

A photograph showing two solar panels mounted on metal stands in a rural, rocky landscape. The panels are tilted towards the sun. The ground is covered with reddish-brown soil and scattered rocks. In the background, there are some trees and a building. The sky is clear and blue.

**Sustainable Energy  
– Rural Poverty Alleviation**

## Contents

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### Challenges

Energy for rural areas: A multifaceted task  
Pathways to rural energy supply

3  
5

### Policy level

International conditions  
National energy policies

6  
7

### Implementation

Sustainable energy projects  
National energy programmes

8  
9

### Bibliography

Glossary  
Recommended reading

11  
11



Rehabilitation of a degraded area can be a piece in the jigsaw of mitigating rural poverty. A Nepali-Canadian research project investigates the feasibility of a drip irrigation system powered by solar energy to turn a degraded area into a productive field. (Photo: S. Wymann)

**InfoResources Focus** is published three times a year in English, French and Spanish. It is available free of charge and may be ordered in pdf format, or as a print publication from the address below.

**InfoResources** consists of three information services: *InfoForest/ Intercooperation*, *Infoservice CDE* and *InfoAgrar*. It is a network that supplies and spreads information on natural resources and international cooperation.

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InfoResources is funded by:



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Today, access to sustainable energy is recognised as a key factor in sustainable poverty-oriented development. On the one hand, energy services such as cooking, heating, lighting and communication are central to improvement of social well-being. On the other hand, energy services used for production and transportation are indispensable to economic progress. Two developments will influence the availability of and access to energy in the future:

- Energy consumption is increasing markedly, despite improved **energy efficiency**, primarily in the industrialised countries. Careful estimates indicate that energy use will double in developing countries in the next 20 years.
- The use of **substitutes** for fossil fuels is increasing, accelerated by rising oil prices. Renewable energy, particularly biofuels, is becoming increasingly important. Consequently, experts predict that today's petroleum-based society will be transformed into a bioenergy-based society in this century. Nuclear energy is once again being seriously discussed, despite unresolved safety issues.

## Energy for rural areas: A multifaceted task

Provision of energy services to poor people in rural, frequently sparsely settled areas is a particularly challenging and multifaceted task. How can energy be provided to rural areas in ways that promote development, address poverty, and protect the environment? What measures are needed at which levels? These questions are at the centre of the present InfoResources Focus.

The problems cannot be addressed only at local levels. Rather, environmental changes, market and power politics at the global level, as well as institutional competence, economic potential and resource availability at the national level, shape the conditions for solutions at the local level.

Some of the most important linkages between these areas are discussed in what follows.

### Energy – environment – poverty

- Poor people and people in marginal areas, above all, presently depend on natural resources (wood, charcoal, dung) to provide energy for cooking and heating. By 2030, the number of people in this category is expected to rise from 2.4 billion to 2.6 billion. The result will be greater local competition for traditional energy.
- The environmental and social impacts of biofuel production, which continues to grow throughout the world, vary depending on the context. Substitution of biofuels for fossil fuels will have positive impacts, primarily in relation to reduction of greenhouse gases and possible recultivation of degraded areas. As a cash crop, biofuels also represent a new source of agricultural income. But there are many questions about the extent to which smallholders will be able to profit from this new market. At the same time, there is a great risk that cultivation to produce biofuels will accelerate soil degradation, overexploitation of water, and loss of

*Sustainable Energy* is defined as "energy produced and used in ways that support human development over the long term, in all its social, economic, and environmental dimensions".

**World Energy Assessment Overview**  
[www.undp.org/energy/activities/wea/drafts-frame.html](http://www.undp.org/energy/activities/wea/drafts-frame.html)

Other energy-related terms, such as "energy services," are briefly explained in the **Glossary** on page 11.

**Growth in primary energy production, 1990–2030, based on a "sustainable development". Scenario strongly influenced by policy-making.**

Primary energy	Share of total use (%)	Annual rate of growth in % in sustainable development scenario				
		1990–2000	2000–2010	2010–2020	2020–2030	
Biomass	10.7*	1.50	1.40	2.70	2.90	
Other Renewables	3.10	3.40	5.75	6.00	4.50	
Nuclear	6.90	2.50	3.55	4.50	8.00	
Coal	22.60	0.70	1.10	1.37	1.41	
Oil	35.10	1.30	0.67	0.75	0.77	
Gas	21.70	2.20	3.55	2.57	2.76	

\* Traditional and modern biomass

**World Energy Assessment Overview: 2004 Update**  
[www.undp.org/energy/weaover2004.htm](http://www.undp.org/energy/weaover2004.htm)

**Energy to 2050**  
[www.iea.org/textbase/nppdf/](http://www.iea.org/textbase/nppdf/)

### Biofuels

An optimistic assessment:  
**The Contribution of Bioenergy to a New Energy Paradigm**  
[www.iea.org/textbase/work/2005/Biofuels/Biofuels\\_Ugarte\\_Paper.pdf](http://www.iea.org/textbase/work/2005/Biofuels/Biofuels_Ugarte_Paper.pdf)  
**The Jatropha-System: An integrated approach to rural development**  
[www.jatropha.de](http://www.jatropha.de)

Critical, differentiated assessments:  
**biofuelwatch**  
[www.biofuelwatch.org.uk/index.php](http://www.biofuelwatch.org.uk/index.php)  
**How much bioenergy can Europe produce without harming the environment?**  
[http://reports.eea.europa.eu/eea\\_report\\_2006\\_7/en/](http://reports.eea.europa.eu/eea_report_2006_7/en/)

biodiversity, and also compete with food production, thereby endangering food security.

- Global climate change, caused by the burning of fossil fuels, has many adverse ecological impacts on people's livelihood. One study has shown, for example, that 11% of the arable land in developing countries will be lost and that cereal production in 65 developing countries will diminish dramatically.

Growing demand for energy will exert increased pressure on natural resources in future, thereby posing a threat to the multiple services provided by ecosystems. Should these services be further degraded, poor populations in rural areas who are directly dependent on natural resources will be affected first and foremost.

