

**Environmental Risk Trade-off for New Generation Vehicle Production:
Malaysia Case**

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Abstract

New Generation Vehicle such as Hybrid Electric (HEV) and Battery Electric Vehicles (EV) have higher efficiency compared to conventional vehicles, and therefore releasing less carbon emissions. However, arguments arise whether this kind of New Generation Vehicle is truly clean compared to the existing system, especially in developing country such as Malaysia since current knowledge only focus on Greenhouse Gas (GHG) generation. This study aims on provide better understanding of the environmental consequences of the compact vehicle production activities based on 5 impact classifications which is GHG generation, Acidification, Eutrophication, Carcinogenic Effect, and Human Health measured in “Disability Adjusted Life-Year” (DALY) using Life Cycle Inventory (LCI) Analysis under local electricity mix in 2017 and 2030. A trade-off comparison then can be made to assess the current vehicle technologies with high potential of mass usage in Malaysia– Conventional Internal Combustion Engine Vehicle (CV), EV, and HEV vehicles with two types of batteries; Nickel Magnesium Hydride (HEV-NiMH), and Lithium Nickel-Magnesium-Cobalt (HEV-NMC). This study found that EV have slightly higher potential to cause a global warming (5,791kg of CO₂ equivalent emission), follow by HEV-NiMH (4,814kg), HEV-NMC (4,596kg) and CV (4,166kg) embodied per vehicle. Cradle-to-gate of CV is better in term of GHG emission and Carcinogenic impact compared to all the studied subjects but in overall measurement, it is not the best solution for human health, measured in DALY. Conversely, HEV have high environmental impact on the same categories. DALY for 2017 EV production is at 0.0014, CV at 0.0019, HEV-NiMH at 0.0036 and HEV-NMC at 0.0022. The situation created a trade-off between having higher Acidification and Eutrophication from CV production against having higher GHG emission of its replacement EV production.

Keywords: transportation, passenger car, electric vehicle, lifecycle inventory analysis, environmental risk