APRACA FinPower Program

No. 2

COMPLETION REPORT:

IFAD-APRACA FinPower Green Finance Forum in Nepal:

Integrating Renewable Energy and Environmental Sustainability into Rural Financing

Researchers and Documentors:
Narayan Prasad Chaulagain
Michael Wegstein
Manu Binod Aryal
Vishnu Nepal

Forum Facilitator:
Benedicto S. Bayaua

An APRACA FinPower Publication with the Special Sponsorship of
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This book is published during the incumbency of Mr. Abdurakhmat Boymuratov, APRACA Chairman, and Mr. Won-Sik Noh, APRACA Secretary General.

Message

The IFAD-APRACA FinPower Green Finance Forum: Integrating Renewable Energy and Environmental Sustainability into Rural Financing held in Kathmandu, Nepal is in line with APRACA's mandate of establishing avenues for systematic interchange of information.

This forum is a testimony of APRACA's strong commitment to pursue the promotion of efficient and effective rural financing that takes into consideration renewable and sustainable energy development.

I wish to acknowledge the technical and financial support of the International Fund for Agricultural Development in this endeavor. In particular, I wish to thank Dr. Thomas Elhaut, IFAD Asia and the Pacific Division Director, and Dr. Ganesh B. Thapa, IFAD Regional Economist, for the trust and confidence they have continuously bestowed on APRACA and for their commitment to help alleviate poverty and accelerate rural growth and development among countries in Asia and the Pacific.

I sincerely wish that this modest contribution of APRACA will add to the ever growing wealth of knowledge in the field of rural finance and microfinance.

Thank you very much.

Abdurakhmat Boymuratov
APRACA Chairman

Acknowledgement

I would like to express my sincere note of thanks also to all the stakeholders who made the forum a success and without whose participation the forum would have been a mere formality. I would like to specially thank the Honorable Krishna Bahadur Manandhar, Acting Governor Nepal Rastra Bank, for his time and closing remarks on the forum.

The Honorable NRB Deputy Governor Bir Bikram Rayamajhi is also specially thanked for his inaugural message and opening of the forum. Dr. Ganesh B. Thapa, IFAD Asia and the Pacific Division Regional Economist, is also appreciated and thanked for his presentations, discussions, inputs and sharing of knowledge drawn from various IFAD projects. I would like to thank Mr. Benedicto S. Bayaua, for providing his efforts, insights, wits, thoughts and inputs as forum facilitator.

The presenters, representing their respective countries also deserve a sincere note of appreciation and vote of thanks. Without their interesting and thought-provoking presentations, the forum would have been a dull mass of individuals. The presentations always raised attention and were lively. NRB, being the central bank of Nepal, had taken the responsibility of conducting the program and the success that the program gained. The NRB Secretariat, along with the able leadership of Executive Director Vishnu Nepal, deserve a special vote of thanks and appreciation. NRB Assistant Director Subash Acharya, the forum moderator was effective in providing administrative support and control of the program and is very much appreciated for his efforts to make it a swift, on-time and interesting.

Mr. Surya K. Sapkota, Senior Planning Officer, AEPC, along with the other team members from AEPC, namely, Mr. Michael Wegstein, Financial Expert and Mr. Manu Binod Aryal, Program Officer, Credit and Information, are also thanked for their contribution in preparing the paper and this report.

And lastly, FinPower is deeply indebted to Dr. Narayan Prasad Chaulagain, AEPC Executive Director, for his two presentations, his papers on Nepal renewable energy experiences and for documenting this regional forum.

Won-Sik Noh
APRACA Secretary General

Acronyms

ADB	Asian Development Bank
AEPC	Alternative Energy Promotion Center
APRACA	Asia-Pacific Rural and Agricultural Credit Association
ASEAN	Association of South-East Asian Nations
BAAC	Bank for Agriculture and Agricultural Cooperatives
BFIO	Banking and Financial Institution Ordinance
BOT	Build-Operate-Transfer
BRI	Bank Rakyat Indonesia
BSP-N	Bio-Gas Support Program, Nepal
BWTP	Banking With the Poor Network
CCRD	Credit Committee for Rural Development
CD ratio	Credit and Deposit ratio
CES	Central Energy System
CSR	Corporate Social Responsibility
Danida	Danish International Development Agency
DCGC	Deposit and Credit Guarantee Corporation
DEF	District Energy Fund
DSM	Demand-Side Management
EDC	Engineering for Developing Communities
EDCOL	Energy Development Company Limited
EdF	Electricité de France
EIA	Environmental Impact Assessment
ESAP	Energy Sector Assistance Program
EVN	Electricité of Vietnam
EXCOM	Executive Committee
FINGOs	Financial Intermediary NGOs
FinPower	Financial Empowerment
GCM	General Circulation Model
GDP	Gross Domestic Product
GHG	Green House Gas
GTZ	Deutsche Gesellschaft fur Technische Zusammenarbeit
HH	Household
IBRD	International Bank for Reconstruction and Development
ICIMOD	International Center for Integrated Mountain Development
ICS	Improved Cooking Stove
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
ISO	International Organization for Standardization
IWM	Improved Water Mills
KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
kWh	kilowatt hour

kWp	kilowatt peak
Lao PDR	Lao People's Democratic Republic
MFDBs	Microfinance Development Banks
MFI	Microfinance Institution
MHP	Microhydro Project
MIPS	Mongolia Integrated Power Systems
MOI	Ministry of Industry
MW	Megawatt
NABARD	National Bank for Agricultural and Rural Development
NBC	National Bank of Cambodia
NEPC	National Energy Policy Council
NGO	Non-Governmental Organization
Norad	Norwegian Development Agency
NPR	Nepalese Rupee
NRB	Nepal Rastra Bank
OECD	Organization for Economic Cooperation and Development
PMU	Programme Management Unit
PSC	Programme Steering Committee
PV	Photo-voltaic
R and D	Research and Development
RE	Renewable Energy
RET	Rural Electrification and Transmission
REEs	Rural Electricity Enterprises
REF	Rural Energy Fund
RET	Renewable Energy Technology
RFIs	Rural Financial Institutions
RGC	Royal Government of Cambodia
RMDC	Rural Microfinance Development Centre
SCC	Savings and Credit Cooperative
SHG	Self-help Group
SHS	Solar Home System
Sq. Km.	square kilometer
STEA	Science Technology and Environment Agency
SWERA	Solar and Wind Energy Resources Assessment
TEPCO	Tokyo Electric Power
TWh	Trillion Watt hour
UNDP	United Nations Development Program
USD	United States Dollars
VAT	Value Added Tax
VDC	Village Development Committee
WB	World Bank
WES	Wind Energy System

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Part 1

Proceedings of the Forum

1.1 Introduction

The goal of the International Fund for Agricultural Development (IFAD) is to reduce rural poverty through sustainable improvements in household food security and incomes. In order to contribute to this goal, one of IFAD's strategic objectives is to provide improved financial and related non-financial services in rural areas.

Rural finance interventions provide small-scale credit and other financial services to poor households and very small informal businesses. They provide a mechanism for the poor to smooth the effects of income shocks on consumption, find safe and affordable repositories for their savings, take advantage of profitable investment opportunities, and insure against risk. Microfinance is firmly established as a cost-effective approach for poverty reduction, including rural poverty. Experience worldwide shows that when microfinance services are linked to other rural sub-sectors such as those focused on child nutrition and education, family health, household sanitation and shelter, welfare and rural energy, among others, there are measurable improvements in the lives of the rural populace.

Since 1977, the Asia-Pacific Rural and Agricultural Credit Association (APRACA) has aspired to work for rural growth and development, with priority emphasis on the uplift of the rural poor in the region. It has pursued the promotion of efficient and effective rural financial systems and broadened access to rural financial services. It has established among its members several avenues for systematic interchange of information on sustainable rural and agricultural financial services, encouraged inter-country studies, and provided matters of common interest in the field of rural finance, training, consultancy, research and publications services.

IFAD had earlier collaborated with APRACA under the APRACA Microserv Program, covering the period 1996-2001, wherein replicable rural finance models were disseminated to member institutions and to a wider audience. In 2007, IFAD re-engaged APRACA under the five-year Regional Program for Accelerating the Financial Empowerment of Poor Rural Communities in Asia and the Pacific through Rural Finance Innovations, dubbed as the FinPower Program. APRACA, with its wide network of member rural financial institutions, central banks and government agencies, is a viable and strong partner for IFAD to engage with senior policy makers and bankers on salient issues of the day. The IFAD-APRACA collaboration has shown that the replication of innovative models was further enhanced when conducted through an organization with an existing, wide geographic network such as APRACA, thereby yielding more cost-effective results, broader geographic reach, and assured project continuity.

Noting the concern being voiced by policy makers and bankers alike on the effects of the environment and climate on the world, particularly on agriculture and more specifically on the poorer farm and fishing households, APRACA, IFAD and the Nepal Rastra Bank (NRB) jointly organized the FinPower Regional Forum: Integrating Clean and Renewable Energy and Environmental Sustainability Components into Rural Financing in Kathmandu on March 2-5, 2010.

Economy and ecology are two systems that are bound tightly together. Without matching basic economical parameters, ecological or better renewable technologies will not be accepted and implemented. Also without fulfilling ecological criteria like sustainability, smooth growth and energy-efficiency, economical concepts are no longer competitive and will fail in the long run. A big percentage of the rural areas do not have access to the electric grid or to other sources of energy. So far, bio-mass resources like forest and agriculture residue contribute to a big chunk of the energy supply need of the rural areas. Due to rapidly growing population, increasing economic activities and growing urbanization, there is an increasing pressure on forest areas resulting in deforestation, land degradation and soil erosion

in an often fragile eco-system. Of course this scenario offers great opportunities for technological intervention and innovation, e.g. providing electricity through renewable energy technologies.

On the other hand, these technologies have to be affordable to everyone. Costly solutions may not be applicable as otherwise people will again fall back on their old practices of going into the forest for collecting fuel wood. In this context, we need proven and affordable technologies that resolve the energy problem for a particular household, village or areas and that repay back within a manageable period of time.

Another aspect that comes into play when we look at the investment is the sources of funds. Only for a few exceptions, the required amount of money comes totally out of equity. The general case is a balanced structure between equity, subsidy and debt. This holds true on the household level as well as on community or project level. This implies that access to financial services is required especially for the microlevel. Unfortunately, renewable energy technologies are not very well-known to banks, microfinance institutions and other cooperatives; hence, lending and investments are still the exception, rather than the rule. Additionally, many people do not have access to financial services at all. Moreover, commercial and well-established banks are reluctant to go to the rural areas to engage in microfinance, which generally results in a lack of financial means in these areas. Therefore, it is challenging to find practical solutions for everyone and bridge the gap between the urban and the rural areas.

The FinPower Program takes a closer look into the processes involved in renewable energy development and the financing arrangements that are needed to be in place. Thus, APRACA FinPower in collaboration with IFAD, Nepal Rastra Bank and the Alternative Energy Promotion Center of Nepal conducted the Regional Green Financing Forum: Integrating Renewable Energy and Environmental Sustainability into Rural Financing in Kathmandu, Nepal on March 2-5, 2010, with a total of 46 participants. The forum was conducted against the backdrop of Nepal's renewable energy landscape and on the strides made by Nepal in developing renewable energy projects at the grass roots level as well as in selected participating countries.

1.2 Day 1 Activities

1.2.1 Opening ceremony

The opening ceremony was formally launched with the lighting of the "panas" by Mr. Bir Bikram Rayamajhi, the Deputy Governor of Nepal Rastra Bank.

The inaugural session began with a welcome speech by Mr. Benedicto S. Bayaua, then APRACA Secretary General. Mr. Bayaua wished the participants a successful completion of the program.

In his opening remarks, Dr. Ganesh B. Thapa, Regional Economist, IFAD Asia and the Pacific Division, emphasized the need for strong and sustainable partnership among rural finance and renewable energy stakeholders. He also mentioned the various activities carried out in Nepal by IFAD in partnership with various government agencies.

Dr. Narayan Prasad Chaulagain, AEPC Executive Director, focused his speech on the role of renewable and alternative energy as a major contributor to solving the energy crisis the world is facing today. Mr. Vishnu Nepal, Executive Director, Nepal Rastra Bank, delivered his closing remarks and wished for a successful completion of the program. Photo session concluded the inaugural session.

1.2.2 Introduction to the forum

Mr. Benedicto S. Bayaua introduced the objectives, contents and methodologies of the forum. He said that country presentations will be made by selected resource speakers, culminating in a more detailed presentation of the status of renewable energy in Nepal. He likewise informed that the participants will travel to an outlying district around Kathmandu to observe a successful renewable project.

1.2.3 Presentation by Dr. Narayan Prasad Chaulagain

Dr. Narayan Prasad Chaulagain's presentation began with a brief discussion on various aspects of Nepal covering topics on energy consumption pattern, access to electricity and the reasons for difficulty in extending grids in rural areas.

