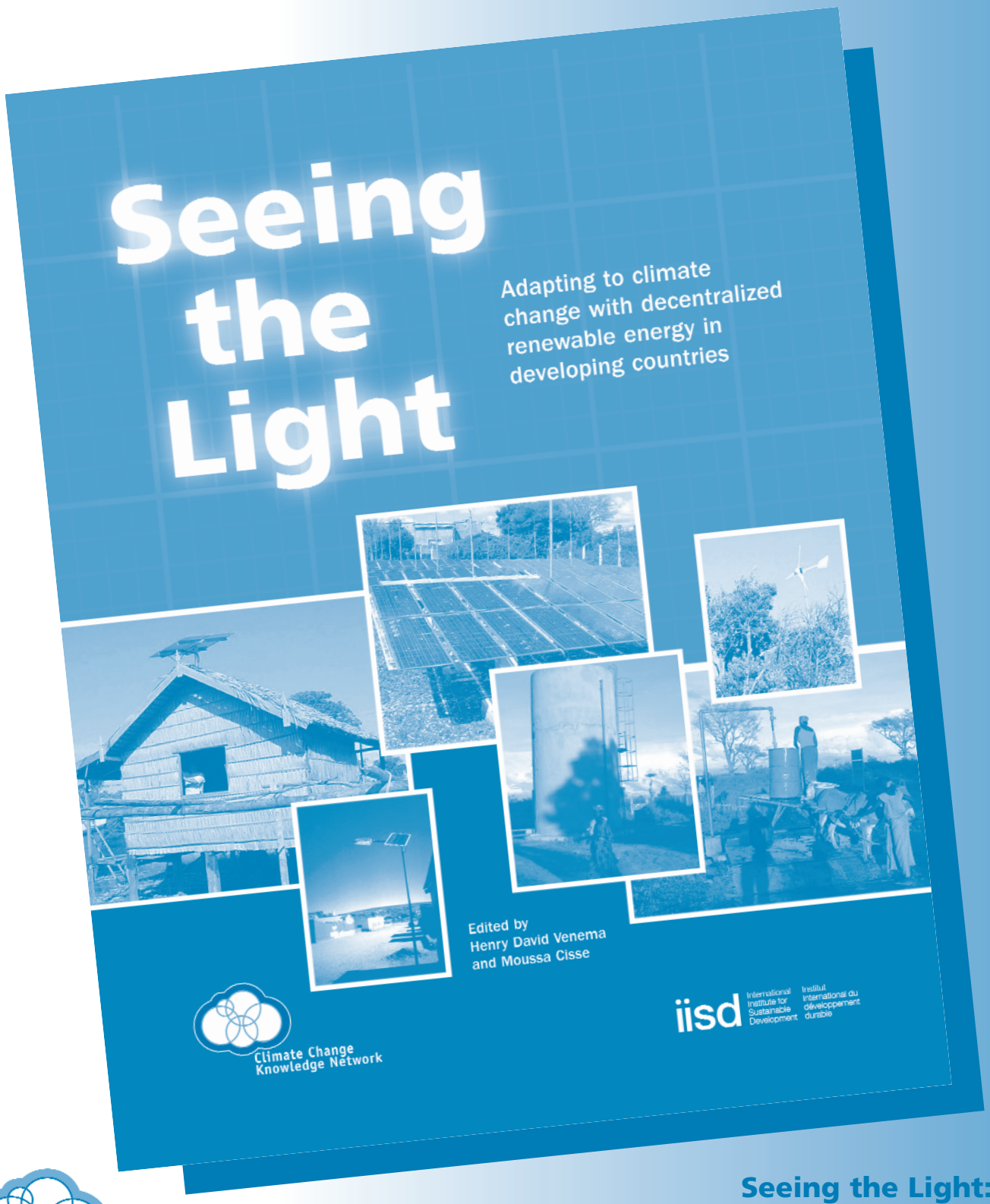

Climate Change Knowledge Network

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Seeing the Light: Adapting to climate change with decentralized renewable energy in developing countries

To Be Released February 2004

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Introduction

Members of the Climate Change Knowledge Network (CCKN) are pleased to introduce *Seeing the Light: Adapting to climate change with decentralized renewable energy in developing countries*.

