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Risk Assessment of Passenger Cars in Switzerland

Master Thesis

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Abstract

In this study, a first-of-its-kind comparative risk assessment is presented for impact on human health of passenger cars in the scope of Switzerland with focus on the vehicle powertrain types. The analysis estimates three impact areas on human health: direct road accidents, accidents in the upstream energy chain, and life cycle emissions, based off online statistical offices, PSI's established Energy-related Severe Accident Database (ENSAD) and data from previous life cycle assessment (LCA) studies. The estimated impact on human health from each are combined and compared among powertrain types in terms of Years of Life Lost/passenger-kilometre travelled (YOLL/p-km). A comparison among powertrain types showed the largest impact on human health arising from fuel cell electric vehicles (FCEV) and petrol-driven vehicles (ICEV-p). The impact from life cycle emissions is largest from all impact areas with minimal influence from the upstream energy chain. Conventionally, the upstream energy chain assesses the direct accident risk related to the energy chain. To investigate the impact of indirect factors involved in upstream production, a novel approach was undertaken to assess the health impact for the upstream energy chain that considered the transport demand and supply chain electricity. Using information available from LCA studies and ENSAD, the influence of indirect factors were found to have a similar impact for passenger cars in addition to using the conventional framework for comparative assessment typically adopted by PSI. For future work, a methodology was developed that allows for the risk analysis of all transport types considering the different impact areas, and the eventual comparative assessment of the Swiss transport sector.