The program implementation modality of Alternative Energy Promotion Center and its various programs were also discussed. AEPC applies Public Private Partnership (PPP) where the demand side is managed by the public sector and the supply side is managed by the private sector. While the public sector focuses on awareness, capacity building, technical/financial assistance, coordination, quality assurance and compliance, the supply side focuses on manufacturing, installation, supply, after-sales service and maintenance. Ultimately, the users get the benefit from this partnership.

Dr. Chaulagain discussed about all the renewable technologies, individually and elaborated on the subsidy as well as administrative aspects. Currently AEPC is promoting projects such as the mini/microhydro projects, improved water mills (IWM), solar home systems (SHSs), bio-mass or improved cooking stove (ICS), bio-gas, bio-fuel and wind projects. AEPC implements its mini/microhydro projects through two programs, namely: the Energy Sector Assistance Program (ESAP) and the Rural Energy Development Project (REDP). More than one million households have already benefited from the 11.2 megawatt of electricity generated thus far from the hydro projects of the two programs.

Both thermal and photovoltaic solar energy technologies are promoted by AEPC. Solar home system, institutional solar PV and solar Tuki are used for lighting, whereas, solar cooker, solar water heater and solar drier are used for thermal applications. With over 300 sunny days, Nepal has the potential of 26 MW of solar energy. Thus far, almost 250,000 households have been electrified via solar home systems.

Domestic bio-gas plants have been a boon for Nepal's efforts towards clean energy applications. With a potential of million domestic plants, the total installations have reached over 200,000 thus far. Two Clean Development Mechanism (CDM) projects consisting of about 20,000 plants have been registered through the Community Development Carbon Fund of the World Bank. The improved cooking stove model has the potential of reducing fuel wood consumption by 25-40% and contributing towards cleaner environment by also reducing indoor air pollution. Over 278,000 ICS have been installed under the Bio-mass Energy Support Program of ESAP.

Bio-fuel, extracted from Jatropha carcass, is at the preliminary stage of development. The bio-fuel strategy is under the draft phase and two pilot initiatives have been started. Jatropha can be cultivated using non-agricultural field adding to the income of the rural people and reducing dependency on petroleum products.

Wind energy is also at a very initial stage under the auspices of AEPC. Although AEPC has recently installed a couple of wind plants of 400 watts and 900 watts, the wind energy policy is still under the draft phase. Efforts to promote the technology via VAT/Tax exemption have been implemented. However, the transportation of equipment and transmission via grid connectivity has emerged as prominent issues.

1.2.4 Presentation by Dr. Ganesh B. Thapa

The second presentation was done by Dr. Ganesh B. Thapa, the Regional Economist of the IFAD Asia and the Pacific Division. The presentation focused on IFAD's experiences in financing energy and environment related activities in Asia and the Pacific region. Mr. Thapa's presentation contained the following aspects:

The introduction on IFAD was briefly discussed in order to orient the participants about the organization itself. IFAD is an international financial organization and also a specialized UN agency for eradication of poverty and hunger in rural areas. IFAD currently runs programs worldwide and has covered 17 countries in the Asia/Pacific region. With a total portfolio of over $2.9 billion, IFAD loans, co-finances and grants over 100 projects in the region. Forestry, renewable energy, soil and water conservation and coastal areas management are major components of several of these IFAD projects.

One of the bigger projects, with a fund of $30 million, is the on-going Sichuan Province post-earthquake agriculture rehabilitation project. The project focuses on bio-gas system construction linked to renovation of toilet, pigpen and kitchen. The project also trains village technicians and the beneficiaries. The simple, safe and improved bio-gas plants thus manufactured will have economic, social and environmental benefits. Such plants are also easily maintained.

IFAD has also funded solar power projects in China for telecommunication relay stations, stand-alone solar home systems and plans to have grid connectivity as well. The benefits of such solar PV systems range from energy savings to income generation from grid connectivity on top of the environmental benefits on account of reduced carbon emissions.

The jatropha plantation in Lao PDR has also been a successful venture. The ability of jatropha to grow in any type of soil, the adaptability in different climate, drought resistance and perennial nature make it an easy option for farmers. The short gestation period (4-5 years for reaching maximum productivity) and long life of over 35 years make it a better cash crop as well. Jatropha can also be used as live fence, green manure and bio-fuel. Jatropha is also useful in glycerine, medicine, lubrication, soap, candle making and ink making. IFAD has invested about US$30 million in Lao PDR for bio-fuel units to basically extract oil and produce unprocessed bio-fuel.

IFAD has also funded a leasehold forestry program in Nepal with the aim of regeneration and improvement of degraded forests, rural poverty reduction and improvement of women's position. The project was successful in securing almost 10,000 hectares of land to over 2,300 groups from almost 17,000 HH. There has been a significant improvement in the condition of degraded forests and the plant species diversity has also increased over the time.

As IFAD has the policy of providing only about 10% of its total investment in the form of grants, Dr. Thapa suggested that such grants can be used mainly for research and capacity building activities. Loans are basically for up-scaling investments and for building partnerships with the private sector. The technical know-how, linkages and innovative ideas, cooperation and access to clean development financing are still the challenges that need to be addressed in the sector.

1.2.5 Country presentations

Bangladesh, Cambodia, Lao PDR, Mongolia and other Nepal local institutions presented on Day 1 with their own country perspectives, focusing on renewable energy financing, the efforts in creating conducive environment for the promotion of RET and their countries' respective policies.

1.3 Day 2 Activities

1.3.1 Presentation by Dr. Narayan Prasad Chaulagain

The second day started with the presentation sequel from **Dr. Chaulagain** on Renewable Energy Technologies and Rural Finance (Experience and Success Stories from Nepal). Dr. Chaulagain started with a brief discussion on the general energy scenario in Nepal. The increasing demand coupled with long power-cuts, difficulty in extending the national grid and the dominance of traditional fuel sources make renewable energy technology (RET) as the only viable option for meeting the energy needs.

RETs, which are also clean in terms of production and operation, are proven, small-scale, easy to operate and are environment friendly. Such technologies also promote local employment, contribute to income generation and poverty reduction, increase access to information, improve quality of life and build social capital.

The Government of Nepal has issued its rural energy policy in order to contribute to rural poverty reduction and environmental conservation by ensuring access to clean, reliable and appropriate energy in rural Nepal. The policy, issued in 2006, a) promotes capacity building of local bodies for planning, implementation, monitoring and evaluation, b) emphasizes involvement of the private sector, and c) promotes community management, productive end-use, research and development.

There are subsidies for mini/microhydropower, solar PV and thermal units, bio-gas, metallic ICS and wind energy technologies. With the brief discussion on the policy and the current scenario on energy, Dr. Chaulagain shifted the focus on the current status of rural financing. As subsidy covers between 30% and 50% of the total cost of the RETs mentioned above, the inability of the targeted group to raise the equity is evident. Therefore, if in the first stage the kerosene-using population can be tapped, the fund gap could be met via microfinancing. However, due to lack of awareness and funds, the problem is still unsolved. The financial institutions also have concerns related to security, costs, viability, partners and profit.

With the loan fund needing to be at least 10%, high initial cost, lack of access to financial services, there is a need for the promotion of RET at the level of local financial institutions and urban financial institutions. Viable models could be wholesale lending and vendor financing for smaller technologies, whereas, microcredit to each user is more appropriate for bigger projects which are not bankable. Wider stakeholder participation such as urban banks, local financial institutions, insurance companies, etc. would bring more institutions into the sector and contribute towards a more viable business environment.

AEPC can contribute towards capacity building, covering the costs of insurance and the support will remain throughout the tenure of loan. Several efforts have already taken firm effect as there is an established bio-gas credit unit under AEPC. Several partner banks and insurance companies have been identified under ESAP. The Asian Development Bank and GTZ are separately going to promote IWM and MHP, respectively by bringing in local banks and financial institutions.

Dr. Chaulagain concluded his presentation with a note that there is high demand for RETs, that local financial institutions need to be the focal point for RET lending and that there is a great potential for business growth for all the stakeholders. These were few recommendations to NRB in rural and renewable energy financing:

- Consider all forms of lending (urban/rural/direct/indirect/regardless of amount) in RET under deprived sector.

– Set aside 10% of its funds for RET lending under Rural Self-Reliance Fund.
– Encourage rural/urban financial institutions partnership in RET lending under Bank and Financial Intermediary Act (BAFIA).
– Consider refinancing the financial institutions for RET lending.
– Issue directives for bigger financial institutions (Class A to D) to mandatorily lend 0.50% to 1% of the total lending in RET.
– Promote RET lending vis-à-vis income generating activities under Enabling Access to Financial Services (EAFS) project.

1.3.2 Discussions and open forum

During the open forum, several queries were also entertained. There was a question on the price of SHS and it was clarified that the price ranges between Rs.800-1,200 per watt peak of SHS. So, for a 20 wP SHS, it would cost roughly about NR20,000.00 (equivalent to USD300.00). Thailand had a sad experience on domestic bio-gas plants as there was no sufficient skilled manpower to install the plant. Therefore, many farmers were discouraged to install such plants.

The Philippines was keen on learning the status of jatropha being financed by banks in Nepal. It was also informed that banks are financing jatropha plantation in the Philippines.

The first query on Dr. Chaulagain's presentation was on financial gap and the need for additional subsidy for the hardcore poor. The income generation activities were also emphasized as RET would only be minimizing expenditure rather than generating income. The migration factor was also discussed. Because of migration, many bio-gas plants are left alone and although they are counted for achieving the target, the real picture is somewhat different. NRB officials asked if there were specific recommendations to NRB on policy and planning and few have already recommended by Dr. Chaulagain per the presentation.

1.3.3 Country presentations

The second session on Day 2 belonged to the country presentations. The presentations were done by the **Thailand, Philippines and Myanmar**.

1.3.4 Group discussions

The third session was a group work on three different topics. Participants were grouped into three groups, each consisting of 11-12 members. Group A discussed and prepared recommendations on "green finance national and institutional policies". Group B was given the task of formulating recommendations on "green finance lending implementations". Group C was given the task of preparing recommendations on "measuring and assessing green finance impact". Each group deliberated on the topics given to them for the recommendations and presented the recommendations at a plenary session.

1.4 Day 3 Field Visit

Mr. Anil Shrestha, Energy Development Officer, REDP briefed the delegates about the project, prior to the visit.

The study visit included observation of a microhydropower project with 12 kilowatt capacity, owned and operated by the local community. About 125 households have been benefiting from the project. The field visit site is the Daunne Khola Microhydro Project, situated at Pinthali of Mangaltar Village Development Committee (VDC), Kavrepalanchok district. The site is about 67 kms southeast from Kathmandu, of which 65 km is motorable and 2 kms of exciting walk up the hilly tracks, with panoramic viewing of beautiful mountains and hills, sceneries, rivers and typical rural lifestyle. It took about one and a half hours to reach the mountain road site and about an hour of trekking along small mountainside tracks.

The visit also included observation of bio-gas plants and improved cooking stoves in the same village.

The community was happy to brief about changes the villagers observed before and after the installation of the plant. There has been a dramatic progress in the lifestyle of the people around and the income generation has also increased.

During visit, the team particularly observed the village landscape, the powerhouse and the forebay area. The team also observed the actual operation when the plant was turned on. The end-use machines were also operated in order to see the actual benefits of the project in terms of economic activity. The team also observed a bio-gas plant, improved cooking stove and watershed management.

Part 2

Status of Green Energy in Selected Countries

2.1 Bangladesh

Bangladesh, a relatively small nation in the South Asian region, is about 144,000 sq. km. in size where roughly 150 million people reside. The main profession is agriculture where about 70% of the total population are engaged. Seventy percent of the total population have no access to electricity, affecting over 100 million people with dire consequences on education, health, agriculture, business, communication and environment. Moreover, Bangladesh is suffering from the effects of climate change in the form of inundation, flooding, drought and cyclone. About 69% agricultural land and only 6% forest cover the total land area (WB, 2009). The average annual per capita energy consumption of Bangladesh is about 158 kg of oil equivalent whereas the average annual per capita electricity consumption is 136 kWh.

The Bangladeshi Government has identified renewable energy as a solution to the problem of energy. Efforts have been exerted in creating access to renewable energy technologies. The benefits such as reduced GHG emissions, less deforestation, poverty reduction have been achieved in this regard. Out of the total energy consumption in 2006, about 57% were supplied from gas and about 42% from bio-mass (ADB, 2009).

Policy-wise, Bangladesh Bank (the central bank) is pushing the banks toward expanding their operation in the rural areas by imposing pro-rural rules. It has taken a liberal stand regarding bank-MFI cooperation and has allowed banks with limited rural branches to use NGO linkage for increasing rural finance. The central bank also refinances the banks which are financing farmers and users.

