

# Green Policies for Clean Energy Vehicles Using Life Cycle Assessment

## Abstract

The paper proposes a carbon taxation scheme and a carbon tariff scheme for clean energy vehicles (CEVs) using life cycle assessment (LCA).

Proposed carbon taxation scheme can enable to be discussed tax amount, tax revenue and total CO<sub>2</sub> emissions by changing the scenarios and parameters, such as: technology development, energy price and total driving distance. The authors figure out the tax rate 28.05[JPY/kg-CO<sub>2</sub>], which makes the hybrid electric vehicle's life cycle cost (LCC) less than that of conventional gasoline vehicles. The simulation results show that LCC after taxation of electric vehicles (EVs) have lowest total cost when battery cost is 0.14 times the 2007 cost and have lower total cost than that of GVs when driven more than 221,600 km. In addition, EVs have lowest emissions when driven more than 63,000 km considered CO<sub>2</sub> emissions in the manufacturing phase, and it is expected that elders who drive shorter distances are best suited for hybrid electric vehicles and gasoline vehicles not electric vehicles considering LCCO<sub>2</sub>. The proposed tax system can provide consumers with an incentive to choose vehicles with lower CO<sub>2</sub> emissions.

It is evaluated CO<sub>2</sub> emissions generated during the manufacturing phase of global supply chain and discusses tariff schemes for sustainable manufacturing. It calculates product costs that incorporate a carbon tax, and emissions from electricity used in manufacturing, emissions during transport from mining to manufacturing countries and emissions during transport from manufacturing countries to market are taxable. A case study of electric vehicle production includes outcomes calculated under various tax assumptions: for production in China, India, Thailand, Germany and Japan. CO<sub>2</sub> emissions during manufacture of EVs vary significantly, depending on each country's technical efficiency and the carbon intensity from electricity generation. A case study further illustrates that transport has a minor influence on emissions.