Derivation of Potential Product-Related Environmental Objectives for Heavy Duty Vehicles in Consideration of Life Cycle

Master's Thesis of Le Li

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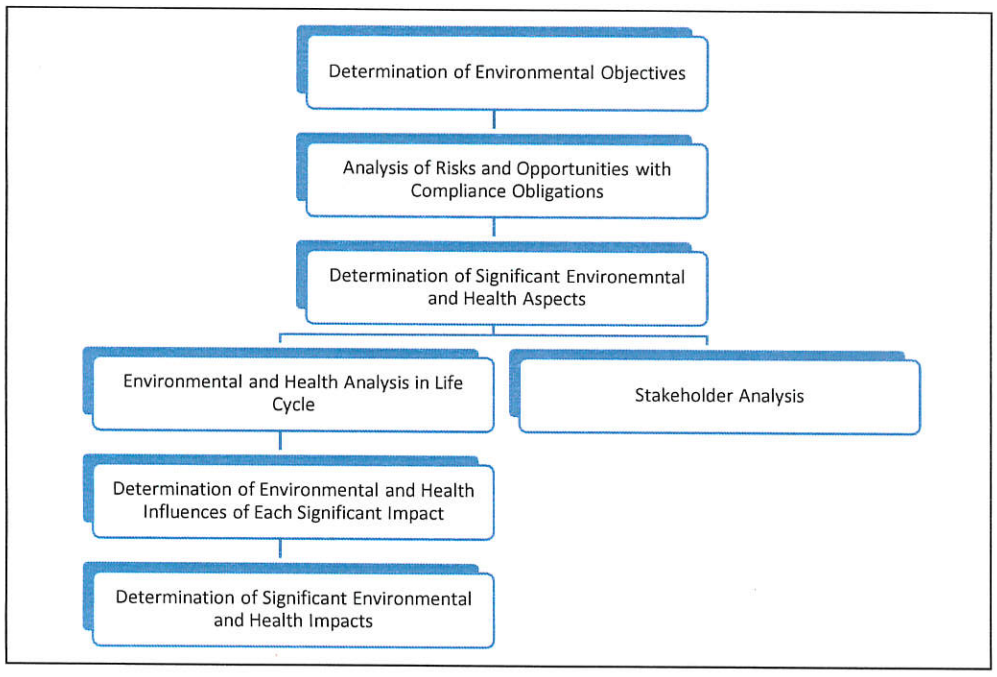
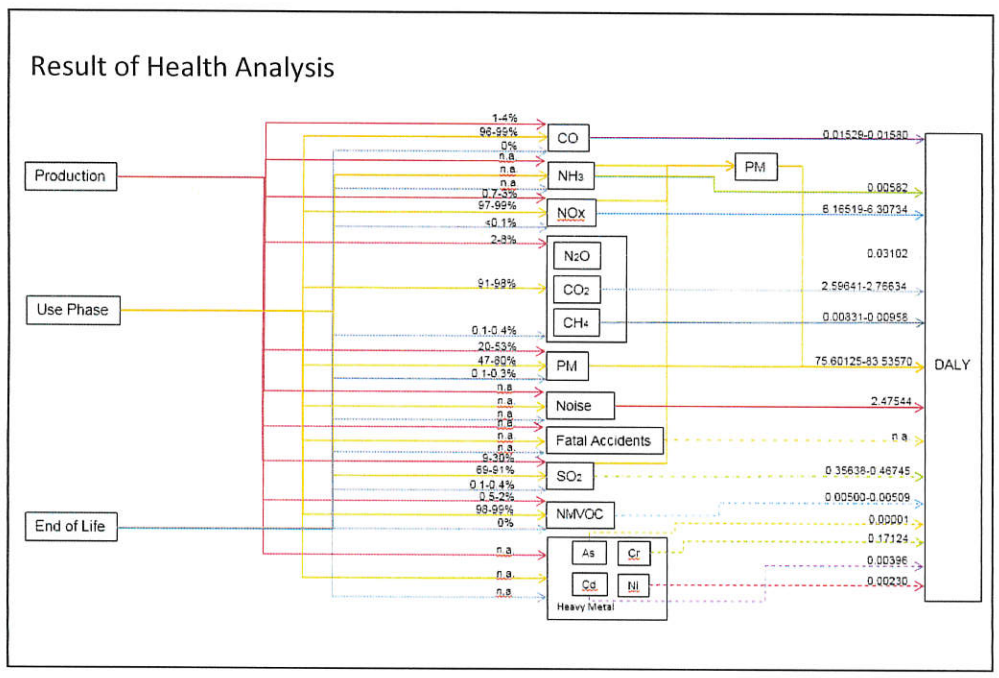
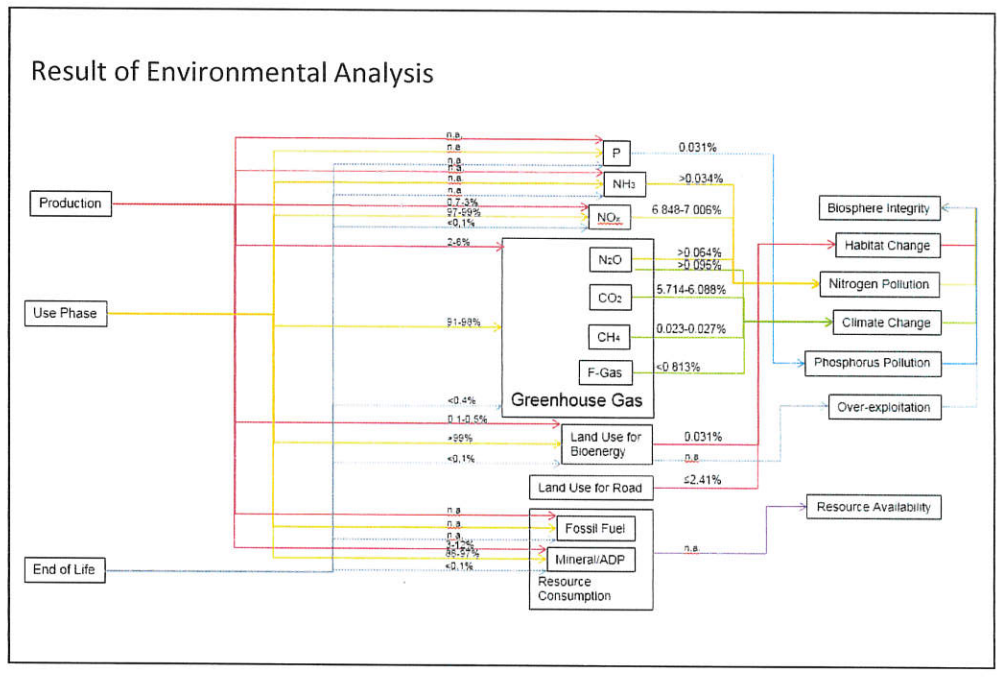


