



Book Review

Urban Sound Environment, Jian Kang. Taylor & Francis, UK (2006). xviii + 278pp., £55, US\$110, Hardback, ISBN: 978-0-415-35857-6

In recent years, large-scale noise-mapping software packages have been developed and widely used, and various prediction methods for sound propagation in micro and meso-scale urban areas have also been explored. As a result of this activity there have been many major new developments in the field of urban sound environment in terms of research and practice and this book is intended to present a concise account of the current state-of-the-art. Of particular relevance to this book is that the importance of soundscape and sound environment design is now widely recognized, and this represents a major step forward from simply attempting to reduce urban noise levels. The chapters in this book relating to the urban soundscape, in particular, reflect the research expertise of Prof. Kang in this area.

The book covers the basic principles of architectural and environmental acoustics before dealing with recent developments in the prediction and abatement of urban noise. A number of simple equations and explanatory graphs are employed to good effect in Chapter 1 to introduce fundamental concepts and theories relevant to the urban sound environment. These include the properties of sound waves, auditory perception, basic sound sources and typical power spectra, acoustic materials, factors affecting outdoor sound propagation and room acoustics such as reflection, reverberation, absorption, diffusion, transmission and diffraction.

The remainder of the book is divided into a further six chapters, covering three main facets of urban sound environment. Chapters 2 and 3 are concerned with sound evaluation and acoustic comfort, Chapters 4 and 5 are concerned with urban sound modelling/mapping and Chapters 6 and 7 are concerned with noise mitigation and sound environment design.

Chapter 2 discusses the description and evaluation of urban noise, including an overview of the subjective evaluation of urban noise in terms of acoustic/physical factors and social/psychological/economic factors as well as commonly used evaluation methods. It is argued that understanding the urban sound environment involves much more than the A-weighted sound pressure level but that the social, psychological, economic and legislative factors all contribute to the perception of the quality of urban space and therefore must also be considered.

Chapter 3 focuses on the urban soundscape and acoustic comfort, with particular attention focused on urban open public spaces. A multi-disciplinary approach is used to examine how people perceive their environment. The chapter starts with a review of general soundscape research and evaluation and then describes a series of soundscape studies in Europe and China. The main factors that characterize the soundscape are studied by means of the semantic differential method. A framework for soundscape description in urban open public spaces is then explored, followed by an overall soundscape evaluation system. The potential application of artificial neural networks in managing the numerous variables arising from the mapping of soundscape, and approaches to the design of soundscape for both indoor and outdoor public spaces are both discussed.

Chapter 4 describes a series of simulation techniques and related acoustic theories for accurately calculating the sound field for microscale urban areas such as a street or a square. This includes energy-based image source methods for street canyons and urban squares with geometrically (specularly) reflecting boundaries, image source method considering interference, ray tracing, radiosity model for diffusely reflecting boundaries, transport theory, equivalent source method, and some other models. Techniques for urban acoustic animation

are also discussed. Physical scale modelling techniques for urban acoustics are then briefly introduced, as well as actual measurements, which have been used for validating some of the simulation models.

Chapter 5 deals with macroscale urban areas, in particular noise-mapping techniques and examines the main algorithms employed, their accuracy, efficiency and strategic application. The accuracy and efficiency of these techniques is examined by means of case studies. Colour maps are effectively employed to illustrate the effects on the resultant sound level of the use of different options for order of reflections considered, façade scattering effects, building configurations and superposition of noise sources.

Chapter 6 discusses the main mitigation measures for urban noise, especially those relating to urban and architectural design, including planning considerations, building envelope design, principles and applications of various environmental noise barriers. Discussed are the use of acoustic windows, noise enclosures, environmental noise barriers, landscape engineered and architectural design strategies. Non-acoustic issues in designing barriers include sections on the whole life cycle analysis of noise mitigation measures and the subjective perception of barriers by the general public.

Chapter 7 analyses the basic characteristics of sound fields in urban streets and squares and the effects of architectural changes and urban design options, including boundary reflection pattern, street/square geometry, boundary absorption and building arrangements. Results obtained from modelling studies are used to demonstrate the effect of diffusing facades on the acoustic conditions experienced in a typical city square.

Combining technical presentation and interdisciplinary approach with suggestions for practical application and design, the book is relevant to researchers, practitioners and students in a number of disciplines and sectors, including urban planning, architecture, landscape, acoustics and noise control, environmental science, civil engineering, transport engineering, and environmental psychology/sociology. New researchers entering this field will also find this book valuable for its very comprehensive list of references.

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