the soundscape of a place might be preferred on the basis that it is peaceful, or tranquil, or promotes well-being. Equally, in a different place or context, a soundscape might be preferred because it is lively, or varied, or creates a sense of excitement. Or preference may be for a soundscape that provides information, clarity, and conveys safety. In yet another place or context, preference for a soundscape may relate to its unique cultural or natural characteristics—such as place with what Schafer (1977) called soundmarks. Those working in particular fields may have a very clear idea, or mandate, regarding particular outcomes—say in national parks, recreation or wilderness areas—but these may not be equally appropriate for those working in other fields, say urban open spaces, or housing complexes. This diversity needs to be accommodated. Table 2 is an initial list, illustrative rather than comprehensive.

The outcomes in Table 2 can be considered for the most part as *direct outcomes*. Measurement of preference for these is premised, to a large extent, on people being aware of the sounds around them—and consciously attributing the particular outcome directly to the soundscape. However the soundscape of a place may enable certain outcomes/activities without people consciously dissecting why it is that the environment of a place provides so well for that activity. For example, people may know that a place is a good one in which to play with children, or in which to relax, or to meet with peo-

ple, or communicate, or undertake other activities. They seek to achieve these outcomes in places—facilitated by the soundscape, along with other dimensions of the place—but not necessarily with conscious attention to the soundscape itself. This poses a significant methodological problem for soundscape assessment by introducing an “experimenter effect”, amongst other things, where measurement of people’s preference in these situations using questionnaire methods requires first drawing their attention to something on which they may have never consciously reflected. Assessment of soundscapes should recognize the existence of both *direct outcomes* (outcomes provided directly by the soundscape) and *enabled outcomes* (outcomes that are enabled or facilitated by the soundscape). There appears little work to date in soundscape assessment that has canvassed this distinction, and the latter may require study methodologies other than questionnaire approaches—behavioral studies, perhaps, where the locational choices of people undertaking certain activities are correlated with the soundscape. There is already some evidence that people’s choices in using an urban square are related to soundscape elements (Yang and Kang, 2005).

Wanted Sounds—Sounds of Preference

What sounds do people want or prefer? The answer depends entirely on the contexts of place, time and activity and who is doing the listening (Herranz-Pascual et al., 2010; Brown et al., 2011). It will vary between groups of people of dissimilar age (different types and intensity of music for example), social status, religion (sounds of Christian church bells or the sounds of Islamic azan) etc. Despite such diversity, it is suggested that there will be more agreement than disagreement between people regarding sounds that can be identified as wanted in many contexts. The task of having to deal with the complexity of different community views with respect to environmental management is not peculiar to the field of soundscapes.

Until recently, the acoustics community has paid little attention to human appreciation of sound outdoors and its contribution to well-being. There have been eight decades of studies into “what noise annoys you” starting with the New York surveys in the 1920s (Brown et al., 1930). By comparison there has been relatively limited investigation into “what sounds do you enjoy” or “what sounds do you prefer”. However, there is now increasing evidence of the types of sounds that people prefer in particular contexts. This includes investigations (Tamura, 2002) of outside sounds residents preferred to hear indoors, and the finding (Carles et al., 1999) that natural sounds, particularly of water, create positive feelings towards the landscape. There is also increasing investigation into the expectations of people in terms of sounds heard in particular environments such as in urban parks and streets in Naples (Brambilla and Maffei, 2006, 2010) the archaeological site of Pompeii (Maffei, 2008), French cities (Gustavino, 2006) and national parks (Kariel, 1980).

Results of work of this type tend to be consistent and unsurprising (Kariel,1980; Pilcher et al., 2009; Gustavino, 2006; Nilson and Berglund, 2006). People prefer sounds of moving water: in all its forms—the gentle trickle of a stream, the roaring of a mountain river, the sounds of waves on the beach whether of peaceful lapping or of violent crashing, the sounds of rain, of waterfalls and of fountains in urban areas. People also prefer the sounds of nature: those of birds, animals and to somewhat less extent, insects, and the sound of wind in trees. Finally, people generally prefer the sounds made by other people (voices, footsteps, laughter, singing) over the

mechanical sounds they generate (vehicles, machinery, ventilators). The exact nature of the source and context are critical. For example, Nilsson and Berglund (2006) found that the mechanical sounds of pleasure and commercial boats were judged as neutral or pleasant in parks and suburban areas in Stockholm, whereas the mechanical sounds of road traffic sources were more likely to be judged as annoying.

