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Going Beyond Climate Change Towards Sustainable Development

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The year 2002 is clearly an important one with respect to environment and development, hosting three major events — World Summit on Sustainable Development (WSSD) in Johannesburg, Assembly of the Global Environment Facility (GEF) in Beijing, and the Eighth Conference of Parties (COP 8) to UNFCCC in New Delhi. However, the overall outcome of these mega events needs to be put in perspective. The recently concluded WSSD has been long on rhetoric of promises, and very short on commitment. The second Assembly of GEF took place in the background of donor countries having committed $2.92 billion in replenishment; however, it needs to be seen how GEF is going to reform itself to be able to make a real impact in achieving global environmental benefits. The COP 8, taking place from 23 October to 1 November, has a little more enthusiasm surrounding it after the promises of ratification by Russia and Canada appeared to save the Kyoto Protocol and the Clean Development Mechanism (CDM) from becoming null and void.

While the Protocol was itself teetering on the brink of collapse, several parallel and complementary initiatives have done much to further the cause of climate change mitigation. Important among these are the scientific studies carried out under the aegis of IPCC; financial mechanisms such as Prototype Carbon Fund (PCF) of the World Bank and CERUPT of the Netherlands; capacity building initiatives such as PREGA of ADB, and USAID efforts in India; efforts at developing measuring tools as that of WRI/WBCSD and Winrock International; and programs by several national governments in engaging stakeholders in the climate change debate. All these activities have advanced the awareness regarding climate change, and prepared industry and other stakeholders to participate in the global negotiations in a meaningful way, and should strengthen the Protocol and CDM when they become operational. The activities at COP 8 are expected to take this process forward in a concrete way.

However, one of the key issues, indeed a major concern for most developing countries, is how the climate change mitigation mechanisms could address the issue of sustainable development. Although Articles 2 and 12 of the Protocol clearly mention sustainable development as a primary objective along with GHG emission reduction, the debate on this has not received adequate attention by the Annex I countries. Negotiations on whether LULUCF (land use, land use change and forestry) should be included under CDM so that carbon credits could be acquired at low-cost, or whether renewable energy and energy efficiency options should be 'fast-tracked' since they are expensive, tended to minimize the importance of sustainable development considerations. A limited focus on cheap carbon credits could result in developed countries being able to meet their reduction targets, developing countries earning a few bucks in the short run, but is likely to give short shrift to

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Editor's Note: The COP 8 issue of REPSOurce/REPSOVision, a joint publication of the Clean Energy Group, Winrock International, USA, and Winrock International India, with funding from USAID, takes up the link between climate change and sustainable development issues.

Climate Change and Renewable Energy

For those wanting to see a strong commitment to promoting renewable energy technologies on the part of the participating nations, the final outcome of the World Summit on Sustainable Development (WSSD) in Johannesburg came as a major disappointment. No specific targets could be set nor could resource commitments be made. One of the bright spots at the otherwise lackluster WSSD however, was the announcement by Russia and Canada that they would be ratifying the Kyoto Protocol on global climate change. This will enable the Protocol to meet the requirement of endorsement from countries accounting for at least 55% of the global GHG emissions. The Clean Development Mechanism (CDM) could now become a reality, and the Conference of Parties (COP 8) to be held at New Delhi in October assumes significance as many of the rules and regulations to operationalize CDM are expected to be finalized at this meet. This is good news for clean and renewable energy (RE) technologies.

RE technologies satisfy two of the key objectives of the Kyoto Protocol: GHG emission mitigation, and sustainable development. These technologies have made impressive strides in the last few decades, and some of them, like wind and small hydropower, have even begun to compete with fossil fuels in specific countries and market niches. Many developing countries, such as China, India and Brazil, have implemented large rural energy programs based on renewable energy sources. In spite of this, the penetration of renewable energy technologies remains low, with only about 2% of total power being generated from renewables. A number of barriers including high front-end costs and lack of access to financing have been impeding the progress. Continuing subsidies and state incentives for fossil fuels have persisted to show renewables in an unfavorable light. CDM and other flexible mechanisms under Kyoto provide an additional and significant opportunity to access additional resources for promoting these technologies. The revenue streams to be generated from trading in the avoided carbon emissions from clean and renewable energy projects are likely to render many technologies economically viable, while accelerating commercialization and technological transfer. Given the commitments of industrialized countries to reduce GHG emissions under the Kyoto Protocol, the carbon market is likely to be very substantial.

Source: www.winrock.org

Winrock International has been a global leader for nearly two decades in fostering the use of cost-effective, clean and renewable energy technologies around the developing world in conjunction with the overall goal of sustainable development and poverty alleviation. Winrock's experience through our Renewable Energy Project Support Offices (REPSOs) in several countries has spawned many best practices in implementing clean energy programs in Africa, Asia and Latin America. Apart from providing clean and reliable energy services, many of these projects promoted local capacity building and redressed gender biases, two of the essential requisites for sustainable development. As an extension of this, Winrock has now taken lead in highlighting climate change impacts of these initiatives. Winrock is today recognized as a leader in measurement of carbon emissions and inventories from different sources.

In this context, the special issue of REPSOurce-REPSOVision, published on the occasion of COP 8, serves to showcase the accomplishments of Winrock International around the world and the benefits of climate change and sustainable development accruing from them. In addition, contributions from well-known experts in the field highlight the major issues in climate change, and expectations from COP 8.

I am particularly glad that this is a joint initiative between Winrock International and its affiliate organization, Winrock International India. Decentralization and partnership with local in-country organizations has been part of Winrock's global vision, and I am happy to see that the first test case in India appears to be succeeding.

As far as COP 8 is concerned, I hope that the conference will serve, in contrast to WSSD, as a platform for agreement on concrete goals and commitments, and for the development of methods and the mobilization of resources for promoting sustainable initiatives including renewable energy programs.

Courtesy: Frank Tugwell, *President and CEO, Winrock International, USA*
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Climate Change Mitigation and Sustainable Development: Indo-US Cooperation

Over the past year, the mood settling over much of our planet has been one of uncertainty for the future. Security has obviously topped the global agenda, but other issues such as poverty, HIV/AIDS, growth in population and environmental concerns continue to cast a shadow on the outlook for a peaceful, sustainable way of living.

But in the face of so much uncertainty, a bright spot in this corner of the world has been a concerted, long-term effort by the US government to transform and strengthen our relationship with India in an expanding range of areas. In terms of climate change mitigation, we are building on many years of close technical cooperation and our maturing bilateral relationship.

The US is the world's strongest economy, and the largest energy consumer and GHG polluter. While sixth on the list of global polluters, India is the second fastest growing producer of GHG emissions that contribute to global warming. India's development imperative requires economic growth in order to lift some 350 million of her citizens out of absolute poverty. And it takes energy to fuel a growing economy, which we know from experience usually contributes to both local and global pollution. Yet Indians have begun to recognize that they have an opportunity to pursue economic prosperity in a sustainable manner through the use of cleaner technologies and best global practices in energy production, distribution, and end-use.

USAID's approach—by four decades of cooperation—has been one of "no-regrets" interventions that contribute to India's sustainable development while simultaneously arresting growing GHG emissions. A hallmark of the USAID/India program has been sustainability through an emphasis on commercialization of clean energy technologies. While a new concept in many parts of the world, the Indian business community, NGOs and the government have a well-established track record of working together for a cleaner environment. Such an approach was vindicated at WSSD in September, where the role of business in environmental protection was emphasized.

In a joint US-Indian statement signed during the 2000 visit of the US President, the Government of India set ambitious clean energy targets, including a 15% increase in energy efficiency, and a pledge that 10% of new energy would come from renewable sources. The US pledged to help India meet these ambitious targets. The momentum continued during Prime Minister Vajpayee's 2001 visit to the US with agreement on a new bilateral economic dialogue including energy and environment issues. The Indian government has since launched an ambitious program to render its power distribution system more efficient. Energy conservation recently got a major boost with the Prime Minister encouraging participants at an international conference to "walk the talk" of energy efficiency.

USAID's climate change program in India to date contributed to a reduction of more than 9.5 million metric tons of CO_2 emissions. USAID and Indian partners from Tamil Nadu to Punjab have co-financed eight power plants exporting power to the grid using sugarcane waste as a carbon-neutral biomass fuel. But the transfer of best US practices in operating coal-fired power plants has had the biggest impact. USAID's transfer of technical know-how from the US Department of Energy to the National Thermal Power Corporation (NTPC), which provides one-third of India's thermal power, is now expanding to several state utilities. With USAID assistance, NTPC has recently set up three Centers of Power Plant Efficiency and Environmental Protection (CenPEEPs) to spread this knowledge throughout India. We are proud to announce that during the 8th Conference of Parties of the UNFCCC, CenPEEP will receive the prestigious Climate Technology Initiative (CTI) award for its many accomplishments.

Over the years the US and India have developed a working paradigm for climate protection and sustainable development between the developed and developing world. Together, we are trying a variety of new approaches — integrated traffic management and alternative fuel vehicles (building on our work with the Indian private sector to commercialize electric vehicles), alternative financing models for renewable energy, the use of market forces to encourage energy efficiency on a massive scale, distribution-level power sector reform, and integrated energy and water activities. All are "no-regrets" options to address climate change that focus first on India's requirement for sustainable development.

The success of the USAID energy program can be attributed to a number of factors, but above all, to our Indian counterpart's interest in gaining access to the most current information in the field, and the energy and talent to use it. The challenges are daunting, and there are no guarantees of long-term global peace and sustainable development. Yet somehow, I have a sense of optimism for our countries' futures, and a vision fueled by clean technologies and the positive energy emerging from our newly transformed relationship.

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Climate Change: The Need for Capacity Building and Networking

Climate change has emerged as an important global environmental issue. The ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC) is stabilization of greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Climate change concerns have important implications for national economy. Indeed, at the national level, environment protection and sustainable development have emerged as key national priorities. Economic, energy, environmental, water, and food security, and provision of shelter and health for all, not only constitute critical priorities of the national planning process but also provide multiple linkage opportunities with climate change concerns.

India is a Party to the UNFCCC. Towards fulfillment of obligations under this multilateral treaty, various existing activities and new initiatives respond to the requirements under this Convention. Many research institutions are working on climate change issues and several Indian researchers have contributed significantly to global knowledge on climate change. As per obligations of being a Party to the UNFCCC, India has initiated preparation of the Initial National Communication (NATCOM) in accordance with the provisions of Article 12 of the UNFCCC, which includes, *inter-alia*, a national inventory of anthropogenic GHG emissions by sources and removals by sinks; general description of steps taken or envisaged to implement the Convention; and, documentation of any other information relevant to the achievement of the objective of the Convention.

A broad participatory approach has been followed involving universities, research and development institutions, government department, experts, scientists and non-governmental organizations. This arrangement facilitates utilization of prevailing sectoral and regional expertise in the exercise, promotes wider research on climate change issues, *inter alia* in inventory estimation, removal of uncertainties in estimates, vulnerability and adaptation (V&A) studies, and establishment of a national Data Center, thereby institutionalizing climate change research in the country. Specific institutional arrangements have been devised based on the component requirements.

Under the NATCOM project, a network of 19 institutions has been established for the preparation of this GHG inventory. Besides, an attempt has also been made to generate India specific emission factors for some key source categories by undertaking *in situ* measurements at 18 institutions and try to define the range in uncertainties in the estimates through statistical methods.

The potential impacts of climate change on Indian agriculture, water resources, forests, coastal zones, natural ecosystems, human health, industry and infrastructure are also being assessed in this project. This involves consistent construction of likely climate and socio-economic scenarios for India and assessment of extreme events using existing models and expertise. The work involves assimilation of existing research work, identification of vulnerable sectors and areas and a few specific case studies for each sector. A total of 34 national institutes are participating in this exercise.

The institutional networks for inventory estimation, uncertainty reduction and vulnerability assessment and adaptation have already been established and are operational under the NATCOM project. However, there are still many institutions in India that have individual researchers working on climate change issues. These are the potential partners and future centers of climate change research. It will be our endeavor to broaden the existing networks to include these research institutions, since it is important for creating a critical mass of researchers that would sustain climate change research in India. Networking mechanisms like data and information sharing are also being established and institutionalized. This would avoid duplication of efforts especially in data collection and ensure effective resource utilization. The networking efforts have to be simultaneously extended to another level to interface the research community with industry and policy makers. Industry would benefit from the latest scientific research, paving way for action on the ground. On the other hand, industry concerns and capabilities would also require to be reflected in research. Thus, climate change concerns will have to be brought more into focus in this networking, especially their linkages with sustainable development.

The Indian government visualizes the NATCOM initiative as an opportunity to enrich and enhance India's experience in identifying constraints, gaps and related financial, technical and capacity needs to respond to the continuing need for improving the quality of National Communications. Despite the comprehensive initiation of activities, there is considerable scope for improvement.