Seeing the Light highlights the positive contribution of decentralized renewable energy (DRE) to integrated climate policy. The Delhi Declaration states that climate change must be contextualized within developing countries' sustainable development aspirations, key among which is adaptation to climate change. For the poorest third of humanity, the capacity to cope with climate change is synonymous with sustainable development. The World Summit on Sustainable Development (WSSD) Plan of Implementation acknowledges that achieving this goal is impossible without more energy. Building coherent climate policy with DRE and the Clean Development Mechanism (CDM) is a win-win opportunity that addresses the South's adaptation needs while having the co-benefit of reducing greenhouse gas emissions.

Through five country case studies, *Seeing the Light* explores how well-designed decentralized renewable energy projects can build adaptive capacity. The case studies review the DRE and CDM experience in Argentina, Bangladesh, Brazil, Senegal and Zimbabwe. The book concludes with recommendations regarding how the CDM should be supported in host countries, by investor countries, and in a multilateral context by agenda-setting institutions like the United Nations and the World Bank.

Seeing the Light: Adapting to climate change with decentralized renewable energy in developing countries will be released by the International Institute for Sustainable Development in February 2004.

Excerpt from the introduction of *Seeing the Light: Adapting to climate change with decentralized renewable energy in developing countries*

1.6 Energy, Ecosystems and the Millennium Development Goals

While the positive economic outcomes of increased energy use are intuitive, the social and ecological benefits of rural energy provision are less obvious. They are, however, central to the idea that decentralized renewable energy can be as integral to sustainable development as climate change mitigation and adaptation. The dual role of DRE with respect to climate policy objectives can be explained with a more careful examination of the energy dimensions of poverty and vulnerability. First, poverty is now more clearly understood as encompassing both income and non-income dimensions of deprivation [World Bank, 2002]. The constituents of poverty include lack of income, material means and livelihood opportunities; poor or no access to education, health services and safe water; and a lack of empowerment to participate in the political processes and decisions that affect one's life. Extreme vulnerability to external stresses and shocks (including, but not limited to, climate change) is also one of the major features of poverty [World Bank, 2002].

The re-orientation of sustainable development goals to poverty alleviation at the WSSD does not diminish the importance of ensuring environmental sustainability goals. Rather, the WSSD plan clarifies that environmental degradation is both a driver and an outcome of poverty and that comprehensive policies to alleviate poverty necessarily entail improved environmental management. The critical dimensions of human poverty further illuminate these linkages.

- ***Livelihoods:*** The poor tend to be most reliant on non-market ecosystem services and the direct use of natural resources and, therefore, are the most severely affected by ecosystem degradation or limited access to ecosystem services.
- ***Health:*** The poor suffer most when water, land, and air are polluted, and environmental risk factors are a major source of health problems in developing countries.
- ***Vulnerability:*** The poor are most exposed to environmental risks and environment-related conflicts, and have the least ability to cope (or indeed adaptive capacity) when they occur.

Energy's central role in poverty alleviation and vulnerability reduction recognizes the overlap between the abjectly poor and the energy deprived. About two billion people world-wide exist on less than $1 a day; the same number lack access to commercial energy. Furthermore, The World Energy Assessment Report [WEA, 2000] reports that two billion people have no access to clean and safe cooking fuels, relying mostly on traditional biomass. As well, 1.7 billion people have no access to electricity—most of whom also fall into the categories of abjectly poor and biomass energy dependent. Rural people meet their basic energy needs utilizing unsustainable wood supplies, crop residues and manure at a very high

