Abstract

Energy related policies play an important role in today's world of increasing oil vulnerability, and climate change due to increasing greenhouse gas emissions. India also faces the problems of oil shortages and high emissions. Transport sector has emerged to be one of the major consumers of oil, and hence a major contributor to greenhouse gas emissions in India. The strategic policy adopted by the Indian government to fight the oil crisis and emissions from the transport sector is to improve the energy efficiency of the vehicles.

Studying energy and environmental measures for the transport sector is very challenging; and hence the study on the energy efficiency measures in this sector could be highly relevant. Many of the energy and environment related policies adopted abroad and in India have not served their intended purpose due to the lack of proper testing and implementation. This research is mainly aimed at assessing the effectiveness of the energy efficiency improvements in personal transportation sector towards mitigating the rising fuel consumption and greenhouse gas emissions in India. The present study is limited to personal transport sector and hence the passenger cars in India and considers only gasoline as transport fuel.

Initially a multivariate statistical analysis was carried out utilizing structural equation modeling with the help of a questionnaire survey of Indian commuters. The study was undertaken to analyze the commuters' attitude and behavior towards mitigating fuel consumption and emissions in the country. The analysis also investigated the causal influence of energy efficiency improvement policy on commuters' travel behavior which gives rise to the phenomenon known as direct rebound effect in energy literature. The direct rebound effect is found to be one of the main reasons for the failure of energy efficiency improvement policy in other economies.

Based on the outcomes of structural modeling and the insights from the energy literature, a detailed feedback loop study for the effectiveness of energy efficiency improvement policy

in personal transport sector was carried out. The developed causal model considered the effect of this policy on four-wheeler ownership, fuel consumption and GHG emissions in India. The model also captures the direct rebound effect induced by this policy. All these causal mechanisms are combined into a system dynamics model. The model is validated with detailed data collected from government recognized data banks. Different complementary policies are combined with energy efficiency improvement policy towards reaping the maximum benefits in the context of India. It has been found that a combined policy performs the best in mitigating the rebound effect induced fuel consumption and greenhouse gas emissions in the country.