Nomenclature for Reporting (NFR) and Common Reporting Format (CRF) proved the emission data used for the environmental analysis and the calculation of the environmental weighting factor for HDVs in Tank-to-Wheel (TTW). The factor is the share of the total emissions in the EU accounted for emissions by HDVs in TTW for each influence. According to the Golf and Federal Environmental Agency (UBA) report, the share of emissions from HDVs of the total life cycle for each phase are generated for the purpose of calculating the environmental weighting factor from HDVs in the total life cycle. The phases include production, use phase (including Well-to-Tank and TTW), and end of life. In the health analysis, the disability-adjusted life years (DALYs) of each health influence can be calculated by multiplying the damage factor (DALYs/kg emission) from Eco-Indicator 99 by the emission data from HDVs in TTW in NFR and CRF. For an easily comparison, the relationship of DALYs of each health influence to DALYs of PM2.5 is generated, which is used as the health weighting factor from HDVs in TTW. The health weighting factor from HDVs in the total life cycle can be calculated in the same way as the environmental weighting factor in the total life cycle.



Recently, the environmental problem has been became a hot political topic. The newly published DIN ISO 14001:2015 is a standard for environmental management system to help companies reduce and control emissions from their products and activities. In this thesis, the derivation of the potential product-related environmental objectives for MAN Truck & Bus is described according to the requirements of DIN ISO 14001:2015. After the significant environmental and health impacts are identified according to the planetary boundary concept, the influences of each impact can also be determined. Then the environmental and health analyses are separately conducted in consideration of the total life cycle of MAN heavy duty vehicles (HDVs) using diesel and electricity. After a stakeholder analysis, the significant environmental and health aspects can be devived and prepared for the analysis of the risks and opportunities with compliance obligations to determine the final environmental objectives for MAN.



In the stakeholder analysis, five groups of stakeholders are taken into account: evaluation of sustainability, competitors, customers, non-government organizations and other organizations, and policy. Each environmental and health influence from stakeholder is also given a stakeholder weighting factor. The influences and impacts with high environmental, health, and stakeholder factors are defined as the significant influences and impacts, including CO_2, NO_x, biosphere integrity, F-gas, resource availability (energy and materials) and habitat change, as well as the significant health influences, such as NO_x, PM, Noise, SO_2 and CO_2. The significant aspects are therefore the output of the significant influences in the phase with the highest emissions. After an analysis of risks and opportunities in consideration of compliance obligations, the significant environmental and health aspects of MAN with a high importance are determined and prepared for the determination of environmental objectives. They are CO_2 emission in TTW, NO_x emission in TTW, PM emission in the total life cycle, and energy availability in the total life cycle, According to compliance obligations of MAN, the first environmental objective is a 20% reduction of fuel consumption by 2020, from 2005. Meanwhile, new environmentally friendly technology will be developed for the treatment of CO_2 and NO_x in TTW.