It is apparent that there is some way to go before climate change issues and concerns are institutionalized in India. A critical mass has to be created at academic and scientific research, industry and policy-making levels so that these initiatives are sustained, further strengthened and institutionalized. This is

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Catalyzing Renewable Energy through CDM Options: Barriers and Solutions

Renewable energy is destined to play a significant role in India's climate change mitigation strategies. The replacement of traditional fossil fuel-based energy with renewable energy offers great opportunities for emissions reduction under the CDM and AIJ mechanisms of the Kyoto Protocol. If properly tapped, these opportunities could result in increased funding and technology induction into the area of renewable energy. India is already gearing itself up for the opportunities arising on the horizon, and the ratification of the Kyoto Protocol in August 2002 is a major step in this direction.

Renewable energy has for long been an integral part of the Indian national strategy for sustainable development and poverty reduction. Development and utilization of non-conventional energy sources has been accorded a high priority in India for over two decades. India has the distinction of setting up the first dedicated Ministry for promoting renewables.

Application of renewable energy has brought about significant changes in parts of the Indian energy sector. Apart from power generation, application of these technologies has benefited millions of rural people by meeting their subsistence energy requirements in an environmentally benign way. India has today among the world's largest programs on renewable energy. Rapid strides have been made in the area of power generation through renewables, and over 3,500 MW, or about 3.5% of the total grid capacity in the country, is now based on renewable energy sources. The country has the world's largest deployment of solar photovoltaics (PV), comprising about 920,000 PV systems aggregating to 53 MW across 30 different applications. Over 3 million biogas plants, 33 million improved cooking stoves, a large number of installations for providing power to small-scale industries and for electrification of groups of villages have been set up in the country.

The Indian Government has a focused vision for development of renewables in the overall energy sector over the next few decades. A goal of adding 10,000 MW from renewables by 2012 has been set for the medium-term. It has also been decided to electrify 18,000 remote villages, which are not economically viable for extension of grid electricity, through renewables during this period. No other country has taken up an exercise of this kind and scale in the past.

In view of the potential of energy technologies in GHG emissions reduction, the Clean Development Mechanism (CDM) could become a strong instrument for harnessing renewable energy and energy efficiency in the country. Such projects offer excellent opportunities for GHG emission abatement. Projects under CDM, if properly designed and approved, could help in technology upgradation, investment and financing of renewable energy projects in the country. And because of the wealth and experience in the field, India is already well placed in the field of renewables to attract a sizeable number of projects for the country. The key to success lies in positioning ourselves properly in an increasingly competitive market.

Some of the renewable energy technologies are still evolving. CDM projects can become strong instruments for accessing leading international technologies. This would, however, be subject to evaluation, and would have to be project- and technology-specific. Implementation of CDM projects will increase access to energy services by stimulating the use of renewable energy. This, in turn, will result in reduction of GHG emissions and improve the sustainability of investments. On the other hand, it will also help in capacity building in the Indian industry for undertaking full-scale renewable energy investment projects in other parts of the world. MNES has constituted a Climate Change Advisory Group on Renewable Energy to suggest approaches for taking advantage of the opportunities, which are becoming available under CDM. In line with the Group's suggestions, MNES has initiated a series of studies for creating an enabling environment for large-scale CDM projects in the renewable energy area. The findings of these specialized studies will be freely shared with all the stakeholders including private promoters, consultants, etc.

There are many perceived barriers for undertaking large-scale CDM projects in the renewable energy sector. Presently, in view of the extremely low cost of Certified Emission Reductions (CERs) and the projected trends, the high transaction cost involved in formulating project baselines and validating procedures is likely to offset investment incentives provided by the CDM. In other words, the scenario in which the CER cost alone will make a project cross the rubicon of viability is, as of now, imaginary. In this scenario, it is apprehended that on the sheer strength of the CER cost alone, based as it is on carbon abatement costs, a floodgate for low-technology options has the potential of being opened (e.g., land-based carbon sequestration). As a result, there may not be an appreciable investment in the higher technology areas particularly, wind energy, solar photovoltaic and other emerging technologies. Further, in view of the anticipated availability of ERUs and AAUs under other provisions of the Kyoto Protocol, the size of the CDM market could shrink, thus implying that it is likely to remain a buyers' market. However, renewable energy

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GHG Protocol Initiative
Building International Accounting and Reporting Standards

The Kyoto Protocol & Emerging GHG Accounting Needs

The Kyoto Protocol is likely to enter into force by the end of this year when at least 55 Parties, including Annex I nations that account for at least 55% of 1990 carbon dioxide (CO_2) emissions, ratify the Protocol. Participating industrialized countries will be required, between 2008 and 2012 or the First Commitment Period, to meet reduction targets of GHG emissions relative to 1990 levels. Following this, the market-based mechanisms under the umbrella of the Protocol — international emissions trading, joint implementation, and the clean development mechanism (CDM) – would be made operational to facilitate the emissions reduction regime. For instance, under CDM, this would translate into individual companies in the industrialized countries with reduction targets investing in or purchasing low-cost credits from projects implemented in developing countries. As emissions reduction targets filter down to specific industries in various countries, there will be an urgent need to establish robust, comparable, and credible GHG accounting systems for measuring and reporting emissions at the company and project levels. The GHG Protocol Initiative aims at addressing this requirement.

The GHG Protocol Initiative

The GHG Protocol Initiative (GHG Protocol) is a multi-stakeholder partnership of businesses, NGOs, governments and other stakeholders led by the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI). Its mission is to develop internationally accepted accounting and reporting standards for GHG emissions and to promote their use by businesses, governments and other organizations.

The GHG Protocol Corporate Accounting and Reporting Standard, published in October 2001, provides standards, guidance and tools covering a range of issues, including:

- Setting reporting boundaries relative to upstream and downstream activities
- Accounting for emissions from partially owned entities
- Calculating emissions
- Tracking performance in a dynamic business environment (e.g., mergers, acquisitions and divestitures)
- Publicly reporting GHG emissions

A Project Accounting Standard is also in development to provide guidance to project developers and others on quantifying the reduction benefits of GHG mitigation projects. These standards, tools and guidance can be successfully utilized by companies to meet the requirements of future government regulations and emissions trading schemes.

The GHG Protocol Corporate Accounting & Reporting Standard

As companies account for, report, and ultimately reduce GHG emissions, they need guidance on how to develop a GHG emissions inventory and establish a base year from which to track emissions performance. The GHG Protocol Corporate Standard helps companies and other organizations:

- Develop a credible GHG inventory underpinned by GHG accounting and reporting principles
- Account and report information from global operations in a way that presents a clear picture of GHG impacts and facilitates understanding as well as comparison with similar reports
- Provide internal management with valuable information on which to build effective strategies to manage and reduce GHG emissions
- Provide GHG information that complements other climate initiatives and reporting standards, including financial standards.

The Corporate Standard was developed over a three-year period by a partnership of over 350 individuals from corporations, non-profit organizations and governments. It was tested by over 30 companies in 9 countries and is supplemented by 11 user-friendly computation tools. These tools have been peer-reviewed and tested by experts and industry leaders and represent the current best practices. The tools address emissions from stationary combustion, mobile combustion, aluminium, iron and steel, nitric acid, ammonia, adipic acid, cement, lime, HFC 23 and semi-conductors (www.ghgprotocol.org).

Designed to accommodate the needs of many users and uses, the Corporate Standard provides relevant and accurate information for a variety of goals, including compliance with regulatory/government reporting, GHG risk management, public reporting/participation in voluntary initiatives, baseline protection and participation in GHG markets. The inherent flexibility of the Standard will aid companies in meeting a variety of government requirements across countries participating in the Kyoto Protocol. It will also serve companies intending to participate in a variety of GHG trading systems, which may have differing requirements but are likely to mandate rigorous and verifiable inventories as well as robust baselines from which to track emissions.

Development of the Project Accounting Standard

The GHG Protocol is also developing a Project Accounting Standard that will be relevant to international and national emissions trading schemes that have a credit trading component (e.g., Kyoto Protocol Clean Development Mechanism; UK Emissions Trading Scheme; and voluntary trading schemes, such as the US-based Chicago Climate Exchange). The standards and guidance will address both emissions reduction projects (e.g., through fuel switching or upgrading the energy efficiency of equipment) as well as projects that absorb or sequester emissions (e.g., biological sequestration in managed forests). The GHG Protocol project guidance aims to provide a number of benefits, including:

- Reducing transaction costs for project developers
- Facilitating identification of new GHG reduction opportunities
- Improving credibility and consistency of the quantification of GHG project reductions
- Improving transparency and accuracy in quantification reporting procedures for GHG reduction projects, which will be essential to prevent double counting
- Facilitating and accelerating the required government acceptance and approval procedures for proposed projects in host countries.

The various task forces and sub-groups will build on existing best practices and seek to achieve broad agreement on unresolved accounting issues, such as setting project boundaries and addressing leakage, testing for additionality, and defining baseline emissions.

Project Accounting Standard Use

The Standard has received an encouraging response across the world with more than ten Climate Change Initiatives and 50 corporate entities adopting it in their activities. These cover USA, a large number of European countries and some developing countries like India and China. Specific examples include initiatives by the US Environment Protection Agency, Chicago Climate Exchange and WWF, and companies like BP, Tokyo Gas, Tata Steel and Ikea.

Next Steps

The GHG Protocol Inititiative has put into place a structured feedback process as part of its efforts to continuously improve the Corporate Accounting Standard. The next edition of the standard will be published by mid-2003. Work on the Project Accounting Standard will also continue, with the intention of creating a first edition in 2003. Additional work is also being undertaken in partnership with several major automobile companies to develop a common methodology for estimating the GHG emissions associated with the use of cars by customers. Concurrent with these projects is continual outreach, information dissemination and capacity building in developing countries, with the ultimate goal of providing comprehensive GHG standards for Kyoto and beyond.

Courtesy: Janet Ranganathan, Pankaj Bhatia, Carey Bylin, *World Resources Institute, Washington DC; Web: www.wri.org*

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long-term sustainable development. While the CDM Executive Board has now developed guidelines to promote RE/EE options on an accelerated basis, much more needs to be done to convince the industrialized countries of the need to deal with lifestyle issues domestically, and promote sustainable programs even at a higher cost. To its credit, UNFCCC managed to involve NGOs and other groups at COPs and other events, to put across their views. Whether that helps sustainable development or not, is to be seen.

Despite its resounding overall failure in securing any resource commitments, the message from WSSD was also clear: a holistic, integrated approach towards sustainable development and poverty elimination is necessary if the Millennium Development Goals are to be met. That is also the central message of this Special Issue of REPSOurce and REPSOVision, jointly brought out by Winrock International and its affiliate, Winrock International India. Climate change initiatives have to transcend GHG emission reduction objectives and aim at sustainable development whether they are in rural energy, industrial energy efficiency, natural resource management or sustainable transport planning. Such initiatives have to go beyond the narrow framework of CERs/ RMUs and their prices. Winrock International and its associates have been implementing such programs around the world for some time, and this Issue showcases some of these best practices emanating from Winrock's experience.

Just as the climate change negotiations are entering a more practical phase of developing guidelines, rules and regulations for operationalizing CDM and other flexible mechanisms, it is hoped that this key message will not get lost in the details. Let better sense prevail.

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Sustainable Energy Development
The Need for Global Action

It is largely accepted today that sustainable energy is a necessary input for eliminating poverty and achieving sustainable development. The Commission on Sustainable Development (CSD 9) emphasized this while stating "to halve the proportion of people living on less than $1 per day by 2015, access to affordable energy services is a prerequisite".

Sustainable energy is also the key to addressing global climate change. Slowing down the use of fossil fuel through increasing efficiency of use and moving towards carbon-free energy, especially renewable energy, has been at the core of the sustainable energy growth and access to energy. The modular nature of clean and renewable energy options provides benefits of a decentralized growth, which address both the poverty as well as the climate change concerns.

The WSSD Outcome

While the recognition of the importance of sustainable energy is universal, this unfortunately does not translate into any concrete action. The Plan of Implementation adopted at the World Summit on Sustainable Development (WSSD) in South Africa had some focus on energy in Chapter 2 on 'poverty reduction', and Chapter 3 on 'consumption and production':

- Taking joint efforts to improve access to reliable and affordable energy services
- Promoting sustainable use of biomass
- Supporting the transition to cleaner use of fossil fuels.