### Energy – social development – poverty

- Almost 1.6 billion people in developing countries have no access to electricity. Approximately 85% of these people live in rural areas. Current projections indicate that this number will decline by only 100 million by 2015.
- 2.5 million people particularly women and children, still die annually of diseases of the airways, because traditional fuels impair the quality of the air in their homes.

Electric light, modern means of communication, and access to new media enhance opportunities for education. Cooking and heating with modern sources of fuel or electricity improves health and reduces workloads, above all for women and children. These examples illustrate how modern energy can significantly improve living conditions and hence help to reduce rural exodus. Access to energy services is an important instrument for empowering poor people and disadvantaged population groups and thus for fostering equity. Accordingly, calls to designate access to sustainable energy as a human right are growing louder.

If energy production does not keep pace with growing demand, there will be an increased risk that poor people, particularly in rural areas, will find it even more difficult to gain access to electricity and modern fuels.

### Energy – economic development – poverty

- The increase in the global market price of fossil fuels is a burden not only on individual household budgets; it is above all a burden on the budgets of many developing countries, amounting to as much as 10-30% of their gross domestic product. The economic and social impacts harbour a potential for conflict that should not be underestimated. Moreover, higher fossil fuel prices diminish the financial options for promoting future-oriented energy projects in rural areas.
- Sparse settlement and long distances make energy in rural areas more expensive. This imposes economic limits on the concept of central power plants that guarantee a countrywide energy supply through a national grid.

Access to modern energy enables agricultural development and the development of productive economic sectors in rural areas. Agricultural products can be processed and sold at a higher prices in urban centres, a key factor for poverty alleviation. Rural households thus benefit from value added. Additionally, if people are connected to the national grid, they can benefit from rates that are frequently subsidised.

The feasibility of financing rural energy supply, and the financial sustainability of doing so, are closely linked with the potential to promote economic productivity that also benefits poor population groups.

*Gender and Energy for Sustainable Development: A Toolkit and Resource Guide*  
[www.undp.org/energy/genenergykit/index.html](http://www.undp.org/energy/genenergykit/index.html)

*Energia: Network on Gender and Sustainable Energy*  
[www.energia.org](http://www.energia.org)

*Small hydropower instead of oil for Indonesian tea production in Dewata*  
2000 people earn income from a tea plantation in Dewata with 600 ha of tea fields and a daily harvest of 20 t. Thanks to a small hydropower plant (an investment of US\$ 330,000) the use of diesel fuel was reduced from 320,000 l annually to 25,000 l.

[www.mhpp.org/docs/DewataInfoSheet.pdf](http://www.mhpp.org/docs/DewataInfoSheet.pdf)

## Pathways to rural energy supply

The many interactions involved demonstrate that sustainable energy production requires trans-sectoral, integrated approaches and an appropriate institutional framework. Accordingly, the following aspects can play a decisive role in rural development:

- **Promotion of locally available renewable energy** to meet basic electricity needs. Decentralised production units are appropriate wherever locally renewable sources of energy are available and where connection to a central power plant is too costly (while nevertheless retaining the option of subsequent connection to a power grid).
- **Efficient use** of traditional and commercial fuels. Together with promotion of renewable energy, this will contribute to environmental protection at the local, regional and global levels, while also saving costs.
- **Generation of value added and income** for local populations through the productive use of energy. Value added is usually a condition for (economically) sustainable operation of the energy system.  
Sale of local energy – for example, hydropower fed into the national power grid – can constitute an additional form of income for local people, if the production unit is owned by the community.
- **Priority in energy supply to social infrastructure** such as schools, health-care facilities, and community centres used by the entire population, above all by disadvantaged groups.
- **Promotion of decentralised organisation and operating models.** When planning, operations and management in decentralised energy systems are in local hands as far as possible, greater account is taken of local conditions. This increases the responsibility for maintenance and hence the reliability of energy supply.

Areas where renewable energy has been used in rural regions in developing countries to date:

Electricity / mechanical power	Heating	Transport
Hydro power	Biomass (wood, charcoal, dung), biogas	Biodiesel, biogas
Wind energy	Solar energy	
Photovoltaic, solar energy	Geothermal energy	
Biogas, biomass gasification, biodiesel		

... energy efficiency improvements are among the more cost-effective means for air-pollution abatement for the various sources of pollution, and recognizing specifically that "a kilowatt of energy saved through conservation and/or end-use efficiency improvements should be valued as much a source of energy as a kilowatt obtained from primary resources", ...

The National Energy Conservation Centre,  
Pakistan  
[www.enercon.gov.pk/index.htm](http://www.enercon.gov.pk/index.htm)

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## International conditions

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### Pressure resulting from economic policy

The liberal market economy and the dominant position of the petroleum industry have sent false signals with respect to sustainable resource policy, and have also limited room for manoeuvre in promoting poverty-oriented energy policies. Increasingly sharp competition to gain advantageous positions is forcing countries to provide energy as rapidly and cheaply as possible and to favour dynamic economic centres. Thus oil prices, which have remained relatively low for decades, have led to the development of unilateral structures in many developing countries.

Currently, liberalisation of markets for energy services, as it is being advanced by the industrialised countries, harbours the danger of new forms of dependency. But developing countries are demanding transfer of new technologies as a counter-response to the opening of their energy markets.

### The environmental conventions

Efficient use of energy with the aim of reducing greenhouse gas emissions is *the* theme of the Kyoto Protocol to the UN Framework Convention on Climate Change. The Protocol clearly states that the industrialised countries have the primary responsibility for reducing greenhouse gas emissions. However, the Clean Development Mechanism (CDM) offers an international financing mechanism to support projects concerned with promoting the use of renewable energy in developing countries. But major administrative efforts and high transaction costs make it difficult for small decentralised projects to gain access to this financing option.

The Convention to Combat Desertification (UNCCD) assigns responsibility for sustainable energy primarily to individual countries. It also calls, however, for cooperation from neighbouring countries to achieve coordinated and hence more efficient use of energy. The UN Convention on Biological Diversity pays little attention to the question of energy, although it will have to confront the issue in the foreseeable future, given the growing production of biofuels.

