Background :

Rural Energy Country Review Findings

The agro - climatic and geophysical heterogeneity of the Hindu Kush - Himalaya Region implies great diversity in energy situations. Complexities in energy endowments and energy use patterns do not lend themselves to generalisations. Yet, it is possible to categorise energy issues within three broad themes, which emerged unambiguously from the country reviews :

Fuelwood Crisis and the Afforestation Imperative. A fuelwood crisis, to which cooking energy needs have largely contributed, is ongoing. The increasing environmental damage makes afforestation crucial.

Energy Options for Integrated Mountain Development. The role of small hydro, farm biomass, biogas, and fossil fuel options, together with the related technologies, their diffusion, and extension, are important considerations in integrated mountain development.

Institutional and Organisational Constraints. In order for decentralised energy planning and management to succeed in overcoming the absence of microfocus in present energy development approaches, institutional and organisational constraints to integrated energy development need to be examined.

A brief summary of each issue follows, although it may be noted that these general issues are not uniformly applicable and that they by no means exhaust all the area-specific problems of the Region.

Dominance of Fuelwood Energy and the Afforestation Imperative

Rural energy consumption is generally dominated by non-commercial fuelwood energy used for cooking and heating. The resulting deforestation near settlements has contributed to landslides and erosion. Open access to difficult terrain and high wood collection rates give rise to pressures and destruction at forest boundaries. The large biomass growth potentially available in the forests does not supplement the fuelwood supply. Non-commercial fuelwood cannot be substituted by most commercial energy (e.g. kerosene, coal, and electricity) without substantially improving the buying power of the mountain communities. Furthermore, forest fuelwood has no immediate substitute other than farm biomass energy (including biogas). In addition, agricultural productivity can decline further if a loss of nitrogen from farming systems is permitted through the burning of farm biomass.

The need for integrated approaches in afforestation, combining fuelwood, fodder trees, and improved cooking stoves, has been realised on account of environmental concerns. These approaches have gradually overtaken the more traditional timber - oriented afforestation schemes. However, inadequate focus on indigenous institutions, forest acts, and legislation make present community and social afforestation programmes largely ineffective for resolving the fuelwood crisis. Thus, institutional and organisational innovations are necessary for extended and successful replication of community afforestation schemes (through effective participation of the people) and the resolution of the fuelwood crisis. The provision of technology which reduces time and effort needed for wood collection and transportation will greatly facilitate acceptance of afforestation schemes by the people.

Energy Options for Integrated Mountain Development

Modernisation of agriculture and promotion of cottage and small-scale industry form the core elements of a strategy for the transformation of the mountain economies, off - farm employment generation, and enhanced incomes. Therefore, rural energy development in the mountains should be viewed from the context of energy constraints in agriculture, cottage industries, transportation, and communication, particularly in the context of emerging energy requirements due to ongoing development.

Rural fossil fuel consumption, dominated by kerosene demand for lighting, is being gradually diversified as more diesel and petrol are utilised for grain mills, irrigation pumps, tractors, and power tillers. Similarly, consumption of diesel for trucks, buses, and aviation fuel has been growing, with increasingly adverse impact on the balance of payments. In this context, the substitution for fossil fuels of renewable energy options such as small hydro, farm biomass, biogas (and, to a limited extent, wind, solar, and geothermal energy) resources needs to be promoted. The adjustment of priorities towards small hydro, biogas, and similar renewable energy resources is a prerequisite to move from singular reliance on forest energy resources, which has caused deforestation and ecological damage.