Some of the commitments made by the countries with regard to sustainable energy are to:

- Promote the internalization of environmental costs and the use of economic instruments
- Establish domestic programs of energy efficiency
- Accelerate the development, dissemination and employment of affordable and cleaner energy efficiency and energy conservation technologies
- Recommend that international financial institutions' and other agencies' policies support countries to establish policy and regulatory frameworks that create a level playing field
- Support efforts to improve the functioning, transparency and information about energy markets with respect to both supply and demand
- Strengthen and facilitate, as appropriate, regional cooperation arrangements for promoting cross-border energy trade
- Implement transport strategies for sustainable development
- Promote investment and partnerships for the development of sustainable energy efficiency, and multi-modal transportation systems.

As can be seen, these are just a set of general commitments without any specific targets. Though EU proposed to launch a program of action with financial and technical assistance to improve energy access with concrete and measurable targets, lack of consensus resulted in such a commitment being reduced to taking "joint actions and improve efforts to work together at all levels'. Similar was the fate of the consultations on an energy plan of implementation — here the efforts to have a time-bound action plan for increasing renewable energy use was replaced by "with a sense of urgency, substantially increase the global share of renewable energy sources, recognizing the role of national and voluntary targets".

To put into context the failure of WSSD to address the issue, one should look at the financial requirement of providing basic energy needs to one billion people, using a mix of centralized and decentralized technologies and systems—around $300 billion or approximately $20 billion every year till 2015. It is also estimated that $350 would be the cost to increase the contribution of renewable energy to 5% of total global primary energy by 2010.

Parallel to the negotiations on the Plan of Implementation, the Summit also had a Partnership Plenary on Energy, which stressed the benefits of small-scale energy investment targets and timetables for energy access, phasing out subsidies and binding targets for renewables. Not encouraged by the outcome, the EU presented a declaration entitled 'the way forward on renewable energy" calling for reducing climate change effects; increasing the global share of renewable and adopting targets at the national, regional and international levels; and promoting partnerships.

The overall failure of the Summit to seek out financial and other resources to meet the targets is further highlighted by the generic nature of the Plan on the "Means of Implementation". The section, though recognizing the need for significant increases in financial resources, as also elaborated in the Monterrey Consensus, stops far short of any agreed time frame and targets translating this need into reality. The document merely emphasizes facilitation of greater flows of foreign direct investment to support developing countries and the need for substantial

increase in ODA and other resources. The document also has nothing concrete on financing the efforts except "urging countries to develop and implement private-public partnerships in the field of access to energy, renewable energy, energy efficiency and advanced energy technology".

Future Prospects

Despite serious efforts, the Oversees Development Assistance (ODA) is far from the target of 0.7%. Although the EU members committed to increase their collective ODA to 0.39% by 2006, and the US too announced plans to raise their core development assistance from 0.1 to 0.15% of GDP by 2006, the overall target is still unattainable. What fraction of this ODA can be diverted to sustainable energy activities is anybody's guess.

Though the WSSD failed substantially to either set targets for achieving sustainable energy access or generating new and additional resources, a distinctive feature of WSSD towards garnering resources was an attempt to bring in the private and non-state sector into implementation of the sustainable development agenda, the Type II partnerships. These partnerships include voluntary cooperative initiatives between non-state partners or between non-state entities and a government body.

The Type II agreements are a new and welcome development as it increases the roles of business and NGOs directly in implementation and resource mobilization for the targets. Estimates of 220 such partnerships amounting to $235 million dollars were announced during the summit process and complement the government commitments. One contentious issue had been that this approach should not become a substitute for government commitment, just the way lack of progress on ODA was pushed behind the FDI.

On the whole, the outcome seems to be one of "a beginning" as was stated by Kofi Annan, the UN Secretary General. The partnership gains, the EU commitment and the possibility of CDM, though with limited markets, are likely to result in some increase in resources flowing into sustainable energy.

Courtesy: Sudhir Sharma, *Winrock International India; Email: sudhir@winrockindia.org*

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systems are generally modular in nature and, therefore, it is expected that a large number of projects in India would fall in the category of small-scale projects. The CDM Executive Board has already suggested a simplified procedure for small-scale projects and it is expected that as a result of the suggestions, the transaction costs for small projects could reduce.

In view of the conflicting analysis and reports, the real gain in terms of economic and sustainable development benefits are yet to be estimated. Further, in view of the Marrakech decisions, there is a need to look into technology issues appropriately so that the CDM projects also fulfill the objectives of technology upgradation. It is by and large an established fact that investment alone will not guarantee the transfer of renewable energy technology and there exist a range of barriers to the implementation of successful and sustainable renewable energy CDM projects. However, it is very difficult to pinpoint the specific conditions that would be required as a 'best practice' for a particular CDM project, as in each situation there are local, regional and international influences on the project. Further, over and above the 'additionality', as defined in Marrakech accord, the CDM projects would need to be looked into for elements of technology transfer from large-scale infrastructure development to the complementary transfer of skills and know-how, infusion of finances and dependence on Government subsidies, etc. CDM structures are still evolving and the best way to understand barriers and solutions would be through actual project implementation or, as they say, 'learning by doing'. The six projects from India, which have qualified under the CERUPT tender from the Netherlands are likely to provide us with the much needed experience.

While the above-mentioned are some of the perceived barriers specific to CDM activities, the renewable energy sector itself is passing through a transition phase in terms of mainstreaming in the national energy planning process. There are other barriers that are regulatory, institutional and policy-specific. Notwithstanding these, India looks forward to an active renewable energy program and a proactive role in the CDM process. With this end in view, the sector is gearing itself up by providing capacity building drives to various stakeholders in the Government, the private and the NGO sectors.

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***Mr Mangotra** is an Electrical Engineer from BITS Pilani and has a Masters in Public Administration. He joined the Indian Administrative Service in 1978 and served the States of Tripura and Manipur, and the Union Government in the Steel Ministry and the Sports Department. Mr Mangotra oversees International Relations at MNES, among other things, and actively works to mainstream renewables in climate change debates.*

Small Scale Rural Renewable Energy Projects and the CDM

The Clean Development Mechanism (CDM) could become a useful tool in promoting renewable energy (RE) technologies in developing countries. A crucial objective in attaining sustainable development objectives in less developed countries lies within the supply of basic infrastructure to a large percentage of the population for whom the paradigm of universal coverage is not working. Rural isolated energy service provision is clearly one such example on the trend of exclusion and non-access to basic services by a large fraction of the society in developing countries.

As a result of the Marrakech Accord at COP 7, the CDM Executive Board (EB) was given the directive to stimulate implementation of the denominated "fast tracking" for Small Scale Project Activities under the CDM. In that direction, we have seen a spread of activities related to small scale projects, starting with the work by the Expert Panel called by the EB in order to define criteria for baselines and procedures applicable for small scale projects (under 15 MW for RE or below 15 GWh savings for energy efficiency or 15 Ktons of CO_2 for combined projects).

Recent work carried out by the Andean Center for Economics in the Environment (CAEMA) with the support from the Inter American Development Bank, shows that in the context of Central America, well over 65% of the RE projects with potential CDM participation are within the scope of the denominated "fast tracking". One clear conclusion from such type of studies is that our CDM portfolios are mostly comprised of small-scale grid connected renewable energy projects with less representation from rural non-grid connected projects.

The denominated fast tracking for the CDM in the context of small projects comprises two basic aspects:

- *Simplified Base Line Calculations*: Defined by using criteria based on combined margin operation for the calculation of displaced energy from operations or dispatch margins and capacity addition margins for grid connected projects and predetermined values for off grid renewable energy applications. Together with the base line issues, several other aspects of CDM projects, like boundaries and leakage are simplified. In general, additionality is granted to small-scale projects under the CDM fast tracking.
- *Simplified Project Procedures*: Allowing for project bundling of small projects at different stages including formulation for PDD as well as validation.

Small Scale Renewable Energy projects face different types of barriers that have to be overcome, like policy and financing ones due to relatively high initial costs associated with small-scale technologies. Organizational barriers are also important especially in off-grid projects where the target developers do not have access to adequate preparatory assistance for developing the business plans required by financial institutions or simply do not qualify as credit subjects. In the context of the emerging carbon markets, two very important barriers are currently identified:

- *Market Behavior*: Most of the current carbon buyers, either buyers groups or specific countries are interested in larger quantities of carbon in order to assess

The Renewable Energy Program in Cambodia

National reconstruction, development and poverty alleviation are major issues for Cambodia, which has the lowest per capita electricity consumption in Asia. Most of the people access lighting and electricity through diesel or battery operators under an unregulated regime. The average price they pay, around $0.90 per unit, is among the highest in the region. The Government of Cambodia, in its desire to have a focused approach linking development and poverty alleviation to a sustainable and environment friendly energy strategy, has been working with the World Bank on implementing a Rural Electrification and Transmission Project.

This project has a renewable energy component, which is supported by the Global Environment Facility (GEF). The main objective of this component is to enable a market driven renewable electricity program for Cambodia. A special Renewable Energy Fund has been set up to finance activities of this program. Winrock International India and Winrock International have been partners in the project to come up with a strategy for renewable energy development, an action plan and its implementation. Activities include developing a document of national renewable energy policy, creating a web site (www.REcambodia.org) to coordinate communications, and analyzing and process documenting the different tasks undertaken by the project.

Courtesy: Jami Hossain
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their compliance with Kyoto targets, and therefore, are relatively risk adverse to small carbon transactions like the ones associated to small scale projects (except in case where learning in the market is an important goal).

- *Transaction Costs*: Current transaction cost information available in the market indicates that for CDM projects, these costs may range from 30% to 65% of the carbon benefits of a project. In the case of very small scale off-grid projects, this fraction may simply be too high to make attractive any incorporation into the carbon market. For example, IEA 2002, quotes that for a baseline study costing $30,000 at current CER values of $3/ton CO_2, a small 100 KW village level project will have a baseline costing 543% of the CER value and a 10 MW wind project will have to spend almost 10% of the CO_2 revenues just in the baseline study.

Adding the carbon revenues to a small energy project implies two fundamental issues: the creation of a commodity, through a demanding international process, and the transferring of the certificates as well as the associated revenues in an efficient market chain.

For example, a small 100 KW hydro project in rural Guatemala displaces around 204 tonnes CO_2/year for a total of 4,284 tonnes for a period of 21 years, which at current market prices translates to a revenue of only US$12,852. The basic underlying question remains to be, where does it make sense to assess the economic impact of such small revenue of carbon into the project? The answer is not easy, but innovative means of financial delivery, for example considering the aportation of carbon revenues to meet initial costs required to assure O&M sustainability or as seed capital for launching the business plans or starting capital for rural energy service providers may prove to be a way to go forward in matching carbon revenues to small scale project development.

Another option is the "bundling" of projects, according to the initial set of criteria defined by the EB of the CDM that are to be discussed in New Delhi at COP 8. Initial valuations of clusters of rural projects done in the Central American region — e.g. clusters of micro hydro plants associated with productive use applications of electricity — have been considered for CDM participation. Bundling of projects for rural energy service provision face similar barriers as any other renewable energy projects. A very important one in this case relates to the establishment of national rural energy plans that will allow a certain reduction on the transactions costs associated with servicing rural territories under innovative approaches. For example in Guatemala, one such cluster has been under development with GEF support, generating a portfolio of microhydro projects totaling to 7.5 MW in small projects at the municipal or village level. Focalization of national subsidies as well as development of suitable financing schemes will be required in order for the CDM to catalize sustainable development. Such type of bundled projects may remove barriers in a shared way, increasing the possibility of reaching the targeted rural dwellers intended in rural service provision.

In that context, the revenues of such cluster of projects may clearly be used to support the development of preparatory assistance facilities that can support business plan development, coverage of soft costs for organization, launching of O&M micro enterprises, etc; and should not be viewed in the traditional way of assisting the coverage of financing for capital costs of the technology. Another way of looking at the issue could be to measure the proportionate impact of the carbon revenues of a rural energy project that is normally financed through private means, which is in the order of 50%.

Commercialization of Renewable Energy in India

This WII project, supported by the UN Foundation and partnered with UNDESA, offers an innovative approach to overcome the barriers in developing and mainstreaming renewable energy technologies (RETs) in five districts of Andhra Pradesh in southern India covering 5680 villages with over 12.2 million people. This region is also the subject of the Rural Livelihoods Project of the Government of AP and the UK Department For International Development (DFID).

The approach on the CREI Project is anchored in the proven concept of stimulating private investment in renewable energy projects/enterprises by helping self-help groups, micro-credit institutions and private firms design programs to assist entrepreneurs to develop projects/enterprises that link RETs with productive use of applications that generate positive cash flows.

This project is on way to create a cadre of knowledgeable and trained entrepreneurs and financiers, who will form a strong body of human resources, which the state can bank upon for sustaining other developmental initiatives. Multiple stakeholders would benefit from work of the CREI Project including the rural poor, local entrepreneurs and investors, and NGOs. In addition, the coordinated participation of UNDESA in the implementation of a replicable project model for sustainable energy development will help internalize an effective approach in the UN system to promote innovative market-driven renewable energy enterprise projects and programs worldwide.

