

Energy for Sustainable Development: The Road from Stockholm to Johannesburg

by Maria M. Morales and Francis X. Johnson, SEI



Photo: Pressens Bild

The United Nations Conference on the Human Environment, Stockholm, June 1972.



Photo: Pressens Bild

The World Summit on Sustainable Development, Johannesburg, August 2002.

The World Summit on Sustainable Development (WSSD) in Johannesburg recognised energy as a key sector in supporting sustainable development. Thirty years after the Stockholm Conference, the WSSD marks another turning point in the relation between energy, environment and development. In this article, we reflect on the road from Stockholm to Johannesburg with respect to energy and sustainable development. SEI Research Associate Maria Morales participated in the WSSD and conducted a series of interviews with a number of researchers, policymakers, development specialists, and community leaders. In this issue we have extracted some of the key points raised.

In June of 1972, world leaders gathered in Stockholm for the United Nations Conference on the Human Environment, which came to be known as the Stockholm Conference. It marked the first time that environmental issues were on the world stage and is widely regarded as the first milestone in international environmental cooperation. The Rio Earth Summit in 1992 brought energy and climate to the world's atten-

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From the Editor:

Dear RED reader,

The RED newsletter is back after a one-year absence! We wish to apologise to our readers for the interruption in publication, which was due to contractual and administrative difficulties. These difficulties have been resolved and publication is now assured for at least the next three years. Except for double issues like this one, publication is quarterly, with issues scheduled for March, June, September, and December each year.

From time to time, we will include other information in this package in addition to the newsletter itself. Items included in this package are a project brochure for the Cane Resources Network for Southern Africa, and a questionnaire that we would be very grateful if you could answer to assist us in improving some of our information services.

In addition to heralding the return of the RED newsletter after a one-year absence, this special double issue also marks two anniversaries this year at SEI. The first is the 30-year anniversary of the United Nations Conference on the Human Environment held in Stockholm in 1972, which came to be known as the Stockholm Conference and from which the SEI takes its name. The recent Johannesburg summit provides the impetus to reflect on the role of energy in sustainable development and consider some of the progress made "on the road from Stockholm to Johannesburg." The SEI was co-organiser of a WSSD pre-event workshop on biomass and rural energy,



Photo: Anders Arvidson, SEI

A rural homestead in the Eastern Province of Zambia.

and a brief report on that workshop is included in this issue.

The second is the 25-year anniversary of the Beijer Institute, the predecessor to the SEI that was founded in 1977 and which brought a number of energy-environment-development issues to the world's attention, ranging from fuelwood in Africa to global climate change. Today's Climate and Energy Resources Programme at SEI continues to take inspiration from innovative work done at Beijer and the partnerships that developed from that work.

This issue of RED also comes on the heels of the UNFCCC Conference of the Parties (COP-8) held in Delhi and therefore we have included a report from COP-8 in this issue. SEI is particularly concerned with the Clean Development Mechanism and adaptation issues, as these have the greatest relevance for developing countries among the different

aspects of the climate treaty. With the Kyoto Protocol nearing ratification, there is no time to lose in fostering global co-operation on sustainable energy solutions.

The RED newsletter aims to provide a forum for the discussion of issues that lie at the intersection of energy, environment and development. In some cases, environment and development goals lie in conflict, but there are many cases where the opposite is true – where positive synergies can emerge through international co-operation. The Climate and Energy Resources Programme at SEI attempts to identify these synergies in its projects and policy research. Your feedback on the newsletter as well as on our projects and publications is most welcome at any time. ■

Francis X. Johnson
francis.johnson@sei.se

The **Stockholm Environment Institute (SEI)** is an international research institute focusing on local, regional, and global issues related to sustainable development. The Institute works through an international network of centres, associates, and field staff located around the world.

The Climate and Energy Resources Programme is concerned with improving access to environmentally friendly energy services, promoting renewable energy and energy efficiency, and advancing global cooperation on climate change.

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For further information contact **Solveig Nilsson**, SEI.
solveig.nilsson@sei.se

Managing Editor: **Anders Arvidson**

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 **SEI** STOCKHOLM
ENVIRONMENT
INSTITUTE

Box 2142
SE-103 14 Stockholm, Sweden
Tel +46 8 412 1400,
Fax +46 8 723 0348
E-mail postmaster@sei.se
www.sei.se

tion, and ushered in progress in other areas such as desertification. The WSSD held in Johannesburg just a few months ago brought the focus back to poverty reduction and basic needs, with special reference to the eight United Nations Millennium Goals (see box).

The WSSD also marked the first summit in which energy was addressed as a distinct sector. It is not included in the Millennium goals, but instead is recognised as a key driver behind the Millennium goals. As noted by Mark Malloch Brown, UNDP Administrator: "Energy helps to achieve poverty reduction, provide access to health care, provision of education, and above all the wealth and prosperity that underpins the achievement of all these goals." It is useful to consider where progress has been made in the last thirty years and where the priorities should be in the future to support sustainable development. The emphasis on renewable energy and rural development reflects the special focus of the Energy Programme at the SEI.

QUESTION 1:

What role does energy play in sustainable development?

"Energy can play a catalytic role in spurring an integrated development that addresses economic hardship and other challenges that the urban and rural poor face in the developing countries".

– Dr. Venkat Ramana, WII, India

"Energy has many links with sustainable development, notably through productivity, income growth, environment, health, education, gender issues, macroeconomic stability, and governance".

– Mr. Jamal Saghir, World Bank

"The role of energy in sustainable development is to provide the services that allow for a development that is economically efficient, environmentally sound and that contributes to social equity, which in sum are three essential pillars of sustainable development. Energy in its own right is not a priority but a means to achieving social priorities".

– Dr Ausilio Bauen, ICCEPT, UK

Millennium Development Goals

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria, and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development

United Nations Millennium Declaration September 2000

"The nature of energy interventions depends on the target group. For poorer groups, interventions should always lead towards development, whereas the richer the society is, the more energy interventions should target environmental questions".

– Stephen Karekezi, AFREPREN, Kenya

"Energy helps to achieve poverty reduction, provide access to health care, provision of education, and above all the wealth and prosperity that underpins the achievement of all these goals."

Remark by Mark Malloch Brown, UNDP Administrator, at the WSSD

QUESTION 2:

How should energy be prioritised in comparison to other basic needs and services such as clean water and sanitation?

"Energy is fundamental for human activity and it is at the core of the problems that poor people face every day. However, the idea of putting basic needs such as clean water, sanitation and health improvement at the same level [as energy] is wrong. Issues like these, along with education, aids and other social problems are more complex than energy and require different approaches".

