

2 · 項目簡介

(項目所屬科學技術領域、主要技術內容、授權專利情況、技術經濟指標、應用推廣、人才培養及對澳門科技進步的推動作用等)

The project has developed a traffic noise model system for acoustic environment assessment in Macao. The contribution of the developed system is twofold: (1) on one side it can be used on an existing road network and traffic scenario to help decision makers identify hot spots where noise control efforts are urgently required to minimize negative health effects on exposed populations; (2) on the other side it can be used to evaluate the acoustical impact of future road planning and various mitigation measures.

Most of the countries have their own traffic noise assessment models. However, up to now there is no generally accepted model for traffic noise prediction in Macao. The Principal Investigator has developed a traffic noise system to suit the urban characteristics, street systems and local conditions in Macao. Particularly, an enhanced prediction model has been established in which the flow of motorcycles is taken as an important parameter and the contribution of motorcycle traffic is taken into account. This is the major innovation of the project.

By integrating the enhanced traffic noise prediction model with digital maps, traffic data and ArcView GIS, a traffic noise model system has been established to realize a building-based traffic noise assessment for Macao. With the building-based data capture and data mining technique, the spatial resolution of the system is about 300 times of that of the traditional grid-based model systems. Human exposures to traffic noise in a city can be investigated at the address level. The predictions by the traffic noise model without taking motorcycles into account correlated with the measured results with an R^2 of 0.789, which has been improved to 0.842 by the present model system. Traffic noise predicted at 2398 receptor points in Macao indicated that the risk of human exposure to high traffic noise may be underestimated if the contribution of significant motorcycle traffic is not considered properly.

The developed model system has been applied to investigate the spatial distribution of traffic noise in different urban areas in Macao. Particularly, the spatial technique has been proposed to visualize acoustic comfort along cultural and heritage routes. The technique may open an innovative methodology in sustainability study of tourism industry and tourism planning.

The developed model system has also been applied to assess the effects of electric motorcycle on human exposure to traffic noise in Macao. It is interesting to find that the effects are different in different urban areas. The study has provided new evidence on the potential adoption of electric motorcycle as a cleaner alternative to gasoline-powered motorcycle.

The project has trained one PhD and eight MSc students, led to three international journal publications (all SCI or SSCI-indexed) and two conference papers (one EI-indexed and one to be EI-indexed). The Principal Investigator was awarded the BOC Excellent Research Award from the Macau University of Science and Technology.

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