

### **3. ENERGY USE VARIABILITY**

Socioeconomic factors are crucial to the understanding of energy use behaviour. Some of these factors affecting energy use patterns in the region are exemplified in this paper, though it goes without saying that many other factors could significantly influence energy use. These factors need to be clearly understood and taken into account for sustainable development of energy in the context of the HKH region.

#### **Population Dynamics and Urbanisation**

Limited potential for improving the quality of life in rural areas forces people to migrate to urban centres (Sharma 1994a). The resources and the demand patterns for energy vary notably between rural and urban areas (Table 7). Dependence on commercial fuels is much higher in urban areas as the transaction cost of these fuels is greater in the rural mountains due to lack of sufficient infrastructure. It should be noted that the transition from low-grade to high-grade energy in urban areas is instrumental to improving energy use efficiency. The outcome is a decrease in the absolute value of final energy input (a decrease of almost 35% is observed in Table 7).

In most urban areas of the HKH the increasing dependence on non-renewable energy will render the consumption pattern unsustainable in the long run. The need to change the present supply mix, which is dominated by imported fossil fuels, to the desired supply mix, with a high share of renewable energy, is crucial.

The relationship between the ratio of urbanisation and final commercial energy consumption for the countries of the HKH clearly indicates that increase in the urbanisation ratio increases the per capita commercial energy consumption (Figure 9).

#### **Income and Energy Transition**

The increase in per capita income level and the proportionate increase in per capita energy consumption is depicted in Figure 10. The trend is not uniform throughout. The low income groups in the region tend to depend more on fuelwood, and, in the event of non-availability of fuelwood, they are inclined to switch over to non-monetised energy forms. The high-income households show a tendency to move up on the energy ladder (i.e., more use of kerosene, LPG, and/or electricity).

The choice of energy resources and technologies clearly depends on the affordability of the household. As people move out of a subsistence economy they tend to use more efficient energy technology and high-grade energy sources. This relationship is depicted in Figure 11.

### **Process of Industrialisation**

The mountains cannot remain in isolation from the present global process of industrialisation if they are to accommodate to the growing concerns of improving the quality of life through more employment generation. The analysis indicates that the increasing rate of industrialisation creates a higher demand for input of commercial fuels (Figure 12), besides also compelling an increasing rate of urbanisation. Ample opportunities exist to sustain the increasing rate of urbanisation and industrialisation by maximising the use of indigenous renewable energy sources.

Various studies point to the need to reorient the development paradigm in relation to urbanisation and industrialisation in the context of the HKH (Sharma 1994b). The nature and forms of industrialisation and urbanisation will exert different impacts on the energy sector. A development paradigm that does not consider the provision of energy, taking into account the mountain-specific situation, is bound to face severe constraints in relation to the supply of energy and technology and is also certain to suffer from inevitable environmental challenges in years to come.

### **Diversification and Intensification of Agriculture**

Concerted efforts by the governments as well as the commitment of donor agencies to the elimination of poverty and to improvement in the quality of life in mountain areas would entail diversification and intensification of the agricultural sector, which in turn requires an increased amount of useful energy for its sustenance (Shrestha 1992; Jodha and Shrestha 1994).

Currently, human and animal labour is the main form of energy employed in this sector, though the direct and indirect use of energy is on the increase. The input of muscle power needs to be gradually replaced with motive power through utilisation of renewable energy sources in order to both reduce the human drudgery, especially on women and children (Omvebt 1995; Overholt et al. 1995) and to release livestock for productive purposes. All of these would require an increased supply of high-grade energy with appropriate technological interventions.

### **Human Development Indicators**

Analysis of the relationships between HDIs, adult literacy, infant mortality, and GNP per capita of the countries of the HKH shows a strong correlation among these variables (Figure 13). Some of the variations could be attributed to the policies and

implementation strategies of respective governments and are indicative of how economic growth is tied to the equity concerns and the governments' expenditure on the social sector. At this point, it is interesting to note that, in regional terms, the average HDI, adult literacy, infant mortality, and GNP per capita are well balanced, and the countries of the region seem to be doing quite well. Unfortunately, a closer look at the condition of the countries of the HKH region with HDIs of about 0.1 indicates an increasing disparity among the mountain people compared to the rest of the population in the countries of the region.

The relationship represented in Figure 14 prompts us to state that an increased level of final energy consumption is a manifestation of economic progress and a better quality of life for the nation (Philips et al. 1995). However, close observation between energy consumption per capita, HDI, industrialisation ratio, and urbanisation ratio clearly reflects that this does not completely hold true, as a substantial variation is observed in Figure 15. This means that the availability of energy resources and technologies alone does not necessarily imply the desired level of human development.