– Prof. Jose Goldemberg, Environment Ministry, Sao Paulo State, Brazil

"Energy is important in ensuring a certain minimum quality of life (e.g. fuel to cook food or heating). Programmatically, without going into the debate of energy vs. other services, one can safely say that energy issues are intricately linked with other issues, and one should aim at an integrated approach. It is not a question of giving energy priority over others, but using sustainable energy inputs to ensure provision of the other services".

– Dr. Venkat Ramana, WII, India

"It is the services that energy can provide that make it a fundamental input to satisfying needs such as health, sanitation, education, etc. New and renewable energy technologies can do so in a sustainable way using regional resources and at the same time generating economic development. Energy in its own right is not a priority but a means to addressing social priorities".

– Dr. Ausilio Bauen, ICCEPT, UK

"Energy is not at the same scale of emergency as HIV/AIDS or lack of access to water, for which investments are urgently needed. However, such investments do not stimulate development per se, whereas energy projects are often conceived towards job generation, increased incomes and entrepreneurship. Finally, it is not a zero sum issue – both types of investments are complementary and you have to do both".

– Stephen Karekezi, AFREPREN, Kenya

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Photo: Pressens Bild

Delegates at the Stockholm Conference 1972.

QUESTION 3:

Where has energy for sustainable development made progress since the 1972 Stockholm Conference?

“At the Stockholm Conference there was a strong lobby against renewables as serious energy alternatives, whereas today there is hardly anyone who can make a convincing argument of that kind. There has been a dramatic change in the mindset of decision makers, researchers, and policy makers. There has been incredible progress in technologies such as wind, whose costs have dropped dramatically. Over the past 30 years, the fastest growing energy technologies have been renewable energy technologies”.

– *Stephen Karekezi, AFREPREN, Kenya*

“The last 30 years have seen a shift towards a more diverse and cleaner energy supply. However, these changes have mainly been related to the cleaner use of a variety of fossil fuels in industrialised countries. The tremendous potential of renewable energy sources remains largely unexploited”.

– *Dr. Ausilio Bauen, ICCEPT, UK*

“Some progress has been made in making people aware of the different energy options available and the services they could provide. Some developing countries (e.g. China, India, Brazil, South Africa) managed to create a fairly robust industrial infrastructure in which energy played a key role. This led to oil dependency and contributed to rapid urbanisation. The fossil fuel paradigm thus provided certain development benefits, but at a high price to the environment and to rural development”.

– *Dr. Venkat Ramana, WII, India*

“At the Stockholm Conference there was a strong lobby against renewables as serious energy alternatives, whereas today there is hardly anyone who can make a convincing argument of that kind”.

Stephen Karekezi, AFREPREN, Kenya

“There has been clear progress in rural electrification in many countries. It is also increasingly being recognised that decentralised renewables can offer less expensive and more environmentally acceptable energy solutions in rural areas. Grid-

based electricity is simply not feasible in many rural towns and villages”.

– *Prof. Jose Goldemberg, Environment Ministry, Sao Paulo State, Brazil*

“... we still have 2 billion people without access to electricity, not so different from the number of 50 years ago”.

Prof. Jose Goldemberg, Environment Ministry, Sao Paulo State, Brazil regarding the lack of progress

QUESTION 4:

Where has there been a lack of progress with respect to energy for sustainable development?

“Rural electrification has not kept pace with population growth in poor rural areas. Consequently we still have 2 billion people without access to electricity, not so different from the number of 50 years ago. There has been little progress in achieving equity in energy access in several respects: rural vs. urban, poor vs. well off, Africa vs. the rest of the world, and so on”.

– *Prof. Jose Goldemberg, Environment Ministry, Sao Paulo State, Brazil*

“Renewable energy potential remains largely unexploited around the world and technologies such as fuel cells that could revolutionise energy supply have not yet made it to the market. It is urgent to develop these further. Little progress has been made in modern energy services for the world’s poor, a basic requirement for their economic development”.

– *Dr. Ausilio Bauen, ICCEPT, UK*

“Clean energies are still fighting a variety of barriers and the rate of penetration remains quite low. There are many reasons for this failure: poor infrastructure, deficiencies in planning processes, ill-advised push towards unbridled privatisation, policy and institutional barriers, no increase in Overseas Development Assistance, and technology push without regard to needs (e.g. solar PVs)”.

– *Dr. Venkat Ramana, WII, India*

“Progress has been slowest in sub-Saharan Africa, where traditional energy sources still account for more than 70 %

of the total energy supply at the household level. The rate of rural electrification is very low and in urban areas there is a huge gap between a tiny group of wealthy people and the remainder who are poor. There needs to be a great deal of growth in energy projects in Sub-Saharan Africa within the next 10 years”.

– *Smail Khennas, ITDG, UK*

“The main difference is that the technologies that have been more participatory and directed towards the end users have achieved greater progress than technologies that have been developed mainly in laboratories and in the research centres, often intended for a larger scale. For example, when wind turbines were scaled down, there was tremendous progress and they were later scaled up again successfully. In technology development incremental projection is very relevant, and also the risk of failure is much higher without the participation of local communities”.

– *Stephen Karekezi, AFREPREN, Kenya*

QUESTION 5:

Taking into account the 2 billion people without access to modern energy services, how shall the choice among decentralised and centralised energy systems be determined?

“Urban areas that remain unconnected in Africa and elsewhere are most economically served by grid extension. For the rural population it seems natural that they should be connected through decentralised means. But for some villages, renewables are not yet much of a solution. Diesel generators and other options will have to be used”.

– *Smail Khennas, ITDG, UK*

“Decentralised generation solutions appear as an increasingly viable option to supply developing regions with suitable energy services”.

Dr. Ausilio Bauen, ICCEPT, UK

“Decentralised generation solutions appear as an increasingly viable option to

supply developing regions with suitable energy services. There are often significant potential benefits with regard to the environment, the costs related to energy infrastructure, and the possibility to provide a better match between energy needs and the regional resources available”.

– *Dr. Ausilio Bauen, ICCEPT, UK*

“I have a different viewpoint on this, especially with regard to Sub-Saharan Africa. I am not as concerned about the absence of electricity – I am more concerned about the absence of clean energy, for cooking and productive applications. For many rural communities, electricity is a luxury stage in their development. So one should be more concerned about the productivity of agriculture, the productivity losses from walking long distances for water and firewood, and so forth. These are more important than the availability of electricity, because electricity cannot help us deal with famine”.

– *Stephen Karekezi, AFREPREN, Kenya*

“There is no ‘silver bullet’ to pierce through this complex situation, but there are some lessons from past experiences. First, energy is an input to development; rural programmes should be targeted towards income-generating applications. Second, most energy requirements are location-specific; technological biases injected to create ‘markets’ should be avoided. Third, where grid extension is costly or poses quality issues, distributed generation is a valuable option. Fourth, a concerted R&D effort and more attention to hybrid systems are needed to make renewables cost-effective. Finally, strong public-private partnerships are needed to implement effective programs to increase access to modern energy services”.