The Infrastructure Development Company Limited, which was established by the Government of Bangladesh, has financed more than 200,000 SHS in 6 years. The Emission Reduction Purchase Agreement has been signed with IBRD to avail of the Community Development Carbon Fund.

The Government of Bangladesh issued a Renewable Energy Policy in 2008 and established the Sustainable Energy Development Agency comprising of solar companies, NGOs, financial institutions and implementing agencies. Moreover, financing policies towards rural financing and renewable energy financing are moving towards the right direction. With a fund of Tk.2 billion for refinancing on renewable energy and environment-friendly technology, scheduled banks can participate in this scheme. The central bank refinances sectors such as solar, bio-gas, effluent treatment plant, among others.

While there is low gross domestic savings, low financial intermediation, low disposable income and high non-performing loans, microfinance appears to be an answer to the problem because it minimizes risks of financial crisis, helps reduce poverty and focuses on the rural poor.

The Bangladesh Government has set its objective of increasing the use of renewable energy use by 10% in order to prevent energy shortage, protect the environment and develop renewable energy technologies. Activities to meet the objective are conducted by different boards such as the Microcredit Regulator Authority, the Power Development Board, the Rural Electrification Board, the Ministry of Environment and the Forest and National Energy Policy.

The Bangladesh Government also has a clear policy on subsidies, loans and tax exemption to top off the other actions as mentioned above.

2.2 Cambodia

Cambodia is bordered by Thailand, Vietnam and Lao PDR. The total area of Cambodia is about 181,035 square kilometers while the total population is about 14.2 million (2006). The GDP growth was 9.6% while the GDP per capita was US$628.00, both in 2007.

The agriculture sector accounts for 40% of GDP and absorbs 70% of the national labour. Commercial energy sourced from petroleum products is used for power generation, transport, industry, residences, and commercial sectors. Average annual per capita energy consumption of Cambodia in 2005 was 344 kg of oil equivalent whereas annual electricity consumption per capita in the same year was 55 kWh (WB, 2009).

Most of the energy consumed comes from bio-mass burning, particularly firewood and charcoal, for rural activities and industries.

In 1995, the Royal Government of Cambodia (RGC) set up the Credit Committee for Rural Development (CCRD) funded by the United Nations Development Program (UNDP) and the Agence France de Developpement (AFD). CCRD's main roles were: i) to formulate strategy framework and national policy in microfinance sector, ii) to follow-up the implementation of this strategy and policy and iii) to monitor the delivery of the credit of microfinance operators.

In 1997, the National Bank of Cambodia (NBC) set up the Supervision Office of Decentralized Banking System for microfinance sector. Since the beginning of 1990s, a number of NGOs incorporated microcredit services into their development programs for providing fund to rural poor people. In 1991, there were only 4,000 borrowers and loan outstanding was US$100,000.00. By June 2009, loans amounted to about US$282 million with 870,000 borrowers and savings amounted to US$7.5 million with 159,000 depositors.

The main objectives of Clean and Renewable Energy Policy of Cambodia are to:

- provide access to reliable, safe and environmentally clean electricity services to rural areas;
- enable and encourage private sector participation in providing rural renewable electricity services;
- provide effective legal and regulatory framework for enabling access to reliable, safe and clean electricity services to rural areas;
- encourage the most efficient systems for generation, transmission and distribution of electricity from clean and renewable energy sources;
- promote renewable electricity systems for rural applications, as part of a national portfolio of grid and off-grid technologies; and
- ensure adequate resources and appropriate institutional mechanisms to empower the poor.

The Strategy for Rural Electrification by Renewable Energy Policy in 2004 aimed at:

- widely expanding access to electricity services for the rural population;
- expanding the supply base for renewable energy services and provide the rural population with efficient and cost-effective services at an affordable price;
- facilitating the systematic market and institutional development in the renewable electricity sub-sector;
- ensuring wide and equitable access to electricity services for all sections of the rural population;
- promoting environmentally sustainable renewable energy technologies in on-grid and off-grid mode; and
- contributing to the empowerment of the rural poor.

The overall goal of the RGC is to achieve 70% electrification coverage in grid-quality electricity to rural households by the year 2030 from the current level of 20%. The current overall RE target determined for the World Bank-supported Rural Electrification and Transmission (RET) project is 45,000 new electricity services by Rural Electricity Entrepreneurs (REEs), including Renewable Energy Technologies (RET). RET is the creation of the RGC and the World Bank (WB), with the goal of encouraging the private sector for investment in electricity supply to the rural population, with smart subsidies and smart credit scheme for the purpose of social equity. Agreed electricity price sold to the rural population would be such that the rural entrepreneurs would be able to undertake sustainable enterprises. Investment fund will come from grants and loans with low interest rate and long-term period from various credit and financing institutions.

The Government of Cambodia aims at providing grid-quality electricity to 70% of the rural population by 2030. The Power Sector Strategy in the future targets: i) an investment in the power sector and private sector participation, ii) interconnection with neighbouring countries' power grids and iii) provincial and rural electrification.

The Rural Development Bank (RDB) of Cambodia has the following strategies in Renewable Energy Participation:

- RDB will implement the pilot project on the renewable energy development by delivering loans to the Rural Electricity Enterprises (REE) for selling electric at lower price to the rural areas where the EDC cannot reach;
- Besides the agriculture sector, RDB will also consider lending to companies who want to import renewable energy equipment such as solar equipment, subject to availability of funds; and
- RDB has undertaken financing of its partners to plant cassava in order to produce bio-diesel.

The Royal Government of Cambodia has established four long-term objectives for electricity-generating renewable energy technologies: 5% of new electricity generation, or about 6 MW will be supplied by renewable electricity technologies, including 3 hydropower mini-grids and some proven, clean and efficient bio-mass/bio-gas electricity generation, 3 viable renewable energy technologies (RET) businesses and 50-100 trained RET personnel. All this should be achieved in the first 5-year period.

About 100,000 households (HH) will be supplied by electricity from renewable technologies on a competitive basis. Of this number, the goal is to get 45,000 HH electrified by the Rural Electricity Enterprises (REE) in the first 5-year period and 10,000 households will be served by Solar Home Systems (SHS). This should be achieved during the first 5-year period.

A sustainable market for renewable electricity systems will be developed and evidenced by households willing to purchase renewable electricity products and services in a competitive business environment.

RET is the result of a joint effort of the Royal Government of Cambodia and the World Bank, with the goal of encouraging the private sector for investment in electricity supply to the rural population, with smart subsidies scheme for reason of social equity. Agreed electricity price sold to the rural population would be such that the rural entrepreneurs will still make project. Investment funds will come from grants and loans with low interest rate from various credit and financing institutions

2.3 Lao PDR

The Lao People's Democratic Republic (Lao PDR) is a Southeast Asian country bordered by the People's Republic of China to the north, Vietnam to the east, Cambodia to the south and Thailand to the west (ADB, 2009). In 2008, there were 6.21 million people living in Lao PDR. The total surface area of Lao PDR is 236,800 sq. km. out of which about 69% was covered by forest in 2005 (WB, 2009). The country is a producer of coal, mostly lignite, which it exports to Thailand. It also exports electricity from its hydroelectric power plants. It imports all of its petroleum product requirements per capita – at 320 kg of oil equivalent – one of the lowest in the world (ADB, 2009). Most of its energy consumption is in the form of non-commercial energy, such as firewood (78%) and charcoal (3%). The energy consumption from commercial sources is comparatively low (oil – 14%; hydropower – 5%; Coal – 0.1%).

The electrification ratio is 30% for the country as a whole, but only 16% of the rural people have access to electricity. Electrification of rural areas is one of the Government's primary goals of development strategy using decentralized options of power generation (microhydro, potential solar PV and bio-mass gasifiers).

The provision of a transmission and distribution network is perceived as costly and difficult to build due to the country's mountainous terrain.

The Government has declared rural electrification as one of its development and poverty reduction priorities. Renewable energy technology has an enormous potential in the rural areas, especially those that cannot be serviced by grid-based electricity. The Government encourages projects for investigating, field-testing and implementing alternate energy schemes. Some microhydropower stations have been successfully implemented (such as the Houyakasen plant generating 75kW). Other forms of renewable energy (wind, solar, bio-gas, geothermal, etc.) are being explored. Solar energy has considerable potential. The Lao PDR is situated in the tropics in an area where the annual mean daily global solar radiation ranges from 4.5 to 4.7 kWh/m^2/day.

Since 1981, solar photo-voltaic (PV) is being used for the supply of electricity in Lao PDR. There are 32 stations for microwave repeaters, 63 stations for radiotelephone, many solar homes and vaccine refrigerators. Around 98% (627 MW) of Lao PDR's electricity is produced by hydroelectric plants. The majority of the hydro potential (26,500 MW) is untapped. Bio-mass fuel wood (mainly for cooking) and electricity are the only local sources. Forests are the main source of fuel wood, supplying around 85% of all fuel wood. Almost 93% of all households use fuel woods as their primary source of energy for cooking. Almost all rural households use fuel woods for cooking, while about 68% of urban households do.

In terms of energy efficiency, there are no mandatory efficiency standards for energy use of devices or regulations in place in Lao PDR. Efforts are currently aimed at setting up institutions to implement policies and regulations. Currently, the Government owns the energy market. The Lao Government has established a set of policies that is designed to encourage private risk taking in power generation, especially to provide services in areas that will not be reached by Government programs for sometime, if at all. Some 26 potential projects have been the result. Small-scale power production plants using microhydro plant and diesel engines are widespread and their use has developed solely as a result of private initiatives. Currently, the market is vertically integrated.

The Lao Government plans to electrify 20% of a total of 11,000 villages with stand-alone renewable electrical systems by 2020. Achieving this goal relies at present on grant aid received for promotion and demonstration of renewable energy technologies. The Government is aware of the environmental impacts of large hydropower projects. Conducting an EIA (Environmental Impact Assessment) for major hydropower stations has been made compulsory in the recently promulgated Electricity Law.

The Ministry of Energy and Mines is primarily responsible for energy policy. The Science Technology and Environment Agency (STEA) founded in 1993 is the agency responsible for environmental management in Lao PDR. The United Nations Development Program (UNDP) assists STEA in the development of a comprehensive environmental law aimed at developing a framework for the protection and management of natural resources and the environment.

The pricing of commercial energy is predominantly market driven. The Government has signed a partnership with a multinational corporation to fund construction of large hydropower generation but the pricing is under the control of the Government. Electricity prices are subsidized for the domestic sector and Government offices. For the domestic sector, tariffs are tiered and subsidy is restricted to a certain level of consumption. In remote areas, small-scale private generation is allowed and prices are market driven.

2.4 Mongolia

Mongolia is a medium-sized country with a surface area of 1.564 million sq. km. and a population of 2.7 million. The capital city, Ulaanbaatar, accommodates approximately 1.0 million people (about 35% of the total population). In 2005, only about 6.5% of the total area of Mongolia was covered by forest. Per capita energy consumption of Mongolia in 2005 was about 1,024 kg of oil equivalent out of which about 95% was coming from coal. Mongolia has an integrated power energy system which was approved by the Parliament of Mongolia in 2007.

The Government of Mongolia's policy on renewable energy and its implementation has the following objectives:

- form a self-sustaining and reliable power system in Mongolia with an efficient generation mix;
- export power to be generated by sources properly situated throughout the country;
- restructure generation sources and make power supply in urban and settled areas reliable by defining the Energy Conservation Policy, introducing new and efficient technology and equipment and utilizing renewable energy sources;
- improve power supply reliability in regions by constructing hydropower plants and high voltage transmission lines to connect these plants, develop merit order dispatching regimes by upgrading the WES and connecting to the CES, and form the MIPS; and
- formulate laws and legislation and strengthen management system making them more consistent with market principles and increase private participation in fuel and energy sectors.

The Parliament of Mongolia approved the country's "National Renewable Energy Program" in June 2005 to promote and extend renewable energy development in Mongolia. Similarly, the Parliament approved the "Renewable Energy Law" in January 2007, the objectives of which are to create conditions for ensuring ecological balance, to reduce unemployment and poverty reduction and to ensure sustainable social and economic development. The objectives are meant to be achieved by increasing percentage of renewable energy share in the total energy supply, by improving structure of energy supply and by widely applying renewable energy in the rural areas' power supply.

2.5 Nepal

Nepal is among the poorest and least developed countries in the world with almost one-third of its population living below the poverty line. The population growth with an annual increase around 2.5% is comparatively high. Agriculture is the mainstay of the economy, providing a livelihood for three-fourths of the population and accounting for about one-third of GDP. In 2007 the GDP was US$10.2 billion. Industrial activity mainly involves the processing of agricultural products, including pulses, jute, sugarcane, tobacco, and grain. Bumper crops, a better security situation, improved transportation and increased tourism pushed growth past 5% in 2008 (WB, 2008).

