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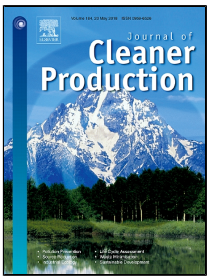

Life Cycle Analysis based Comprehensive Environmental Performance Evaluation of Mumbai Suburban Railway, India

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Life Cycle Analysis based Comprehensive Environmental Performance Evaluation of Mumbai Suburban Railway, India

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Abstract

Suburban railway systems are recognized as one of the most promising options to improve the environmental footprint of urban passenger transport in developing countries. In the present study, life cycle assessment has been performed for the Mumbai Suburban Railway with the objective of developing a comprehensive methodology for environmental evaluation of suburban railway projects in terms of energy consumption and relevant impact categories. The system boundary comprises the construction and maintenance of railway infrastructure such as tracks, power supply installations, foot over bridges and platforms, in addition to manufacturing, maintenance and operation phase of Electric Multiple Unit (EMU). The functional unit identified for this study is per Passenger Kilometer Travelled within a service lifetime of EMU of 25 years. The results show that operation phase is the main contributor (87-94%) to the total environmental impact, whereas the contribution of remaining life cycle phases is relatively insignificant (6-13%). It is mainly due to electricity production from non-renewable sources in India. The material and energy intensive rails entail the major contribution to construction phase (24-57%) and maintenance phase (46-71%), whereas the contribution from fastenings, ballast and on-site energy consumption is less significant. The increasing utilization of renewable energy, light weighting of coach bodies, enhancing the service life and reuse potential of rails and fastenings and enhancing train occupancy are fundamental to accomplish suburban railways as a clean transportation mode. This comprehensive study can serve as a preeminent support and benchmark for the future environmental performance assessments of public transportation in India. Eventually, decision makers and regional transport planners can more effectively craft the strategic decisions and priorities of measures for providing sustainable mobility options.

Keywords Environmental Performance, Suburban Railway, Public Transportation, Electric Multiple Unit