– *Dr. Venkat Ramana, WII, India*

QUESTION 6:

What results or changes in energy for sustainable development have been achieved through the World Summits?

“We have had too many Summits with too little achieved. What is required is

concrete assistance from developed countries, and willingness on the part of developing countries to embrace new energy paths. I am hoping that implementation of CDM and a reformed Global Environment Facility will play a key role in promoting sustainable energy programs. At the least, WSSD acknowledged the need to approach the issues in an integrated fashion”.

– *Dr. Venkat Ramana, WII, India*

“For the first time this summit has confirmed that energy is of high priority to many policy makers in the North and the South, in the private, government and NGO sector. Second, a unique part of this summit was the advent of new partnerships. Third, a lot of countries have shown renewed interest in the energy-related conventions. Finally, a debate on renewable energy targets was initiated and has been put on the global agenda”.

– *Stephen Karekezi, AFREPREN, Kenya*

“There have been relatively few practical results from the Summits. However, the summits have been crucial in raising relevant issues, promoting international dialogue, and creating an increasing dialogue between governments, industry, NGOs and the research community”.

– *Dr. Ausilio Bauen, ICCEPT, UK*

“It is time to mobilise the massive investments of about 100–150 billion US\$ needed to get access to modern energy”.

Smail Khennas, ITDG, UK on what is needed for sustainable energy to be achieved

“In terms of concrete results not much has happened. The most important is the increasing awareness, the focus on poor communities, and different sorts of technological and financial transfers. It is time to mobilise the massive investments of about 100–150 billion US\$ needed to get access to modern energy. There are many opportunities and we have the most important stakeholders around the table”.

– *Smail Khennas, ITDG, UK*

Voices from Limpopo: South African Women on Water, Energy and Food

by Maria M. Morales, SEI

Several members of the community-based women's group Water for Food came to the Summit from their homes in Limpopo Province in the northern region of South Africa. We discussed with them the role of water and energy services in relation to their everyday lives and the traditional role that energy has played in their livelihoods. Two interviews held with the group provided a grassroots perspective on the roles of traditional and modern energy services and their relation to basic household needs.

Mrs. Tsepo Khumbane, leader of *Water for Food*, recognises the different roles for energy in sustainable development. Of particular interest for her is the role that energy plays in sustaining “mother earth”. She points out that “energy plays an important role bringing back the social systems and the social norms; healing and rehabilitating the land.”

Displacement and Migration

Back at the end of the 1950's, the 'Apartheid' system displaced people like Mrs. Khumbane from their old villages to new villages where livelihoods were not secured and people were located far from water resources. The people displaced in Limpopo lost their fields and their knowledge on subsistence; their old social networks and functioning social systems were missing. There were mass migrations, and many of the men who left never returned.

Environmental degradation and social disruption went hand-in-hand after the migrations and the loss of livelihoods. Tsepo commented that “deforestation and soil erosion resulted after the displacements. People started to decay morally and spiritually. The spirit is destroyed, which



Members of the community-based women's group Water for Food, from Limpopo Province, South Africa.

“deforestation and soil erosion resulted after the displacements. People started to decay morally and spiritually. The spirit is destroyed, which is real poverty – it is not just about food!”

*Tsepo Khumbane
on the effects of displacement*

is real poverty- it is not just about food! The mother soil is bleeding.”

Women and children were left to fend for themselves in many situations and this led to the organisation of the *Water for Food* group. Women were mobilised in 31 villages and organised activities such as cooking, planting, harvesting, food processing and conservation.

Social Systems and Energy Services

The women place special emphasis on the importance of well functioning social systems with a strong moral and ethical

base. They make it clear that the decay of social systems lay at the root of the poverty faced by their communities, as opposed to the lack of physical infrastructure. Consequently, this poses the intriguing question about the role of energy services in rural communities. Is a well functioning social system a prerequisite for the provision of energy services to be useful in rural communities? Should there be much more scepticism about the value of introducing modern energy services before their social context is fully understood?

This led to a number of questions posed to the women about the role of energy in their daily lives. They noted some of the key links between energy and their well-being, such as lighting for night time security and energy for pumping water and for boiling dirty water, thereby improving sanitation and health.

For Mrs M.Tisane and Mrs M. Madhlaba, energy is seen as most valuable



Mrs Tsepo Khumbane, leader of Water for Food, from Limpopo Province, South Africa.



Mrs. Matlowe Madihlaba and Mrs. Mmasetholagweng Tisane (left to right), from community-based women's group Water for Food, from Limpopo Province, South Africa.

All photos by Maria Morales, SEI

For Mrs M.Tisane and Mrs M. Madihlaba, energy is seen as most valuable for cooking, protection (lighting), education, and for small income-earning activities.

for cooking, protection (lighting), education, and for small income-earning activities. After receiving electricity in 1993 and 2002, respectively, they found that it made a difference in their lives in a few key ways:

- saving time fetching wood
- children learning from educational television
- safety provided through public lighting
- improved ability to make and sell dresses and other items

Although energy is a valuable instrument for development and poverty alleviation, modern energy services can bring their

own social problems. Tsepo noted that “electricity could be a form of social exclusion at the village level because those that can’t afford electricity feel shy and backwards as they use traditional methods.” It is therefore important for communities to recognise the importance of traditional energy uses even as modern energy services are introduced.

Water for Food supports women who use the mud fireplace, a traditional way of cooking still used by many women in Limpopo. In some rural areas, 75 % of families live from social aid and cannot afford modern energy. More and more people are getting electricity, but due to the high poverty levels, not all will use it because of the costs and the need to buy appliances that they may not be able to access financially. Some groups of women feel left behind as they continue cooking with the mud fireplace.

The social context must be well understood before modern energy services are introduced if they are to fulfil their main goals – which are poverty alleviation, and improved quality of life.

Tsepo emphasises the need to embrace and not disregard the use of traditional energy and try to counteract the tendencies for people to see those that use it as backward. Access to energy services is not seen as a panacea for rural development. ‘Access’ to energy does not equal ‘use’ of energy, where use is very much related to income. The social context must be well understood before modern energy services are introduced if they are to fulfil their main goals – which are poverty alleviation, and improved quality of life. ■

Outcomes from the WSSD: the Case of the Global Village Energy Partnership

by Maria M. Morales and Amanda Bergqvist, SEI

The main results of the Johannesburg Earth Summit 2002 process are summarised in two types of outcome documents, referred to as Type 1 and Type 2. Type 1 outcomes include two major documents adopted by all Member States participating in the Summit; (a) Johannesburg Programme of Action; and (b) Johannesburg Political Declaration. Type 2 outcomes are non-negotiated outcomes of two kinds: (a) for announcement and for launching at the Summit; and (b) Partnerships and initiatives to implement Agenda 21. In comparison to previous summits, this Summit placed special emphasis on building partnerships with the business sector.