Courtesy: Jami Hossain, *Winrock International India*
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This could indicate that carbon revenues may increase the IRR of a rural project by as much as 5-8 percentile points, thus improving its financial viability.

The experience being generated by the consideration of the reduction of transaction costs as well as the impact of bundling in rural energy projects is favorable to the idea that evolving carbon markets may be responsive to the participation of small activities, provided that adequate assistance is available for developing innovative approaches to resolve critical issues associated with the project cycle in terms of reducing risks and perceptions on the complex nature of carbon transactions of small projects.

Courtesy: Dr Oscar Coto, *Fundación Solar Guatemala, Winrock International Central America REPSO; Email: ocoto@amnet.co.cr*

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Accelerating Renewable Energy Commercialization

Winrock International India (WII) is executing the USAID-sponsored Accelerating Renewable Energy Commercialization in India (ARECOMM) Program to address the fundamental barriers that retard private investment in renewable energy technologies and foster the development of enterprises that harness these technologies. ARECOMM helps defray the high up-front costs associated with developing small- and medium-scale renewable energy enterprises by i) providing an investment window for low-cost, long-term credit to entrepreneurs in the initial phase of a subject project; ii) strengthening entrepreneurial ability in developing business plans necessary to access financing; iii) linking entrepreneurs with financiers and technical assistance services tailored to meet the requirements of their business; and, iv) assisting entrepreneurs in developing an umbrella association to deal with policy and trade issues as they pertain to the industry.

The distinguishing feature of ARECOMM is that it connects entrepreneurs proposing small and medium-scale renewable energy projects, and others who plan to integrate renewable energy in existing business units with small amounts of low-cost, long-term credit and enterprise assistance services at an early stage. The Project will then link them with suppliers of second stage debt and equity to meet the financing requirements of their project.

WII is currently in the process of inviting eligible applicants to submit a brief summary of the proposed project. The terms and conditions for each sanctioned loan will vary depending on the credit worthiness of the borrower and the proposed investment opportunity.

Courtesy: Ayesha Grewal
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a complex task and requires sustained efforts and resources. International funding may play a critical role here. The technology and resources transfer, and assistance for capacity building, as envisaged in the Convention, have to be simultaneously provided to fulfill commitments under the Convention.

The 21st Century poses enormous opportunities and challenges to humanity. Development would remain the primary preoccupation of developing countries through the century. Notwithstanding the commitment of developing countries to respond to climate change and its impacts, they need cooperation and assistance from the developed world to effectively contribute to the objectives of the climate convention. Global sustainable development and climate regime therefore, will have to interface closely and coherently. The measure of the success of the 21st century global development would be the development in developing countries, the narrowing of the income and capability gap among the nations, and equity in all international spheres. Development and climate regimes would be profoundly affected by the dynamic that would influence equity among nations and people, especially the trade, labor movement and sustained peace in all regions. That is the vision of developing countries, which would gain most from the positive dynamics in these spheres and so also from the resulting benign climate regime.

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LULUCF Issues at COP 8 and Natural Resource Management

Next to energy sector, the focus of attention of the Climate Convention, and the scientific community is largely on the forest sector since

- Forests play a critical role in global carbon cycle.
- Forest sector accounted for 20% of the global CO_2 emissions at 1.6 GtC annually (during the 1990s).
- Forest ecosystems and plantation forestry are vulnerable to projected climate change with adverse impacts on forest distribution, biodiversity, regeneration and productivity. There is a need to assess impacts at regional level, develop adaptation strategies and implement them.
- Forest sector provides mitigation opportunities with a potential to offset 10 to 20% of the global CO_2 emissions during the coming decades.

Thus, forest sector is linked to climate change in multiple ways. Mitigation through forest sector has been a contentious issue, which has attracted a lot of attention of researchers as well as negotiators. For the purpose of negotiations, forestry activities are included under the category of Land Use Land-use Change and Forests (LULUCF).

The global negotiations under UNFCCCC umbrella have so far focused largely on mitigation. According to the Third Assessment Report of IPCC the annual mitigation potential of LULUCF sector is estimated to be 2 GtC. A recent study in 7 major tropical countries showed that nearly 50% of mitigation potential could be realized at net negative cost.

LULUCF sector is often favored by Annex-1 (industrialized) countries with GHG emissions reduction commitment, mainly due to the lower unit abatement costs. However, many developing countries view that LULUCF provides a 'loophole', since for every tonne of CO_2 sequestered in LULUCF activities, Annex-1 countries can continue to emit one tonne of CO_2 from fossil fuels.

In many developing countries, forests are vulnerable to degradation and loss of biodiversity. Depletion and degradation lead to loss of source of biomass and non-wood forest products and contribute to greenhouse gas emissions. Many developing countries such as India and China face severe shortage of roundwood.

In the present scenario, loss of biodiversity and topsoil is irreversible. Tropical deforestation, land degradation, biomass shortages and decline in biodiversity are projected to continue. Thus any programme or activity leading to forest conservation and revegetation would provide multiple benefits. Thus forest conservation and revegetation are 'win-win' options and should be top priority components of any sustainable development strategy.

LULUCF Under Global Climate Negotiations up to COP 7

UNFCCC creation following at UNCED at Rio de Janeiro in 1992 was a landmark in global effort to address a global environmental issue. The next major achievement was the agreement (not ratification) on Kyoto Protocol in 1997 at Conference of Parties (COP) 3. Under Kyoto Protocol, LULUCF activities were addressed in Articles 3.3, 3.4, 6 and 12. Under Article 3.3, 'Afforestation', 'Reforestation' and 'Deforestation' were included. After much debate and negotiations, activities to be included under Article 3.4 were agreed to in the Bonn Agreement — cropland management, grazing land management, forest management and revegetation. The quantity or upper limit of CO_2 emission reduction from Article 3.4 activities was also agreed upon. Definitions of forests, afforestation, reforestation, etc. were also agreed upon in the Bonn Agreement.

Afforestation and Reforestation Under CDM (Article 12)

Inclusion of LULUCF activities under the Clean Develop Mechanism (CDM) of Article 12 was one of the most debated and contentious issues with divergent views. Many of the developing as well as some Annex-I countries opposed the inclusion of LULUCF activities under CDM due to several reasons:

- 'Low hanging fruits' meaning low cost mitigation projects in developing countries will be lost to Annex-I countries.
- High uncertainty in measuring, monitoring and verification of carbon stock changes.
- The 'loophole' issue as feared by developing countries that carbon credits from LULUCF activities would encourage Annex I countries to continue to emit CO_2 from fossil fuel consumption.

Finally under the Bonn Agreement, 'afforestation' and 'Reforestation' activities were included under CDM for the first commitment period (2008 to 2012). Marrakech Accord (COP 7) set a limit on certified emission reductions (CERs) from Afforestation and Reforestation activities at 1% of the base year emissions for Annex I countries. Marrakech Accord also renamed CERs from 'Afforestation and Reforestation' activities as RMUs (removal units).

LULUCF Issues at COP 8

Issues under Negotiations: Majority of the issues relevant to LULUCF under article 3.3, 3.4 and 6 have been agreed

to under the Marrakech Accord. The Critical issues which are under negotiation and likely to be discussed at COP 8 are

- Definitions of 'Afforestation and Reforestation' as applicable to CDM
- Modalities for implementing Afforestation and Reforestation projects

COP 7 requested SBSTA (and IPCC) to address all contentious and technical issues relevant to LULUCF activities. SBSTA is addressing the issue of developing definitions and modalities for including Afforestation and Reforestation project activities under Article 12 in the first commitment period, taking into account the issues of non-permanence, additionality, leakage, uncertainties and socio-economic and environmental impacts, including impacts on biodiversity and natural ecosystems.

IPCC is addressing the following:

- To elaborate methods to estimate, measure, monitor, and report changes in carbon stocks and anthropogenic greenhouse gas emissions by source and removals by sinks resulting from LULUCF activities under Article 3, Paragraphs 3 and 4, and Articles 6 and 12 of the Kyoto Protocol, on the basis of the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories.
- To prepare a report on good practice guidance and uncertainty management relating to the measurement, estimation, assessment of uncertainties, monitoring and reporting of net carbon stock changes.
- To develop definitions for direct human-induced 'degradation' of forests and 'devegetation' of other vegetation types and methodological options to inventory and report on emissions resulting from these activities.
- To develop practicable methodologies to factor out direct human-induced changes in carbon stocks.

Modalities for Afforestation and Reforestation Activities under CDM

Modalities for oprationalizing Afforestation and Reforestation will be discussed at COP 8, though no decisions will be taken. Developing countries have to ensure their concerns are addressed in the discussions on definitions and modalities. Some of the concerns and suggestions are as follows:

- **Priority for small-scale Afforestation and Reforestation projects:** An agreement has been reached to give priority for small-scale renewable energy technology based projects. Similarly, small-scale Afforestation and Reforestation projects should get priority. It is difficult to state, at this stage, what should be the upper limit for the scale of the Afforestation and Reforestation projects under CDM. To promote regional equitable distribution across countries and even within countries, small-scale projects could be preferred. Surely projects of more than a few thousand hectares at a single location could be discouraged. As a rough suggestion, projects below 2000 ha should get priority and projects above 5000 ha should be rejected.

- **Promotion of biodiversity:** Afforestation and Reforestation projects that specifically demonstrate the conservation of biodiversity should be preferred. The approach, goals and monitoring arrangements aimed at conserving biodiversity should be clearly indicated in the project proposal. Projects where open or degraded biodiversity rich forests are going to be replaced by monoculture plantations should be rejected. Biodiversity under baseline as well as CDM project scenario should be described quantitatively in the project. Project proposals incorporating multi-species and multifunctional aspects of Afforestation and Reforestation could be given priority.
- **Promotion of community participation and livelihoods:** Any forestry project should adopt a participatory approach and enhance livelihoods and more so any CDM project. Thus the project proposal should clearly state the approach and institutional arrangements to be adopted to promote participation of local communities.
- **Private sector participation:** Though priority should be given to projects involving local communities and groups of small farmers, private sector projects cannot be excluded. In many locations private sector such as timber or plantation companies or paper mills may undertake a CDM project by involving

Forestry Resources and Technologies (FOREST) Project in Russia

The biomass energy component of the USAID-funded $22 million FOREST Project (2000-2005) aims to promote the use of wood waste where cost-effective to provide heat and energy for timber companies and settlements in the Russian Far East and Siberia. The component is designed to support USAID's objective to manage environmental resources more effectively to support economic growth, as well as to reduce the threat of global climate change. Winrock International is providing technical, financial, and grant assistance to design and build biomass facilities, and to develop capacity in biomass energy in the region to enable a commercially sustainable program. FOREST is working to promote sustainable forestry management and economic development in Siberia and the Russian Far East.

Courtesy: Erin Hughes, *Winrock International, USA*
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small farmers. Any proposal from private sector should clearly describe the socio-economic implications, such as employment generation, access to land and forest products to local communities, and institutional arrangements to incorporate the perspectives of local stakeholders.

■ **Linking mitigation with adaptation:** Forest ecosystems and plantations are likely to be adversely impacted by the projected climate change. Thus there is a need to assess climate impacts and develop and implement adaptation strategies. The mitigation projects should be evaluated for implications for vulnerability of forest ecosystems as well as plantation forestry. Though the approach to promote adaptation strategies in mitigation projects is not clearly known, it is desirable to work towards synergy between mitigation and adaptation. Afforestation and Reforestation CDM projects, which incorporate strategies to reduce vulnerability to climate change or foster adaptation should be given priority.

IPCC Related Issues at COP 8

Currently IPCC is working on a range of issues such as; methods, guidelines, good practice guidance, definitions of 'degradation' and 'de-vegetation' and practicable methodologies to factor out direct human induced changes in carbon stocks. The progress of work of IPCC on all these issues will be presented and debated at COP 8. The developing countries should ensure that their concerns with respect to their technical and institutional capacities to adopt the methods and techniques required to estimate carbon stock changes in forests (vegetation and soil) are addressed. The IPCC work on good practice guidance for LULUCF activities will be ready only by COP 9.

LULUCF Mitigation Activities and Adaptation

There is a new realization to explore the linkage and synergy between mitigation and adaptation. Firstly, no mitigation activity should increase the vulnerability of forest ecosystems and plantation forestry. Secondly, it is necessary to explore the possibility of incorporating forestry practices to reduce vulnerability and enhance resilience of forests. Some examples of practices that may reduce the vulnerability and enhance the ability to adapt to climate change are:

■ Adopt mixed species forestry than monocultures
■ Promote natural regeneration than plantation forestry
■ Incorporate anticipatory planting of a few vulnerable species
■ Have flexible rotation cycles
■ As far as possible, link the blocks of project activities to enable migration of species in the long run.