The deteriorating world economy in 2009 had only a slight impact on tourism. Remittances in 2006 have officially contributed 15% of the GDP but are assumed to be even higher. The worldwide downturn of economies has led to a general reduction of job opportunities abroad. Nepal has considerable scope for exploiting its potential in hydropower and tourism, areas of recent foreign investment interest. Prospects for foreign trade or investment in other sectors will remain limited (WB, 2008).

The financial indicators suggest that Nepal had an annual growth rate of 4.7 in 2008 whereas the same figure stood around 4.0 during 2009. While the consumer price changed by as much as 7.7% during 2008 and jumped to more than 13% in 2009, the GDP per capita stood at US$468.00 during FY 07/08 and US$473.00 during FY 08/09, per estimates by Nepal Rastra Bank (NRB). The total deposit stood at US$549,828.50 million, whereas the CD ratio stood at 81.2% during 2009, indicating that there is still some room for lending. The liquidity deposit ratio was also relatively high at 34.1% for the same period. The cash-reserve ratio in mid-July, 2009 stood at 5.5 whereas the bank rate stood at 6.5%.

The total import of petroleum products stood at a staggering Rs.42,209.20 million during 2008/09 out of the total imports of Rs.163,892.4 million from India (at 25.75%), suggesting that it is high time for the renewable energy technologies to replace the petroleum products to the extent possible.

The Alternative Energy Promotion Center (AEPC) established in 1996 to promote alternative energy technologies in a systematic and planned way is currently responsible for policy and planning, resource mobilization, donor coordination and sector capacity enhancement in order to enhance the rural people's livelihoods and to preserve the natural environment. AEPC is currently under the Ministry of Environment and implements microhydropower plants (MHPs), solar home systems (SHS), improved water mills (IWM), bio-gas and bio-mass energy technologies. The aforementioned technologies are time-tested and have a proven track-record on performance, efficiency and life. AEPC has also initiated activities on bio-fuel and wind energy technologies in order to maximize the benefits of RETs.

2.6 Philippines

The Philippines has a total land area of 300,000 sq. km., out of which about 24% is covered by forest (WB, 2009). The Philippines is one of the major energy-importing countries in Asia due to its limited oil and coal resources. It has about 3.48 trillion cubic feet of proven natural gas reserves and 140 million barrels of proven oil reserves (ADB, 2009). Due to the Government policy of accelerating the provision of electricity to 100% of all its villages, the electrification rate in the Philippines was 81% in 2008. In 2005, the average energy use per capita of the country was 510 kg of oil equivalent while per capita electricity consumption was 582 kWh (WB, 2009).

Out of the total energy supply, about 49% has been supplied by oil following 17% by electricity and 6% by coal. On the sectoral basis, the transport sector is largest consumer of electricity with a share of 36% of the total energy consumption. Likewise, the residential and industrial sectors consume about 29% and 24%, respectively, of the total energy consumption (ADB, 2009).

The renewable energy act was signed on 16 December 2008 and it took effect on 30 January 2009. The policy covers RETs such as bio-mass, solar, wind, geothermal, ocean and hydro. The RE Act focuses on market development. Therefore, it guarantees fixed price for at least 12 years for electricity produced from emerging RE resources (wind, solar, ocean, run-of-river hydro and bio-mass). The renewable energy market will also trade RE certificates. The policy also provides cash incentive to developers for missionary electrification.

The policy also provides production incentives, namely in the form of income tax holiday for 7 years, duty free import of RE machinery, equipment and material for 10 years, special realty tax rates, net operating loss carry-over for next 7 years, 10% corporate tax rate, tax exemption on carbon credits and tax credit on domestic capital equipment and services.

For technology advancement and wider use, the Act also provides incentives similar to those provided for production stimuli. They are basically:

- Tax and duty-free importation of components, parts and materials,
- Tax credit on domestic capital components, parts and materials,
- Income tax holiday for 7 years,
- VAT zero-rated for all RE equipment transactions and
- Tax rebate for purchase of RE components.

The consumers also get the benefits, termed as consumption incentives:

- Zero percent VAT on sale of fuel generated from RE,
- Green energy option to allow end-users the option to use RE as their source of energy and
- Net-metering for RE to allow end-users generating own power to sell it to the grid.

The Act foresees convening of the National Renewable Energy Board with representations from the Department of Energy, National Planning Commission, RE developers, Government financial institutions, NGOs, private distribution utilities and electricity suppliers, among others. The functions of the Renewable Energy Board would be to recommend the minimum generation capacities in off-grid areas, recommend actions and implementation of the National Renewable Energy Program and oversee the implementation of the RE Trust Fund.

The establishment of RE Trust Fund would focus on finance research, development, demonstration and promotion of RE sources for power and non-power applications. The Act is the most comprehensive as it promotes feed-in tariff, capital subsidy, grant or rebate, investment excise or other tax credits, sales tax, energy tax or VAT reduction, tradable renewable energy certificate, energy production payment or tax credits, net metering, public investment or financing and public competitive bidding among the ASEAN countries.

2.7 Thailand

Thailand is situated in South-eastern Asia, bordered by Lao PDR, Cambodia and Myanmar, with access to the Andaman Sea and the Gulf of Thailand. Thailand has a total area of 514,000 sq. kms. The population is estimated at about 61.5 million and has a tropical, rainy and warm kind of weather.

Thailand wishes to diversify its energy mix and to promote the use of renewable energy within its energy mix. The use of renewable energy within Thailand's energy mix has the added benefits of reducing the environmental impact of using conventional fossil fuels and simultaneously displacing Thailand's need to spend foreign exchange on the import of fossil fuels. It is anticipated that the majority of renewable energy in Thailand will be generated by bio-mass-fuelled projects (presently estimated to account for 90-95% of renewable energy capacity in Thailand). This will significantly benefit the agricultural community in Thailand. The Ministry of Energy (MoE) has a stated policy objective that 8% of Thailand's overall installed generating capacity by 2011 be contributed by renewable energy projects. It is estimated that this will represent approximately 2,300-2,400 MW of installed capacity by 2011. Thailand's present renewable energy capacity is approximately 1,240 MW, of which only approximately 640 MW is delivered to the Thai electricity grid.

The Energy Policy Planning Office (EPPO) reports that the MoE's objective is to increase the installed generating capacity of renewable energy by 2,000 MW by 2011. Against this background, it is important that Thailand establishes a renewable energy policy, tariff structure and contractual framework, i.e., Power Purchase Agreement (PPA)) that will support investment in renewable energy projects and maximize the energy delivered, accepted and purchased from these investments. A set of principles for the development of a renewable energy policy ("RE Principles") has been prepared for the consideration by the MoE. The policy also sets out a conceptual mechanism for a feed-in tariff that may be used to support the cost differential between the expected cost of renewable energy tariffs and those achievable using conventional fossil fuels. The policy also sets out recommendations for a renewable energy PPA ("RE PPA").

Thailand wishes to apply the renewable energy policy to projects that qualify as 100% renewable energy projects. This is consistent with the Renewable Portfolio Standard introduced by the National Energy Policy Council (NEPC) in August 2004. Such projects shall be permitted to utilize fossil fuels only for the purposes of start-up operations (i.e. 5 days equivalent full-load operation). Consideration may also be given to developing a separate policy regime to promote co-firing with renewable energy and fossil fuels.

The policy also provides a 'level playing field' by establishing a renewable energy policy to apply to all renewable energy projects, including existing operating projects. Provision should be made for existing renewable energy projects to choose to come under the renewable energy policy, including the application of the tariff mechanism and RE PPA.

The optimized delivery of renewable energy in Thailand's energy mix is possible by deeming renewable energy projects as 'must run/must take' facilities. This is necessary to optimize the delivery of renewable energy in Thailand's energy mix. It is inappropriate that the dispatch of renewable energy projects, and therefore the fulfillment of policy objectives, be left in the hands of the power purchaser(s). This should be controlled by the Government, and supported by the Feed-in Tariff mechanism (Principle 8), in order to meet Government policy objectives.

The Government's policy also tries to provide for a guaranteed minimum dispatch for projects (e.g. bio-mass projects) that can accommodate a reasonably reliable and predictable availability and require dispatch assurances to optimize cost effectiveness and fuel supply planning and contracting.

Notwithstanding the 'must run/must take' requirement, a guaranteed minimum dispatch is essential to enable the generator to plan and contract fuel supply (including on a take-or-pay basis) which will generally be done with farmers or agricultural communities. This is also beneficial to the power purchaser to enable predictable and reliable dispatch, system planning and load flows on a more consistent and dependable basis.

The Government policy provides for an exclusive zone around projects such that no competing project utilizing the same fuel type will be licensed within the exclusive zone. This is essential to protect the fuel supply of the project and assure that the fuel supply will not be diverted to a subsequently established competing project, as has occurred in a number of instances in Thailand. Creating an appropriate tariff mechanism to match the capital cost and operating cost of renewable energy projects and recognizing the typically higher initial capital cost for renewable energy projects are challenges. The policy tries to answer this problem. The capacity and energy payment components of the tariff will need to reflect the renewable energy technology employed in the relevant project. The policy includes the energy payment component of the tariff the cost of fuel, on a pass-through basis, based on either a market price mechanism or a fixed price with indexation to a consumer price index (CPI) to account for inflation.

The policy also provides for a 'Feed-in Tariff' to meet the differential between the small power producer ("SPP") PPA tariff and the RE PPA tariff. This will have the effect of making the power purchaser indifferent to dispatch between a renewable energy project and an SPP project. This is appropriate and consistent with the 'must run/must take' principle.

The policy introduces a renewable energy PPA that provides for an appropriate balanced risk allocation between the generator and the power purchaser. The present SPP PPA had its genesis as a basis for co-generation facilities to sell excess capacity and energy to the Thai electricity grid and was developed for the benefit of the power purchaser. It is heavily one-sided in favour of the power purchaser. When applied to renewable energy projects, such a contract serves to discourage investment whereas the objective should be to encourage investment in this sector. In order to achieve a balanced risk allocation, it is inappropriate that the RE PPA be written by the power purchaser without the involvement of the generator. In this regard we suggested principles to be included in an RE PPA. The policy also tries to remove capacity constraints for renewable energy projects. In looking to maximize the contribution of renewable energy, scale should be encouraged not confined.

The Feed-in Tariff mechanisms contemplated below are based on 2006 estimated load factors and calculate the Feed-in Tariff that would be required if 6% or 8% of delivered energy was derived from RE projects. The reality is that in 2006, Thailand has only approximately 640 MW of RE capacity which results in only approximately 4,500 GWh of delivered energy to the Thai electricity grid. On this basis, the MoE could employ a step-up approach to the imposition of the surcharge on delivered energy, whether applied to all delivered energy or only on non-RE energy delivered.

2.8 Vietnam

Vietnam is a rapidly growing economy with a total land area of more than 310,000 sq. km. and a population of 84.1 million in 2006 (ADB, 2009). About 39% of the total land area of the country is covered by forest. In 2005, the annual per capita energy consumption in Vietnam was about 617 kg of oil equivalent and per capita electricity consumption was 573 kWh (WB, 2009). About 84% of the population have access to electricity (ADB, 2009).

Vietnam has diverse fossil energy sources, such as oil, gas and coal, but uses a variety of renewable energies, such as hydro, bio-mass, solar and geothermal. Main sources for electricity generation in Vietnam are renewable (46.4%), coal (17.7%), oil (6.5%) and gas (29.4%). Vietnam uses its own natural resources of crude oil, natural gas and coal. Since 1990, the country has been a net energy exporter, exporting mainly crude oil and coal. However, owing to its lack of refining capacity, Vietnam imports petroleum products for most of its domestic consumption. The State power company, Electricité of Vietnam (EVN) plans to develop a national electricity grid by 2020 by patching together several regional grids. The country's distribution infrastructure has been poorly maintained, but has benefited from recent improvements. A North-South power cable transmits electricity from Vietnam's largest generator, the Hoa Binh hydropower plant in the North, to large population centers in the South, linking the country into one electricity grid and helping alleviate electricity shortages in Ho Chi Minh City. At the end of June 2005, the National Power Grid had reached all provinces, connecting 95.5% of communes and 88.91% of households in rural areas.

Although Vietnam's per capita electricity consumption is among the lowest in Asia, demand has risen in recent years, straining the country's limited generating capacity. Rapid commercial sector growths, population migration to major cities, and elevated living standards have all contributed to a growing demand for electricity. The energy generation of the Vietnamese power system increased from 26.56 TWh in 2000 to 46.21 TWh in 2004, average growth rate of 14.9%. Electricity demand in Vietnam is forecast to grow 15% per year until 2010. Vietnam currently buys power from China to prevent shortages in the North, and plans to begin purchasing from Lao PDR in 2008. To meet increased demand, construction or expansion is planned for 32 power stations (7,547 MW) before 2010. EVN plans to commission 16 hydropower plants by 2010. Vietnam also plans to complete its first nuclear power plant by 2020, with a pre-feasibility study submitted in 2004 to the National Assembly.