The Type 2 outcomes consist of a series of commitments and action-oriented coalitions focused on translating political commitments into action. Specific modalities of such partnerships (e.g. targets, timetables, monitoring, coordination, implementation mechanisms, funding and technology transfer) were elaborated at the Summit by potential partners from governments, international organisations and private sector groups. The weakness of Type 1 outcomes at Johannesburg – and the lack of commitment they imply – has led many to question the value of the Partnerships launched at WSSD. Type 2 outcomes should have been framed in a legally sound Type 1 outcome as some now see the partnerships as having been conceived in a “vacuum”.

One partnership conceived through the multi-stakeholder platform is the Global Village Energy Partnership (GVEP), launched during the Summit by UNDP/World Bank Energy Sector Management Assistance Program (ESMAP). The partnership brings together developing and industrialised country governments, public and private organisations, multilateral institutions, consumers and community leaders in an effort to improve access to modern energy services by the poor. Under a 10-year “implementation-based”

programme, the Partnership reaches out to non-energy organisations in the health, education, agriculture, water, transport, telecommunications and enterprise sectors. The range of technology solutions proposed will include renewable energy options, energy efficiency measures, and cleaner fossil fuel applications. The partnerships build on the knowledge and capacity of each member of the community in supporting energy service delivery and use.

Mark Malloch Brown, UNDP Administrator, commented on the importance of the cooperation among government, civil society and private actors: “looking at rural energy, the private sector without civil society in active partnership is perhaps no more likely to meet the challenges of dispersed distribution of energy than government was previously.....and without the government, the private sector and civil society are unlikely to enjoy the incentives of regulatory frameworks that allow them to take on these challenges effectively.”

During the launching ceremony, the Minister for Energy and Mineral Resources in South Africa, H.E. Phumzile Mlambo-Ngcuka, suggested that the GVEP partnership offers a tool to democratise energy policy-making. It facilitates improvements in gathering data to support policy-making, enables appropriate responses to needs of different communities, and brings the Department of Minerals and Energy closer to its constituency. She also pointed to an initiative to establish village energy learning and information centres, which will disseminate ideas for cost-effective rural energy options thereby supporting science students as well as consumers.

Mr. Jamal Saghir, Director of the Energy and Water unit at World Bank, highlighted the fact that this partnership addresses one of the most persistent challenges of sustainable development – how to build energy services that stimulate

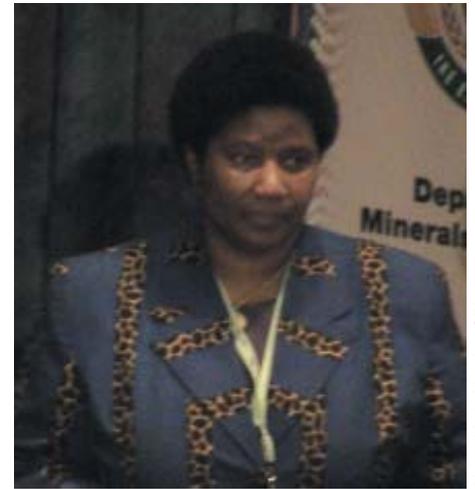


Photo: Maria Morales, SEI

H.E. Phumzile Mlambo-Ngcuka, Minister for Energy and Mineral Resources, South Africa, at the launching of Global Village Energy Partnership.

economic growth, especially in rural areas. “Can the GVEP help make a difference? We believe it [GVEP] is an important step that will complement other World Bank efforts. Particularly, we believe that partnership emphasis on knowledge transfers can have a tremendous multiplier effect throughout the world”.

Mr. Peter Woicke, Managing Director of the World Bank and Executive Vice-President of the International Finance Corporation (IFC), believes that the GVEP addresses one of the most persistent challenges of sustainable development – how to build energy services that stimulate economic growth in rural areas. “A significant amount of money has been spent, but we have too little progress to show for. The Bank is deeply engaged in meeting energy and poverty challenges, however they are beyond the scope, capabilities and resources of any single organisation. The GEVP is a new framework under which different organisations can communicate their efforts to help ensure greater access to modern energy services.” ■

For more information:
www.gvep.org

The Brazilian initiative

by Prof. Jose Goldemberg, Secretary of State for the Environment, Sao Paulo State, Brazil

One of the issues brought forward at the Johannesburg Summit was the need to introduce a minimum of renewable energy into the energy matrix of countries around the world. The Brazilian delegation to the WSSD, with support from many Latin American countries, proposed the “Brazilian energy initiative.” The initiative is very simple – it proposes that by the year 2010, at least 10 % of energy around the world should come from renewable energy sources.

Renewable energy sources, particularly biomass, can address poverty directly, due in great part to their decentralised nature and the fact that the energy is normally generated in close proximity to its use. Modern efficient energy sources will improve the quality of life in developing countries by reducing harmful emissions and improving the indoor environment. The use of biomass indoors for cooking is one of the important sources of respiratory diseases in much of Africa.

Biomass the oil of the poor

Although biomass is a small fraction of energy sources in developed countries, it represents a significant share of energy sources in developing countries – more than 80 % in some African countries. Traditional biomass does not offer a sustainable energy path because of the low end-use efficiency. However, modern and efficient uses of biomass can offer a wonderful source of energy. In some respects, we might say that biomass is the “oil of the poor.” The rich have oil, but in the Southern hemisphere what we have is a lot of sun and in general a lot of trees.

These biomass resources are largely untapped and are available all over the world, something that is not widely understood among policy-makers.

Biomass is stored energy that is available continuously, unlike intermittent renewables such as wind and solar. Sustainable use of biomass is a tremendous resource for the developing world, where tropical and sub-tropical sources allow productivity levels that are several times those available in the temperate climates of Europe and North America. Photovoltaics, with their high-tech appeal, are sometimes presented as the ideal clean energy solution but in fact the applications in which they are cost-effective are quite limited. They are appropriate in some cases for lighting and health clinics, but not for general use. Furthermore, they do not support development in the way that biomass does, since biomass offers sustainable livelihoods and is less reliant in imported technologies and supporting services.

Sugarcane biomass in Brazil

Brazil provides what may be the world’s best example of exploiting an indigenous biomass resource – sugarcane. It is a flexible plant from which ethanol for transportation and electricity by cogeneration is obtained at low costs. The idea of converting sugarcane into ethanol in Brazil on a large scale arose after the oil crisis of 1973 and received strong support from the scientific community. The role of science is to prove that something is possible and then to convince the rest that it is possible. In Brazil the scientific community played that role together with some ‘enlightened’ ministers in the government that gave it their support.

