Chapter 4: Total and Average Household Energy Requirements

The chapter begins with an introduction to the concept of energy requirements of households and related literature on this topic. A discussion of the methodology used for calculating total household energy requirements for India using national level data on private final consumption expenditures, and the calculated primary energy intensities of producing sectors that were presented in the last chapter, follows. After briefly introducing some of the terminology and the data sources used for the analysis, results relating to total, direct and indirect energy requirements per capita, and for total energy requirements of all households in India are presented. In Sect. 4.4, the relative importance of the main drivers of the observed changes in household energy requirements over the study period are determined using a decomposition analysis for changes in both the total as well as in each of the major categories of indirect energy requirement. Finally, some comparisons of the results of this study are made with previous studies.

4.1 Overview of Literature on Household Energy Requirements

Changes in technology, income levels, and lifestyles are bringing about major changes in total household energy requirements in the country. Incomes and spending patterns clearly have a strong bearing on both direct and indirect energy consumption. The embodied or indirect energy requirements of goods and services consumed are also affected by changes in energy intensities of the producing sectors. Household spending, in fact, ultimately determines to a large extent total energy use in the economy. Therefore, by using data on household consumption expenditures along with information on the energy intensities of the consumed goods and services, it is possible to find out more about the use of primary energy in a country. Households are directly responsible for about 40% of total final

energy consumption of the nation. Yet, the results of this study indicate that total (direct and indirect) primary energy use of Indian households accounts for over 70% of total primary energy use in the country. The remainder comprises government use, energy content of investments and net imports. While net imports of energy are included in the analysis, imports of other goods and services are not, as these are still relatively small for India.

A number of studies have been carried out in developed countries to analyse total direct and indirect energy requirements in households. Studies specifically examining total (direct and indirect) energy requirements of households using input-output analysis have been done for the USA (Herendeen et al. 1981), for Norway (Herendeen 1978), New Zealand (Peet 1985), Finland (Nurmela 1993), and Switzerland (Ospelt et al. 1996; Duerrenberger et al. 2001). Studies extending the analysis to calculate total carbon emissions associated with household consumption have been conducted in the UK (Gay and Proops 1995), in Australia (Common and Salma 1992; Lenzen 1998) and in other countries. A series of publications by researchers at the University of Groningen and the University of Utrecht have examined household metabolic flows in the Netherlands (Noorman and Uiterkamp 1998; Vringer 2005; Vringer et al. 1995a, 1995b, 1995c, 2000; Biesot and Noorman 1999; Wilting 1996, 1998; Karla et al. 1995; Van der Wal and Moll 2001). Other studies that have examined the energy and emissions flows embodied in household consumption include Wier (1998), Wier et al. (2001), Wilting et al. (1999), Jacobsen (2000), Munksgaard et al. (2000a, 2000b), and Lenzen (2001). More recent publications in this field that link consumption and lifestyles to environmental pollution include a European study covering several different countries (Weber et al. 2000; Moll et al. 2005).

Literature in this field, for developing countries in general and Asian countries in particular, is very limited. A recent study by Park and Heo (2004) examines the direct and indirect household energy requirements in Korea over a period of two decades. Researchers at the Indira Gandhi Institute of Developmental Research have used input-output analysis to calculate the carbon dioxide emissions from energy consumption for different groups of Indian households for the year 1989-90 (Parikh et al. 1990, 1994, 1997). Pachauri and Spreng (2002) have carried out a similar analysis on direct and indirect energy requirements of households for the decade 19983-84 to 1993-94. However, to the best of the author's knowledge, the present study is the first attempt at examining changes in total energy requirements over the period from 1983-84 to 1998-99, including non-