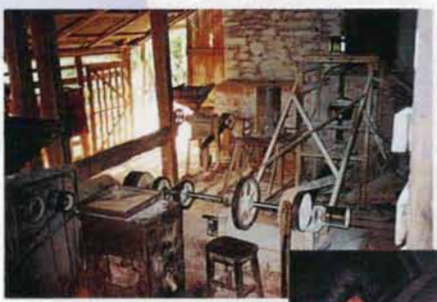
ICIMOD

Renewable Energy Technologies

A Brighter Future



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Cover Photoes : 1) Wind generator installed at a wind energy demonstration site, Badling, China
2) Solar photovoltaic cell of a solar lantern installed on the roof of a building, Garampani , Nainital, India
3) Micro-hydropower operated agro-processing facilities, along the Prithvi Highway, Nepal
4) Improved Cooking Stoves installed in a household in the Northern Areas, Pakistan

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Renewable Energy Technologies: A Brighter Future

Policy Options for Mountain Communities in the HKH and Agenda for Action in Nepal

Editor
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Kathmandu, Nepal
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Preface

Mountain people have always relied on renewable energies, mostly in their natural forms, for their mere survival - be they for cooking food, keeping the house warm, milling grain, ploughing fields, or transporting goods. With the growing aspirations of mountain communities and the rapidly increasing population, energy requirements have increased to a level at which present use and technologies are no longer balanced with the sustainable use of resources.

The potential for sustainable use of renewable energy resources in the Hindu Kush-Himalayas (HKH) by far exceeds the total energy consumption in the region. The gross disparity between the potential and current contribution of most renewable energy sources results in foregone social benefits in terms of environmental protection, economic sustainability, and, to some extent, energy security and widespread distribution of jobs and income compared to conventional energy sources.

Action and programmes for the adoption of renewable energy technologies (RETs) have been initiated in the mountains, but, unfortunately, so far they have not resulted in any significant increase in the use of renewable energy in spite of its great potential. The promotion of RETs is hampered by: i) the absence of appropriate policies to ensure matching of energy resources and technologies with needs; ii) lack of technical, organizational, and financial backstopping; iii) the failure to fully understand the spatial characteristics of the mountains; and iv) the lack of appreciation of socioeconomic and cultural factors. However, there are also several instances in which RET interventions have not only improved the energy situation at household level significantly but have also helped to support the economic productivity of the area.

It is against this background that ICIMOD, with its major mandate of poverty alleviation and environmental conservation, introduced a programme on renewable energy technologies suitable for mountain areas. This programme is guided by an overall mountain perspective for sustainable development formulated by ICIMOD for the Hindu Kush-Himalayan Region.

As part of this programme, a project was implemented on 'Implications of National Policies on the Use of Different Renewable Energy Technologies in Nepal and Selected Other Countries in the Hindu Kush-Himalayas'. It had three components: firstly, national policy studies were undertaken in China, India, Nepal, and Pakistan; secondly, detailed case studies were made of various renewable energy technologies (Biogas, Micro-hydropower, Solar Photovoltaics, Improved Cooking Stoves) in Nepal; and, thirdly, a two-day consultation of regional experts was held at which the studies were discussed.

The present document contains the summarised version of the country studies, the Nepal RET studies, and a policy framework for the sustainable development of RETs in the HKH Region based on the studies and consultation. It also provides broad guidance for designing and implementing energy programmes for mountain communities. Particular emphasis is given to the role of renewable energy technologies that can act as prime movers in diversifying economic activities in mountain areas and, at the same time, also meet the energy requirements of individual households. In this context, we think the document will be of use to energy planners, technology experts and development specialists in national institutions, and NGOs and donor agencies engaged in decentralized rural development.

I would like to extend my sincere appreciation to the study team from the Centre for Rural Technologies, Kathmandu; Mr. V.B. Amatya, Mr. G.R. Shrestha, Mr. R.N. Gongal, Mr. S. Shrestha, and Ms. K. Bajracharya; for carrying out a study on Implications of National Policies on RETs along with detailed case studies of various RETs in Nepal. I also appreciate the work of specialists from other countries, namely, Mr. Zhang Mi from China, Ms. Soma Dutta from India, and Mr. Tajjamul Hussain from Pakistan, in carrying out review studies on 'Implications of National Policies on RETs' in their respective countries and presenting appropriate recommendations for desirable policy shifts.