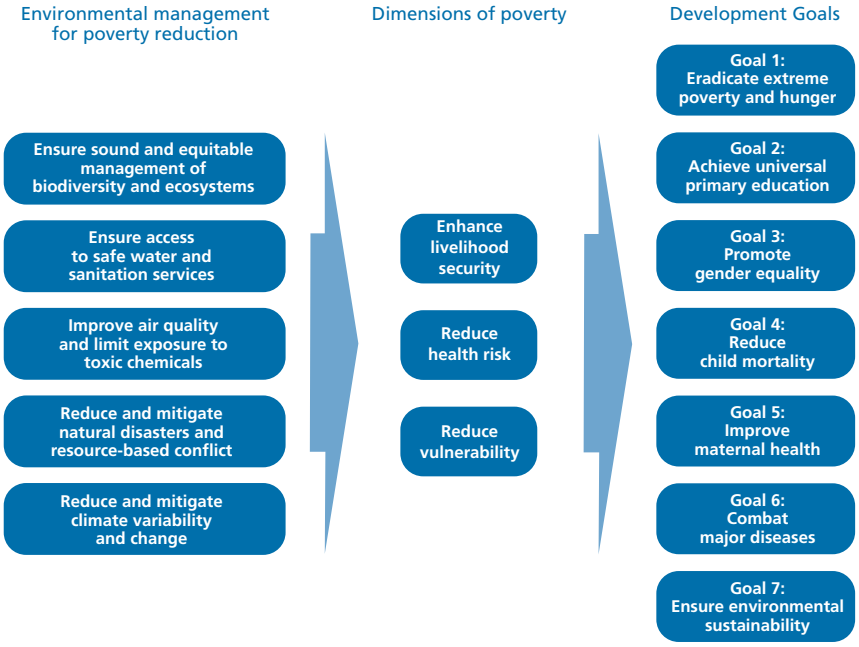
human energy cost—a relentless daily burden borne mainly by women and children. Moreover, energy consumption patterns tend to aggravate poverty by further degrading ecosystems and agricultural productivity [FAO, 2002].

The plight of the rural poor is further exacerbated by their powerlessness in the face of the institutions and policies that influence their livelihoods. Yet any credible poverty alleviation strategy should recognize that the poor do possess social capital and are traditional stewards of their environment. In general, the poor are acutely aware of their dependence on ecosystem services and are capable of identifying priority management actions to protect them [UNEP, 2003].

The role that energy plays in poverty alleviation, ecosystem management and vulnerability reduction is further examined:

- first by reviewing a general framework for linking environmental management, poverty and the Millennium Development Goals;
- second, the relationship between decentralized energy services provision and environmental management; and
- third the direct relationship between vulnerability reduction and the Millennium Development Goals.

Figure 8



Redrawn from "Linking Poverty Reduction and Environmental Management: Policy challenges and opportunities," World Bank, 2002.

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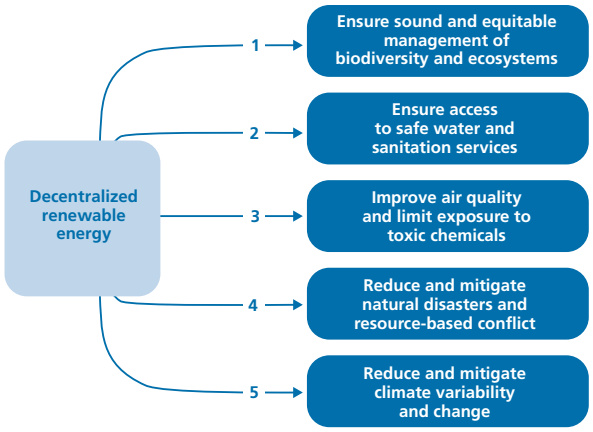
Figure 8 shows a conceptual schematic of the relationship between environmental management, the dimensions of poverty and the Millennium Development Goals. The diagram intends to convey the main pathways between environmental conditions and dimensions of poverty, although the authors acknowledge that in reality the linkages are dynamic and inter-connected [World Bank, 2002].