Inaccessibility and scattered settlements make small-scale, decentralised energy development more attractive than centralised energy supplies, such as grid electricity, large-scale biogas plants, and similar large - scale modern energy units. Significant progress has been achieved in small hydropower development in India, Nepal, Pakistan, and Sichuan and Yunnan in China. Small hydropower has been found cost - effective when adapted to allow use of local construction techniques and resources. Also, hydraulic rams have proven to be the cheapest means of lifting water for irrigation and drinking. It has been found that costs can be further reduced by promoting indigenous designs, local fabrication of equipment, and utilising local civil work designs. Considerable improvements in load factors can be achieved in small hydel units, by the integration of energy demands from food processing (mills), lift irrigation, cottage and small - scale industries, with lighting load. The improved profitability of integrated small hydel development schemes

provides an opportunity to draw private sector investments into small hydel development and to launch such schemes in a self - sustaining manner. The provision of low - interest loans, through various credit institutions to farmers' groups, individual entrepreneurs, and equipment manufacturers, has played a significant role in the promotion and dissemination of small hydro units in the Region (e.g. Nepal, China, and to a certain extent, India and Pakistan). The potential contribution of small hydel development towards agro - processing, cottage and small - scale industry development, and off - farm employment generation can be significantly increased through integration with other sectors.

Fuelwood - scarce mountain communities utilise crop residues, animal dung, and agricultural wastes for cooking and heating. The conversion of farm biomass and dung into biogas provides an improved alternative to direct burning, as biogas manure retains most of the valuable nitrogen nutrients. But the scope of biogas development in the mountains is limited to the lower valleys which have a warm climate. Limited experiences with biogas plants in the mountains to date indicate that water and dung scarcity is a major problem apart from low digester efficiency. Hydrams and turbine pumps can provide the needed water at low cost if resource potential exists nearby. However, the most binding constraint to biogas development arises from fodder and grazing limitations, and low levels of dung collection due to the migratory pattern of livestock rearing. Stall feeding and/or improved organisational methods for dung collection and biogas distribution are necessary for the development of large community biogas plants, which may exploit converted internal combustion engines to provide motive powers for grain mills, irrigation pumps, and electricity generation, for example.

The potential for wind, solar, and geothermal energies are location - specific. This and their generally high costs imply that applicability is limited to special use in particular geographic areas. Considerable scope, however, exists in utilising solar energy, for uses such as water heating and grain drying, and photovoltaics for communication equipment. Wind energy has been used for lifting water and electricity generation on a limited basis in the mountains. Geothermal energy resources have been exploited to some extent on the Tibetan plateau.

Energy development efforts do not satisfactorily deal with existing energy interrelations. Studies of shifting cultivation in the eastern Himalaya, and mountain agriculture in general, indicate that energy flows in traditional subsistence activities are highly complex, requiring carefully designed energy development strategies which are economically and environmentally sound. In attaining an energy (supply and demand) balance, it is necessary to incorporate the spatial dimension in energy planning. The concept of regionalisation becomes a necessary construct in dealing with the topographical, ecological, and environmental diversity in the mountains. Multilevel energy planning based on regionalisation, and energy extension based on micro-experiments, are needed for rapid dissemination of rural energy innovations.

Institutional and Organisational Constraints in Integrated Energy Development

Lack of implementation of well - conceived energy policies is typical of energy development in most of the Region. No specific executing institutions in Bhutan, Nepal, or Tibet may be considered entirely responsible for energy planning and development. Energy - related activities of government departments, research and credit institutions, private and public enterprises, and external donor agencies are often coordinated by a national level planning agency, which is not an executing institution. Thus, energy plans and policies are often formulated from a macro - perspective and suffer from lack of microlevel specificity during implementation. In a majority of countries in the Region, a clear gap exists between microlevel energy programme implementation and the macrolevel plan and policy formulation. The energy planning process does not extend to the lower levels where specific energy projects and programmes have to be identified and examined for implementation and management.

In the context of new decentralisation policies that have been gathering momentum, decentralised energy planning can provide a means to overcome energy development constraints arising out of the weak functional linkages between national institutions engaged in planning, and implementation of energy programmes. This need for a decentralised energy planning and management approach was crystallised during a meeting of Indian energy professionals held at ICIMOD, in January 1986.

There is a need to strengthen the decentralised energy planning process, to build planning and implementation capabilities, particularly to promote energy sector investments, and to develop materials based on field experience which could enhance the effectiveness of training in the energy sector. Although the exact mechanism for implementing the proposed collaborative work has yet to be determined, the present report is oriented towards a discussion of problems and issues and a proposed action programme.