MEASUREMENT AND MANAGEMENT DIFFERENCES

In addition to the different foci of the two approaches described in Table 1, Table 3 summaries critical acoustic differences.

Table 3. Differences between environmental noise and soundscape approaches with respect to human response, measurement and management

Environmental Noise Management Approach	Soundscape Approach
Human response related to level of sound	Preference often unrelated to level—quiet not the objective
Measures by integrating across all sound sources	Requires differentiation between sound sources: <i>wanted sound</i> from <i>unwanted sound</i>
Manages by reducing level	Manages by <i>wanted sounds</i> masking <i>unwanted sounds</i>

Environmental noise management is rooted in physical measurement. Even in psycho-acoustic studies of human perception of sound and response to noise, emphasis is on physical descriptors that correlate with human response—acoustical exposure parameters: level, frequency and temporal dimensions of environmental noise. Environmental noise management then uses these physical descriptions to set limit criteria for human exposure and consequently for noise management and design of noise mitigation. To most involved in noise policy, management and control, objective physical measurement is fundamental. Most adverse human responses to environmental noise are understood, on good evidence, to be a function of the level of exposure to sound.

However, from the soundscapes field, there is growing understanding and acceptance that outdoor sound quality (quality in terms of human preference) cannot be determined by physical measurement. Matters such as context, the information in the sound, and individual attitudes and expectations, all play an important role in judgments of outdoor sound quality, either more important than level of sound, or even to the exclusion of level. Davies et al. (2009) observe *...soundscape assessment relies upon the identification of the sounds, the prominence of the sounds, and potentially the ratio of certain sound types to other sound types within the soundscape.*

There is consistent evidence that human judgement of soundscape is not related to the loudness of urban sound. Brambilla and Maffei (2006) demonstrated, from a laboratory simulation experiment, that acceptability of sounds in a countryside context depended on the presence (detectability) of certain types of sounds (church bells, stream, children’s voices) and less on the level of these sounds. Similarly, Yang and Kang (2005) showed clearly that, in urban open public spaces, self-assessment of acoustic comfort was largely unrelated to the

level of the sound being experienced, even over an L_{eq} range from 50 to greater than 75dB(A). Further, acoustic comfort evaluation was greatly affected by sound source type, with comfort greatest when the source was a fountain in a park. This effect was present at all levels of sound. Others (Lavandier and Defréville, 2006) found that, while loudness and judged unpleasantness/pleasantness of the soundscape were highly correlated for trafficked streets (largely judged as unpleasant environments by their respondents) the two were poorly correlated for the soundscapes of parks, and there was no correlation between them in the soundscapes of market places. The parks and markets were regarded as having relatively pleasant soundscapes. This is experimental evidence that explained variance of hedonic judgments of sound in Paris streets and other locations is increased by including source identification.

The results are similar for the response of outdoor recreationists. Response to sound (on a pleasing-annoying scale) in an outdoor recreation environments was independent of the level of sound, over a very wide range of sound exposures (Kariel, 1990). There is evidence (Anderson et al., 1983) that visitor response had much less to do with loudness or with quietness than it did with whether the sounds present were appropriate to that particular setting. Quiet is certainly not the only acoustic characteristic that determines peoples' preference for outdoor soundscapes.

The energy-integrative approaches to sound measurement that have become the norm in environmental noise appear particularly unsuitable in assessing soundscapes. Human assessment of soundscapes depends critically on distinguishing between different sound sources: mechanical sounds from natural sources; human voices and footsteps from the sounds of transport, etc. Integrating sound may be intuitive in noise measurement, but counter to the way people experience much of the outdoor acoustic environment. Evidence through psycho-linguistic studies, shows that meanings attributed to sounds act as determinants for sound quality evaluations. People categorize urban soundscapes by source when specific sound sources can be isolated, and by the presence or absence of human sounds where many sources contribute to the background. The conclusion is that soundscapes need to be conceived and investigated by first identifying relevant semantic features, and only then by correlating them with quantifiable (acoustic) parameters. A similar notion is that areas of high acoustic quality are identified by whether sounds are *wanted* or *unwanted* in particular contexts, not just by the levels of sound (Brown, 2006). High quality acoustic environments result where the dominant sounds heard in a place are those that are wanted or preferred in that place, and/or that sounds that are not wanted or preferred in that place are not heard.