Of the more than 130 countries that grow sugarcane, only a handful have at-



Photo: Maria Morales, SEI

Prof. Jose Goldemberg, Secretary of State for the Environment, Sao Paulo State, Brazil.

tempted to fully harness this renewable energy resource. In spite of the Brazilian example, there remains a lack of interest or a lack of political will to replicate this success. As shown in Brazil, the difficulties are not so much due to high production costs, as is often claimed. Costs are quite competitive in Brazil and elsewhere, but the longer-term success is ultimately more dependent on good governance and leadership than it is on costs.

Technology by itself is not sufficient to keep the momentum going on such a programme – there must be a supportive and consistent policy framework. Some countries, such as Zimbabwe, initially copied the Brazilian example, but today Zimbabwe’s ethanol is not used for fuel blending, but for export to the EU as potable alcohol. Nor is it sufficient to have a great resource base – Cuba has vast sugarcane resources but they have not used them for producing ethanol. The ethanol case in Brazil is a good example of mobilising the scientific community and of creating synergies between private incentives and public interests. ■

The Role of Energy in Sustainable Development

Jamal Saghir, Director, Energy and Water unit, World Bank

Jamal Saghir is director for Energy and Water in the World Bank Group's Private Sector Development and Infrastructure Vice Presidency. Mr. Saghir has been with the Bank for over ten years and has worked on a variety of private sector development, privatisation and restructuring assignments in Africa, Latin America, the CIS countries and the Middle East/North Africa region (MENA). We asked Mr. Saghir to reflect on the changing role of energy in sustainable development and comment on what has been achieved and where the focus should be in the future.

It is sometimes pointed out that there are many needs of the poor that should take priority over energy – clean water, sanitation, elimination of diseases such as Malaria and AIDS, and other health improvements. However, the issue is not which of the various basic needs has priority over the others. Rather, the issue is how the services required to meet these needs can be most effectively provided. Energy is one of these services, and is needed to provide basic needs such as cooking, lighting, heating, refrigeration, education communication and other information services, as well as health, water and sanitation.

Environmental Impacts

It is worth noting, though, that the environmental impacts of energy critically impact the sustainability of development. Indoor and urban air pollution from traditional energy sources and inefficient engines damages the health of millions in developing countries, with enormous cost to families and to the economy. At the end of the 1990s it was estimated that exposure to soot and smoke caused 4 million premature deaths and 40 million new cases of chronic bronchitis every year. Indoor air pollution causes more

deaths and illnesses than tuberculosis, AIDS, or malaria. Air quality in 85 percent of the developing world's large cities – where the population is growing fastest – is a major public health hazard.

The poor need energy to drive productivity-boosting equipment that increases their incomes. The poor are ready to pay the full cost of a reliable supply of modern energy. In fact, they already pay more for low-quality energy services than better-off people pay for good-quality services. Moreover, the amount they pay for energy tends to represent a much larger share of their cash income – as much as a third – than it does for the better-off.

Energy and SD

Energy has many links with sustainable development, notably through productivity, income growth, environment, health and education, gender issues, macroeconomic stability, and even through governance and the environment.

Energy consumption shows a strong correlation with national income. Most economic activity would be impossible without energy, even the small and medium-scale enterprises that are the main source of new jobs for the poor. Thus the kind of economic growth that creates jobs and raises incomes depends on greater and more efficient use of energy.

Energy consumption also shows a strong correlation with human development indicators. A good example is the close correlation with the UN Human Development Index that reflects achievements in the most basic human capabilities – leading a long life (life expectancy), being knowledgeable (educational achievement), and enjoying a decent standard of living (income, measured in purchasing power parity terms).

Modern energy services vital

Modern energy services improve the delivery of social services. In health clinics electricity makes it possible to refrigerate vaccines, operate medical equipment,

and provide lighting after sunset. In homes electricity helps to improve children's educational attainment, even where its use is limited to a single light bulb. In rural communities energy for water pumping and treatment makes it possible to provide clean water. And for poor people everywhere, access to modern energy services frees time for productive pursuits, education, and leisure – time that would otherwise be spent collecting traditional fuels or in less productive manual labour.

The health, education, and productive activities of women and children are particularly sensitive to the availability of modern energy services. Modern cooking fuels free women and children from the burden of collecting and carrying large loads of fuel wood and from exposure to debilitating fumes from primitive cooking stoves. Improved lighting enables adults and children of both sexes to study after their daytime activities end. And electricity enables both women and men in poor households to engage in activities that generate income – by providing lighting that extends the workday and powering machines that increase output.

Economic policies and financing

Energy is also important for macroeconomic stability. Even with support from government, public resources are usually inadequate to finance the investments to meet the energy needs of the poor. Reforms that transfer responsibility for financing energy investments to the private sector directly benefit the poor by reducing the strain on public finances. But the transitional costs of adjustment to private financing can be high and can bear heavily on the poor, especially when large subsidies for energy consumption are reduced or removed. In these cases safety nets may be needed to soften the impact on the poor.

A key policy concern is maintaining fiscal stability to protect budgets for social programs that help the poor directly. Controlling the deficits of state-owned

energy suppliers is a critical part of this. And that often means removing politically popular and strongly defended consumer subsidies that take the form of regulated energy prices. Such subsidies generally weaken energy suppliers' financial position, eventually burdening the government with unmet debt servicing obligations and loss of tax receipts. Moreover, the poor receive only a small share of these subsidies because they consume little of the energy being subsidized – or none at all. Governments need to find ways to remove these subsidies as quickly as is feasible.

Energy market reforms

During the thirty years that have elapsed since the Stockholm Conference, progress has been made in a number of areas. The key developments in recent decades are the reforms in market regulation and the accompanying change in the role of government. The focus has turned to ensuring sound governance of energy markets – both mainstream networks and off-grid supply. Ensuring that energy markets are fair, efficient, and uncorrupted helps the poor by supporting economic growth and expanding the availability of modern energy.

Governments need to support private partners in making the transition from a poorly performing state-owned sector to a commercially viable sector. This support could take the form of mitigating risks beyond the control of private investors and private risk insurers, providing or arranging guarantees to mitigate exceptional political risks that deter private investors, providing guarantees for repatriation of funds by foreign investors under exchange controls, and providing performance undertakings on behalf of state-controlled enterprises for privately financed investments and concessions.

