

Environmental assessment of road construction projects in India: A novel approach

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Abstract

The road sector is one of the basic pillars for national economic growth owing to its role in movement of goods and people across a vast country such as India and can contribute positively towards several sustainable development goals (SDGs). However, conventional road construction methods may hinder country's progress in achieving climate action and environmental SDGs due to substantial raw material requirements, fuel consumption, and associated pollution. The proposed approach connects the bill of quantity (BOQ) of the road with accessible analysis of rates document and India-specific construction materials environmental footprint database. A case study on a 49 km Indo-Nepal border road found that conventional natural coarse and fine aggregates, Portland cement, steel bars, bitumen, and diesel are responsible for the majority of impacts. The study identified environmental impact on six domains per km of the road section. The proposed approach can serve as a template for future LCA studies on road construction, and the information generated can be utilized by decision makers.

Keywords: LCA; Roads; India; Environment; Climate change; Sustainability

1 Introduction

A resilient road infrastructure plays a vital role in the economic and social development and can contribute positively towards multiple sustainable development goals of a country [1]. However, laying down new roadway pavements or maintenance of existing roads is a resource intensive activity resulting in environmental damage through greenhouse gas emissions, air and water pollution, land degradation and consequent habitat fragmentation of biodiversity in the area etc. [2]. The transport sector accounted for around 23% of global greenhouse gas (GHG) emissions globally in 2013 and 30% of overall energy consumption, after the power and heat generation sector, which accounts for 42% [3,4]. Out of this, road development accounts for around 10% of the total GHG emission due to the transport sector [3].

Road development and vehicular movement is responsible for around 161 million metric tonnes of GHG emissions annually in India [5]. Under the Ministry of Road Transport and Highways and the Ministry of Rural Development, the Government of India has initiated several new highway and rural road development projects under which massive amount of road construction will take place over the next decade to handle increasing passenger and freight traffic [6]. All of this can have negative consequences on India's climate and environmental sustainability goals [4].

The road development activities use a massive amount of construction materials along with heavy construction machinery and equipment. Starting with extraction of raw materials from ground, their processing in factories, transportation of ready to use processed materials to road construction site, the use of equipment on site for earthmoving activities and laying down different layers of road