### International development initiatives

For the past 10 years the UNDP has increasingly promoted energy projects as the key to sustainable development. The World Bank and the International Monetary Fund advise developing countries to take account of the linkage between improved national energy policies and poverty reduction in their Poverty Reduction Strategy Papers (PRSP). Nonetheless, in virtually none of the national PRSPs produced so far is energy mentioned as a significant factor in poverty alleviation.

Sustainable energy production is also one of the primary aims of the Johannesburg Action Plan of 2002 and one of the thematic priorities of the Commission on Sustainable Development. Recently, the UN Millennium Project has also recognised that its eight development goals can only be realised with improved energy services.

#### **CDM Financing**

*Bundling small projects in the energy sector makes it possible to access sources of CDM financing.*

[www.cdmpool.com/reports/0797%20Handbook%20FINAL%20Version.pdf](http://www.cdmpool.com/reports/0797%20Handbook%20FINAL%20Version.pdf)

#### **REPIC (Renewable Energy Promotion in International Co-operation)**

*Switzerland's interdepartmental cooperation platform is an example of how synergy effects can be achieved through better coordination (joint promotion strategies, network-building, strategic partnerships, etc.), thereby contributing to climate protection and promoting renewable energy.*

[www.repic.ch/files/index\\_en.html](http://www.repic.ch/files/index_en.html)

#### **PRSP Sourcebook: Chapter Energy**

*The chapter on Energy, offers guidelines for more poverty-oriented energy policies at the national level.*

[http://povlibrary.worldbank.org/files/4722\\_chap21.pdf](http://povlibrary.worldbank.org/files/4722_chap21.pdf)

## National energy policies

### From sectorally organised energy supply ...

Problematic structural conditions make sustainable energy policies difficult in developing countries.

Unclear and competing responsibilities among ministries, as well as lack of cooperation between government, non-governmental organisations and donors lead to overlapping and inefficient planning processes. Diversification of supply is made more difficult by the powerful political position of national suppliers and by subsidies for electricity and fossil fuels. Moreover, large-scale energy projects are susceptible to a certain degree of corruption. Especially when they are financed by foreign investors, such projects can sometimes be burdened with foreign exchange risks and contribute to indebtedness.

### to a trans-sectoral energy policy

The process by which energy services are distributed equitably and produced in an environmentally friendly way requires deliberate political commitment and guidance. This makes it important to take account of the aims of PRSP and the MDGs in national energy policy, rather than giving primary emphasis to maximisation of profits. Comprehensive regional and land development planning can serve as the basis for establishing priorities. The following elements support this process:

- Including all stakeholders, particularly disadvantaged groups, in development of national energy policies. This makes it possible to assess the long-term energy needs of industry, agriculture, the transport sector, rural and urban households, etc. Joint negotiation of goals and priorities will help ensure ownership of the policies developed.
- Creating legal, institutional and political conditions that promote renewable energy and favour efficiency measures. This includes, for example, the presence of independent authorities to monitor liberalisation processes, standardisation and quality control, regulatory models for granting concessions, etc.
- Promoting public-private partnerships that protect also the interests of consumers and allow value added to be channelled to the local population. When PPPs are advantageous for local investors or for alternative models of ownership and operation such as user associations, foreign exchange risk can be reduced and legal validity enhanced.
- Establishing financing mechanisms and tax measures that make energy services affordable, even for poor population groups. Reducing subsidies for fossil fuels and internalising external costs helps to promote energy efficiency and renewable energy.
- Initiating regional cooperation to harmonise infrastructures and encourage exchange of information between neighbouring countries, in order to increase energy reliability and efficiency.

In addition to technical competence, it will be important above all to strengthen institutional, legal, and scientific competence at the national level, in order to develop and implement these elements.

#### *Private Gain – Public Risk?*

*A critical analysis of experience with long-term Power Purchase Agreements.*

[www.irn.org/programs/bujagali/bujagalippa-background.pdf](http://www.irn.org/programs/bujagali/bujagalippa-background.pdf)

*Recommendations for a poverty-oriented focus in national energy policies can be found in:*

#### *Energy Services for the Millennium Development Goals*

[www.unmillenniumproject.org/documents/MP\\_Energy\\_Low\\_Res.pdf](http://www.unmillenniumproject.org/documents/MP_Energy_Low_Res.pdf)

*For an example of participatory development in a comprehensive energy policy, see:*

#### *White Paper on the Energy Policy of the Republic of South Africa*

[www.info.gov.za/whitepapers/1998/energywp98.htm](http://www.info.gov.za/whitepapers/1998/energywp98.htm)

#### *White Paper on Renewable Energy Policy on the Republic of South Africa*

[www.polity.org.za/pdf/WhitePaper.pdf](http://www.polity.org.za/pdf/WhitePaper.pdf)

*Small hydropower in Nepal: In recent years, with the help of a GTZ project and other support, a model electricity law was drafted that has several exemplary features: conditions for feed-in electricity, facilitation of access to electricity for the rural population, subsequent connection to grids for previously isolated small hydropower plants, and founding of Rural Electricity Entities to improve rural electrification.*

[www.entec.com.np](http://www.entec.com.np)

#### *Regional cooperation*

*The West African states have agreed on a common White Paper with the aim of improving their supply of energy and making it more efficient through regional coordination.*

[ftp://ftp2.ptfm.net/ptfmc/references/ecowas\\_white\\_paper.pdf](ftp://ftp2.ptfm.net/ptfmc/references/ecowas_white_paper.pdf)

# Sustainable energy projects

## Learning for Sustainability

In a joint process in a mountain village in Kyrgyzstan, residents and outside specialists examined the local energy condition, energy uses and needs, and possible ways of improving the energy situation. The knowledge they shared serves as the basis for sustainable energy projects. For more about this learning tool, see:

[www.cde.unibe.ch/Tools/ALS\\_Ts.asp](http://www.cde.unibe.ch/Tools/ALS_Ts.asp)  
[www.cde.unibe.ch/Regions/CAMP\\_Rs.asp](http://www.cde.unibe.ch/Regions/CAMP_Rs.asp)  
 For information on the case study:  
[info@cde.unibe.ch](mailto:info@cde.unibe.ch)

## Integration of traditional knowledge:

**Energy efficiency & passive solar architecture in the construction sector**  
[www.ffem.net/jahia/webdav/site/ffem/users/administrateur/public/projets%20FFEM/Brochure%20Afghanistan.pdf](http://www.ffem.net/jahia/webdav/site/ffem/users/administrateur/public/projets%20FFEM/Brochure%20Afghanistan.pdf)

## Energy efficiency in brickmaking in Vietnam

This project made it possible for local small and medium-sized enterprises to express their needs and requirements, and provided a suitable input from international experts. Local actors were at the center of the process, which involved ongoing optimization, further training, management consulting, and accompanying measures concerned with the environment and with working conditions.