Theoretical potential of hydropower in Vietnam is about 70,000 MW of capacity and 308 billion kWh of energy out of which the potential of small hydropower is about 2,000 MW of capacity and 2 billion of kWh annually.

Despite Vietnam's grid-based rural electrification program, by 2010 over 3 million rural households will still not have access to grid electricity services. Some of these households could be economically served by decentralized renewable energy sources. Hydro Vietnam currently has five hydroelectric expansions underway, mostly in the central highlands. The Son La project, started in late 2005, is anticipated to have a generating capacity of 2,400 MW by 2012 and will be the largest hydroelectric project in Vietnam when completed. In September 2004, construction began on the Ban Ve hydroelectric power plant, expected to begin operations in 2008. Electricité of Vietnam (EVN) began work on four additional hydroelectric projects in late 2004. The Dong Nai 3 and Dong Nai 4, are expected to be completed within four years and to provide approximately 520 MW of generating capacity. In December 2004, EVN began construction of the Se San 4 hydropower plant. The plant is anticipated to have a capacity of 330 MW and to generate 1,390 million kWh per year Vietnam also plans to build three additional plants before 2010. Much of Vietnam's large rural population relies heavily on non-commercial bio-mass sources such as wood, dung, and rice husks.

It is estimated that more than 50 million tons of bio-mass is generated every year from agricultural residues. However, so far only from 30-40% of bio-mass is used for energy purposes, mainly for cooking in households and 150 MW electricity generations in 42 sugar mills. It is estimated that about 2.5 million tons of rice husk and 4.6 million tons of bagasse can be used for electricity generation and heat production. Additionally, residues from wood processing enterprises are being considered for use. So far only 3 from 42 existing sugar plants supply surplus electricity to the power grid. They can supply about 100 MW. In 2005, the first 750 kW waste-to-power project was completed (US$16.4 m, 60% funded by the Netherlands). Two additional turbines, with capacities of 750 kW and 920 kW are expected to be commissioned in 2006.

A 15 MW wind energy plant has been constructed (Binh Dinh province) and another plant is being built with a capacity of up to 250 MW. Electricité of Vietnam (EVN), a state-owned utility founded in 1995, engages in generation, transmission and distribution of electricity in Vietnam. Power tariffs are approved by the government. There is a National Load Dispatch Center, fourteen main power plants, four transmission companies, and the Institute of Energy operating as dependent accounting units under EVN. The electricity industry in Vietnam is vertically integrated and State-owned. In accordance with the Strategy for Electricity Sector Development approved in 2004, the Vietnamese Government laid down a policy to gradually establish a domestic competitive power pool, diversify investment and trading methods and stimulate participation of several economic sectors. The State maintains a monopoly in transmission, construction and operation of large-scale hydro and nuclear power plants.

The Vietnamese government has set out its policy to build up a power market by opening it up to competition in stages. In line with the new Electricity Law (2005), the power market in Vietnam is expected to undergo various phases of development. Generation companies have to compete to sell electricity to EVN. Power companies and large customers have a choice of whom to buy power from. Retail distribution companies compete to sell power. All customers have a choice of whom to buy power from. More foreign companies are beginning to enter into the growing Vietnamese power market in the form of Build-Operate-Transfer (BOT) projects. EVN and a consortium including Tokyo Electric Power (TEPCO), Sumitomo, and Electricité de France (EdF) began BOT construction of the Mekong Delta's 715 MW Phu My 2-2 in January 2003. The plant is fuelled by gas from Nam Con Son Basin.

The Ministry of Industry (MOI) of Vietnam has completed the National Energy Policy in 2005 for:

- developing energy infrastructures and ensuring adequate, stable energy supply;
- developing energy with due considerations of environmental protection and sustainable development;
- using energy economically and efficiently replacing low-efficient equipment and facilities;
- establishing measures in favour of energy efficiency and conservation in high buildings;
- applying demand-side management (DSM) and energy supply management
- developing new and renewable energy resources, such as small hydro, wind power and solar energy;
- promoting rural energy policy by ensuring adequate energy supply in rural and mountainous areas, concentrating on rural electrification and complete rural access to energy by 2010; and
- enhancing international cooperation in energy;

The Vietnamese Government has signed an agreement on energy cooperation with Lao PDR and Cambodia. Vietnam will import 2000 MW from Lao PDR and supply between 80-200 MW of power to Cambodia. When Cambodia builds more hydropower plants and starts participating in the regional electricity market, Vietnam will buy electricity from Cambodia. Vietnam joined the Power Trade Agreement amongst the Greater Mekong Sub-region (2002) which includes Vietnam, Lao PDR, Cambodia, Thailand, Myanmar and China. The Ministry of Industry (MOI) is responsible for the State management of energy industries, including formulation of law, policies, development strategies and annual plans. Under the new Electricity Law, the Ministry of Industry (MOI) is responsible for administering electricity activities, and the People's Committees will manage electricity activities.

In November 2005, the Electricity Regulatory Authority of Viet Nam was established to assist MOI for improving legal framework and implementing market-oriented power reform. Particularly, the Electricity Regulatory Authority was aimed at:

- preparing national master plans for power sector;

- developing regulations on the operation of a competitive power market and directions for implementation;
- assessing and promulgating tariffs for electricity and wholesale, and fees for transmission and distribution;
- assessing electricity retail tariffs and submitting to the government for approval, issuing, amending and revoking electricity licenses;
- issuing guidance on the conditions and procedures for electricity outages and on reduction of electricity consumption;
- studying and recommending measures to regulate power supply-demand relationship;
- issuing guidance on the conditions and procedures for interconnection to the national electricity system;
- monitoring the implementation of plans and investment projects in the development of electricity sources, transmission and distribution grids for compliance with the master plans;
- keeping track of the implementation of the approved electricity tariff; and
- settling complaints and disputes in the electricity markets.

The Prime Minister is responsible for issuing regulations and conditions for forming and developing the power market. Power price is set with reference to market development level, to enable investors to achieve a reasonable profit, to encourage energy saving, protect lawful rights and benefits of electricity companies as well as consumers. The Ministry of Industry (MOI) is responsible for the State management of energy industries, including the formulation of law, policies, development strategies and annual plans.

Though the Vietnamese Government is trying to facilitate the power sector reform, there are still some regulatory barriers:

- market unknown (no data base available),
- EVN did not zone and prioritize areas where grid extension is not economical,
- no comparison available of advantages and disadvantages of different rural electrification options,
- electricity consumption too low for financial sustainability,
- low quality of technology except for PV,
- limited financing available,
- have to get approval from power companies, Ministry of Planning and Investment, MOI and others,
- no high level renewable energy coordination body,
- private sector does not share responsibility for rural electrification with EVN, and
- no subsidy similar to grid electricity.

Part 3

Clean Energy and Rural Financing: The Case of Nepal

3.1 Introduction

Economy and ecology are two systems that are bound tightly together. Without matching basic economical parameters, ecological or better renewable technologies will not be accepted and implemented. Also without fulfilling ecological criteria like sustainability, smooth growth and energy-efficiency, economical concepts are no longer competitive and will fail in the long run.

Embedded in the context of Nepal, this coherence becomes truth every day. Electrifying rural areas in Nepal, where still more than 50% do not have access to energy, efficient energy solutions are required. So far, bio-mass resources like forest and agriculture residue contribute to more than 85% of energy supply. Due to rapidly growing population, increasing economic activities and growing urbanization, there is an increasing pressure on forest areas resulting in deforestation, land degradation and soil erosion in an often fragile eco-system. Of course this scenario offers great opportunities for technological intervention and innovation, e.g. providing electricity through renewable energy technologies.

On the other hand, these technologies have to be affordable to everyone. Costly solutions may not be applicable as otherwise people will again fall back on their old practices of going into the forest for collecting fuel wood. In this context, we need proven and affordable technologies that resolve the energy problem for a particular household, village or areas and that repay back within a manageable period of time.

A third aspect that comes into play when we look at the investment is the sources of funds. Only for a few exceptions, the required amount of money comes totally out of equity. The general case is a balanced structure between equity, subsidy and debt. This holds true on the household level as well as on community or project level. This implies that access to financial services is required especially for the microlevel. Unfortunately there are still many boundaries in Nepal in two regards: renewable energy technologies are not very well-known among microfinance institutions and other cooperatives; hence, lending to these investments are still the exception. Additionally, many people do not have access to financial services at all. Moreover, commercial and well-established banks are reluctant to go to the rural areas to engage in microfinance, which generally results in a lack of financial means in these areas. Therefore, it is challenging to find practical solutions for everyone and bridge the gap between the urban and the rural areas.

3.2 Energy Resources and Climate Change

The overall energy consumption of Nepal is dominated by traditional energy sources like fuel wood, agricultural residues and animal waste. As shown in Figure 1 below, in 2007/08 the share of traditional, commercial and RE sources was 87.8%, 11.5% and 0.7%, respectively. Commercial energy includes petroleum products, coal and electricity mainly from hydropower. The RE includes microhydro, solar, bio-gas etc. In the traditional energy consumption, the highest share is from fuel wood at around 77% (MoF, 2009).

Despite the huge potential of hydropower in Nepal, with an estimated theoretical capacity of 83,000 MW and other renewable energy (RE) resources like solar, wind, bio-mass etc., the country is heavily dependent on the traditional bio-mass and also imported fossil fuels to meet the growing energy demand. Still more than 85% of the consumed energy comes out of Nepal's forests (WECS, 2006). Concerning access to electricity, still more than 50% of the population are using kerosene or candles for lighting.

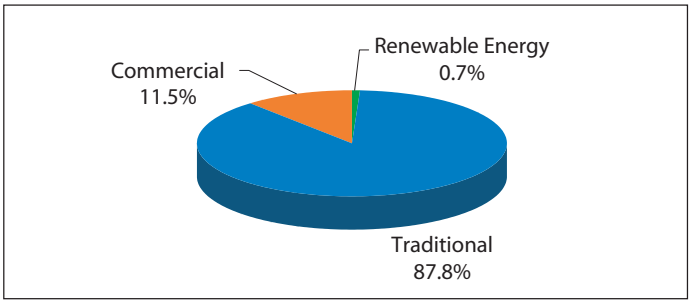

Figure 1: Energy Consumption by Energy Source, 2007/08, Source: MoF 2009

Due to the difficult geographic terrain and scattered settlements, among others, the extension of the grid in rural areas is not feasible. Also developing a large scale hydropower will require huge investment and over a long period of time.

One of the consequences of high-fuel wood consumption is the significant sign of deforestation and land degradation. Though a remarkable amount of the forest area is under community forestry, many hills and mountain areas are subject to soil erosion. Nepal is one of the countries on the world with the richest diversity in eco-systems – from river deltas with 70 m up to the peak of Sagarmatha at 8,848 m (which is also known as Mt. Everest). Climate change is visible at many places. One of the most significant evidence is the reduction of glacier and increasing variability and uncertainty of the monsoon precipitation pattern in terms of quantity and duration.

Overall with the economical, social and geographical situation, Nepal has a challenging task in developing the country while also facing limited financial sources. But still with its rich diversity in nature, ethnicity, culture and geography there is also a high potential which needs individual solutions each based on the different conditions of the surroundings.

3.3 Renewable Energy Technologies in Nepal

Renewable energy is generated from natural resources such as sunlight, wind, rain, tides, bio-mass and geothermal heat, which are renewable (naturally replenished). With the help of technologies, energy can be turned into electricity, heat or other forms of energy. Renewable energy technologies have already a long track record in Nepal. With around 650 MW (2007/08), hydropower is the major source for electricity generation and provides more than 90% of the required power. Also bio-gas, using bio-mass as input material, is already widely used in Nepal and can be used for cooking and lighting, replacing fire wood and kerosene. With the help of sunlight, photovoltaic generates electricity that can be stored in batteries and used for lighting in the evening. This technology is also well-known in Nepal and serves especially in areas with no hydropower potential for lighting purposes. Other technologies also include wind power generators, geothermal power or others that are less important in the context of Nepal.

Renewable energy technologies such as bio-gas, improved cooking stoves, mini/microhydropower and solar energy technologies have been widely promoted in Nepal. Bio-fuel, wind energy and geothermal energy technologies are still at the primitive stages. Renewable energy technologies have preferences over the conventional energy technologies because of more than one reason. First, the excessive dependence on traditional bio-mass energy (fuel wood, agricultural residues and animal wastes) and their inefficient use has undesirable implications for the environment, health and economy. Secondly, commercial fuels are not easily available in the remote areas. Most of the rural areas in Nepal do not have access to electricity from the national grid and the situation is unlikely to change in the near future because the national

grid is already over-burdened, the terrain in the hills and mountains is difficult and population density is low. The price of commercial energy, wherever available, is generally beyond the purchasing capacity of rural people (ICIMOD, 2006). Despite its importance and desirability, a major hurdle in promoting renewable energy is its high installation cost. Sustainability of renewable energy is often questioned, as it cannot freely compete with grid electricity and petroleum fuels in the existing national and global market and energy systems.