Energy markets still fail – sometimes spectacularly as in California and elsewhere. Hence Governments sometimes need to compensate for ways in which energy markets fail to act in the public interest, including the interests of the poor. They can do so by regulating pollution and other public health and safety risks posed by energy production and distribution, regulating the economic behav-

our of natural monopolies (energy transmission) through legislation or ownership, promoting competition in energy supply or for concessions to supply energy services, creating markets for private initiatives in environmental protection, subsidizing, where appropriate, the costs of access to modern energy services, and reducing barriers to market entry for energy service providers and promising new technologies.

Grid vs. off-grid solutions

Grid connection and small decentralised systems should not be viewed as mutually exclusive options. Urban and rural power markets differ but the conditions required for successful reforms are similar. Establishing commercially sustainable markets in both will require service providers that can recover costs through user fees or subsidies.

The development of private, community, or cooperative distribution companies may be one way to make energy supply more responsive to demand in off-grid areas. Since often it is not clear which model may work best in different areas, the adopted approach should have liberal entry regimes that allow different approaches to arise that meet differing circumstances. Under this approach, renewables would have the opportunity to enter the market without facing unfair barriers.

The Bank's business strategy

The World Bank Group's recently adopted business strategy for energy identifies the following four business lines:

1. Helping the poor directly, by facilitating access to modern fuels and electricity, reducing the cost and improving the quality of energy supplied and supporting energy for social services;
2. Improving macro/fiscal balances by, for example, rationalizing energy taxes, eliminating operating subsidies and improving procurement and marketing energy products;
3. Promoting good governance and private sector development, by, among others, creating objective, transparent and non-discriminatory regulatory mechanisms, introducing and expanding competition,



Photo: Maria Morales, SEI

Jamal Saghir, Director of the Energy and Water Unit, World Bank.

- and strengthening capacity to finance rural energy businesses; and
4. Protecting the environment including by removing market and regulatory barriers to renewables, promoting fuel switching, and strengthening environmental management capacity.

The role of renewables in the World Bank Group's work in the energy sector is linked to all four of these business lines. Renewables are often the least cost solution for off-grid electrification, and the provision of environmental benefits through avoided pollution offers added incentives. There are cases where renewables may make a significant contribution to macro and fiscal balances, by substituting for conventional energy. A country's desire to develop its indigenous renewable resources can also be a driver for promoting good governance of the energy sector.

From Stockholm to Rio to Johannesburg

The Earth Summits have the benefit of publicising trends that have been quietly underway for some time. In the case of energy, the WSSD brought out how energy has become less of a sector on its own and more a component of a multi-sectoral approach to meeting basic objectives. This trend will undoubtedly continue in the work of the World Bank. The publicity given to this trend at the WSSD will stimulate this development by attracting more participants in the development process to this approach. Hence one benefit of the WSSD will be more coherence in purpose and effort in making energy support the needs of the poor. ■

Energy Services and Sustainable Development: a Multi-level Approach

by Dr. Smail Khennas, Senior Energy Advisor, Intermediate Technology Development Group, U.K.

The overwhelming majority of the rural population in developing countries are interested in energy services as opposed to being concerned with particular energy sources. The technical, social, economic and environmental comparison should thus always be carried out with reference to the needs for specific end uses: cooking, lighting, water supply, and so on. A three-level conceptual framework can be used for evaluating the role of energy services in sustainable development: household, community, and small-scale industry.

The sustainable supply of improved and affordable energy services meets basic needs and is of vital importance in the reduction of poverty. However, it has particular aspects that make it difficult to promote: it is not profitable; many benefits deal with the quality of life, rather than with income generation; and the amount of energy used by each household is relatively small.

The household level

Energy service for cooking is the most basic energy requirement of poor people. People who live off of subsistence farming or in otherwise marginalized groups devote a considerable amount of time to collecting, transforming and using traditional fuels (firewood, bio-residues etc.) for cooking. Women and children often perform such tasks, and they suffer disproportionately from the high labour requirements and health effects. Cooking from traditional sources has a serious impact on health, and to a lesser extent also contributes to deforestation and a potential loss of resource productivity.

In the rush to new energy technologies and systems, there is a tendency in



Photo: Anders Arvidson, SEI

Solar photovoltaics used to power communication facilities, and other energy service needs at a school and a clinic in a remote location in the Himalayas.

policy circles to forget the fact that hundreds of millions of households still rely on traditional energy sources for cooking. It is therefore important to improve the flow of information to key institutions, policy-makers, and donors and to create and disseminate the knowledge needed to improve the energy options available to the rural and peri-urban poor in the developing world.

The community level

Energy services serve as inputs to generate high quality social services, particularly communication, education and health. Information and Communication Technologies (ICT) are rapidly revolutionising the socio-economic links that communities can develop worldwide. For ICTs to reach remote communities, decentralised power will be needed. Wireless communication and Internet access, despite their sophistication, can cost-effectively contribute to improved availability of services for the poor and advances in the creation of sustainable livelihoods.

Rural electrification affects society as a whole and transforms entire communities. Lighting and other services increase the options for educational activities, and contribute to improved security and

health. Modern energy services also lead to social changes in the relationship within the family and the community. Synergies are also created through which one improvement leads to another, such as improved education leading to better awareness of health issues; or a reduction in smoke alleviation leading to improved health in children, which, in turn leads to greater educational achievements.

The productive level

Among the key lessons learned in the provision of modern energy services in the developing world (particularly in rural areas) is that the services must give rise to greater productivity if they are to be sustainable. The facilitation of new productive activities is what creates sustainable livelihoods for poor people and makes the energy projects financially viable.

Productive services include a wide range of activities such as agro-processing, transport provision, battery charging, and small-scale manufacturing. Very often, particularly in dry areas, power is needed for water pumping to supporting agriculture. Various options, ranging from manual and animal power to photovoltaics or wind pumps should be considered against the dual criteria of sustainability and affordability. ■

Report from New Delhi: COP-8 Focuses on CDM and Adaptation

by Bill Dougherty, Erika Spanger-Siegfried, Steve Bernow and Nancy Odeh, SEI

Several members of the SEI community participated in the recent UNFCCC COP-8 meeting in New Delhi. This article selectively summarises highlights from some of the side events in the areas of Adaptation and the Clean Development Mechanism (CDM) and the key points of contention from COP-8, and concludes with some brief comments on the "Delhi Declaration" resulting from the Conference.

The Eighth Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) came to a close on November 1st, concluding a week and a half of negotiations at the Vigyan Bhawan Conference Centre in New Delhi, India. Unlike several of its predecessors, this COP held less of the drama that has come to define earlier COPs where major decisions had been anticipated – and reached – albeit after sometimes arduous negotiations. But, with ratification of the Protocol only a hair's breadth away, aspects of the mechanisms as yet undefined, and the new frontier of adaptation to climate change opening up, it was not without its own urgency and intensity.