[www.sdc.org.vn/index.php?navID=21490&langID=1&userhash=9c431ed98ec17fd6b1c75dc72947a8e1](http://www.sdc.org.vn/index.php?navID=21490&langID=1&userhash=9c431ed98ec17fd6b1c75dc72947a8e1)

## Energy competence centres

The Bibliography (page 16) contains a list of regional and international competence centres.

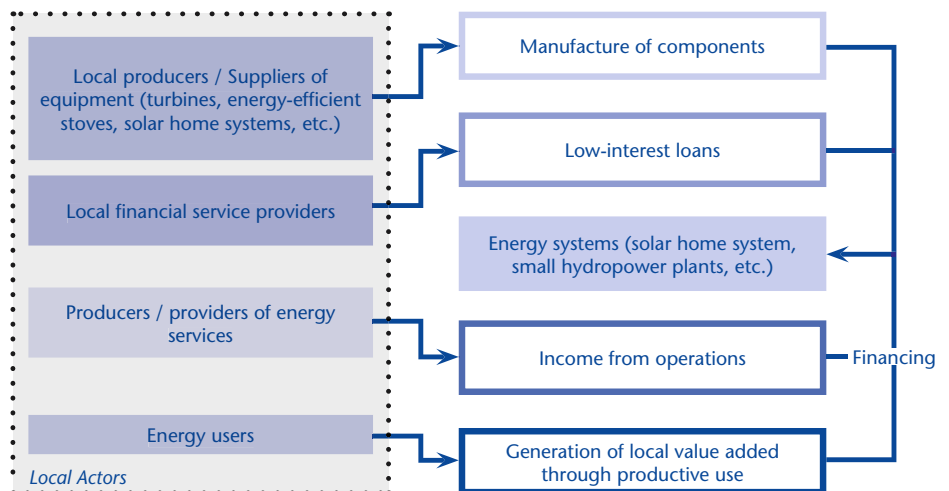
## The participatory demand-driven approach

Including all local stakeholders – women and men – makes it possible to assess local demand (energy needs, type of organisation, financing, etc) in detail. It is important during this process to distinguish among different needs for households, local production purposes, and social infrastructure, and to determine short- and long-term demand in each area. What type of energy (mechanical, thermal, electric) is required for what purposes (cooking, heating, powering machinery, lighting, etc.), and at what time of day and year? A detailed analysis of energy needs also provides the basis for demand-side management and can improve the use and efficiency of energy production facilities.

## Not always the newest but the most appropriate technology

Detailed knowledge of ecological conditions and the social environment makes it possible to choose an environmentally friendly technology that is suited to local conditions. Locally available knowledge can be applied, local construction materials used, and existing production capacity developed further. In addition, existing distribution structures can be activated to disseminate such things as energy-saving stoves and solar home systems. Access to credits for start-up investments, method of payment, maintenance costs, etc. must also be taken into account. Use of proven technologies and their continued adaptability to local conditions has been shown to be more sustainable than use of the most innovative technologies. At this point, it is necessary to benefit from the experience of regional and international centres, working groups, and energy programmes, and to promote South-South cooperation.

Capacity development and motivation of local actors as the agents of technological change are prerequisites for project sustainability.



A model for including local actors in order to enhance institutional and financial sustainability



### Institutional development

It is important that rural and often decentralised energy projects are able to provide reliable supplies of energy for the long term. This is more likely to succeed when responsibility is delegated to local decision-makers, sustainable operational and maintenance structures are in place, and ownership as well as rights and responsibilities are clear. Training for local personnel and for management responsibilities is indispensable. Exit procedures for supporting organisations must be determined and made transparent from the outset.

### Financing and economic efficiency

Energy projects must be able to create long-term added value that benefits poor population groups above all, in order to enable the financing of modern energy systems by their users. In addition, sustainable financial mechanisms, such as favourable credits and opportunities to economise, ease investment costs for poor households over the long term.

In many cases the use of renewable energy is profitable from an economic point of view alone (see also the table on the following page). In any case, transparent economic accounting (clear formulation of all assumptions) and information about subsidies that may be needed should be included in all project planning.

## National energy programmes

National poverty-oriented energy programmes should be developed in accordance with the same considerations as local projects. Efforts should also be made to develop synergies with other rural development projects. In this way, for example, irrigation projects could benefit from water power facilities. Other aspects are important as well:

### Sustainability-oriented cost estimates and incentives

Realistic and transparent assessment and comparison of both the costs and the benefits of different technological options at the onset are needed. With respect to poverty alleviation, the main aim is to assess how benefits are distributed and who profits from which technologies. Cost assessment must include transaction costs (costs for information search, negotiations and enforcement of a programme), as well as external costs.

Specific incentives may be needed to develop energy systems. Indirect subsidies from urban consumers should be considered in order to cover the sometimes higher costs of rural energy supply and to reduce supply disparities. Maintenance costs, however, should not be subsidised if possible, and market influences should be minimised and of limited duration.