Figure 9 illustrates the relationship between decentralized renewable energy services provision and the environmental management drivers associated with poverty alleviation. Renewable energy does not ensure a positive environmental management outcome, but with sound physical and institutional design, renewable energy contributes to positive outcomes. The linkages in Figure 9 are described as follows:

Figure 9



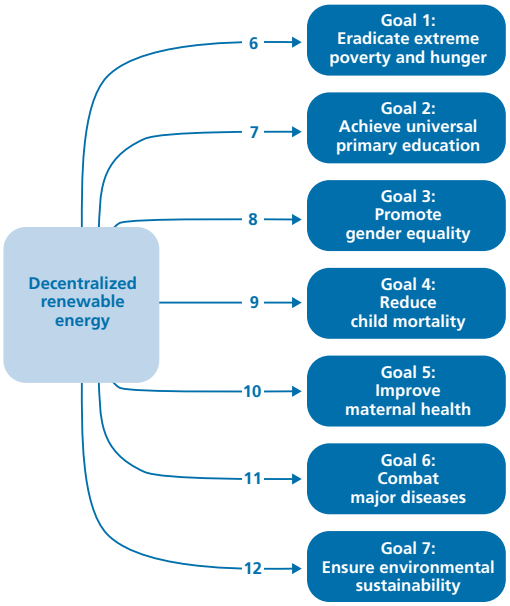
1 DREs contribute to the sound and equitable management of biodiversity and ecosystems by lessening pressure on natural forests in several important ways:

- DREs improve agricultural productivity by providing energy for irrigation pumping and post-harvest processing. These productivity improvements can in turn reduce pressure to convert forest to agricultural land otherwise required to maintain or increase productivity [Ravindranath and Hall, 1995].
- If bioenergy feedstock is produced by afforestation on degraded land, the deforestation pressure on native forests is reduced and biodiversity conserved [Sudha and Ravindranath, 1999].

2 DREs can contribute to ensuring access to safe water and sanitation services. Access to deep groundwater (generally much safer and cleaner than surface water sources) is often constrained by a lack of energy for pumping [Ravindranath and Hall, 1995], [WEC, 1999].

3 DREs such as renewably-generated electricity for household lighting or bioenergy-derived liquid fuels for cooking, or the introduction of improved cookstoves to make more efficient use of traditional biomass, all limit the exposure to the toxic by-products of traditional biomass combustion. In the rural third world traditional biomass provides almost all primary energy demands, the largest use of which is for cooking. Despite the widespread perception that the worst air pollution occurs outdoors in urban areas, the most severe chronic exposure to indoor airborne pollutants occurs among rural women and children due to biomass combustion in primitive, inefficient stoves. The use of residual biomass fuels such as crop litter and dung exacerbate the problem as they generally produce more smoke and require longer cooking times [Smith, 1994], [WEC, 1999], [UNDP, 2000].

Figure 10



4 DREs based on bioenergy can reduce and mitigate natural disasters such as droughts and floods. If bioenergy feedstock is also produced by afforestation in degraded watersheds, floods and droughts can be attenuated by improved watershed function through reduced runoff and increased deep percolation [Pal and Sharma, 2001], [Perry *et al.*, 2001].

5 DREs reduce and mitigate climate variability and change. DREs do not emit greenhouse gases, or in the case of sustainably harvested bioenergy, they are "carbon-neutral"; the next generation of biomass sequesters CO_2 equivalent to that released on combustion—but still permanently displaces competing fossil fuels.

In addition to the linkages between DREs and the proximate environmental drivers of poverty alleviation described above, Figure 10 illustrates the direct linkages between DREs and the Millennium Development Goals. High quality energy services in general, and not specifically DREs, are positively associated with development goals. As will be explained in relation to Goal 7, though, DREs may be the only practical option for providing the energy services required by the rural poor. The individual linkages are elaborated as follows:

6 *Goal 1: Eradicate extreme poverty and hunger*. At the most basic level, eradicating extreme poverty and hunger revolves around food and water security; energy for cooking, irrigation and agricultural post-processing is essential [Ravindranath and Hall, 1995], [WEC, 1999].

7 *Goal 2: Achieve universal primary education*. Better energy access promotes universal education in two fundamental ways. Improved accessibility of bioenergy reduces a major labour burden on women and children, particularly girl children, and improves their opportunities for education [Agarwal, 1997], [WEC, 1999], [Malhotra, Neudoerffer and Dutta, 2003]. Furthermore, household electrification improves the quantity and quality of lighting, the provision of which is very important for encouraging home study and education [Chakrabarti and Chakrabarti, 2002], [IEA, 2002].