There were roughly 5,000 persons from 170 countries who participated in COP-8, including 65 ministers in the official high-level deliberations. The SEI activities at the COP reflected expertise in adaptation and in the CDM, and included side events focused on:

- a potential labelling system for proposed CDM projects;
- vulnerability and adaptation in the Maghreb Region;
- building resilience of vulnerable communities through sustainable livelihood strategies.

In addition, SEI staffers took part in key meetings such as "Adaptation Day", which was part of the three-day Inter-Regional Conference on Adaptation to Climate Change. The Conference was organized by the RING – an international alliance of sustainable development research and advocacy organizations, of which SEI is a member.

Progress on negotiations

As in the past, a variety of tensions defined COP-8 negotiations, straining all manner of intergovernmental relation-

ships – North-North, North-South, South-South. Annex I governments questioned non-Annex I progress on Policies and Measures to reduce GHG emissions while. Non-Annex I (developing country) representatives made increasingly strong statements opposing their countries' commitments to emission reduction targets, an issue which will certainly be back on the agenda in future COP meetings. There was also disappointment at

Continued on p. 14

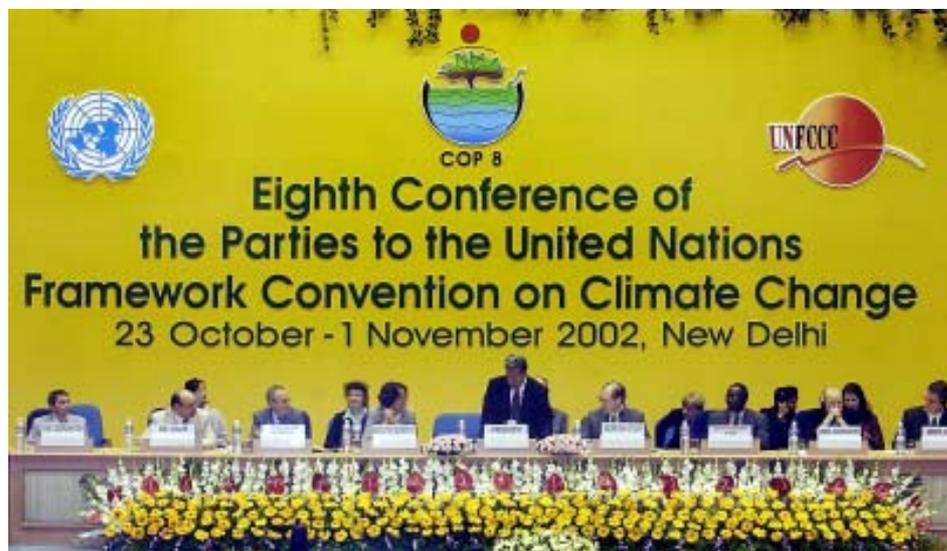


Photo: Pressers Bild

Members of the United Nations framework convention on climate change attend the opening ceremony in Delhi 23 October 2002.

Box 1: A "Gold Standard" for CDM and JI projects

To ensure that the highest quality CDM projects are encouraged (regardless of the standards and procedures of the CDM Executive Board), the World Wide Fund for Nature (WWF) is developing criteria to set a "gold standard" for CDM and JI projects. These criteria will entail screens for:

- technology (new renewables and efficiency);
- climate integrity (additionality); and
- sustainable development (local environment, livelihoods, capacity).

The criteria will thereby support investments that meet the central goals of the Convention and Protocol. At COP8, WWF met with a Standards Advisory Board of international experts to discuss and refine a set of detailed standards, further review and refine before circulation for wider input. While these standards will be useful to all who wish to evaluate proposed projects, it is hoped that a Carbon Label will later be established.

Russia's failure to ratify the Kyoto Protocol in time for COP-8. At the same time, in the Subsidiary Body sessions, progress on specific issues was slow.

A key goal of the 8th session was to prepare the Delhi Declaration, a document that would attempt to refocus Parties on the urgent tasks at hand and recommit them to the over-arching goals of the Convention. In advance of the draft Declaration released at the end of the first week, the European Union and the Climate Action Network (CAN) produced sets of "demands" for consideration and inclusion in the Declaration (see box 3 Climate action ...). Not surprisingly, the initial draft failed to meet their expectations and was widely criticized. The mood in the corridors grew increasingly subdued as neither the "big picture" Declaration, nor the technical details of the Subsidiary Body sessions appeared to be falling into place.

Operationalising the CDM

Meanwhile, numerous Side Events were being held on operationalising the Clean Development Mechanism (CDM) and Joint Implementation (JI), the two project-based flexible mechanisms of the Kyoto Protocol. Negotiations focused heavily on land use, land use change and forestry (carbon sinks) under the CDM with respect to additionality, leakage, socio-economic and environmental impacts, and systems of crediting. Resolution of such issues affects progress on the twin goals of CDM: emissions reductions and sustainable development. A likely holdover for several COPs to come, carbon sinks in the CDM pose a tangle of challenges to negotiators.

Ultimately, negotiations on the CDM needed to arrive at draft rules of procedure, and rules and modalities for small-scale CDM projects. However, the numerous proposals made were met by equally numerous obstacles and at the close of the conference, no clear decisions had been made on a number of these points.

At the same time, an encouraging CDM development was taking shape, albeit outside of the formal negotiations. This en-



Photo: Pressens Bild

Indian children and youths hold a poster asking for the United States to take a stronger stance in protecting the environment.

Box 2: Adaptation at COP-8

An "Adaptation Day" was held at the Habitat Centre in Delhi, which focused on how developing countries can begin to integrate near-term adaptation concerns in development planning. A presentation on the relationships between sustainable livelihoods and adaptation strategies was made by SEI in a joint side event with the World Conservation Union (IUCN) and International Institute for Sustainable Development (IISD). It focused on a discussion of a carbon sequestration project in rural Sudan in which productive activities (e.g., macaroni production, sheep fattening, para-veterinary activities) complemented the introduction of new drought-resistant grass and tree species and increased the resilience of local communities while simultaneously improving carbon sequestration. In another event, a new report was released on vulnerability in water resources, coastal zones, and agriculture in the Maghreb region, outlining a regional approach for a new 3-year adaptation project.

tailed the crafting of a system (coined the "Gold Standard") that would apply technology, additionality and sustainability criteria to potential CDM and Joint Implementation (JI) projects. The system would help to distinguish projects that ensure climate integrity and sustainability from those with questionable or more ambiguous socio-economic and environmental impacts (see Box 1 Gold ...).

The "Adaptation" COP

In addition to CDM and JI, there was much attention devoted to climate change

adaptation. In fact, COP-8 had come to be known as the "Adaptation COP" during its lead-up, and was widely viewed by developing countries as an opportunity to take real strides on the various needs and commitments surrounding adaptation. Government (both North and South) and civil sector voices were joined from the outset in calling for progress on adaptation and – of particular concern to a number of groups – on the integration of adaptation with sustainable development goals. In side events and related meetings where policy proposals were

presented, a common theme was that adaptation needs to be recast as a near- to mid-term challenge, rather than a long-term challenge, as it has been traditionally viewed (see Box 2 Adaptation ...).