Hydropower schemes in the range of 100 kW to 1,000 kW are generally termed as minihydro and those of less than 100 kW as microhydro. The micro and minihydropower schemes are suitable and common choice for rural hills and mountains of Nepal due to low capital investment, simple technology for which Nepal has in-country capacity, mountain topography, fairly high rainfall, numerous streams, and scattered rural settlements and communities. To identify the potential of hydropower especially in the rural areas, a carpet study has been conducted by the Alternative Energy Promotion Centre (AEPC). According to this study, 659 projects have been identified as technically possible and financially viable. These are in total around 17 MW (AEPC, 2008). In this survey not all districts have been covered and districts already being grid connected have been excluded. The following map shows the districts with the most promising potential:

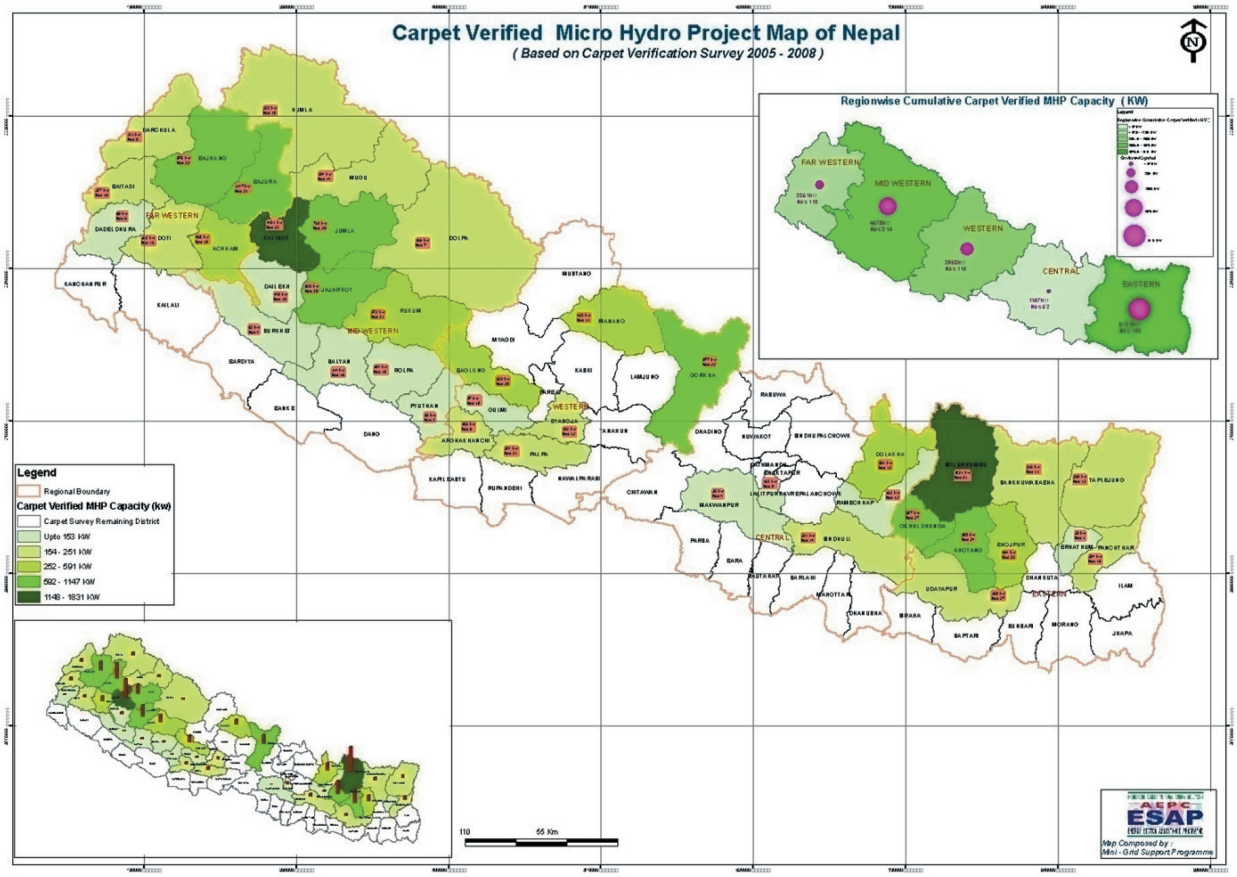

Figure 2: Map of microhydro potential, Source: AEPC

Despite its potential and advantages, there are constraints and obstacles to mini/microhydro's widespread development. The electricity generated from microhydro has been used mainly for evening lighting. Thus, the peak load occurs from 6 pm to 9 pm with low utilization at other times. Low load factor is a consistent problem for mini/microhydro and affects the sustainability of these schemes. There is a need to link microenterprises in rural communities. Repair and maintenance is a major problem faced by mini/microhydro plants installed by outside agencies. Operation, maintenance and management are done

locally, but there is general lack of technical skills and management capacity at the local level. Mini/microhydro plants and civil structures are susceptible to damage by landslides and monsoon floods due to the mountain terrain and high rainfall. Some studies have reported that the traditional water wheel less than 1 kW has been in use in rural Nepal for centuries for agro-processing. However, the data shows the development of microhydro since 1962. Till 2008, the total numbers of MH was more than 2,000 with total installed 13.12 MW in more than 57 of the 75 districts in Nepal.

Bio-gas, a methane-rich gas, is produced by anaerobic digestion of animal and human excreta. Livestock keeping is an important and integral part in Nepal's rural livelihood and farming system. Bio-gas plants are particularly suitable in the Terai region where the climate is generally warm. As they require animal dung, rural households with livestock are potential users; however, the poorest of the poor who have no livestock are unlikely to benefit. The estimated potential for bio-gas production in Nepal is around 1.9 million family-sized bio-gas plants. So far, more than 200,000 domestic bio-gas plants have been installed in different districts of Nepal (BSP-N, 2009).

Solar energy has been traditionally used for drying crops, clothes, fuel wood and others. Nepal has about 300 sunny days a year and the average insolation is 4-5 kWh/m^2/day. Nepal's solar energy potential is estimated to be about 26 million MW. There are basically two methods of utilizing solar energy-solar thermal system and solar photovoltaic system. Solar thermal systems use solar radiation directly for heating, whereas solar photovoltaic systems generate electricity from solar radiation. The mountains and hills have great solar energy potential. According to a study carried out by AEPC under SWERA/UNEP, 2008, the commercial potential for solar power for grid connection is 2,100 MW if only 2% of the land area of Nepal is considered as suitable land. This shows the exploitable area for grid integrated PV potential is significantly high in the country. Although solar PV started since 1963, it has been popular and promoted significantly since 2000. Till 2009, the total installed numbers of solar PV have reached to more than 200,000 with total capacity of 4.7 MW. Solar PV is emerging as an important RE sources for household lighting in rural areas where there is no feasibility of hydropower and other options. Government is providing the subsidy for installation of solar PV, solar driers and cookers in Nepal.

Wind power development is still at an experimental stage, and very few efforts have been made so far to harness wind energy in Nepal. Lack of wind data for proper assessment of wind energy and lack of technical expertise are the main obstacles to wind power development in Nepal.

3.4 Climate and Climate Change in Nepal

There are three distinct climatic regions in Nepal: 1) Sub-tropical: The Terai, the Inner Terai and lower foot hills have a sub-tropical climate. In this region, there are three seasons – the hot and dry summer from March to June followed by the rainy season from July to October and the cool winter season from November to February. The annual mean temperature is between 20-25 degrees Celsius. The average rainfall is between 1,100-3,000 mm. 2) Temperate: The area between Mahabharata range and the Himalayas has a temperate climate. Summers are warm and winters are cool. Annual mean temperature is 10-20 degree Celsius and the average annual precipitation is 275-2,300 mm. 3) Alpine: The Himalayas and the Inner Himalayas have Alpine type of climate. Winters are severe while summers are cool and short.

The average annual rainfall of the country is about 1,530 mm. But there are sharp spatial and temporal variations in rainfall. The pattern of rainfall distribution varies in both north-south and east-west directions. The monsoon rain is more intense in the east and gradually declines westwards, while the winter rain falls comparatively more in the north-westwards and goes on declining to south-east. The

rainfall pattern and the existing rugged and mountainous topography have resulted in the existence of rich natural biodiversity in Nepal. Moreover, around 39.6% of the country's total land is covered by forest of which nearly 18% are protected areas.

An analysis of about 30 years of observed temperature of Nepal has shown that maximum temperatures in Nepal are increasing at an alarming rate. The average warming in annual temperature between 1977 and 2000 was 0.06°C per year. Such warming is found to be more pronounced in the northern high altitude regions of Nepal. Further, warming in the winter is more pronounced compared to other season. In general, increasing trend is dominant over most of the country. The projection indicates that it could be warmer in Nepal by 4°C in winter and 2.5-3°C in summer by the end of this century. The assessment of 12 recent GCMs by OECD also shows a significant and consistent increase in temperature projected for Nepal for the years 2030, 2050 and 2100 across the various models. In terms of precipitation, the models predict almost no change in the western part and 5-10% increase in the eastern part of the country in winter season. During summer, however, the whole country is expected to experience increase in precipitation in the range of 15-20%.

3.5 Rural Financial System

3.5.1 Financial Sector and Regulations in Nepal

In recent years, the financial sector in Nepal has been undergoing some major changes. In February 2004, a new Banking and Financial Institution Ordinance (BFIO) was passed with the objective of bringing all banks and financial institutions together under a single law. Until that time, banks and financial institutions were established under separate Acts. For example, commercial banks were established under Special Acts specifically related to their category. The Agriculture Development Bank of Nepal was included under the Agriculture Development Bank Act 1968, while the development banks were licensed under the 'Development Bank Act, 1995.

As a result, an umbrella act, the 'Bank and Financial Institutions Act' was passed in 2006. All commercial banks, development banks, finance companies, microfinance development banks are regulated under the umbrella law as 'Class A', 'Class B', 'Class C' and 'Class D' institutions respectively (Adhikary et al., 2007). Nepal Rastra Bank (NRB), the regulatory body for the financial sector in Nepal, has been positive in recent years towards issuing policies in favour of the development of the microfinance sector. The new regulations of NRB have made provisions that facilitate the establishment of different types of microfinance institutions:

Microfinance development banks (MFDBs)

A small MFDB can be established with paid-up capital of Rs.10 million to operate in three districts outside Kathmandu. For operating in 4-10 districts outside Kathmandu, the paid-up capital requirement for an MFDB is Rs.20 million, and for a national level microfinance bank Rs.100 million is required. For every Rs.2.5 million of additional capital, another district can be included under an MFDB's area of operation. With a view to expand microfinance programs in the hills and mountains, NRB also allows MFDBs to expand their programs to an additional five hill districts without injecting additional paid-up capital. These banks can provide loans to the poor up to Rs.60,000 without collateral and above the amount up to Rs.150,000 for microenterprise with physical collateral (NRB, 2002).

Financial Intermediary NGOs

Licenses can be issued to financial intermediary NGOs (FINGOs) by NRB for conducting microfinance operations under a special Act named the 'Financial Intermediaries Act, 1998 (amended in 2002)'. An NGO cannot operate a microfinance program without getting a license for financial intermediation from the central bank. Before getting a license of microfinance operation from NRB, an NGO has to be registered with the respective District Administration Office. However, recently NRB stopped providing new licenses to NGOs until a separate second-tier organization for regulating the financial NGOs is established (BWTP, 2009).

Savings and Credit Cooperatives

Savings and credit cooperatives (SCCs) are regulated by the Department of Cooperatives, under the 'Cooperative Act, 1991'. A group of 25 persons in a community can apply at the District Cooperative Office for registration of an SCC. In accordance with the law, an SCC can provide service only to its shareholder members. A few years back, NRB had given Limited Banking License to a few cooperatives to allow them to serve non-members too. NRB has now stopped issuing such licenses to new cooperatives due to its inability to supervise these institutions regularly. It has been found that most of these cooperatives have not adhered to the directives of NRB (NRB, 2007).

3.5.2 Existing Rural Financial Mechanism

Over the past two decades, Nepal's financial sector, along with the number and type of financial institutions, has grown rapidly due to reforms and liberalization in the sector. Yet in most parts of the country, the access to financial services remains limited to a small segment of the population. Institutions providing financial services are grouped into two broad categories: formal and informal. Formal institutions are banks, finance companies, microfinance development banks and regional rural development banks and financial NGOs and cooperatives—both licensed and not licensed by Nepal Rastra Bank. Informal institutions include family members, friends, moneylenders, shopkeepers, landlords, and employers (Ferrari et al., 2006).