#### *Vietnam Women's Union (VWU) promotes solar home systems*

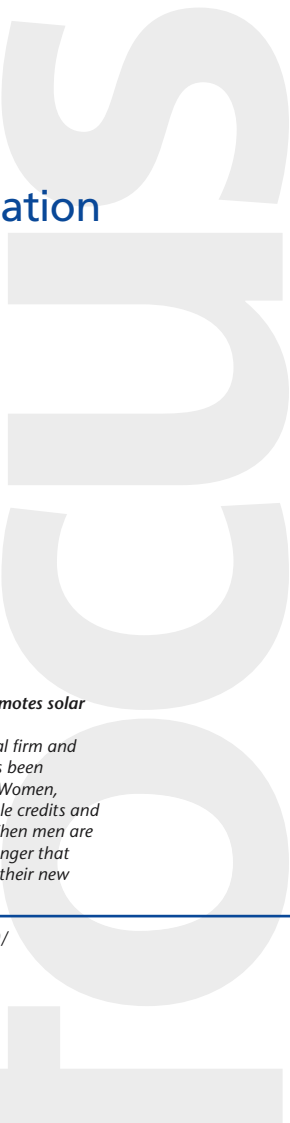
*The VWU, together with a commercial firm and a Vietnamese development bank, has been marketing solar systems since 1995. Women, above all, receive favourable repayable credits and training in technical maintenance. When men are given technical training, there is a danger that they will migrate and attempt to use their new knowledge to find employment.*

[www.itdg.org/docs/energy/docs50/bp50-solar-vietnam.pdf](http://www.itdg.org/docs/energy/docs50/bp50-solar-vietnam.pdf)

#### *A village electricity programme in Laos*

*Carefully planned institutional development with village electricity managers chosen by village residents, certified electricity service firms, and a long-term financing mechanism for village residents, is intended to guarantee that energy supply remains reliable over a period of many years. Currently, solar home systems and small hydropower plants are the primary energy sources at the village level, although regulations and financial mechanisms are open to other technologies.*

[www.hedon.info/docs/Intro-Village-Energy-Lao-8April04.pdf](http://www.hedon.info/docs/Intro-Village-Energy-Lao-8April04.pdf)



Energy production		
	Investment costs per installed kW	Production costs per kWh produced (heavily dependent on level of utilisation of the stand alone unit)
Stand alone small hydropower (including costs of energy distribution!)	ca. 1,500 – 3,500 USD	0.2 – 0.35 USD (of which ca. 0.01 – 0.02 USD/kWh for energy distribution in isolated grids)
Small hydropower linked to grids		0.05 – 0.065 USD
Photovoltaic (solar home system)	7,000 – 11,000 USD	0.6 – 1.0 USD
Wind	1,000 – 5,000 USD	0.05 – 0.3 USD
Biogas	1,500 – 2,500 USD	0.06 – 0.3 USD, heavily dependent on biomass costs
Small-scale diesel aggregates	500 – 1,200 USD	ca. 0.2 – 0.3 USD/kWh (0.17 USD/kWh fuel costs only; 1 l Diesel at 0.5 USD)
Energy distribution		
Medium voltage lines	ca. 10,000 USD/km	Distribution costs per kWh are heavily dependent on the level of utilisation of the line and transformers!
Low voltage lines	ca. 4,000 – 8,000 USD/km	
Transformer: E.g. 100 kVA, 20 kV – 0.4 kV); without installation	ca. 3,000 – 5,000 USD	
Example of energy production costs in a national grid		
National grid based on a central, oil-powered energy facility		0.12 – 0.3 USD/kWh (Assuming a crude oil price of 70 USD/barrel to produce ca. 500 kWh of electrical energy plus production costs, amortisation, etc.)

### Energy production costs differentiated by source

The statistics below represent only a rough categorisation of costs. Depending on the local context, raw materials prices, and the level of utilisation at which facilities operate, figures may deviate sharply from the order of magnitude indicated here.

### Expanding access to modern energy services: Replicating, Scaling Up and Mainstreaming at the local level.

[www.undp.org/sgp/download/Expanding\\_Access\\_to\\_Modern\\_Energy\\_Services\\_-\\_Replicating,\\_Scaling\\_Up\\_and\\_Mainstreaming\\_at\\_the\\_local\\_level.pdf](http://www.undp.org/sgp/download/Expanding_Access_to_Modern_Energy_Services_-_Replicating,_Scaling_Up_and_Mainstreaming_at_the_local_level.pdf)

## Replication and scaling up of successful projects

Successful small-scale projects can serve as a starting point for national energy programmes. Experience so far provides important knowledge about gradual replication and adaptation to other local contexts. In addition, these projects can indicate whether experience can contribute to national development goals in the local context (scaling-up dimension) or whether conceptual adaptations are needed. Formulation of standards and quality requirements guarantee that such energy projects can become an integral part of national energy programmes.

Capacity development at all levels, networks, and cooperation in exchanging experience are important prerequisites for successful implementation of national programmes.

## Glossary

Term	Definition
Bioenergy	All energy produced from biofuels. <a href="http://www.fao.org/docrep/meeting/009/j4313e.htm">www.fao.org/docrep/meeting/009/j4313e.htm</a>
Biofuel	Fuel produced directly or indirectly from biomass. Biomass: material of biological origin (excluding material embedded in geological formations and transformed to fossil), such as: fuelwood, charcoal, agricultural wastes and by-products, energy crops, livestock manure, biogas, biohydrogen, bioalcohol, microbial biomass, and others. <a href="http://www.fao.org/docrep/meeting/009/j4313e.htm">www.fao.org/docrep/meeting/009/j4313e.htm</a>
Energy services	The term energy services refers to the end use applications of an energy delivery system that meet tangible and/or intangible life and livelihoods needs and social services (e.g., recreation, lighting, cooking, communications, transportation, heating). <a href="http://www.undp.org/sgp/download/Expanding_Access_to_Modern_Energy_Services_-_Replicating,_Scaling_Up_and_Mainstreaming_at_the_local_level.pdf">www.undp.org/sgp/download/Expanding_Access_to_Modern_Energy_Services_-_Replicating,_Scaling_Up_and_Mainstreaming_at_the_local_level.pdf</a>
Modern Energy	This expression is used very broadly, and has no international definition. It refers to a variety of commercial forms of energy such as liquefied petrol gas (LPG), kerosene, petrol, and electricity (connected to grids or independent of grids), bioenergy, etc.
Renewable Energy	There is no universally accepted definition of renewable energy the following description captures the most important, widely agreed characteristics. Renewable energy (sources) capture their energy from existing flows of energy, from on-going natural processes, such as sunshine, wind, flowing water (hydropower), biological processes such as anaerobic digestion, and geothermal heat flow. The most common definition is that renewable energy is from an energy resource that is replaced by a natural process at a rate that is equal to or faster than the rate at which that resource is being consumed. <a href="http://en.wikipedia.org/wiki/Renewable_energy">http://en.wikipedia.org/wiki/Renewable_energy</a>
Sustainable Energy	Energy produced and used in ways that support human development over the long term, in all its social, economic, and environmental dimensions. <a href="http://www.undp.org/energy/activities/wea/drafts-frame.html">www.undp.org/energy/activities/wea/drafts-frame.html</a>
Traditional Energy	Traditional Energy. The term traditional energy is used to denote locally collected and often unprocessed biomass-based fuels, such as crop residues, wood and animal dung. Most traditional energy is used non-commercially (i.e. non-commercial energy). <a href="http://www.undp.org/energy/weaover2004.htm">www.undp.org/energy/weaover2004.htm</a>

