Towards a general framework for intergrating concrete work and noise impact in BIM – life cycle assessment method

Noise has physical and psychological impact on living creatures. But it is ignored in most of the environmental impact assessment. Life cycle assessment is a widely used environmental to calculate the various environmental impacts. Construction noise impact has been integrated in this research. Result indicated that 174 m^2 of concrete floor construction work has 5 times higher impact in NSW compared to Darwin. The reason is that the exposed population number is higher in NSW compared to Darwin. So, more critical assessment and mitigation measures are required in highly populated areas.

Abstract

Concrete, the primary building material, creates noise throughout material procurement, fabrication, construction, and demolition. Noise affects humans and other animals in direct and indirect ways. For example, noise can cause hearing loss, hypertension, heart difficulties, and psychological issues like aggravation, sleep deprivation, reduced focus, mental well-being, limited cognitive development, and poor cognitive task performance.

Life cycle assessment (LCA) is a widely used technique to calculate the comprehensive environmental impacts of human activities. Although various impact indicators are assessed in the LCA method, the present life cycle assessment still excludes noise impacts due to limited research on noise assessment methods.

This paper presents a framework to quantify the environmental impacts of noise in the BIM-LCA of concrete. There are two health indicators for noise impact, such as annoyance and sleep disturbance. Later the corresponding health damages are evaluated by using disability-adjusted life year (DALY). As a case study, a Low-populated region (Darwin) and a high-populated region (Sydney) have been selected to compare the noise impact. The result indicates that 5029 and 119985 people will be highly annoyed due to concrete work in Darwin and NSW, respectively. In addition, 3178 and 76091 people will be highly sleep deprived in Darwin and NSW, respectively. After integrating noise impact, the DALY value increased 5 times more in NSW (0.11) than in Darwin (0.024). All those findings could help the policymaker to decide.