There is a need for research studies to understand the linkages and synergy between addressing climate impacts and climate mitigation projects. This becomes very relevant to biodiversity-rich forest ecosystems of tropical countries. The IPCC assessment reports have not addressed the issue of linking mitigation and adaptation strategies and practices. Climate Convention could suggest the inclusion of mitigation and adaptation linkages and synergy in future assessments of IPCC.

Kyoto Protocol is likely to be ratified soon and by COP 9 the definitions and modalities to operationalize Afforestation and Reforestation activities under CDM would be approved by Climate Convention. Further Marrakech Accord is in place providing guidance on methodology, reporting, review and verification. The guidelines for CDM projects under Afforestation and Reforestation activities may be ready by COP 9 or soon after that. Developing countries have a critical role to play in ensuring the environmental integrity of the LULUCF activities under the convention, so that real reduction in GHG emissions or removal of CO_2 from atmosphere occurs, contributing to stabilization of GHG concentration in the atmosphere and meeting the goals of Article 2 of UNFCCC.

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CDM Technical Services

Winrock International India with view to promote renewable energy and energy efficiency efforts is working with the industry in helping them access the emerging CDM market. WII helps industry in identifying and developing CDM projects. It works closely with the industry in assessing the compatibility of projects with the CDM guidelines, undertaking construction of baselines, developing monitoring and verification plans, and preparation of project design document. WII help industry investors in CDM component of projects. WII delivered first Validated CDM project in India under the CERUPT tender launched by the Netherlands government to procure emission reductions under the Kyoto Protocol. It is also working closely with PCF, World Bank in identifying projects in India as well as developing projects.

Courtesy: Sudhir Sharma
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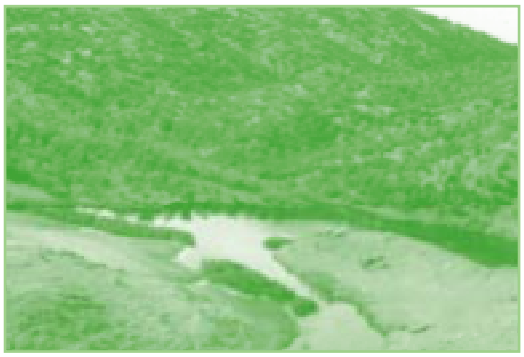
Ecosystem Services: Innovative Solutions for Global Problems

Winrock's Climate Change Portfolio

Over the past twenty years, negotiations and agreements on a variety of international issues including climate change, biodiversity, desertification, the ozone layer, forest certification, clean water supply, and oceans has made everyone more aware of the interdependence of the global environment. Winrock International (WI) has long been an active participant in global efforts to use good science and economics to develop sustainable solutions. WI's work on development of methods for measuring carbon stocks began in 1992. Drawing on its experience with the science of agriculture and forestry, staff at Winrock combined simple, ground-based, cost-effective methods into peer-reviewed procedures that allow accurate comparisons of carbon stocks for various carbon pools across broad landscapes and over time (www.winrock.org). WI has also worked to develop inexpensive analytic and measurement tools that can be used to assess and evaluate positive and negative changes in the performance of ecosystems. WI established the Ecosystem Services Unit in January 2002 to help test and disseminate new tools around the world in collaboration with its global partners. A similar approach and understanding of measurement and markets for carbon credits informs WI's work in development and dissemination of renewable energy systems. Its established network of local Renewable Energy Project Support Offices (REPSOs) facilitates design, finance and monitoring of renewable energy projects that yield carbon benefits. Thus, WI programs address global climate change



Source: WII Annual Report

Noel Kempff Climate Action Project

In 1996, the Government of Bolivia, Fundación Amigos de la Naturaleza (FAN), American Electric Power and The Nature Conservancy designed a forest-based joint implementation pilot project to allow for the expansion of Noel Kempff Mercado National Park, now totaling approximately 1.5 million hectares. The duration of this $9.5 million project is 30 years. Industry investors PacifiCorp and British Petroleum America (now BP Amoco) joined the project in 1997.

Project funds were used to compensate forest concessionaires for giving up logging rights on government-owned forestlands to the west of the previously existing park. The Government of Bolivia then retired the logging rights on this land and expanded the national park to encompass these former forest concessions, thus launching the Noel Kempff Climate Action Project. The project area includes only those lands now within the national park for which the former concessionaires were compensated using project funds.

The project is located in northeast Bolivia in the Department of Santa Cruz in Noel Kempff Mercado Nationa Park. The project area of approximately 634,000 ha is located within the newly expanded western region of the park that was added in 1996. The park is bounded on one side by the Bolivia-Brazil border formed by the Itenez River that drains into the Amazon Basin. Prior to the initiation of the Noel Kempff Climate Action Project (NKCAP), the two threats to the project area were continued forest logging by the concessionaires and deforestation for agricultural expansion from communities on the Bolivian and Brazilian boundaries of the area. The NKCAP generates Carbon offsets by permanently halting forestry operations in the park expansion area, and protecting these lands from future agricultural encroachment.

The NKCAP funds ongoing Carbon monitoring to calculate real benefits over the life of the project. Funds also support leakage prevention activities that are being undertaken in conjunction with the former forest concessionaires and the local communities in and around the park. Carbon offsets are calculated by determining the Carbon emissions that would have occurred within the project area on the subset of lands that would have been impacted by logging or conversion to agriculture if the project had not occurred. The analysis of avoided Carbon losses incorporates historical data and assumptions about long-term forest management and settlement patterns in this area, and will be revisited and adjusted as the project proceeds.

in two ways:

- Carbon Storage – using land management strategies to capitalize on the growth process of trees and crops to absorb CO_2 from the atmosphere and store it in soils and vegetation.
- Emissions Avoidance – Avoiding greenhouse gas emissions by conserving forests and soils and using clean energy technologies for home, industry, and transportation.

Both approaches require accurate, replicable, and transparent methods to quantify carbon benefits, and would become important in the context of the Kyoto Protocol coming into force by the end of 2002. The CDM Executive Board has already produced guidelines for implementation of renewable energy projects under the Kyoto Protocol and plans to issue guidelines for measurement and monitoring of land use change and forestry projects at COP 9 in 2003.

Measuring Carbon Storage in Land Use Change and Forestry Projects

Changes in lands formerly covered by forests have been and are currently a significant source of atmospheric concentrations of GHG, up to about 20% of current fossil fuel CO_2 emissions annually. As trees and plants grow, they absorb CO_2 from the atmosphere and store it as organic matter. Accurate and precise measurement of stored carbon is one of the critical first steps in development of carbon management systems and the emerging worldwide process of carbon credits trading. Winrock has developed proven methods and procedures for measuring and monitoring changes in carbon stocks that result from a range of project activities. More than one million hectares of land in the United States and other countries has been covered for measuring carbon stock using these methods. WI is now a world leader in this field.

Winrock has provided measurement and verification services to environmental organizations, private industry, and governments that seek to implement carbon storage projects. Activities include:

- Design and implementation of measurement and monitoring plans
- Project review and carbon benefit assessment
- Establishment of baselines
- Appraisal of the risks of "leakage"
- Measurement quality assurance and quality control programs
- Assessments of risk of loss from fire, drought, flood, and severe storms
- Training in project design, data collection and monitoring plans

During the first commitment period for the Kyoto Protocol (2008–2012), afforestation and reforestation are the only categories of land use change and forestry projects eligible to receive credits. Winrock International measuring and monitoring methods also can be used for other categories of potential projects, including:

- Restoration of degraded forested lands and watersheds
- Converting marginal agricultural land to agroforestry systems or production forests
- Planting trees for windbreaks and buffer strips around waterways
- Improving tillage practices
- Modifying pasture use
- Lengthening timber production rotations
- Changing timber harvesting practices
- Conserving threatened forests

Aerial Inventory Methods

While developing and testing field survey methods, WI simultaneously began to examine alternative methods for measuring carbon storage in land use change and forestry projects based on remote sensing. Initial efforts to use satellite imagery did not produce satisfactory results. Trials using cameras attached to low-flying aircraft proved more promising and led WI to develop digital multi-spectral camera systems that can save time and produce accurate, cost-effective alternatives to

field surveys. In order to keep costs to a minimum, Winrock designed the camera systems to be portable and capable of mounting on virtually any small aircraft. The systems include geo-positioning equipment that exactly locates each frame and a pulse laser profiler to capture ground elevations and vegetation height measurements. This combination of equipment enables remote measurement of biomass of trees and provides comprehensive site data that can be used for multiple purposes including assuring project compliance across large areas at low cost.

For example, WI's approach for tree measurement creates a three-dimensional model of the terrain that allows measurement of the heights and diameters of individual tree crowns. The results from aerial survey methods have produced statistically similar results to the analysis of data collected by field crews for the several sites where both methods have been applied. Besides measuring carbon stocks in trees, the camera systems can produce a variety of other products potentially useful to ecosystem valuation such as:

- Monitoring changes in forest structure over time
- Species counts and migration patterns
- Vegetation mapping and change detection
- Plant site and watershed inventories
- Impacts of forest harvesting

- GIS data compilation and modeling to predict future changes
- General and point source pollution studies
- Geo-referenced mosaics and orthophotoquads

Assessing Other Environmental and Social Benefits

Projects designed to store carbon often produce other environmental benefits. The approach used to develop peer-reviewed methods for assessing and evaluating carbon can be used for measurement and valuation of other ecosystem services. WI staff are working with a variety of partners to develop, test and build consensus around transparent, replicable and accurate methods for quantifying potential ecosystem benefits associated with carbon storage projects, including:

- Habitat protection and restoration
- Watershed and wetlands management
- Introduction of sustainable forest management practices
- Soil improvement
- Introduction of land management practices to reduce non-point source pollution and improve water quality
- Enhanced ability to adapt to environmental stress
- Biodiversity conservation

Aerial imagery can provide valuable tools for monitoring biodiversity. Habitat assessment at the landscape scale can complement field surveys in identifying important ecological features. In comparison to satellite only approaches, the aerial system can be used to:

- Monitor changes in vegetation structure and health through time (e.g. mortality, canopy health, species dynamics, succession, etc.),
- Assess the distribution and quantity of vegetative food resources over larger scales,
- Establish a consistent, standardized and detailed spatial data base for overlaying other geographically explicit data (e.g. animal tracking, bird populations), and
- Help explain the spatial and temporal patterns of fauna and flora.

In addition to environmental benefits, some carbon projects can potentially produce social and community development benefits by providing resources for better management of local ecosystems and addressing land tenure issues. New lower cost cameras and tools for managing data make it possible for community organizations to more actively see what is happening in their local environment. The development of methods for collecting digital imagery and automatically preparing mosaics make it possible to compile and print maps of an area right after the plane lands if a suitable printer is available.

The ability to measure and quantify other ecosystem assets should allow carbon projects that produce multiple benefits to receive preferential treatment under international agreements and attract premium prices.

Design and Development of Clean Energy Systems

Clean Energy program forms a central focus of WI's efforts to improve rural livelihoods while protecting the environment. Through various projects to design and finance cost effective clean energy systems beginning in 1989, WI and its partners have overcome multiple barriers to the introduction and use of clean energy systems. The work has led to the installation of thousands of megawatts of installed and operating renewable energy systems, and resulted in dissemination of wind, solar, hydro and biomass energy technologies.

Besides powering rural development, these renewable energy systems help preserve the atmosphere by reducing GHG emissions. Signatories of the Kyoto Protocol specifically seek to accelerate the use of renewable energy and have tasked the CDM Executive Board with developing an accelerated system for approval of small renewable energy systems.

Winrock REPSO network understands the challenges that must be overcome to accelerate dissemination of clean energy systems and has participated in and provided input to the international negotiations. Knowledge of how to develop baselines and quantify and measure carbon benefits from renewable energy systems can minimize transaction costs, and will be particularly critical if prices for carbon credits are low.

Courtesy: John Kadyszewski and Sandra Brown, *Winrock International*

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Dr Sandra Brown *is Senior Program Officer with the Ecosystems Services group at Winrock International, and is a known authority on carbon measurements of forestry and natural resources. She is a Lead Author of the IPCC on LULUCF. Email: sbrown@winrock.org*

Sustainable Transport and Technology Limitations

The resources consumed and greenhouse gases emitted to support even the cleanest of Northern cities are, on a per capita basis, far larger than those associated with the cities of the South.[1] Yet rising emission levels from India and China and other low-income countries is a major concern for policy analysts dealing with climate change issues. Urban transport sector in low-income country cities presents a complex challenge for developing sustainable transport policies.