8 *Goal 3: Promote gender equality*. Energy accessibility and quality directly affect women, who comprise 70 per cent of the world's poor. Along with children, women are the primary gatherers and users of traditional bioenergy (woodfuel, crop residue, animal dung). They are most severely affected by environmental degradation and bioenergy shortages, and are the primary beneficiaries of increased bioenergy accessibility and improved quality and quantity of household energy services [Cecelski, 1987], [IEA, 2002], [Malhotra, Neudoerffer and Dutta, 2003].

9 *Goal 4: Reduce child mortality*. Improved energy services, particularly high quality fuels and cooking technology directly impacts the health of children. Long-term exposure to biomass smoke increases the risk of a child developing an acute respiratory infection by 100 to 400 per cent; about four to five million childhood deaths annually can be attributed to acute respiratory infections [WEC, 1999, p.26]. The average under-five mortality for countries who derive less than 20 per cent of rural primary energy from biomass is 27.5 per 1,000 live births, rising to 173 per 1,000 for countries deriving more than 80 per cent of primary energy from biomass [UNDP, 2000, p.53].

10 *Goal 5: Improve maternal health*. As already noted, women are heavily impacted by bioenergy accessibility and the quality and quantity of household energy services, because of the large fraction of their labour devoted to energy provisioning and energy end-uses. The greater these arduous household chores, the less emphasis on women's education and the lower the age of marriage. Energy services can create rural livelihood opportunities that also help delay marriage age and can reduce child labour requirements for water and fuelwood collection, thereby decreasing the rationale for large families [Batliwala and Reddy, 1994]. However, typical rural, developing world energy consumption patterns are not consistent with the prerequisites for a decline in fertility and consequent increases in maternal health [UNDP, 2002].

11 *Goal 6: Combat major diseases*. The first, second and third largest risk factors with respect to the global burden of disease are malnutrition; poor water and sanitation; and indoor air pollution respectively [Smith, 2000]. High quality energy services reduce all these risk factors through improved food security by intensifying agricultural productivity, increasing water accessibility and security, and reducing the exposure to indoor air pollutants from low-efficiency biomass combustion. Furthermore rural electrification is also essential for basic disease prevention and treatment including refrigerated vaccines, intensive care and communication.

12 *Goal 7: Ensure environmental sustainability*. Decentralized renewable energy for rural energy services is essential for climate protection. The alternative "business-as-usual" option—extending national power grids and expanding centralized power generation capacity using fossil fuels—is not compatible with stabilizing atmospheric CO_2 concentrations and reducing the risk of catastrophic climate change [WEC, 1998]. Global sustainability also includes the role that DREs play in promoting rural livelihoods. The majority of the world's population is still rural, geographically dispersed and generally well-matched to the diffuse nature of renewable energy resources [WEC, 1999]. Without the livelihood and agroecosystem opportunities that DREs promote, according to some observers, chronic rural under-development will be exacerbated; distressed rural-urban migration will continue [Rajvanshi, 2002], [Gupta, 2003]; the world will become increasingly urbanized; and the opportunity of serving the majority of the world with DREs may be forever foreclosed.

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The Climate Change Knowledge Network (CCKN) Global Issue – Global Partnerships

http://www.cckn.net

The Climate Change Knowledge Network (CCKN) came together in 1998 to open and increase the exchange of knowledge and research expertise between developed and developing countries on climate change-related activities and to make this knowledge accessible throughout the world. Through the cross fertilization of ideas and collaborative efforts within the network, the CCKN strives to strengthen the pool of knowledge on climate change that can inform the international policy process on this issue.

Collectively the member organizations of the CCKN seek to:

- promote a more effective, sustainable and equitable climate change regime through capacity building, research and communication on issues such as the Kyoto mechanisms, adaptation and technology transfer;
- improve dialogue and exchange among industrialized and developing countries in an effort to enhance understanding of the linkages between climate change and sustainable development in all regions; and
- develop the capacity of its own member organizations to create and communicate policy-relevant, country- and region-specific knowledge on climate change.

The CCKN puts a particular emphasis on using its unique combination of substantive, technical and geographic expertise and perspectives to build the capacity of developing countries to respond to climate change in a manner consistent with their own sustainable development priorities.

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