## Recommended reading

The following list features a documented and targeted selection of print documents and internet sites of relevance to “Sustainable Energy – Rural Poverty Alleviation”. For easier reading they have been allocated to four rubrics: **Overview, Policy, Instruments, Case studies**. The documents are listed by title in alphabetic order. Most of them are available online (accessed on 5 September 2006).

### Policy

**V.S. Ailawadi and Subhes C. Bhattacharyya. 2006**

#### **Access to energy services by the poor in India: Current situation and need for alternative strategies**

**In: *Natural Resources Forum* 30. pp 2–14. [www.blackwell-synergy.com/doi/pdf/10.1111/j.1477-8947.2006.00153.x](http://www.blackwell-synergy.com/doi/pdf/10.1111/j.1477-8947.2006.00153.x)**

This is a critical survey of the energy situation in India, focusing on lack of access to clean energy for cooking and lighting for a major portion of the population. Using statistics and other information, the survey shows that energy policy in India has not achieved its goals in this respect. The authors maintain that the current strategic focus on market reform, promotion of renewable forms of energy and change in pricing policies have found little acceptance. They present a proposal for an alternative strategy.

**IT Power. 2005**

### Instruments

#### **A Guide to Bundling Small-scale CDM Projects**

**EU Synergy CDM POOL. 51 pp. [www.cdmpool.com/reports/0797%20Handbook%20FINAL%20Version.pdf](http://www.cdmpool.com/reports/0797%20Handbook%20FINAL%20Version.pdf)**

Small-scale projects that hope to be acknowledged as Clean Development Mechanism projects are faced with complicated procedures and high transaction costs. This publication shows how these obstacles can be reduced by bundling several small-scale projects to form a larger project. Information is presented in the form of tables, a glossary, lessons learned, and – last but not least – concrete examples and a model business plan.

**Overview****biofuelwatch**

**[www.biofuelwatch.org.uk/index.php](http://www.biofuelwatch.org.uk/index.php)**

The English independent group biofuelwatch monitors the development of the biofuel market in Europe critically, with the aim of regulating this market. It supports sustainable production of biofuels in order to prevent deforestation of primary forests. This web site offers relevant literature and links. It also allows visitors to participate actively in different campaigns.

**Case studies**

**Soma Dutta. 2005**

**Dissemination of solar home systems in Vietnam: a case study of successful partnership**

**In: *Boiling Point No 50*. [www.itdg.org/docs/energy/docs50/bp50-solar-vietnam.pdf](http://www.itdg.org/docs/energy/docs50/bp50-solar-vietnam.pdf)**

This brief article reports on a successful project in Vietnam. Collaboration between an NGO, a bank, and a solar energy company made it possible to supply 2000 households with solar home systems. The exact project cycle is described, lessons learned are discussed, and some conclusions are drawn.

**Case studies**

**ADEME, geres et al. 2004**

**Energy efficiency & passive solar architecture in the construction sector in Afghanistan**

**[www.ffem.net/jahia/webdav/site/ffem/users/administrateur/public/projets%20FFEM/Brochure%20Afghanistan.pdf](http://www.ffem.net/jahia/webdav/site/ffem/users/administrateur/public/projets%20FFEM/Brochure%20Afghanistan.pdf)**

Energy-optimised architecture exploits environmental advantages by absorbing solar energy and minimising disadvantages such as extreme temperatures and wind. Architecture of this sort was used in the context of a project financed by numerous partners to construct public buildings such as schools and hospitals as well as private dwellings. Several examples are described in this publication, including data on costs and savings and information about further advantages of this approach.

**Overview****Energia: Network on Gender and Sustainable Energy****Instruments**

**[www.energia.org/](http://www.energia.org/)**

The aim of this Network is to empower women with respect to energy. Its activities, which commenced with the production of a newsletter, have expanded over the years to encompass capacity building, advocacy, and development of a resource centre, among other things. This web site offers a good deal of information, including a data bank of contact persons and offices, and a detailed list of additional links.

**Policy**

**Department for International Development (DFID). 2002**

**Energy for the Poor: Underpinning the Millennium Development Goals**

**London. 32 pp. [www.dfid.gov.uk/pubs/files/energy-for-the-poor.pdf](http://www.dfid.gov.uk/pubs/files/energy-for-the-poor.pdf)**

Focusing primarily on financial policies and instruments, this DFID publication presents recommendations for helping poor populations achieve better living conditions through provision of energy services. The authors make a plea for a holistic approach with a focus on co-determination by populations affected and on trans-sectoral cooperation, with actions at the local, national and international levels.

**Policy**

**Vijay Modi, Susan McDade, Dominique Lallement, Jamal Saghir. November 2005**

**Energy Services for the Millennium Development Goals****Instruments**

***Achieving the Millennium Development Goals. Millennium Project, UNDP, World Bank, ESMAO. 100 pp***

**[www.unmillenniumproject.org/documents/MP\\_Energy\\_Low\\_Res.pdf](http://www.unmillenniumproject.org/documents/MP_Energy_Low_Res.pdf)**

Although none of the MDGs are concerned with promoting better access to energy services, this access is nonetheless a decisive factor in achieving the millennium goals. This report, conceived by the UN Millennium Project in cooperation with other institutions, explains the links between energy services and each one of the MDGs. While not ignoring the respective challenges involved, the report proposes qualified goals that should be incorporated into national strategies. These are complemented by relevant strategies and options as well as concrete examples drawn from national strategies.

