

Input-Output Modeling for Scenario Analysis of the Indian Household Energy Use

*Shimpo Kazushige^a; Hikita Koichi^b, Nakano Satoshi^c; Okamura Asako^d,
Shukla, Megha^{e*}*

***^aDEPARTMENT OF BUSINESS AND COMMERCE, KEIO UNIVERSITY
2-15-45 MITA, MINATO-KU., TOKYO, 108-8345 JAPAN
PHONE: +81-3-5427-1272 FAX: +81-3-5427-1578
E-MAIL: SHIMPO@75.KEIO.JP***

***^b1-3-11 MINATOJIMA, CHUO-KU, KOBE CITY, HYOGO-KEN, 650-0045, JAPAN
PHONE: +81-78-940-1142 FAX: +81-78-303-1565
E-MAIL: K-HIKITA@KOBESHANUKAWA.AC.JP***

***^cGLOBAL SECURITY RESEARCH INSTITUTE, KEIO UNIVERSITY
MITA 2-15-45, MINATO-KU, TOKYO, 108-8345, JAPAN
PHONE: +81-3-3453-4511(EXT.23748) FAX: +81-3-5427-1705
E-MAIL: NAKANO@SANKEN.KEIO.AC.JP
E-MAIL: ASSAAT79@GMAIL.COM***

***^dTHE ENERGY AND RESOURCES INSTITUTE (TERI), SOUTHERN REGIONAL CENTRE
4TH MAIN, 11 STAGE, DOMLUR, BANGALORE-71
PHONE: +91-80-2535-6590-95 FAX: +91-80-2535-6589
E-MAIL: MEGHAS@TERI.RES.IN***

***CORRESPONDING AUTHOR**

Abstract

With the growing concerns of climate change, the environmentally/energy extended input-output (EIO) tables and databases become very relevant tools for analysis of environmental economic impacts, environmental and energy modelling at a national and global levels, environmental effects on changes in life styles and consumption preferences, among others. Thus, since I-O techniques and I-O based models are increasingly playing an important role in addressing such issues and this paper attempts

to analyze the scenarios on households' life style, future technologies and so on, for India.

EIO tables expressed in natural and thermal units are estimated to extend original Indian I-O tables for the years of 1993/94 and 1998/99 with an advantage that these represent structural relationships of industrial energy use. Biomass and limestone are parts of fuels and sources of CO₂ emissions, respectively, to reflect actual pattern of energy use in India. Then the energy commodities and sectors adopted in the energy balances of International Energy Agency (IEA) are converted into those of I-O tables in order to fit the energy balances into economic analysis. The consistency of the IEA's energy balances---constructing individual energy balances with the data obtained from several statistical sources and comparing both of balances, are examined and replaced with the figures of the IEA. Next, the inconsistency between the quantities and monetary values in the I-O tables is checked. The unit prices computed from the quantities and the values must be within acceptable range if it had to be compared with those in other available statistics. Since the monetary values in the Indian I-O tables are evaluated in basic prices, the basic prices using the micro data of Annual Survey of Industries for certain energy commodities is calculated, in addition to seeking the price figures exclusive of any taxes, subsidies and margins through available resources. This resulted in replacing certain monetary values in the original I-O tables into our estimates; typical examples are the value of electricity inputs in agriculture and household sectors, where the effective subsidies to these sectors are extremely high. Finally, these aggregated figures of individual energy commodities are disaggregated into 115 industries of the Indian I-O tables.

Further, scenario analysis has been conducted on the energy consumption patterns in the household sector using extended EIO tables in natural and thermal units. The residential sector has been selected since it is the largest consumer of energy, accounting for 40-50% of the total energy consumption in India. This sector is decomposed into several household groups by consumption levels, as well as by rural and urban households, using information from household survey for India compiled by NSSO (The National Sample Survey Organization), to consider the observed diversities of consumption patterns among household groups. In this paper, scenarios are developed assuming that there is switch of energy use from traditional fuels into LPG use for meeting energy needs for cooking and its effects are analysed on the overall economy in terms of economic and environmental influences (mainly estimations of increased national GHG emissions, such as CO₂).

Keywords: Environmental I-O, India, Scenario analysis, Household energy use.