The World Bank Study "Access to financial services in Nepal" points out several facts in the following table:

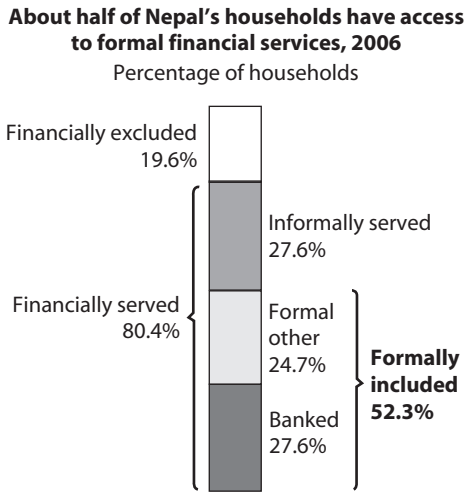

Figure 3: Access to financial services, Source: Ferrari, et al., 2006

About half of Nepal's households do not have access to formal financial institutions, which includes banks, financial intermediary NGOs (FINGOs), cooperatives and finance companies. The informal sector, on the other hand, includes money lenders, traders and friends. Poorest of the poor mainly borrow from family and friends and this source makes up the largest source of informal loans.

In comparison to urban people, rural people are deprived of bank services, as most of these formal financial institutions are located in the urban areas. Bank procedures are perceived as cumbersome by rural and low-income people.

Only 28% of Nepalese households have accounts with banks or have taken loans from banks.

Another 25% have accounts or loans from formal financial institutions other than banks. Some 28% rely solely on informal financial sources, while 20% are financially excluded and receive no service from the formal or informal financial sector. The total rural credit requirement in the country is estimated at Rs.23.3 billion, while the total supply from the formal and semi-formal sectors is only Rs.9.6 billion. Of the approximately 2.1 million households living below the national poverty line, nearly half are deprived of services from the formal microfinance sector (BWTP, 2009).

The following table shows the differences between rural and urban areas. Most bank accounts are in the Kathmandu valley and other urban areas. In the rural areas FINGOs or cooperatives play a significant role in providing financial services. Still in the rural areas 55% of the population have no accounts compared to only 23% in the urban regions.

Table 1: Household access to banks

Household access to bank accounts in urban and rural areas, 2006

(percentage of households in each area)

Area	No account	Bank	Finance company	MFDB or RRDB	FINGO or cooperative	Multiple accounts
Kathmandu and Lalitpur	23.8	50.5	9.5	1.0	2.4	12.9
Other urban areas	27.1	43.3	3.3	1.0	12.9	12.3
Rural	55.4	15.9	0.2	4.4	19.3	4.7
Average	51.0	20.4	0.9	3.9	17.9	5.9

Source: Ferrari et al., 2006

Table 2 indicates that there is high percentage of informal lending in urban and in rural areas. It is no surprise that informal lending is more used in rural areas. Easy access, very simple loan decision making processes, quick delivery of loans, flexibility in loan size and its utilization are some of the reasons for the use of informal sources of loans (BWTP, 2009; Ferrari et al., 2006).

Table 2: Households with and without credit by region

Households with and without credit in urban and rural areas, 2006

(percentage of households in each area)

Area	None	Formal only	Informal only	Both
Urban	43.4	18.3	26.0	12.3
Rural	30.0	14.4	39.6	16.0
Average	32.1	15.0	37.5	15.5

Source: BWTP, 2009; Ferrari et al., 2006

In general all microfinance institutions serve only their members. These MFIs generally provide short-term loans of less than 18 months for productive uses such as agriculture, livestock, poultry, petty trading, and grocery stores. Except for SCCs, MFIs in general do not provide loans for consumption or social activities. Most of them offer compulsory group savings and voluntary individual savings services. A few microfinance banks and cooperatives now offer remittance transfer service products. Due to the lack of insurance services available in rural areas, most MFIs have offered some institution-based protection schemes related to livestock death and life insurance.

3.6 Policies for Promotion of Renewable Energy Technologies

The policies in the RE sector are scattered in various documents and executive orders. They include the policy statement of the Government made in the periodic plan mainly five year development plans, government orders (policies during the annual budget announcement and policies approved by cabinet, laws enacted by Parliament) and notices. Although there is no RE Act in Nepal, there exist the Water Resource Act 1992, Electricity Act 1992 and the Hydropower Policy 200, which are mostly related to hydropower including microhydro as well as the Renewable Energy Policy 2006 and RE Subsidy Policy 2008.

3.6.1 Rural Energy Policy 2006

The Government of Nepal promulgated its Rural Energy Policy in 2006. This is its first national policy on RE sector with focus on decentralization to some extent. The overall goal of this policy is to contribute to rural poverty reduction and environmental conservation by ensuring access to clean, reliable and appropriate energy in the rural areas. Some of the major aspects of this policy are capacity of the local bodies for planning, implementation, monitoring and evaluation, increase involvement of private sector, community management, diversification of productive end-uses and research and development.

3.6.2 Subsidy Policy for Renewable Energy 2009

The Government revised the subsidy policy for RE in 2009 with the objective of increasing development impact in terms of service delivery efficiency and increased access to rural poor and disadvantaged people. The policy has provisions of providing subsidy to hydropower up to 500 kW, solar energy, bio-mass (bio-gas, Metallic ICS), improved water mill and wind energy. This subsidy policy is more inclusive as it focuses on remoteness, poor and disadvantaged people and low caste. There is a financial subsidy in solar photo-voltaic (PV) system and the amount of which depends on the size of the PV and the geographical location of the recipients. The average size of the system sold is around 20 kWp. Due to transport costs, the subsidy is higher in more remote areas. The subsidy for SHS contributed is on an average around 40% of the total investment costs. For the PV systems of 5-10 Wp, the subsidy amount is NPR2,000; for the PV systems of 10-18 Wp, it varies from NPR5,000 to NPR7,000; and for the systems more than 18 Wp, it varies from NPR6,000 to NPR10,000.

Generally, the subsidy is being provided to micro/minihydro plants below 500 kW installed capacity for installation and for rehabilitation. The subsidy for microhydro is calculated at two ceilings – one ceiling is per kW and the other ceiling is per household electrified. The lower ceiling is applied for the subsidy approval. There is also a transportation subsidy that is approved based on the remoteness – the distance in km to the next road ahead. Sometimes the nearest road can only be reached within a few days walk, which results in increased investment costs significantly – as all the construction materials have to be carried by porters to the site. For microhydro, the subsidy contributes up to 50% of the total investment.

The subsidy for bio-gas also distinguishes between remoteness and size – equal to the mechanism for solar home systems. The subsidy is around 30% of the total investment costs. The subsidy is given by the Rural Energy Fund (REF), a cash fund that is supported by different donor agencies (Danida, Norad, KfW) and administered by AEPC and one of its programs Energy Sector Assistance Program (ESAP). In the case of the Rural Energy Development Program (a program for community-managed microhydro jointly supported by the World Bank and the United Nations Development Program), the subsidy to the communities for the microhydro installation has been provided through the District Energy Fund (DEF). The subsidy is given through a transparent and clear mechanism that is soon qualified for ISO-Certification. To ensure quality of the technologies, AEPC has its own test station. The qualified technologies and manufacturers are shortlisted. This ensures that only proven quality is supported and installed at the household level.

Summarizing, renewable energies have a huge market potential in Nepal. As the technology is already proven and its quality monitored there is hardly any technical risk. Additional manufacturers offer a guarantee mechanism up to 2 years. To make the technology affordable to everyone, subsidy is contributing significantly to the total investment costs – between 30-50% depending on the technology. On the household level the technologies are easy to operate. Many technologies offer multiple appliances for lightning, cooking or others.

3.7 Issues in Rural Financing

This chapter combines the two aspects of renewable energies and finance that have been covered by the previous chapters. Though there are microfinance institutions in the rural areas and renewable energies have been promoted for some years, there are hardly any loans available for these technologies. This problem has been lately addressed by AEPC.

3.7.1 Lack of awareness and knowledge

In general microfinance institutions do not have any knowledge about renewable energies in terms of technical risks, required repayment period, etc. In general they have only short-term loans that do not suit the requirements of RET investments. Local financial institutions as well as the users themselves have only limited knowledge about the subsidy programs and other possibilities to get support.

3.7.2 Lack of funds

The loan amount that is often required for microhydro projects is beyond the capacity of the local financial institutions. Therefore they need additional funding from outside, which is in most of the cases not available. Though there are some institutions like the Rural Microfinance Development Centre (RMDC), the procedures are often connected to administrative efforts and organizational improvements that again are barriers for many microfinance institutions.

3.7.3 Lending concerns of commercial bank

Commercial banks are potential partners for placing funds at local financial institutions for investment into rural renewable energy technologies. According to existing rules and directives by the Nepal Rastra Bank they are obliged to lend a certain amount of their portfolio to the deprived sector. But there are existing practices that offer loop-holes so that hardly any money reaches the rural areas. Being asked about investments in rural areas, banks have been very reluctant. They raised a number of concerns.

- Securities:
  A major concern is the lack of securities. Banks are used to a bundle of securities like personal guarantee, landowner certificates and others. In the case of rural finance, banks fear that these kinds of securities are not enforceable in the case of default.
- Administration Costs:
  Going to rural areas implies high administration costs. To monitor a microhydro project needs several visits per year. Located in Kathmandu, this implies huge travel cost. Additionally compared to the other businesses, the loan amount is comparatively small so that from the banks perspective the profit out of rural energy lending is not competitive.
- Financial viability of renewable energy projects:
  For banks renewable energy investments in rural areas are financially not viable. In their opinion there is not enough cash-flow to repay the interest and the principal.

– Lack of knowledge:
  Most of the banks are not familiar with the renewable energy technologies. As a consequence they cannot consider the risks and the deposits that are required. The concept of project lending – the repayment is based on the cash-flow that is generated by the project – is not common practice.

From AEPC's perspective, further promotion of renewable energies needs the involvement of the financial sector. For a solid financial structure, investments on household level as well as on project level need access to credit. Only then can the outreach and widespread use of renewable energies in the whole country continue. Therefore high efforts have been undertaken to solve the current situation and motivate banks taking their role in the rural renewable energy finance.

3.8 Solutions in Financing Rural Renewable Energy Technology

The general model concentrates on financing solar home systems and microhydro plants. These two technologies offer access to electricity – which is considered to be the motor for further development and is also part of the millennium development goals to which Nepal committed itself. The major challenge lies in creating linkages between the urban banks and the rural areas. The general idea behind these linkages is to channel funds from commercial banks to microfinance institutions. These institutions act as local financial partners for the banks. The local partner will be responsible for the further lending to each household, collecting the repayment, monitoring etc. The following figure shows the model that is currently promoted:

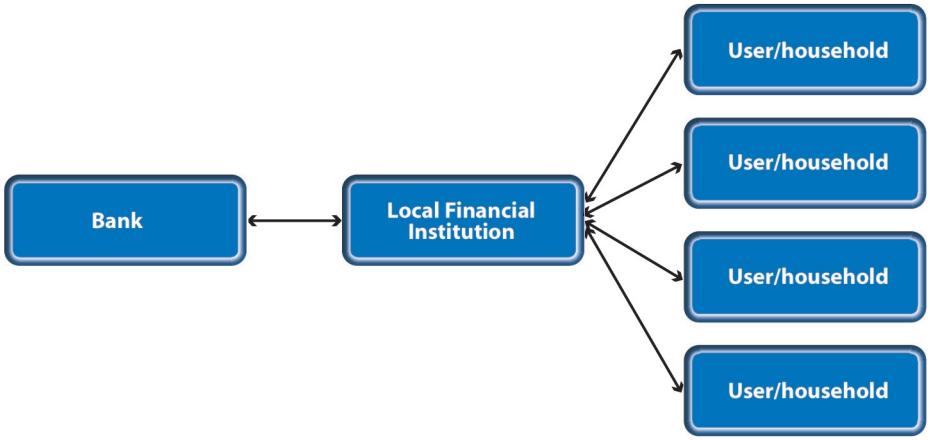

Figure 4: Proposed financial model for rural finance, Source: AEPC

This model has several advantages. Banks can reduce their administration costs as they will only do the wholesale lending to the local partner. This is efficient and costs only small administration costs. The local partner will do all the lending and documentation as it is required for proper bank practices. For each individual household, there can be different sorts of securities. This will satisfy the requirements of the banks and ensure the commitment of the household to repay its loan. The collaterals can be in form of cattle, landowner certificate, personal guarantee or others. The repayment rate can be arranged per the need of each household. In general the repayment rate is close to the amount of money that has so far been spent on kerosene. The local partner is responsible for the collection, monitoring and controlling of each loan agreement.

For the bio-gas program, there is a credit module in place that provides funds for microfinance institutions. The money, funded by KfW, is administered by the bio-gas credit unit of AEPC. Microfinance institutions can apply for a bulk loan for bio-gas plants that are going to be constructed within their area of activity. So far, more than 200 microfinance institutions availed of loan from the bio-gas credit unit.