Nearly 60% of world population lives in developing regions (Africa, Asia and South America). These regions are characterized by the dominance of large cities, which experience such extremes of wealth and poverty that they can be characterized as having dual or multiple economies. One economy serves the needs of the affluent and features modern technologies, formal markets, and outward appearance of developed countries. The other serves disadvantaged groups and is marked by traditional technologies, informal markets, and moderate to severe levels of economic and political deprivation. Urban poverty characterized by unemployment, dependence on the informal sector, low wages and insecure jobs has a direct bearing on travel and transport demand of a large segment of the population residing in urban areas. Their dependence on access to job markets becomes essential for survival. This need is more critical for them than for those with high income and secure jobs.

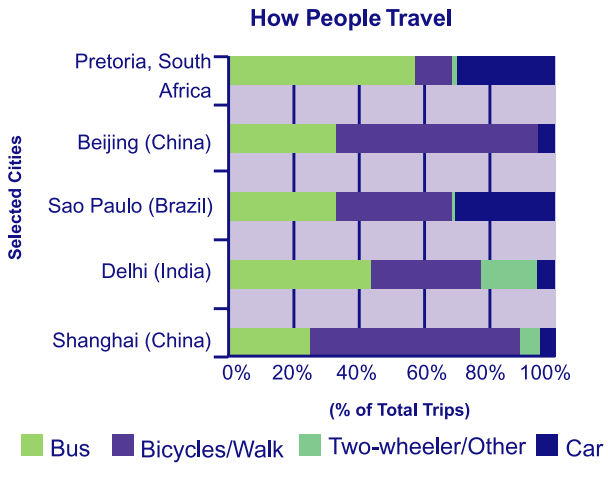
Majority of the commuters in cities in the South are bus commuters or people walking and cycling (Figure1). The exponential growth of ownership of personal vehicles (cars and two wheelers) is another notable feature of these cities (Table 1). Motor vehicles produce more than half the emissions of carbon monoxide, hydrocarbons and nitrogen oxide in many of these cities. The middle-income citizens are deserting buses in favor of individual modes of transport.

The recent discussions on sustainable transport have been largely around technological innovations in bus transport[4] as well as personal transport[5]. The emission estimates of adapting these clean technologies along with higher shares of public transport shows major benefits in emission reductions. However, the clean technology options - fuel cell buses, electric vehicles and clean fuel - CNG, ethanol or methanol cannot be the complete solution for majority of the urban residents because a bus commuter, a bicyclist and a person walking to work in Delhi or any Chinese

Table 1: Change in Modal Share of Passenger Travel[3]

	Year	Two-and Four-Wheelers	Bus	Taxi/ Minibus	Train/ Metro	Non-motorized
Sao Paulo	1977	29	41		5	26
	1987	27	27		8	38
	1997	31	25		7	36
Mexico City	1986	25	42	11	22	
	1995	22	8	56	14	
Shanghai	1986	3	24		72	
	1998	11	18		71	
Delhi	1981	16	60	.23	2	17
	1994	25	62	.06	.5	7

Fig 1: Modal Share of Passenger Travel[2]



[1] McGranahan, G, Songsore, Jand Kjellen, M (1996) 'Sustainability, poverty and urban environmental transitions', in C Pugh (ed) Sustainability, eEnvironment and tUrbanisation, eEarthscan, London, pp108; [2] Vasconcellos A Eduardo (2001), 'Urban Transport, Environment and Equity', pp17; [3] International Energy Agency (2002), 'Bus Systems for the Future', pp31; [4] ibid., [5] Sperling Daniel, Deborah Salon (2002), 'Transportation in Developing Countries: An overview of greenhouse gas reduction strategies', Pew Center on Global Climate Change, Washington DC.

city is not doing it by choice.

Cities in the South have captive riders of buses and non-motorized vehicles. Despite hostile environment, they continue to walk or bicycle or use overcrowded buses because their survival in the city depends on that trip. If the cost of bus travel increases because of using a clean technology, some of the present users may be forced to either switch to two wheelers or bicycle long distances. Both increase the risk of traffic accidents in the present infrastructure. In Delhi, the Supreme Court directive of changing the bus fleet to CNG has already reduced availability of public transport vehicles in the city and also introduced RTVs (rural transport vehicles) running on CNG. Thus, attempts to reduce traffic emissions introduce inappropriate technology from a commuter's perspective. The RTVs are designed for rural operations and not for the convenience of urban commuters. Again, these will be used by people who have no choice, and may encourage some people to move away from public transport.

To preserve the sustainable transport friendly modal shares in the cities in the South, introduction of commuter friendly systems take priority over clean technology. This means creating safe infrastructure for pedestrians to ensure safe approaches to bus stop and prioritizing road usage for public transport vehicles, pedestrians and bicyclists. Making streets and bus stops hawker friendly because they provide essential services to a range of road users, which the formal sector has ignored. Cycle repair shops, cold drinks and snacks provided by street hawkers serve the same function that a well-designed service area performs along a highway. The difference is in the speed of users and therefore the difference in frequency and density of service providers. Clearing encroachments along the streets often implies prohibiting street hawkers. This not only denies employment opportunities to people but also creates lonely streets, which are vulnerable to crime. Even the essential activities are carried out in fear and use of public transport and non-motorized modes reduces. Not surprisingly safety is one of growing urgency as cities in many countries are becoming more violent, restricting access and mobility in the city, particularly for women.

The capital intensive projects which aim at congestion reduction for cars for example expanding road capacity, construction of grade separated junctions in the city have not made the streets safer for the most vulnerable groups and lives continue to be lost in road traffic crashes. Sustainable transport implies that mobility concerns of the "critical group" must be addressed. This requires geometric design standards of roads from a "non car" perspective. The "space left over" after providing for public transport, bicycles and pedestrians to be given to cars in urban areas. The economic and social cost of following car oriented design standards is too high.

New technology of fuel cell buses, use of cleaner fuels and efficient engine technology may reduce emission levels as compared to the present fleet of buses. However, whether they can meet the needs of the majority of the urban commuters in a sustainable way in the long run is doubtful.

If sustainable transport is to be promoted, then the following must be kept in mind:

- Stricter emission laws in the West did not reduce total emissions. Lifestyle issues must be addressed.
- At present many low-income countries have desirable modal shares.

Alternative Transport Fuels in India

With the recent announcement by the government on making ethanol blended petrol mandatory from January 1, 2003, in large parts of the country, Winrock International India's (WII) sustained and dedicated efforts are at the threshold of becoming a reality. WII has been at the forefront in promoting ethanol as a renewable vehicular fuel in India. It has taken a number of initiatives in capacity building and information dissemination including study tours to Brazil and USA, organizing international workshops, seminars, and Roundtable meetings, etc. These efforts focused on relevant issues encompassing policy, institutional, market, and financial factors, and involved intense dialog with policy makers. WII has also launched the India Ethanol Coalition in February 2000 to institutionalize promotion of ethanol and bring all stakeholders on a common platform. WII has also been publishing a quarterly newsletter, which is the only one of its kind on this topic serving all the stakeholders. WII is pleased that its humble efforts contributed in a small way in the introduction of ethanol as a transport fuel.

Courtesy: Jai Uppal
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A "Clean" Ride in Bharatpur

Building on the successful operation of over 600 electric 3-wheeled taxis (SAFA Tempos) in Kathmandu, Winrock's Clean Energy Group in Nepal has initiated the second phase in its mission to help provide environmentally sustainable transportation throughout the country. Since June 2002, eight battery powered Tempos have been transporting commuters around Bharatpur, one of the fastest growing cities in the Nepal Terai. The vehicles are providing modest but welcome relief from the rapidly increasing air pollution in the city. More importantly, they are showing residents of Bharatpur that clean transportation options do exist for them.

Continuing Winrock's dedication to gender equity, all the eight drivers selected are economically disadvantaged women who now operate the electric vehicles on a lease purchase arrangement. An initial payment towards the price of the vehicle and battery has been made by each driver, with the remaining payments to be made in installments over a 3-year period. Upon completion of lease payments, the drivers obtain freehold ownership of vehicles and a cooperative of these very women will own and operate the charging station.

Winrock designed and structured the project, assembling a number of players, including Bharatpur Municipality (BM), Bharatpur Cancer Hospital, Nepal Merchant Bank (NMB), the EV manufacturers Nepal Electrical Vehicle Industries (NEVI) and Green Valley Electrical Vehicle Co. (GVEV), Nepal Electric Vehicle Charging Association (NEVCA), as well as the NGOs Service, Peace and Research School (SPARS) and Martin Chautari to make this clean transportation project possible.

Successful electric vehicle demonstration here is expected to motivate other entrepreneurs to purchase EVs and operate them for public transportation in Bharatpur as well as other cities outside Kathmandu.

Courtesy: Bikash Pandey
Winrock International, Nepal
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The challenge is to preserve them in future amidst growing car ownership rates.

- If these have to be preserved and encouraged then clean technology alone is not sufficient. It may have adverse effect of increasing use of two wheelers, force people to use bicycles in a hostile infrastructure. Both may lead to increase in accidents and possibly harmful emissions.
- Sustainable transport needs inclusive cities, which are also safe cities. This means going beyond physical infrastructure. Inclusive streets ensure not only safe mobility, but also reduced street crime and better social cohesion, makes public transport attractive, and the preferred choice for commuting.

Courtesy: Geetam Tiwari, *Indian Institute of Technology, Delhi 110016*

Prof. Tiwari *has a Ph.D. in Transport Planning and Policy and a Masters from the University of Illinois, Chicago. She has 15 years of experience in transport planning and traffic engineering and worked in India, USA and Bangladesh. Prof. Tiwari serves on the Boards of the Institute for transportation and Development Policy, New York, and of the Sustainable Transport Action Network for Asia and the Pacific. (geetamt@hotmail.com)*

Alternative Bagasse Cogeneration

Cogeneration in high-efficiency boiler-turbine systems under high temperature/pressure conditions using renewable fuels, such as bagasse, facilitates offsetting carbon dioxide emissions from coal-fired power generation. USAID's Greenhouse Gas Pollution Prevention Project's Alternative Bagasse Cogeneration Component (GEP-ABC) was begun in 1995 to reduce the emission of greenhouse gases per unit of electricity generated by encouraging increased and efficient use of biomass fuels in sugar mill cogeneration facilities.

This project gave financial assistance (to nine sugar mills) and matching grants (three) for technology demonstration, training, capacity building, and outreach for GHG emissions reductions through increased use of biomass fuels for electricity generation.

These nine sugar mills have operated for 270 days in a one-year period using biomass fuels for electricity generation and export. The total installed cogeneration capacity is approximately 200 MW for these projects, which are currently estimated to generate up to 500 million kWh of electricity valued at $25 million, offsetting 550,000 metric tons of GHG emissions annually.

The project has also conducted over 20 training programs, workshops, conferences and study tours, and has published 15 issues of the highly appreciated Cane Cogen India newsletter to promote high-efficiency cogeneration in sugar mills in India.

Courtesy: Anita Khuller, *Winrock International India*
Email: akhuller@winrockindia.org

Energy Efficiency, Distributed Generation and Climate Change: Rising Convergence, Expanding Opportunities

Energy. Environment. Reforms. Three words linked in a maelstrom of events driven by economic growth, industrial expansion and globalization. Energy efficiency, distributed generation (DG) and climate change are the derivatives of these events, with points of intersection at the level of policy planning, utility system operation and consumer markets.

For some time now it has become evident that renewable power must play a growing role in our long-term electricity strategy, and that we must also boost energy efficiency and substitute coal with less polluting and less green-house gas (GHG) emitting fuels. Taken together, the following issues underscore the convergence between DG and energy efficiency on one hand, and the opportunities to mitigate GHG emissions on the other.

- Given the growing gap between energy supply and demand, policy makers are turning increasingly to energy efficiency and renewable energy to help mitigate the impact of power shortages and improve the quality of electricity delivery. The quality and reliability of power supply is primarily dependent upon the ability of system capacity to meet demand while maintaining the stability and integrity of the grid system. The maintenance of grid stability, particular at the tail ends, will be greatly advanced by distributed generation systems.
- Integrated solutions that advance quality and reliability of electricity supply, address the issue of peak capacity and energy shortages as well as advance energy efficiency on both sides of the utility meter are called for. Thus a distributed generation system has the advantage of improving power quality and, by inference, raising end-use efficiency among the consumers.
- The on-going reform of the Indian power sector has resulted in the unbundling of the vertically integrated public power utilities (SEBs) spinning off distribution companies, which have the growing motivation to implement demand-side initiatives among their consumers as well as augment supply through decentralized renewable power systems. The impact of these strategies on GHG emission reductions through supply-side efficiency gains in coal-fired utilities as well as through energy substitutions effected by DG systems and end-use efficiency could be considerable.

