LINKING ENERGY EFFICIENCY WITH TRADE AND ENVIRONMENT: A SYSTEM DYNAMIC APPROACH

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Overview

International trade as an integral part of human activity is creating and increasing interdependence between countries. But, trade is directly and indirectly contributing to degrading the environment and climate change. So, promoting fair trade with a sustainable environment has become a challenging issue these days. Similarly, weak environmental standards are also creating obstacles in free trade. Realizing the growing concerns on climate change and energy security, most of the small and medium enterprises as well as large industries of advanced countries are giving priority for energy efficiency measures. Similar priorities are slowly being established all over the world. The growing trend of implementing trade measures based on environmental concerns justifies the nexus between trade and environment. In this context, this paper has attempted to link energy efficiency with trade and environment. The paper is divided into two parts: the first part has justified the linkage of energy efficiency with trade and environment by the use of system dynamics tools. Causal loop diagrams developed on the basis of relevant past literatures and theories have simplified and visualized the role of energy efficiency measures to achieve twin goals of trade promotion and environmental protection. Energy intensity and carbon intensity are used as the proxy variables for measuring energy efficiency. Second part has exemplified Nepalese scenario and attempted to address the question: does energy efficiency matter for promoting trade and sustainable environment of small landlocked country Nepal? For this, a system dynamic model based on real time data has been used. By justifying the importance of energy efficiency the study suggests that Nepal should actively implement energy efficiency measures for mitigating adverse impact of climate change and generating environment friendly competitive tradable goods in the near future for securing comparative advantage in the world market.

Methods

The paper has used system dynamics tool as a major method to illustrate the linkage of energy efficiency with trade and environment. System dynamics is a set of conceptual tools that helps us to understand the structure and dynamics of complex systems. The polarity of relations amidst the selected variables is shown with the help of causal loop diagram. Dynamics of system is further explained with the help of postive and negative feedback loops. Causal loops are formed on the basis of findings of past research works, literatures, theories and following functional relations:

Energy efficiency = f (carbon intensity, energy intensity),
Trade = f (energy efficiency),
Environment = f (energy efficiency)

System dynamics model developed by using real data on energy demand, composition of energy consumption, trade and carbon dioxide emission have been used to test the need of energy efficiency measures for promoting trade and sustainable environment in Nepal. Spearman correlation analysis and outcome of past impirical studies is used to identify the sign of causal relations.

Results

The feedback loops justify that lowering carbon intensity and energy intensity gives better energy efficiency outcomes. There is bidirectional relation between trade and energy efficiency as well as environment and energy efficiency. The present level of energy demand, carbon dioxide emission, and composition of energy consumption justify the effective implementation of energy efficiency measures in Nepal.

Conclusions

The study concludes that improvements in energy efficiency create a positive impact on environmental quality and sustainability. Trade and environment have bidirectional linkage with energy efficiency. Energy efficiency measures help to develop green trade and increase competitive advantage in goods. Nepal can take benefit from energy efficiency measures for the promotion of trade and a sustainable environment. The paper suggests monitoring eco-friendly energy efficiency policies for the economic development and progress of countries. Energy efficiency outcomes must be integrated with a carbon reduction framework.

References