The Marrakech Accords, worked out at the previous COP-7 in Marrakech, had laid the framework for how adaptation activity would be supported, but it was left to negotiators at COP-8 to finalize a number of issues related to the specific funding mechanisms. Ultimately, and not surprisingly, the issue of adaptation funding appears to have provided one of the meeting's largest sticking points.

The three funding mechanisms agreed upon at COP-7 are the LDC (Least Developed Countries) Fund, the Special Climate Change Fund and the Adaptation Fund – each to be channelled through the Global Environment Facility (GEF) to support a range of developing country adaptation activities. Disagreement arose over Annex I country suggestions on strict limits for use of the LDC Fund, and was further distracted by the vocal insistence of the Saudi Arabian delegation that compensation for lost oil revenues should be provided to them through adaptation funding.

UNFCCC National Communications

Over the course of the COP, the issue of guidelines for the second round of National Communications emerged, somewhat unexpectedly, as particularly problematic. Disagreement on points such as the LDC submission of National Communications, dealing with data challenges, and the starting year of non-Annex I greenhouse gas inventories bogged down the discussion, leading Parties to agree that the existing – and outdated – First National Communications guidelines would be used in the absence of a decision on improved guidelines.

The Delhi Declaration

On the second to the last day of COP-8, the launch of the ministerial sessions appeared to provide a subtle shift in the negotiations, focusing discussion on the urgency of avoiding “dangerous” climate change. The Kyoto Protocol, which had

Box 3: Climate Action Network deepens the debate

On the eve of the Delhi Declaration, Climate Action Network (CAN), a coalition of Northern and Southern NGOs, released its “Demands for the Delhi Declaration” in its climate negotiations newsletter (ECO, 28 October), setting a high standard for negotiations to come. Among other things, it calls for:

- “... an emissions path that holds temperature change well below 2 degrees C while allowing sustainable development.”
- “Increased capacity and financing for adaptation..... However, without far deeper emission reductions no amount of adaptation can stave off catastrophic impacts.”
- “Recognition that the North’s historical responsibility for climate change and the pressing needs of the South are the basis for substantial financial transfers to support energy efficiency, new renewables and sustainable development in the South.”
- It concludes: “The science, the principle of common but differentiated responsibilities, and the need for sustainable development all require that Parties launch a process at COP8, based on the Convention and the Protocol, that moves forward to a just, equitable and adequate climate agreement.”

Box 4: Conveying a sense of urgency

The New Delhi conference has achieved its main goals of further strengthening international collaboration on climate change while meeting the requirements of sustainable development. Now the spotlight must focus on action to accelerate the transition to climate-friendly economies. Industrialized countries have only 10 years to meet their Kyoto emissions targets – and the evidence today is that most of them still have a great deal of work to do to reduce their greenhouse gases.

Joke Waller-Hunter, Convention Executive Secretary

not even been mentioned in the initial draft of the Delhi Declaration, was openly acknowledged as an essential first step, but ultimately inadequate to the task at hand. In spite of the discord and lack of progress in a number of areas, the Conference did end up conveying a sense of urgency through widespread recognition of the challenges that lay ahead in meeting carbon reduction goals (Box 4 Conveying ...). The discussion in the final days contributed to improvements in the Delhi Declaration and for concluding on a resolved note on 1 November.

The Delhi Ministerial Declaration on climate change and sustainable develop-

ment encourages immediate ratification of the Kyoto Protocol and refers to a wide range of responsibilities and goals in the areas of adaptation, technology transfer, cross-sector integration, access to energy services, and promotion of renewables. The Declaration makes particular mention of island states and African states as being the most vulnerable to the effects of climate change. The next COP meeting is to be held in December 2003 in Italy. ■

The unedited Delhi Declaration is found at:
http://unfccc.int/cop8/latest/1_cpl6rev1.pdf

WSSD pre-event workshop report:

Biomass, Rural Energy and the Environment, 19–21 August 2002, Durban, South Africa

by Rainer Janssen (WIP, Germany)

One week prior to the World Summit on Sustainable Development (WSSD) a pre-event workshop on biomass, rural energy and the environment was organised in Durban by WIP-Munich and Illovo Sugar Ltd. as a joint effort of three Thematic Networks funded by the European Commission Fifth Framework Programme for Research: CARENSA, SPARKNET and LAMNET.

The Cane Resources Network for Southern Africa (CARENSA) focuses on the role of bio-energy from sugarcane in promoting sustainable development and improving global competitiveness in the region of southern Africa. SPARKNET is a multi-stakeholder interactive Knowledge Network focusing on how people, in the context of acute poverty, can gain access to better energy services and improve their livelihoods. LAMNET, a Global Network on Bioenergy, constitutes a transnational forum for the promotion of the sustainable use of bioenergy.

This workshop was aimed at identifying synergies and initiating future co-operation among the three multi-stakeholder networks in order to promote sustainable energy for development by assessing energy demand and resources, expanding the institutional knowledge base, and by creating a broad-based discussion forum to evaluate innovative policy options. Additionally, a position paper with recommendations for the utilisation of bioenergy for sustainable development was jointly elaborated and promoted at the Johannesburg Summit.

The workshop featured an international group of presenters from Europe,



Photo: Maria Morales, SEI

Cane being burnt before harvest. Efforts are increasing around the world to avoid cane burning in favour of green cane harvesting, particularly where the additional residues can be used in bioenergy production.

Latin American, Africa, and China. The workshop had a special emphasis on sugarcane, a promising source of bio-energy in southern Africa and in many developing countries. Illovo Sugar, invited the participants on a technical tour, including a field visit on harvesting and collection of sugarcane and a visit to a sugar mill and ethanol distillery.

The talks and the concluding round table discussion brought out the following conclusions:

- The sugar industry around the world has considerable renewable energy potential, but needs supportive policies and some modest economic incentives.
- New pelleting technologies will facilitate improved handling, storage, and transport of bagasse and make year-round use of bagasse economically viable.
- Bioenergy can make a significant contribution to sustainable development by identifying synergies across envi-

ronmental/conservation, economic and social objectives.

- Sustainable development requires greater investment in local human resources and local capacity, rather than relying on imported knowledge and technologies.
- Successful rural electrification programmes require a prioritisation of income generating activities in rural areas, with a special role for biomass. ■

The full workshop proceedings are available on the LAMNET project web site:

www.bioenergy-lamnet.org

www.carensa.net

www.sparknet.info