The convergence of DG and end-use efficiency is nowhere better demonstrated than in the area of power distribution reforms. India's power sector is characterized by inadequate and inefficient power supply. Plant availability and efficiency are generally low, and system losses are high throughout India's T&D networks, specifically the secondary low tension or last mile distribution networks. The financial performance of the sector is unsatisfactory with low tariffs, heavy cross-subsidies, poor collection performance and outright theft, combined with increasingly tight state budgetary resources that have constrained supply expansion and investment in upgrading T&D systems. Any solution that addresses the problem of sector profitability must necessarily target the issue of high T&D losses estimated at over 50% and amounts to over $ 6 billion annually or about 2 percent of India's GDP. These commercial losses, which have historically doubled every 3 years, represent 10-15% of a typical state's fiscal deficit and are double of what the country annually spends on health and half of its expenditure on education. Above all else, the impact of power distribution system improvement strategies on the ability of the Indian state to raise the social standards of its people cannot be minimized.

At the heart of the energy loss problem lies the pervasive issue of poor metering,

Improved Stoves Save Health, Protect Trees

Winrock International's ONFARM project, funded through USAID introduced fuel-efficient Lorena stoves constructed from inexpensive, locally available materials to rural households in Uganda. The project has resulted in more than 3000 people being trained in the construction of the stoves, and 948 stoves installed. Following completion of the funded project cycle, the men and women who received stove construction training from Winrock have used their skills to independently market the stoves as an income generating activity. Households adopting the stoves have benefited from savings in fuel wood collection time and expenditure and reductions in indoor air pollution, with the greatest impacts focused on women and children.

Courtesy: Jamal Gore and Jennifer Mandel *Winrcok International; Email: jgore@winrock.org*

inefficient billing and inadequate revenue collection, the result of a lack of systemic across-the-board governance. Starved of funds Indian State Electricity Boards (SEBs) have made inadequate investments in distribution networks that result in overloaded feeders, ill-maintained substations with aging transformers and insufficient reactive compensation capacity causing a high level of technical losses particularly in rural power low voltage systems. Compounding the issue of poor design and operation of the distribution system are the losses on account of unmetered supply and theft – euphemistically referred to as commercial losses.

Emerging Solutions

A deeper analysis confirms that the power distribution problem in the country is a multi-dimensional one and that there are clear technical solutions indigenous to the distribution system. Two possible solutions that stand out are energy efficiency and distributed generation. The distribution losses in India's power sector occur due to inefficiencies on both sides of the energy meter – the utility side as well as the consumer side. On the utility side, the main causes of energy losses are inefficient and overloaded distribution equipment and antiquated distribution engineering practices. At the consumer end the problems leading to avoidable energy losses are lack of meters, non-renumerative tariffs for rural consumers and inefficient end-use of electricity.

Distributed generation could play an important role in providing several grid-side benefits to India's ailing distribution systems. Distributed power refers to a variety of small (10 kW -10 MW) modular power generating technologies (biomass generators, combustion turbines, solar PV, micro turbines, engines/generator sets) that can be combined with storage and energy control systems and used to improve the operations of the electricity delivery systems, whether or not these technologies are connected to the electricity grid. Customer-side DG could provide several grid-side benefits to its host utility. These include:

- *Deferment of T&D investment*. Since many rural and urban distribution systems in India are either close to or have exceeded their maximum capacity, the value of DG is high in deferring T&D investments.
- *Reduction of T&D losses:* Since DG systems are at the tail end of the grid and close to the consumer, there will be little if any T&D losses. Given the relatively high marginal cost of generation in India, the reduction in T&D losses represents a major economic value to DG investments.
- *Improved Reliability:* While the reliable supply of power is key to economic and industrial growth and offsets the need for misallocation of resources to install stand-by capacities, its impact on groundwater use and poverty alleviation is strong.

Energy Efficiency and Climate Change

The impact of energy use, specifically fossil fuels such as coal, on global climate change is well recognized. In India, coal use in the country's thermal power generation accounts for the lion's share of national GHG emissions – over 60%. New and more efficient power sources as well as an increased thrust in improving power end-use efficiency in industry, in homes and offices and on farms is a key element of the country's national energy strategy. The recently announced Action Plan on Energy Efficiency to be implemented by the country's Bureau of Energy Efficiency sets out a substantial, integrated package of policies and measures to improve industry's use of energy, augment the numbers and strengthen the capacity of energy efficiency service providers (i.e. energy managers and auditors), introduce efficient building codes, pursue utility DSM programs particularly in the agricultural sector and ensure that the public sector takes a leading role in implementing energy efficiency programs. The government has set itself a challenging target to reduce energy consumption in public sector buildings by 30% (below 2001 levels) in 5 years time and has asked the private sector to voluntarily reduce their energy consumption by 20% over the same time period. The key to success lies in the ability to formulate and direct public policy to catalyze private business delivery of energy efficiency services.

Conclusion

The reform of the Indian power sector, its independent regulatory oversight and the subsequent emergence of distribution utilities on one hand, and the commitment of the government to advance energy efficiency through public policy legislation on the other, opens up significant business opportunities in areas such as industrial and commercial co-generation, on and off-grid distributed generation systems, renewable power and end-use efficiency. By combining public and regulatory policy with business policy mechanisms, the country stands to address the key issue that currently constrains economic and industrial growth – establishment of a vibrant and creditworthy power sector operating under full cost recovery conditions and unencumbered by the current level of high technical and commercial losses in the distribution of electricity.

It also makes for a sound climate change strategy.

Courtesy: S Padmanaban, *Senior Energy and Environment Advisor, USAID/India; Email: spadmanaban@usaid.gov*

On leave of absence from the World Bank, ***Mr Padmanaban*** *is involved in designing power distribution reform programs as part of USAID's bilateral energy program. He has over 25 years' experience in strategic planning and implementation of national, regional and unit level energy management programs in power, industrial and agricultural sectors in several developing countries. Mr Padmanaban is a Mechanical Engineer from University of Madras and has a Masters in Energy Management.*

Climate and Sustainable Energy

The need to restructure global energy systems in order to achieve lower greenhouse gas concentrations has been emphasized time and again in the context of addressing global climate change. IPCC scenario and assessments[1,2] have effectively pointed out the necessity of reducing global carbon dioxide emissions from the current level of about 8 GT per year to about 5 GT per year by 2100, and stabilize at less than 2 GT per year by 2200, in order for the CO_2 concentration to stabilize at 550 ppm. This concentration would already be double of the pre-industrial CO_2 concentration; implying substantial committed global warming with its associated impacts on global temperature, sea level, and changes in climate patterns.

At the simplest level, these numbers indicate that if we could all reduce our energy consumption by about 40% each over the next 100 years, we would be well on our way to successfully address the challenge of climate change. However, the last ten years of climate-change negotiations have shown, with good reason, that this approach is nothing more than simple-minded rhetoric. The global statistics for energy use and for CO_2 emission hide massive differences amongst different groups of countries, and amongst people within countries, in the amounts of energy they use, their sources of energy, and the efficiency with which they use energy.

The focus in this note is on one such group, the poor in developing countries[3]. While definitive statistics about the consumption patterns of the poor are hard to come by, especially at the global level, it is clear that their energy consumption is extremely low – even as compared to the non-poor in developing countries, and a fraction of the average consumption in the industrialized countries[4,5]. Further, the poor largely consume biomass energy sources, which have zero or low net CO_2 emissions[6]. To a large extent, this low energy consumption reflects their poor quality of life, and it is expected that energy consumption would increase as their incomes and quality of life increase[7].

As this transition from traditional biomass fuels to fossil fuels occurs, it is expected to have a major impact on global carbon emissions. The IPCC results seem to indicate that such a shift – a necessary adjunct of the increasing quality of life of the poor – could be a significant contributor to the increase in carbon emissions over the next century.

So the challenge is, how to make this necessary transition as climate-friendly as possible. It starts with the recognition that most modern low and zero carbon energy options – especially renewables – are financially more expensive than fossil fuel options such as kerosene, LPG, and coal or diesel based electricity. Even with the lower costs of fossil fuels, most

Home Employment and Lighting Package

The Home Employment and Lighting Package, HELP™ , is a program operated by the Himalayan Light Foundation to intrinsically combine the dissemination and use of solar electricity technology with income generation. Villagers participating in HELP™ are offered a skill-training program, the tools to set up an income generating activity such as knitting, weaving, handmade paper product, thangka painting, etc. and a solar electricity system, which extends the working day. Marketable products can therefore be made in the home in spare time apart from agricultural pursuits. HLF will act as a link between these producers and the international market enabling the workers to find a market for their products. The villagers can repay the cost of the solar lighting system with handicraft items made in their home.

Winrock International's (WI) Nepal program financed the feasibility study of the HELP concept.

Based on the study, a pilot HELP program was started in Bongadovan village of Baglung district with support from the (UNDP/GEF) Small Grants Program and leveraged funds provided by the government's Alternate Energy Promotion Center. So far 106 Solar Home Systems (SHS) of 20 w each have been purchased and installed in beneficiary households through the Solar Development Committee in Bongadovan VDC. Each participating family pays with a handmade bag (pictures below) every month for 24 months, at the end of which it fully owns the SHS system. A new family would then get a SHS as recommended by the Solar Development Committee. In this way, the number of participating families has increased from the original 68 to 106. HLF will continue to market the product even after the 24 months so the participating households not only receive the SHS but also a means of livelihood.

Winrock International supported the development of the Website Development for HELP including a Shopping Cart Software for international marketing of handicrafts produced by beneficiaries for the payment of the SHS. Customers from all over the world will soon be able to purchase bags and other handicrafts directly on the Internet from HLF.

Courtesy: Bikash Pandey
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developing countries currently find that the poor are unable to fully pay for energy; this makes the transition from traditional to modern renewables even more difficult.

This suggests that the goal of enhancing the energy access of the poor should focus both on clean fossil fuels and renewables, and the latter are available as an option to the poor, whenever viable.[8] From a climate change perspective, this means integrating the provision of renewable energy services within sustainable development initiatives in general, and in poverty-reduction interventions in particular.

A recent DFID paper[9] highlights the importance of energy as a key facilitator to achieving the UN Millennium Development Goals[10], which, *inter alia*, aim at halving the poverty by year 2015. In the context of these goals, energy services are needed for:

- productive uses which facilitate additional income generation for the poor through micro enterprises;
- water pumping and purification;
- ensuring reliable health services, including lighting of operating theaters, refrigeration of vaccines, and sterilization of instruments;
- cooking, so as to eliminate the need for children to forage for biomass, and to reduce indoor air pollution from biomass burning; and,
- home lighting to enable after-school study, and to extend working periods beyond daylight hours.

Can renewable-energy based technologies meet these needs reliably, and in a cost-effective manner? In seeking an answer to this question, it is useful to separate out technology issues from market-development issues, though they are obviously linked: product and market developments have followed each other in an iterative fashion.[11] On the technology front, the first concern is the availability of products, which meet the user needs. There is a distinction drawn here between technologies and products: a PV panel is a supply technology, while a PV-powered refrigerator is a product, which provides cooling service. Other examples of products, which can meet the energy service needs include PV home lighting systems, PV pumps and wind pumps, and biogas plants.

There is, however, a dearth of RE products that can provide energy services for productive uses such as drying of spices and other agricultural products, cooling for cold storages, and shaft power for sawmills and flourmills. A few examples indicate that this can be done successfully, but requires close interaction with users - focusing on trials of product models, each upgraded through feedback from trials on earlier models[12]. In each case, the major institutional innovation relates to understanding the energy service needs of the poor, and then engineering a product (configured around a core renewable-energy technology – such as a PV module, or a biomass gasifier) that successfully met those needs. The financial, geographical and intellectual barriers that constrain long-term interaction between the product-configuration firms, with formally trained and probably urban-based engineers, and poor, rural users need to be addressed in order to convert RE technologies into products of use to the poor. Innovation grants, public-sector venture capital, and risk-sharing mechanisms could be instruments

Improved Cookstoves in India

India has one of the world's largest improved cookstove (IC) programs, with nearly 33 million improved stoves disseminated so far. More than 100 different models of stoves are in use in different parts of the country. Winrock International India (WII) recently completed a study for the World Bank to evaluate successful practices for Improved Cookstoves (ICs) in India. Three states — Gujarat, Maharashtra and Haryana – were covered to identify factors responsible for the success of the program and to document best practices in improved stove implementation.

Presently, the national improved cookstove program is at an important juncture as it was recently decentralized to be implemented directly from the states. The program is also moving away from the improved mud stoves to longer lasting cement stoves. While the national program cannot be called an unqualified success, its experience offers several lessons for stove dissemination in general. NPIC in states like Gujarat has been a testing ground for different approaches and models of implementation. Similarly, various lessons can be learnt from Maharashtra's experience with commercialization of ICs.

