

9. ENERGY SYSTEM TRANSFORMATIONS

Energisation of mountain communities can be feasible only if appropriate technological interventions in terms of energy sources, technologies, and institutional mechanisms are conceived and translated into reality. Energy technology interventions with increased economic activities would lead towards breaking the vicious cycle of poverty and environmental degradation, as exemplified in Figure 17. If energy transformations are implemented appropriately, even the poor can contribute significantly to development, which in turn would positively affect their lives as well as the overall economy.

The appropriateness of technological intervention (energy resource, technology, and institution) needs to be assessed not only from the quality and quantity of energy services required but also in the context of the physical environment. For example, the quality of energy services required dictates the choice of energy resources (fuelwood, biogas, electricity), whereas the quantity required dictates the choice of energy technologies (decentralised, centralised) and institutions (private, public, participatory). The choice of particular energy resources, technologies, and institutions depends on technical parameters (availability of energy resources and technologies, prices, life and efficiency of the device), though the final selection should be based on social and cultural acceptability. All of these factors are location specific and require close scrutiny in the context of the mountain-specific situation. This would mean that mountain-specific opportunities and constraints should be considered in designing a package for energy technology interventions.

The development process in the mountains should be accompanied by energy system transformations which include (Philips et al. 1995; Goldemberg 1988; World Bank 1993; Monga et al. 1992), but are not limited to: i) increased availability of renewable energy and energy-technology supply infrastructures; ii) introduction and/or increased use of energy conversion devices to alleviate human drudgery and boost productivity; iii) an increase in productivity which facilitates off-farm employment; iv) improved efficiency of use; v) higher value use of energy forms; and vi) increased use of efficient devices.

Sustainable human development could be achieved if energy systems' transformation means a movement towards the model that embodies (Ramani et al. 1995; deLucia 1994; UNDP 1995):

- lower system supply costs (infrastructure, technology) for any and all types of energy systems;
- improved environmental sustainability through greater reliance on renewable energy and improvement in the supply chains of traditional fuels;
- greater financial sustainability reflective of user's preference, ability, and willingness to pay;
- adoption of a system in a manner that maximises both direct and indirect benefits; and
- use and development of alternative institutional and financial approaches and incentives by all key players – international agencies, government at all levels, NGOs, and the communities themselves.