Despite the growing evidence that measurements based on level or loudness are unable to account for much of human preference for outdoor soundscapes, the search for physical acoustical correlates continues. Hearing-related physical parameters, other than the averaged intensity of the acoustic stimulus, may be necessary to characterize environmental sounds (Genuit and Fieberg, 2006). Measures such as sharpness, roughness and fluctuation strength of sound have been suggested (Raimbault et al., 2003; Semidor, 2005), as have acoustic properties of sound events (Genuit and Fieberg, 2006), and music-likeness (Booteldooren et al., 2006), with emphasis on the spectral and temporal properties of sound—though there is little evidence to date that these explain human preference in outdoor sound environments.

In summary, these observations demonstrate a strong divergence between soundscape and noise control in their approaches to measurement and management. In the noise control field, sounds are measured by integrating them, generally independent of source. In the soundscape approach, the information content of the sound is critical and identification of sounds of different sources is required. Methods of integration of energy (irrespective of sound source) that we predominantly use in noise control (the L_{eq}), are likely to be found wanting as a way to measure sound related to human preference. Further, management of noise is most often achieved by reducing these integrated levels of exposure. Management in soundscape approaches may need to utilize level reduction, but its objectives are not necessarily lower levels of sound, rather in ensuring that wanted sounds are not masked by unwanted sounds. This raises interesting technical questions for acousticians regarding how to define, measure and control sound where human preference is the criterion.

Masking

Nearly all acoustic environments in outdoor places of interest will consist of sounds from many, and different, sources.

Human perception of an outdoor soundscape is likely to be determined, again within any particular context, by the nature and relative intensities of the sounds that are present. Preference (on some particular human outcome dimension such as enjoyment, relaxation, excitement, comfort etc) is likely to depend on whether wanted sounds are heard and unwanted sounds not heard. Soundscapes need to be disaggregated by component sources. In acoustical terms, this is masking—wanted sounds not masked by unwanted sounds, or wanted sounds masking unwanted sounds. It is suggested that the masking is a key concept to soundscape study, analysis, and design.

This principle is already in application in some aspects of management of outdoor soundscapes, though not always specifically recognised as fitting under the umbrella of masking. Variations include:

- the concept of natural quiet (natural sounds not to be masked by human-made sounds),
- management based on audibility criteria (Miller, 2008) (certain sounds required to be inaudible),
- masking for a minimum period of time (unwanted sounds not to be audible for more than a percentage of time)—a “time above” measure, and
- more colourfully—as Westerkamp (1974) suggests—*“Walk towards the fountains and continue to listen to the city sounds until they disappear behind the sounds of water”*.

The masking of the sounds of road traffic by the sound from a water structure in a park, and vice versa, have recently been examined (Nilsson et al., 2010; You et al., 2010).

OTHER ISSUES

While there has been quite rapid advancement in our conceptual understanding of people's perception of their acoustic environments, there are still significant gaps including:

- appropriate techniques for measurement of soundscape perception,
- the ability to simulate soundscape experience through, for example, studies in virtual laboratories,
- the effect on perception of the individual's levels of engagement

- with the space/activity,
- with the soundscape of that space/activity,
- visual/aural interaction
- the potential restorative value of soundscapes – potentially important in quality of life and human well-being
- the role of listening styles: analytical listening versus distracted listening (Truax, 2001).

Researchers in environmental and community noise are also beginning to investigate the contribution that soundscape approaches can make to an understanding of human response to noise in both urban and non-urban contexts. This includes the effect of source and context on human experience of noise (Raimbault, 2006) and the potential restorative capacities of soundscapes on human health and well-being, including the value of high quality acoustic environments to people otherwise living in noisy urban areas (Kilman, 2002; Gidlöf-Gunnarsson and Öhrström 2007, Öhrström et al., 2006).

