



## **Assessment of Short-Term Annoyance due to Combined Noises of Urban Road Traffic and Tramway Pass-bys**

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Due to the rapid expansion of urban areas, an increasing number of residents are exposed to combined community noise sources. Studies on the human response to community noises show that the exposure to transportation noise significantly affects health and wellbeing (e.g. noise annoyance). Up to now, noise annoyance due to transportation noises is mostly assessed by considering single noise exposure situations neglecting the effects of potential interactions between noise sources. However, the understanding of human responses resulting from combined noise sources is crucial for the application of adequate noise control strategies. In this study, noise annoyance due to combined urban road traffic and tramway pass-by noises is assessed in laboratory conditions. The urban road traffic is constituted of light vehicles, heavy vehicles, buses and powered-two-wheelers in different driving conditions (acceleration, deceleration, constant speed). The tramway pass-bys correspond to different tramways in in-curve operating configurations. Noise annoyance responses are analyzed using Vos' representation. The results indicate that noise annoyance cannot be sufficiently explained by the sound pressure level. Furthermore, an asymmetry between partial noise annoyances due to road traffic and tramway noises can be observed: road traffic noise is mainly the most annoying source even for cases where tramway noise is dominant in terms of sound pressure level. Finally, based on the perceptual phenomena highlighted in the analysis, it is suggested that total noise annoyance due to the two combined noises could be predicted by the strongest component model.