The Canadian Cooperation Office, Kathmandu, provided generous funding for the study and publication of this document, and this is gratefully acknowledged. Special thanks go to Mr. Jaipal Shrestha, Environment Advisor and SPEF Coordinator, Canadian Cooperation Office, Kathmandu, for his timely comments for improving the quality of this publication.

Dr. Kamal Rijal, Energy Specialist, ICIMOD coordinated the study and the regional experts' consultation. I would like to thank him especially for his efforts in bringing out this document.

Egbert Pelinck
Director General

Abstract

This document reviews renewable energy policies for mountain areas of China, India, Nepal, and Pakistan and highlights the important findings. The main policy issues identified are: a) choice of energy policies, programmes, and institutions is largely dictated by urban and industrial needs; b) a gap exists between policy announcement and programme implementation as reflected in terms of low budgetary allocations for RETs; c) conventional wisdom in energy development (i.e., extension of grid electricity and a marketing network for fossils fuels) prevails without considering the options of decentralized, renewable energy systems; d) energy policies are mostly geared towards reducing the consumption of fuelwood without considering appropriate technological options to suit the sociocultural aspects of mountain communities; e) alleviation of human drudgery and deteriorating health conditions, particularly of women and children in the mountains, still receive low priority designing energy sector intervention programmes; and f) active participation of women in designing household energy programmes is not taken care of holistically even though they are responsible for managing household energy systems.

The document argues that technology design compatible to local conditions, participation of the private sector in the development of RETs, and devices affordable by mountain communities are critical for improving their financial viability.

Four case studies are discussed, namely, Mini- and Micro-hydropower, Solar Photovoltaic Technology, Biogas, and Improved Cooking Stoves. These case studies were carried out in Nepal. Through them various issues pertaining to these RETs are identified. These issues are: management methodology, administrative and financial procedures, technical and financial feasibility of the programme, choice of technology to match the user's needs, and longer term sustainability of the renewable energy programme. The identification of issues has been instrumental in pinpointing the need for programme coordination by adopting a holistic approach with long-term vision in technology promotion; for adopting an integrated approach to the development of RETs; for increasing opportunities for women's participation; for good research, development, and demonstration; for training to improve skills; for technical back-up and monitoring services; for increasing local capabilities and capacities to undertake repair, maintenance, and production of small-scale renewable energy technologies; for generating awareness not only among users but also among planners, developers, and promoters; for emphatic quality control and standardisation; for warranty and insurance to safeguard entrepreneurs and users from loss; and for consideration of social equity for the poor and marginalised mountain populations.

The document proposes a framework for policy recommendations to promote the development of renewable energy resources and technologies and provides broad policy guidelines not only for Nepal but also for the Hindu Kush-Himalayan Region. This framework has six components: a) to recognise and measure the benefits of renewable energy technologies (RETs) with particular emphasis on drudgery reduction; b) to reform energy-price signals so as to provide an equitable environment for each energy source; c) to revamp the energy decision-making process in order to promote decentralized renewable energy technologies and involvement of local-level institutions; d) to change energy users' investment incentives by attracting participation of the private sector and NGOs in manufacturing and promoting RETs; e) to accelerate investments in commercialisation of RETs by supporting RD & D, capacity building, information and awareness generation through public sector or donor funding and by providing attractive incentives to manufacturers; and f) to develop a commercialisation plan for each RET to suit location-specific needs. Finally, the document proposes an agenda for policies and action to promote RETs in Nepal, in addition to proposing technology-specific measures.

