Railway noise and vibration problems and mitigation solutions in practice

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Railway transport is a game changer for sustainable development of urbanisation. It emits the least carbon footprint per traveller per distance, compared with the other transport modes. Despite the positive values, railway is considered to be one source of noise complaints. Noise and vibration problems in railway are not new indeed. However, its mitigation solutions have been implemented and progressed in practice. This lecture will entail the noise and vibration issues in railway sector. There are many sources of noise and vibration, ranging from rolling noise, wheel/rail noise, squeal or screech noise, traction noise, aerodynamic noise, ground-bourne plus structural-bourne noise and vibration, as well as impact noise (at rail joints or switches and crossings). The effects of noise and vibration on environment, human, and assets are highlighted. Examples of noise spectra will be demonstrated in terms of visualised measurements and audible records. The mechanisms of each noise and vibration sources will be discussed in detailed, since they are the fundamental insights that lead to various ad hoc and engineered mitigation solutions. Then, the mitigation solutions in practice will be illustrated in terms of track-based and vehicle-based approaches. The pros and cons, life cycle aspects, uncertainties, resilience and adaptation to climate impacts, as well as sustainability of the mitigation solutions will be discussed.

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