SOUNDSCAPE PLANNING

Soundscape concepts open up the potential for the same expertise that is brought to the control of the adverse components of the acoustic environment to be applied positively—to the management of those parts of the outdoor acoustic environment that are of high quality and are valued by people—by acoustic design or acoustic management of outdoor space. As Kang (2006) suggests, the study of soundscapes is not only the passive understanding of human acoustic preference, but can be *...placed into the intentional design process comparable to landscape...and into the design process of urban public spaces*. Soundscape planning involves design or management to manipulate the acoustic environment of a place in a way that results in improved human perception of its environment. Soundscape planning can contribute to management of, not just urban environments, but rural, recreational and wilderness environments too (Pilcher et al., 2009; Hedfords and Berg, 2003). There are many locations that are appropriate for soundscape planning, design and management, and opportunities are likely to be greatest when areas are being redeveloped, or in initial design stages:

- urban parks and gardens
- country parks
- national parks & wilderness
- recreational areas
- malls and pedestrian precincts – in fact any public or quasi-public city space
- places in which the preservation and reinforcement of sound marks (Schafer, 1977) is appropriate
- historical, cultural or heritage sites (Maffei, 2008)
- some residential precincts.

STEPS IN A SOUNDSCAPE DESIGN PROCESS

The design of outdoor acoustic space requires careful specification of acoustic objectives. The steps in a design process for outdoor space that incorporate these principles are shown in Figure 1. Step 1 requires unambiguously defining the place of interest and context (who are the people involved, what are they doing, what are others doing, time of day, weather, motivations, expectations, etc.). In Step 2, the acoustic objectives for this place and context need to be established (using the normal processes by which planners gain community or focus group consensus in similar matters). Examples of some possible acoustic objectives (for different places and different contexts) which take into account the soundscape design principles of preference and masking, are:

- moving water should be the dominant sound heard;

- a particular (iconic) sound should be clearly audible over some area;
- hear, mostly, (non-mechanical, non-amplified) sounds made by people;
- not be able to hear the sounds of people;
- the sounds of nature should be the dominant sound heard;
- only the sounds of nature should be heard;
- suitable to hear unamplified speech (or music);
- suitable to hear amplified speech (or music);
- acoustic sculpture/installation sounds should be clearly audible;
- sounds conveying a city’s vitality should be the dominant sounds heard.

Unlike noise control where acoustic objectives are usually specified in terms such as, “levels should not be greater than x dB”, the objectives include specification of the wanted sounds in this place (e.g. moving water, nature, speech, music, church bells), sometimes the unwanted sounds (e.g. not be able to hear the sounds of people), and specification of the extent of masking required—whether masking should be *complete* (the *only sound heard*) or *partial* (the *dominant sound heard*) - step3. If planners complete Steps 1 to 3, acoustic specialists can be charged with investigating the opportunities for acoustic management and design in Step 4, using all of the skills and tools normally applied in noise management and acoustic design.

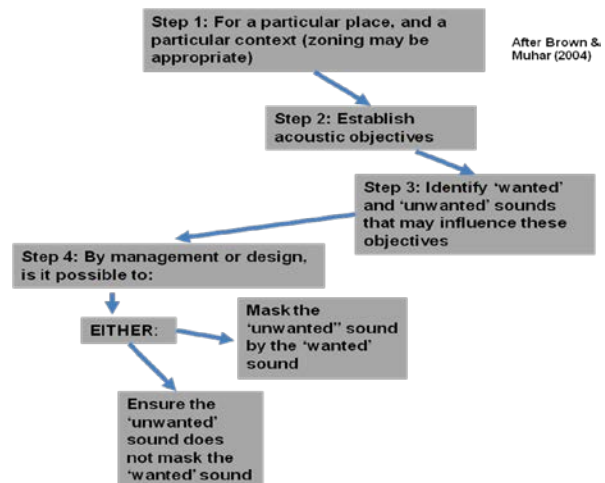


Figure 1. Steps in an acoustic design process for outdoor space.

CONCLUSIONS

The outdoor acoustic environment is a resource whose diversity is to be managed and enhanced, complementing the waste management control of environmental noise management.

In terms of human preference for a soundscape, the level of sound is likely to be far less important than place and context, and whether particular sounds are wanted or unwanted there. This is a significant shift for those practiced in environmental noise management in which objective physical measurement of the acoustic environment has been paramount.

The immediate focus for soundscape planning/acoustic design should be on small areas as demonstration projects.

The primary message is that it is not a matter of choosing either a noise control or a soundscape approach, but rather noise control supplemented by soundscape planning. A potential outcome of adopting soundscape approaches may be that it will assist in capturing the imagination of politicians, policy makers, and a range of design professions with respect to the management of the outdoor acoustic environment in a way that the current sole focus on environmental noise control tends not to.

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