Environmental Methods for Transport Noise Reduction
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Highway noise, for the most part, at least in North America, is abated with highway barriers. These barriers, located parallel to the road, on the highway right-of-way, are meant to reduce noise to residents or to "quiet areas" that are on the opposite side of the roadway. There are other methods of course, like quiet pavements, but the predominant solutions are highway barriers that range from about 5 to 10 m high. These barriers are mostly constructed of metal or concrete.

This book takes an alternate approach, one using environmental methods to reduce noise. And what are these? They are the use of vegetation, soil and other natural and recycled materials, in combination with artificial elements.

Environmental Methods basically presents the finding of the research project, "Holistic and Sustainable Abatement of Noise by optimized combinations of Natural and Artificial Means", referred to as "HOSANNA". The reductions suggested give, maybe a calculated A-weighted noise reduction of 2 or 3 dB (actual results may vary). So combinations of methods are needed. The book is written so laypersons and experts can read and understand the concepts. It starts with a glossary that would be good for any reader and then a listing of the 34 contributors and a brief summary of the HOSANNA project. There are ten chapters, each ending with supporting references.

Chapter 1 – Introduction to traffic noise abatement – This chapter is a good, rather elementary but adequate, treatment of noise propagation, a bit about noise control, and the introduction of a discussion about the spectrum and perception of changing effects of abatement.

Chapter 2 – Innovative barriers – This chapter discusses low height (1 m) vegetation covered earthen filled cages (gabions) giving reasonable noise reduction in urban streets. Further, rows of trees, vegetation on the top of a barrier, and non-flat berms are discussed. One type of barrier, new to me, was the "sonic crystal-assisted barrier:" spaced horizontal cylinders. Details are provided to obtain a real understanding of the implementation of these "barriers".

Chapter 3 – Acoustic [sic] performance of vegetation and soil substratum in an urban context – This chapter deals with measured and predicted data of noise attenuation by these natural elements. This section has both theory and testing and my major concern is the usefulness of these, except as concepts. Plant leaves grow and die, and have different densities and heights. And soil is hardly uniform. So the lack of isotropy and homogeneity for all experiments and theory makes experimental and theoretical treatments good for guidelines only.

Chapter 4 – Acoustical characteristics of trees, shrubs and hedges – This short chapter discusses the interactions between sound waves and vegetation. It is very interesting but my concerns are similar to those of the previous chapter. Nevertheless, this chapter has important information and is worth the read.

Chapter 5 – Designing vegetation and tree belts along roads – This chapter provides practical examples of placing vegetative "barriers" along roads. It discusses the interactions between sound and these barriers. For example, trees may not be too effective on their own, that they change the wind environment near and below the tree-tops and that makes them beneficial to aid in noise abatement. It is a useful chapter for acoustical engineers.

Chapter 6 — Noise reduction using surface roughness — This interesting chapter introduces the concept of adding roughness to a surface, not to the roadway but to the surface between source and receiver. Like a bunch of parallel low (0.2 m) barriers, the authors show that by using this technique, perhaps 3 dB or so (at mid frequencies), attenuation can be achieved at the receiver. The innovative approach is worth consideration when it can be applied.

Chapter 7 – Porous ground, crops and buried resonators – This chapter talks about the surface treatment of nearby ground. As expected, the porosity of the ground and the type and configuration and density of the ground plantings all can determine effectiveness of this approach. Experimental data are provided. Also replacing tram soil road with grass is discussed and seems quite effective. Many suggested that treatment is included too. I suspect that actual predictions might be quite difficult, depending on the weather (wet or frozen or snow covered) and season.

Chapter 8 – Vegetation in urban streets, squares and courtyards – This section treats green roofs, green walls with both experimental and theoretical approaches for certain models.

Chapter 9 – Perceptual effects of noise mitigation – This very interesting chapter brings up an important concept: while abatement might reduce audibility, it might also increase annoyance because of the change of the spectral characteristics of the noise. Further, reducing noise from traffic may make other sounds more noticeable. On the visual front, a vegetative or natural barrier might make a vast improvement over the most common flat tall walls used as shields.

Chapter 10 – Economic analysis of surface treatments, tree belts, green facades, barriers and roofs –

The chapter talks about the cost effectiveness of the natural abatement techniques. I cannot comment much on the veracity of this chapter. I do not know much about economics. But the chapter is easy to read and shows that the costs of environmental methods seem to be either less expensive than those incurred by traditional approaches or worthwhile for the attenuation achieved.

I was very happy to review this book. I like this book very much. It is easy to read, well organized, filled with important concepts and data, and most useful. It is highly recommended to any acoustical engineer, highway planner, community groups or others who care about mitigation of vehicle noise.

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