Perhaps, the most important lesson that the program offers is that it cannot *a priori* be assumed that stove users appreciate more efficient stoves and that fuel saving is necessarily the feature users value in an improved stove. Improved stoves can be appreciated and adopted for other benefits that they offer such as reduction/ removal of smoke from kitchens, cleanliness and time saving. In fact, there is a clear case for promoting improved stoves on the basis of their health benefits. However, in order for that reorientation to take place, it is necessary to redesign the dissemination strategy.

Courtesy: Winrcok International India

through which the climate-change community can help overcome these barriers. The recent emphasis in the GEF on addressing the productive uses of renewable energy[13] is a positive step in enabling this barrier removal.

Even when appropriate products exist – and PV-based vaccine refrigerators and biogas plants are good examples – developing a sustainable market for these products is difficult. In almost all countries where they are used, they are subsidized; immediately limiting the market size to the amount of subsidy available. However, estimates indicate that these products may often be the least-cost options, especially in terms of the lifetime benefits (such as the drastic reduction in wasted vaccines, or in the time spent for fuelwood collection) that they bring. Despite this advantage, their high upfront financial cost, as well as the unwillingness of local banks to lend to the poor for such products, turns out to be the major barriers to their widespread adoption. Availability of credit at the doorstep – especially if provided through local microfinance institutions – is being increasingly demonstrated as an effective way to address this barrier. However, establishing such a network is time intensive as well as expensive. Again, grant and risk-sharing mechanisms are increasingly being used to help markets reach critical masses beyond which they can be sustainable, and to attract local banks and financial institutions to provide loans for purchasing these products.

In conclusion, aligning climate-change mitigation with poverty reduction in developing countries is the only way to ensure a sustainable energy future in the long run. Without access to affordable renewables-based energy services, the poor will turn from traditional biomass to fossil fuels; and the transition will lock the energy-supply infrastructure built over the next few decades to meet their needs into a high carbon intensity mode. Grant-led investments to promote the development of renewables-based products and markets to meet their energy-service needs, will, on the other hand, provide a parallel low-carbon infrastructure which could start replacing the current fossil-fuel infrastructure as it ages and requires replacement.

Courtesy: Ajay Mathur, *Team leader, Climate Change, The World Bank, Washington DC*
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A Bachelors degree in Chemical Engineering from the University of Roorkee, and PhD from the University of Illinois, Dr Mathur's current priority is the development of methodologies and best practices to enhance the resilience of the Bank's investments in sectors such as forestry, agriculture, water resources and coastal-zone development which are likely to be adversely affected by the impacts of climate change, and to reduce the vulnerability of people who depend on those investments for their livelihoods. Dr Mathur earlier managed the Energy & Environment Technology Division of the Tata Energy Research Institute in New Delhi.

[1] N. Nakicenovic et al., Emissions Scenarios, IPCC Special Report, Cambridge University Press, 2000. [2] R. Watson et al., Third Assessment Report, IPCC, Cambridge University Press, 2001. [3] The poor are defined as these with a per capita income of less than $2 per day in purchasing-power parity terms. [4] OECD/IEA, World Energy Outlook 2000. [5] World Energy Assessment (2000). [6] In case of biomass harvesting being sustainable. N. Nakicenovic et al., Emissions Scenarios, IPCC Special Report, Cambridge University Press, 2000. [7] UNDP, Human Development Report, 2001. [8] World Bank, Fuel for Thought: An Environment Strategy for the Energy Sector, 1999. [9] DFID, Energy for the Poor: Underpinning the Millenium Development Goals, 2002. [10] See Http://www.developmentgoals.org/ [11] Mahesh Vipradas and Ajay Mathur, "Product and Market Development Process in Renewables", in Renewables: Products and Markets, Mahesh Vipradas, ed., TERI, New Delhi, 2001. [12] See, for example, the many renewable-energy product development case studies presented in Renewables: Products and Markets, Mahesh Vipradas, ed., TERI, 2001. [13] GEF Business Plan FY 03-05, Document GEF/C.19/10, April 17, 2002, http://gefweb.org/Documents/Council_Documents/GEF_C19/C.19.10_GEF_Business_Plan.pdf

The opinions expressed in this Viewpoint are those of the author, and not necessarily those of the World Bank.

Island Electrification in the Philippines

Winrock International has an $8 million three year Cooperative Agreement with USAID to implement the Alliance for Mindanao Off-Grid Renewable Energy (AMORE). This project is designed to provide support for community electrification projects in Mindanao island, focusing on assistance to the private sector in planning and social preparation of projects. This objective supports the Government of the Philippines Department of Energy (DOE) policy of relying in part on Independent Power Project (IPP) operators and other private firms to cofinance and implement rural electrification projects. Winrock will support off-grid *barangay* (municipal council) electrification primarily through project preparation and community development activities, including an intensive consultation process to identify community needs and to assess capacity; define roles and secure commitments from the community to ensure its sense of project ownership; and build local technical and financial management capability to ensure effective operation and maintenance of the RE systems. Financial leverage would be in the form of equipment supply by independent power producers (IPP), USAID through Winrock/AMORE, and other organizations and agencies. This project will support broader USAID objectives of fostering social and economic development and peace and order in Mindanao.

The energy technologies to be used in the assisted communities—with project funding from USAID and others sources—will include solar PV, small-scale micro-hydroelectric, wind, hybrid, and biomass energy that are inherently non-polluting. Needless to say, this project is likely to result in significant GHG emission reductions in addition to the sustainable development benefits.

Courtesy: Chris Rovero, *Winrcok International, USA*
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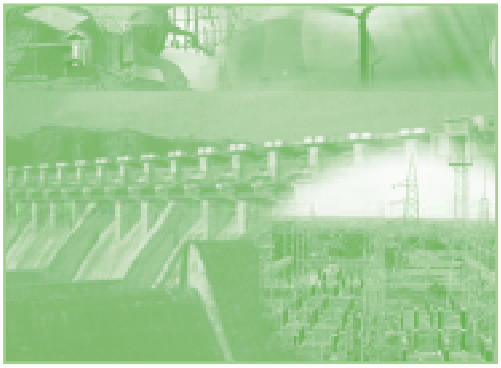
The REPSO Model: USAID's Perspective

Eliminating the barriers that stand between the world's poor, a healthy environment and a better quality of life is beyond the scope and capabilities of any single entity. In addition, entities that are on ground in the developing countries understand local conditions and institutions and can be the most adept at identifying problems and designing projects that provide solutions. Because of this reality, Winrock International, with USAID support, has conceived and created a global network of project support offices to promote the development of renewable energy enterprises and innovative applications of technologies for business, industrial, farm and residential use. Winrock's Renewable Energy Project Support Offices (REPSOs) provide a full range of services including technical assistance, development of financing strategies, policy guidance, project development, and implementation assistance and training. REPSO experience and expertise ensures that projects are well designed, use appropriate technology and are sustainable.

USAID has supported this growing network of Winrock offices and affiliates as a tangible way to address USAID strategic objectives. Acknowledging that energy is a critical factor of production as well as a major source of pressure on the environment, the use of renewable energy sources for achieving environmentally sustainable development has become critical. In addition, USAID recognizes that the expanding, yet limited, energy infrastructures of developing countries are particularly well positioned to make use of sustainable energy technologies. These countries can choose to pursue less carbon-intensive economic development. The Winrock REPSO network is well positioned to assist countries with expanding their use of renewable energy technologies. REPSOs work closely with in-country energy stakeholders to promote policies and regulatory changes that create a more inviting investment environment. They work closely with international and indigenous companies to help them overcome market and institutional barriers to encourage the use of renewable energy systems in USAID assisted countries.



Winrock's Renewable Energy Project Support Offices (REPSOs) exist in Indonesia, Philippines, Nepal, Brazil, South Africa and Central America. REPSO in India became an integral part of Winrock International India (WII), an affiliate of Winrock International.

The REPSO Network helps to achieve sustainable integrated development approaches by fostering cooperation between government agencies, private enterprises, nonprofit organizations, and communities to implement and commercialize proven renewable energy technologies for development. Specifically, REPSOs work to implement policy or regulatory changes that support renewables. They work with businesses to pursue renewable energy projects and identify financing for such projects from domestic and international donor institutions. REPSOs also serve to strengthen of host-country non-profit institutions that work to promote renewable energy use.

In addition, as USAID objectives move beyond an emphasis on just the provision of energy towards integrated and sustainable processes that address development in a holistic fashion, the REPSO Network has also expanded its work with local communities to develop integrated approaches to development – focusing on energy as an input into projects such as those dealing with poverty alleviation and rural empowerment.

REPSOs are staffed with experts from all areas of development, often individuals with extensive in-country experience and an understanding of the needs of local communities, which allows the REPSO to develop a holistic view of community a project needs. This expertise and in-country support make the REPSO network an important vehicle to achieve strategic developmental goals all over the world.

Courtesy: Ms Patricia Flanagan
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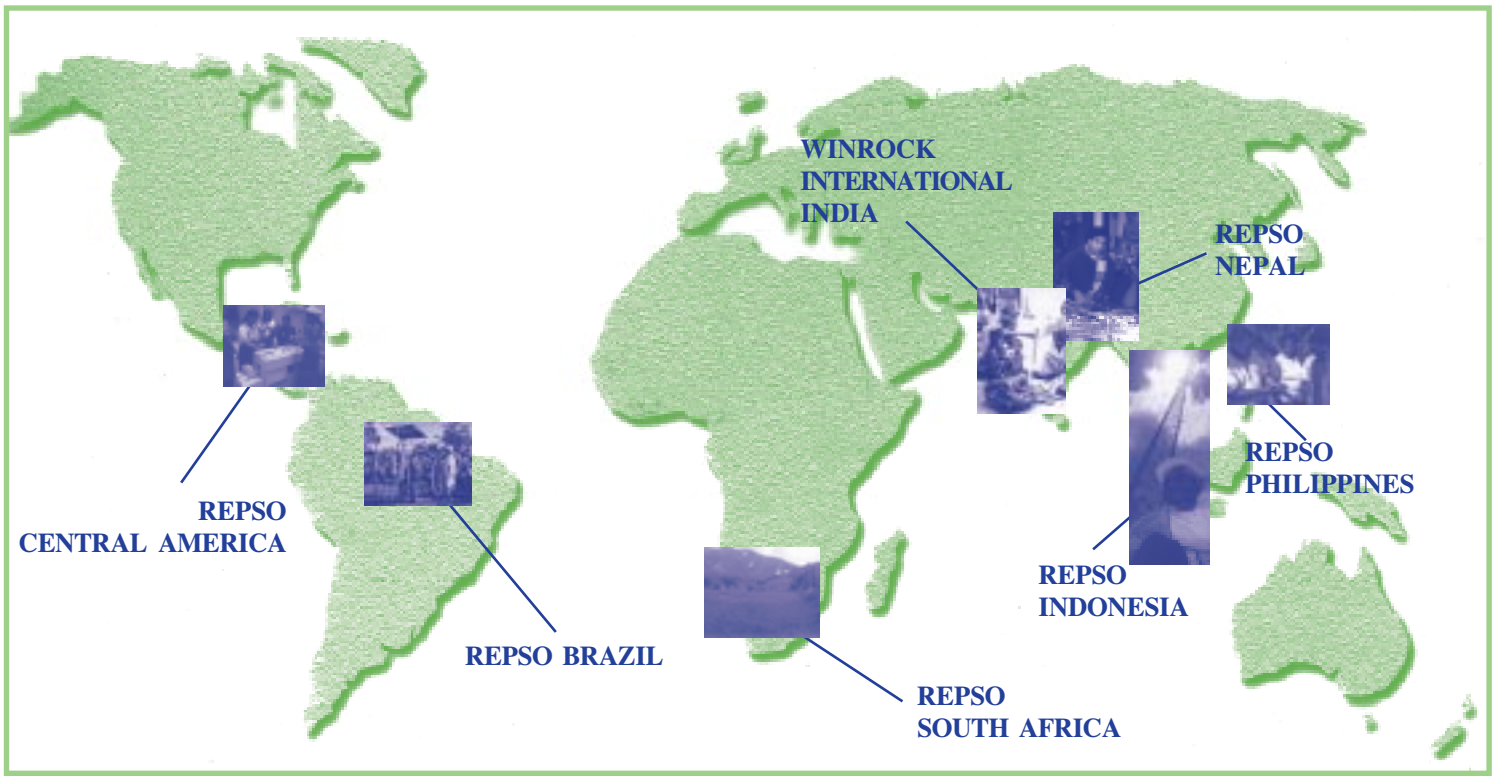
***Ms Flanagan** manages USAID's Global Renewable Energy program, and has been closely involved in monitoring Winrock's REPSO network around the world. She is also the Leader of the Rural Energy Services Team. She is a Chinese expert and previously worked with Winrock, IIRR, UNDP and Voice of America, among others. Ms Flanagan has a BA from the State University of New York, and a Masters in International Affairs from Columbia University.*

Winrock International's REPSO Network



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