3.9 Role of AEPC

AEPC is undertaking great efforts to promote and realize partnerships between urban banks and rural financial partners through its programs such as the Energy Sector Assistance Program. As a facilitator, funds have also been earmarked to cover the costs for technical insurance and debt insurance. Including Nepal's existing debt insurance company, DCGC is part of the strategy to involve all relevant partners. Instead of setting up a guarantee fund, DCGC is the matching partner for reducing the investment risks. Compared to a credit guarantee fund this approach is more challenging, but on the other hand has more potential as the total loan amount is not dependent on the limited amount that could be covered by a guarantee fund.

Additionally AEPC/ESAP is responsible for the capacity building of local partners as well as for the urban banks. Regarding the local partners the capacity, procedures and management processes have to be improved up to the needs of the commercial banks. Only then banks are willing to enter into partnership. AEPC/ESAP will keep up the support for the local partners until all loans of the households are repaid. Urban banks are receiving capacity building in renewable energy technology, project finance and risk analysis. This will make them more comfortable with the concept of project lending and helps them consider and reduce inherent risks. To reduce the administration costs, AEPC/ESAP is also willing to share the costs of the required field trips up to a certain level.

Overall AEPC/ESAP is using its broad network to bring banks, local financial partners and user committees of microhydro projects together. Particularly, AEPC/ESAP is providing the relevant information for banks which microhydro projects require loan. These documents cover cash flow analysis, technical analysis, feasibility study, among others. At the same time AEPC is looking for suitable local partner institutions. Bringing all partners together around one table is already considered a first-step success and the basis for entering into loan agreements.

3.10 Example of Successful Partnerships

In the case of solar home systems, a pilot project has successfully been carried out. In three districts, an assessment of the demand for solar home systems has been undertaken. On the basis of the demand, 20 microfinance institutions have been trained on technical and financial issues. To strengthen the institutions, accounting, bookkeeping, management, business plan training and the like are also conducted. Finally these institutions are introduced to urban banks as potential partners for renewable energy finance with sufficient potential for solar home systems – as the pre-assessment showed. So far two commercial banks entered into agreement with local partners and transferred already the first part of the agreed sum. This successful model will now also continue in three other districts. For the future it will be expanded to other technologies as well.

For microhydro projects, currently seven commercial banks are interested in financing. Suitable and financial viable sites have already been selected. It is expected shortly that the first microhydro project will be financed by a commercial bank.

3.11 Future Prospects of Rural Financing in Clean Energy Promotion

In financing renewable energy technology within a rural framework, everyone is entering a new ground. AEPC, as the apex body of the GoN for promoting renewable energies, is taking the lead role also in improving the access to these technologies for everyone. Facing high initial investment costs, this goal can only be achieved when financial services (loans) are available in rural areas. This is necessary because especially in rural and remote areas, people cannot make high cash contributions to cover the initial cost. Therefore to further continue its successful role as a promoter, AEPC wants to work together with financial institutions to create linkages between the urban and rural financial sector. This implies provision of training and capacity building of these partners in order to increase motivation and commitment. This in a way would reduce barriers to financing renewable energies.

Recently AEPC has been successful in creating partnerships in the field of solar technology. Capacity training of local financial institutions that face a high demand of solar home systems has been fruitful. A few banks finally lent money to those institutions that act now as their local partners. This successful program is to be replicated in other districts.

Regarding microhydro projects, many banks are willing to invest in the rural areas. AEPC/ESAP is currently training these banks in project and risk analysis. At the same time AEPC/ESAP is training local potential partners for entering into agreement with the urban banks. The first partnership for microhydro lending with a commercial bank will come soon and can be seen as a milestone and a great success for AEPC/ESAP.

In the future, financing rural renewable energy technology will be a standardized procedure. All relevant partners, the financial sector, the insurance companies and the users will be comfortable and familiar with the technological and financial aspects. AEPC, with its organizational structure, is already present in nearly all the districts and therefore plays a leading role for distributing information and offering support. AEPC is part of the bridge between the rural and urban regions and has also in the future the major responsibility to keep this bridge a living construction. This mechanism then is hoped to ensure access to finance which is the base for access to energy in rural areas.

Part 4

Recommendations

The linkage between renewable energy and financing is a new phenomenon, specially, in Asia. Given the newness of the potential linkage between the two, a mediator, specially the Government, will have to play a crucial role. Governments can also partner with institutions like APRACA, IFAD, NRB and other stakeholders to make this linkage happen.

With similar role and responsibility, APRACA, IFAD, AEPC and NRB and other stakeholders organized a forum in order to share experiences, innovations, plans, etc. in the renewable energy sector and its financing. The special intervention had, thus, formally begun in Nepal. The lack of awareness, lack of funds, access to financial services, high up-front costs and still primitive government plans and policies both in renewable energy sector and financial sector make it a difficult task for the practitioners. Therefore, the participants who are also the practitioners have recommended several points to governments, financial institutions, private sector and the rural communities, based on the group work during the forum itself.

It is with positive intention that the forum had begun and by the end of the second day, when the technical sessions were completed, the forum had been successful in delivering the positives and ended on a high note.

This study shows many experiences from many countries. Some of the countries already have a track record in rural renewable energies so they provide useful experiences for other countries. But also countries that have taken only a few steps so far can contribute to these recommendations.

4.1 Role of the Government

For creating a conducive environment, a policy for renewable energy should be in place. Setting funds to promote RET financing following a public-private partnership model has shown good results. Also facilitating carbon trading for all RETs at the international market is an important aspect that should be considered in all countries.

Experiences have shown that governments should not engage in direct lending in microfinance and project financing because in most cases, this results to politicized lending. Instead, government agencies can outsource the activity to formal banks, development finance institutions and microfinance institutions which have better financing technologies and are better connected with the community.

In general governments should provide orientation and technical support. Offering additional funds in form of a refinance program for RET loans could be a good solution to support the financial sector via central bank regulations. Furthermore, allocation for lending in the RET sector, for example 1%-5%, will lead to a sufficient supply of RET loans. This support for RET lending could also be in form of a credit line for promoting RE products.

Besides the regulatory framework, partnerships between financial organizations, local partners, service providers and manufacturers play an important role and should be promoted. This network can be used for risk mitigation, information transfer and knowledge network. Also, insurance companies should be part of this network and provide required insurance products to users and banks.

Governments, research institutes and universities are also important in the field of monitoring and research. The assessment of the satisfaction on loan policy and loan procedure, about RE technology in general, social and environmental issues, technical appropriateness, effectiveness of policies and more is a crucial task that has to be taken care of. Also research in these fields is important to improve and develop the existing policies, framework and regulations.

4.2 Role of Financial Institutions

Commercial banks should focus on the wholesale lending and microfinance institutions on retail lending. Track record-based financing for microfinance institutions should be promoted. Therefore effective coordination and networking among concerned agencies is necessary. New approaches in product delivery should be developed and used by commercial banks (e.g. community-based project, self-help groups). Third parties (agents) should be involved to facilitate borrower selection, disbursement, recovery and technical assistance to help banks invest via wholesale lending. Equity principles as well as corporate social responsibility should be in place.

4.3 Role of the Private Sector

The private sector should provide quality products without uninterrupted supply. The private sector should be open to connect with banks and local financial institutions. To support the availability of loans, insurance services for RET should be provided.

4.4 Role of the Community

It should also be the role of the community to harmonize among users and communities in order to make larger projects happen. Partly it should also be the communities' responsibility to create awareness and explain the benefits of RET. In case of loan, the community should encourage each household to avail of a loan to purchase RET – as long as the particular household has sufficient repayment capacity and pays promptly.

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Annex 1

Program Schedule

Monday, March 1, 2010	
	Arrival of Delegates and Participants Check-in at the Everest Hotel, Kathmandu
Tuesday, March 2, 2010	
08:00–08:30	Registration
08:30–09:45	Inaugural Session – Welcome address by: Mr. Benedicto S. Bayaua, Secretary General, APRACA – Remarks by: Dr. Ganesh B. Thapa, Regional Economist, IFAD Asia Division – Remarks by: Dr. Narayan Prasad Chaulagain, Executive Director, Alternative Energy Promotion Centre, Nepal – Inauguration and opening address by Honorable Deputy Governor Bir Bikram Rayamajhi, Nepal Rastra Bank – Closing remarks by Mr. Vishnu Nepal, Executive Director, Nepal Rastra Bank
09:45–10:05	Photo session and Break
10:05–10:15	Forum Introduction: Mr. Benedicto S. Bayaua, Secretary General, APRACA
10:15–11:15	Plenary Session: Renewable Energy Technologies and Rural Finance: Experiences and Success Stories from Nepal by Dr. Narayan Prasad Chaulagain
11:15–12:15	Presentation by Dr. Ganesh B. Thapa, IFAD Asia and the Pacific Division Regional Economist
12:15–14:00	Lunch
14:00–17:00	Presentation by Country: Bangladesh, Cambodia, Lao PDR, Mongolia Presentation by Nepali Institutions
Wednesday, March 3, 2010	
09:00–10:00	Plenary Session: Renewable Energy Technologies and Rural Finance: Experiences and Success Stories from Nepal by Dr. Narayan Prasad Chaulagain
10:00–10:20	Break
10:20–11:20	Presentation by Country: Thailand, Philippines
11:20–12:15	Group Workshop: Moderated by Mr. Benedicto S. Bayaua
12:15–14:00	Lunch
14:00–15:30	Group Workshop
15:30–16:15	Group Presentation of Workshop Output – Group A – Group B – Group C
16:15–16:30	Summary and Recommendations Mr. Benedicto S. Bayaua Dr. Ganesh B. Thapa Dr. Narayan Prasad Chaulagain

16:30–17:15	Closing Ceremony – Closing Remarks by Mr. Benedicto S. Bayaua – Closing Remarks by Dr. Ganesh B. Thapa – Vote of Thanks – Certificate Distribution and Closing Remarks by Honorable Acting Governor, Krishna Bahadur Manandhar, Nepal Rastra Bank
18:30	Closing Dinner jointly hosted by Agriculture Development Bank Ltd. and Rastriya Banijya Bank at Nepali Chulo Lazimpat, Kathmandu.
Thursday, March 4, 2010	
	Field Visit to a Rural Finance Project
Friday, March 5, 2010	
	City Tour Farewell Dinner Hosted by Mr. Vishnu Nepal, Executive Director, Nepal Rastra Bank at the Everest Hotel, Kathmandu
Saturday, March 6, 2010	
	Departure of Participants

Annex 2

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About APRACA

APRACA stands for the **Asia-Pacific Rural and Agricultural Credit Association**. Under the auspices of FAO, rural finance and agricultural credit institutions in the region formally launched APRACA during its first General Assembly Meeting in New Delhi, India on **October 10-14, 1977**, held in conjunction with the Third FAO Asian Conference on Agricultural Credit and Cooperatives. Its Constitution and By-laws were also adopted during the meeting.

Vision: APRACA aspires to work for rural growth and development, with priority emphasis on the uplift of rural poor.

Mission: APRACA pursues promotion of the efficiency and effectiveness of rural finance and access to financial services in order to broaden the target group.

Objectives:

- Fostering cooperation in **improving and planning the financial arrangements** for rural and agricultural development;
- Establishing among the members, a machinery for **systematic interchange of information** on sustainable rural and agricultural financial services;
- Encouraging and assisting in undertaking **inter-country studies** on matters of common interest in the field of rural finance, and publishing and distributing such studies;
- Organizing and coordinating **training programs** on rural finance, and facilitating the exchange of personnel/experts among its members;
- Providing services related to **consultancy, research** and **publications** in the field of rural finance; and
- Facilitating cooperation on **rural finance projects** between its members and donors, including assisting in project proposal preparation and project implementation.

APRACA has a total of 58 member institutions in 23 countries. It is based at the UN-FAO Regional Office for Asia and the Pacific premises in Bangkok, Thailand.

About AEPC

Alternative Energy Promotion Center (AEPC) is a Government institution established on November 3, 1996 under the then Ministry of Science and Technology with the objective of developing and promoting renewable/alternative energy technologies in Nepal. Currently, it is under Ministry of Environment. It functions independently, and has a nine-member board with representatives from government sector, industry sector and non-governmental organizations. The mission of AEPC is to make renewable energy mainstream resource through increased access, knowledge and adaptability contributing for the improved living conditions of people in Nepal. AEPC aims to be an institution recognized as a regional/ international example of promoting large-scale use of renewable energy sustainable and a national focal point for resource mobilization. The focus is to make AEPC recognized as an active institution promoting Renewable Energy Technology (RET) in the region.

Dr. Chaulagain is the current Executive Director of Alternative Energy Promotion Center. He holds a doctoral degree in Energy Economics from the University of Flensburg, Germany. He has been associated with the energy and renewable energy sector for the past 25 years.

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