Abbreviations

AC	Alternating Current
ADB	Asian Development Bank
ADB/N	Agricultural Development Bank (Nepal)
AEPC	Alternative Energy Promotion Centre
ARECOP	Asia Regional Cooking Stoves' Programme
ATDO	Appropriate Technology Development Organization (Pakistan)
BEW	Butwal Engineering Works (Nepal)
BSP	Biogas Support Programme
BYS	*Balaju Yantra Shala* (Nepal)
CBO	Community Based Organization
CFDD	Community Forestry Development Division
CFDP	Community Forestry Development Programme (Nepal)
COMSATS	Commission on Science and Technology for Sustainable Development in the South (Pakistan)
CRE	Centre for Renewable Energy (Nepal)
CRET	Council for Renewable Energy Technology (Pakistan)
CRT	Centre for Rural Technology (Nepal)
CSD	Self-help Development
CTEVT	Council for Technical Education and Vocational Training
DC	Direct Current
DCS	Development and Consultancy Services
DGNRER	Director General's Office for New and Renewable Energy Resources (Pakistan)
EAST	East Consult
EEC	European Economic Commission
ENERCON	National Energy Conservation Centre (Pakistan)
ESD	Energy Saving Device
EXIM	Export and Import
FAO	Food and Agriculture Organization
FATA	Federally Administered Tribal Areas
FECT	Fuel Efficient Cooking Technology
GGC	Gobar Gas Company
GOP	Government of Pakistan
GTZ	German Agency for Technical Cooperation
HDIP	Hydro-Carbon Development Institute of Pakistan
HKH	Hindu Kush-Himalayas

HMG/N	His Majesty's Government (Nepal)
HP	Horsepower
IAAS	Institute of Agriculture and Animal Science
ICIMOD	International Centre for Integrated Mountain Development
ICS	Improved Cooking Stoves
IFAD	International Fund for Agricultural Development
ILO	International Labour Organization
INGO	International Non-Governmental Organization
IOE	Institute of Engineering
IOF	Institute of Forestry
IREDA	Indian Renewable Energy Development Agency Ltd
IRs	Indian Rupees
ITDG	Intermediate Technology Development Group
JICA	Japan International Cooperation Agency
KFW	Kreditantstaff Für Wiederaufbau
KMI	Kathmandu Metal Industries
KVIC	Khadi and Village Industries' Commission
LEDeG	Ladakh Ecological Development Group (India)
LRMC	Long-run Marginal Cost
MMHP	Micro- and Mini-Hydropower
MMT	Mrigendra Medical Trust
MNES	Ministry of Non-Conventional Energy Sources (India)
MOC	Ministry of Commerce
MOF	Ministry of Finance
MOP	Ministry of Power (India)
MOST	Ministry of Science and Technology (Pakistan)
MPPU	Multipurpose Power Unit
NA-PWD	Northern Area - Pakistan Works Department
NARC	National Agricultural Research Council, Nepal
NDFC	National Development and Finance Committee (Pakistan)
NEA	Nepal Electricity Authority
NGO	Non-Government Organization
NIP	National Institute of Power (Pakistan)
NIST	National Institute of Silicon Technology (Pakistan)
NPC	National Planning Commission (Nepal)
NRB	Nepal Rastra Bank
NRs	Nepalese Rupees
NSA	National Science Association (China)
NWFP	North West Frontier Province (Pakistan)

O&M, O+M	Operation and Maintenance / Organization and Management
PCAT	Pakistan Council of Appropriate Technology
PCRW	Production Credit for Rural Women
PCSIR	Pakistan Council of Scientific and Industrial Research
PEP	Perspective Energy Plan
PHC	Primary Health Centre
PLF	Plant Load Factor
PRs	Pakistani Rupees
PSEDF	Private Sector Energy Development Fund (Pakistan)
R&D	Research and Development
RBB	Rastriya Banijya Bank
RCC	Reinforced Concrete
RD&D	Research, Demonstration and Dissemination
RECAST	Research Centre for Applied Science and Technology
RET	Renewable Energy Technology(ies)
RONAST	Royal Nepal Academy for Science and Technology
RWEDP	Regional Wood Energy Development Programme
SEB	State Electricity Board
SEC	Solar Energy Centre (Pakistan)
SFDP	Small Farmers' Development Programme/Project
SHYDO	Sarhad Hydel Development Organization
SNV-Nepal	Netherlands' Development Organization
SPV	Solar Photovoltaic
SWH	Solar Water Heater
TERI	Tata Energy Research Institute (India)
UMN	United Mission to Nepal
UNCDF	United Nations Capital Development Fund
UNDP	United Nations Development Programme
UNESCO	United Nations Organizaton for Education, Science, and Culture
UNICEF	United Nations International Children's Fund
USAID	United States' Agency for International Development
VDC	Village Development Councils/Committee
W	Watt
WAPDA	Water and Power Development Authority (Pakistan)
WB	World Bank
WDD	Women's Development Division (Nepal)
WDS	Women Development Section (Nepal)
WECS	Water and Energy Commission Secretariat (Nepal)
WLD	Works and Labour Department

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