## Instruments

**International Energy Agency. 2003****Energy to 2050: Scenarios for a Sustainable Future.****219 pp. [www.iea.org/textbase/nppdf/free/2000/2050\\_2003.pdf](http://www.iea.org/textbase/nppdf/free/2000/2050_2003.pdf)**

Formulating policies concerned with energy and the environment requires a long-term focus, which is always linked with uncertainties and gaps in knowledge. Scenarios are employed in an attempt to explore the range of possible developments. The publication presents and evaluates different existing scenarios and their methodologies, and compares them with two innovative approaches to development of scenarios that take particular account of long-term processes: the explorative approach, which sketches potential visions of the world in the future by examining important drivers, and the normative approach, which defines a set of desirable outcomes from the start and constructs a scenario for this purpose.

## Policy

**UNDP. May 2006****Expanding access to modern energy services: Replicating, Scaling Up and Mainstreaming at the local level.****43 pp. [www.undp.org/sgp/download/Expanding\\_Access\\_to\\_Modern\\_Energy\\_Services\\_-\\_Replicating,\\_Scaling\\_Up\\_and\\_Mainstreaming\\_at\\_the\\_local\\_level.pdf](http://www.undp.org/sgp/download/Expanding_Access_to_Modern_Energy_Services_-_Replicating,_Scaling_Up_and_Mainstreaming_at_the_local_level.pdf)**

Based on numerous UNDP project experiences, this publication shows how community energy projects and initiatives for energy services can be successfully replicated and adapted in order to achieve positive results at both the local and national levels. The general section, which presents conceptual frameworks, models and lessons learned, is complemented by descriptions of three case studies from Kenya, Nepal and the Dominican Republic.

## Instruments

**UNDP 2004****Gender and Energy for Sustainable Development: A Toolkit and Resource Guide****85 p. [www.undp.org/energy/genenergykit/index.html](http://www.undp.org/energy/genenergykit/index.html)**

Based on UNDP experience and experience in the international Energia Network, this publication discusses the links between energy and gender issues at the policy and project levels. It shows how gender perspectives can be integrated into energy programmes and projects. Numerous detailed tables and additional annotated bibliographical entries offer the reader a stimulus to pursue the topic further.

## Overview

**European Environment Agency. June 2006****How much bioenergy can Europe produce without harming the environment?****67 pp. [http://reports.eea.europa.eu/eea\\_report\\_2006\\_7/en/eea\\_report\\_7\\_2006.pdf](http://reports.eea.europa.eu/eea_report_2006_7/en/eea_report_7_2006.pdf)**

This study is based on hypotheses and scenarios produced by the European Environment Outlook. Forecasts for 2010, 2020, and 2030 indicate how much bioenergy can be produced in the agricultural and forestry sectors, as well as from wastes, without putting increased pressure on the environment. The conclusions demonstrate both the possible advantages and the risks of biofuel production, and call attention to the need to create appropriate policies and conditions. Developing countries will also need to address the fundamental considerations presented here for the European context.

## Instruments

**Centre for Development and Environment (CDE)****Learning for Sustainability****[www.cde.unibe.ch/Tools/ALS\\_Ts.asp](http://www.cde.unibe.ch/Tools/ALS_Ts.asp), for more information: [info@cde.unibe.ch](mailto:info@cde.unibe.ch)**

Learning for Sustainability is a tool that facilitates a common learning process involving external specialists, the local population, and government representatives. It was applied in a mountain village in Kyrgyzstan to obtain further information about the local energy situation, energy use and demand, and possible ways of improving the situation. This information is used as the basis for sustainable energy projects such as insulation of houses with local materials, improved stoves, etc.

Case studies

**MHPP and entec**

### **Mini Hydro Power Plant – Dewata Tea Estate**

**2 pp.** [www.mhpp.org/docs/DewataInfoSheet.pdf](http://www.mhpp.org/docs/DewataInfoSheet.pdf)

This document is a brief but detailed description of a project in West Java. The Dewata tea region broke away from a dependency on diesel energy by constructing a hydroelectric power station. In addition to reducing energy costs, this development did much to help conserve a protected area.

Instruments

**Peter Bosshard. 2002**

### **Private Gain – Public Risk?**

Policy

**The International Experience with Power Purchase Agreements of Private Power Projects**

**International Rivers Network. 21 pp.**

[www.irn.org/programs/bujagali/bujagalippa-background.pdf](http://www.irn.org/programs/bujagali/bujagalippa-background.pdf)

Power Purchase Agreements (PPAs) are intricate and basically confidential documents that define the rights and responsibilities of the state and private investors in relation to private power plants. As they frequently contain great advantages for investors and disadvantages for the state and the general population, they are increasingly encountering sharp criticism and protest. This article explains how PPAs function and lists the risks and the disadvantages that they entail. Its aim is to help the public come to grips with and scrutinise PPAs.

Policy

**Ranjit Lamech and Kyran O'Sullivan**

### **PRSP Sourcebook: Chapter 21 – Energy**

**Worldbank. 29 pp.** [http://povlibrary.worldbank.org/files/4722\\_chap21.pdf](http://povlibrary.worldbank.org/files/4722_chap21.pdf)

In its chapter on Energy, the PRSP Sourcebook describes a set of five development goals that are closely linked with better energy supply. Identification of appropriate indicators facilitates the setting of priorities and monitoring to determine whether goals are being achieved. Different options for intervention show how a country's energy policy can be shaped to achieve national poverty alleviation goals.

Policy

### **Renewable energy & energy efficiency partnership (Reeep)**

[www.reeep.org](http://www.reeep.org)

REEEP is a global public-private partnership. It facilitates knowledge sharing with regard to coherent supportive policy and regulation frameworks. The web site also provides insights on innovative approaches to financing and project development.

Instruments

### **REPIC (Renewable Energy Promotion in International Co-operation)**

Policy

[www.repic.ch/files/index\\_en.html](http://www.repic.ch/files/index_en.html)

Switzerland's Interdepartmental Platform for Renewable Energy Promotion in International Cooperation is an example of how donor countries can also achieve synergy effects through improved coordination. Joint promotion strategies, network-building and strategic partnerships contribute to climate protection and promotion of renewable energy.

Case studies

**entec and GTZ**

### **Small Hydro Power Promotion Project**

Policy

[www.entec.com.np](http://www.entec.com.np)

Recently a law on electricity in Nepal was drafted with support from a GTZ project and other sources. This law is exemplary in many respects. Its most important elements are stipulation of the conditions for supplying power, provision for how rural people can gain access to electrical power, provision for subsequent connection to electrical grids for previously isolated small hydropower plants, and establishment of Rural Electricity Entities to improve rural electrification.

Case studies

**Swiss Agency for Development and Cooperation (SDC)**

### **Sustainable Brickmaking**

[www.sdc.org.vn/index.php?navID=21490&langID=1&userhash=9c431ed98ec17fd6b1c75dc72947a8e1](http://www.sdc.org.vn/index.php?navID=21490&langID=1&userhash=9c431ed98ec17fd6b1c75dc72947a8e1)

Inefficient use of energy, environmental damage from air pollution, and health hazards faced by workers are disadvantages associated with traditional ovens in Vietnam. This project allows local small and medium enterprises to formulate their needs and requirements, and provides appropriate input from international experts. In a continual process of optimisation, further training, management consulting, and accompanying measures related to the environment and to working conditions, local actors and their needs and requirements are the central focus of the project.

## Overview

**Daniel De La Torre Ugarte. 2005**

**The Contribution of Bioenergy to a New Energy Paradigm**

*EuroChoices. The Agricultural Economics Society and the European Association of Agricultural Economists.*

**12 p. [www.iea.org/textbase/work/2005/Biofuels/Biofuels\\_Ugarte\\_Paper.pdf](http://www.iea.org/textbase/work/2005/Biofuels/Biofuels_Ugarte_Paper.pdf)**

This article makes a plea for including bioenergy as an important element in the paradigm shift to sustainable development and renewable energy. It emphasises the many advantages for the environment and for rural development that accrue from production and use of bioenergy under appropriate conditions. The risks that can primarily affect poor people are not discussed in the article.

## Case studies

**The Jatropha System**

**[www.jatropha.de](http://www.jatropha.de)**

Jatropha is a bush that has multiple uses. When planted in gardens and fields it protects useful plants from animals and regulates the water balance. It is also a raw material used in the production of biodiesel. This web site explains how the Jatropha system also offers socio-economic advantages and helps alleviate poverty and improve living conditions for women.

## Case studies

**The National Energy Conservation Centre, Pakistan**

## Policy

**[www.enercon.gov.pk/index.htm](http://www.enercon.gov.pk/index.htm)**

The government of Pakistan launched ENERCON as a clearing house and a coordination office for its energy conservation activities. Its services are manifold and extend from disseminating information and conducting audits to formulating policies for different sectors such as agriculture, industry, transport, etc. The web site provides general information about the Centre and its activities, as well as an overview of other related institutions in the country.

## Case studies

**Adam Harvay. 2004**

**Village Energy and Electricity: Best Practice in Lao PDR**

*Off-Grid Promotion and Support Office. 20 pp. [www.hedon.info/docs/Intro-Village-Energy-Lao-8April04.pdf](http://www.hedon.info/docs/Intro-Village-Energy-Lao-8April04.pdf)*

This document reports on a successful ongoing project in Laos. Carefully planned institutional development with village electricity managers chosen by village residents, certified electricity service firms, and a long-term financing mechanism, are intended to guarantee that the supply of energy to village residents remains reliable over the long term. Currently solar home systems and small hydropower plants are the primary facilities being used at village level, although regulation and financing mechanisms are open to other technologies.

## Policy

**ECOWAS. January 2006**

**White Paper for a Regional Policy**

*Geared towards increasing access to energy services for rural and periurban populations in order to achieve the Millennium Development Goals. [ftp://ftp2.ptfm.net/ptfmc/references/ecowas\\_white\\_paper.pdf](ftp://ftp2.ptfm.net/ptfmc/references/ecowas_white_paper.pdf)*

The White Paper describes the willingness of 15 West African countries to coordinate their efforts in the area of energy services through a common vision and a common policy. The following goals are at the centre of this aim: strengthening of regional integration through exchange of knowledge, experience and information; harmonisation of policies and institutional conditions; and development of coherent national policies focusing on rural and peri-urban regions. Finally, the four most important activity lines and the financial resources required to fund them are defined.

## Policy

**Department of Minerals and Energy. 1998**

**White Paper on the Energy Policy of the Republic of South Africa**

**[www.info.gov.za/whitepapers/1998/energywp98.htm](http://www.info.gov.za/whitepapers/1998/energywp98.htm)**

The Energy Policy Discussion Document prepared in 1995 as part of a broad consultation process serves as the basis for this White Paper, which aims to define a framework for the energy sector with a focus on integrated planning and regional cooperation. The publication describes the international and national context, analyses supply and demand, and identifies the broader areas that must be involved in implementing energy policy.

## Policy

**Republic of South Africa. 2004****White Paper on the Renewable Energy Policy of the Republic of South Africa****45 pp. [www.polity.org.za/pdf/WhitePaper.pdf](http://www.polity.org.za/pdf/WhitePaper.pdf)**

This paper is intended to complement the South African energy policy formulated in 1998. Its aim is to provide approaches and solutions to the question of how greater energy security can be achieved through diversification in the next 10 years, and how greenhouse gases can be reduced by cutting back on the use of coal and other fuels. Four strategic issues form the backbone of the publication: financial instruments, legal instruments, technological development, and awareness raising.

## Overview

## Policy

**UNDP, UNDESA, World Energy Council. 2004****World Energy Assessment Overview: 2004 Update****[www.undp.org/energy/weaover2004.htm](http://www.undp.org/energy/weaover2004.htm)**

This publication is an update of the first Assessment published in 2001. It reports on the current status of information relating to energy production and use and on technical trends, as well as the most important energy-related results of the World Summit for Sustainable Development (WSSD) and other international fora. Its aim is to present and assess themes and options for sustainable global energy policy and formulate recommendations based on them. In this respect it emphasises the role of institutions and financing and regulating mechanisms.

**Web sites focusing on regional competence centres...**

- ASEAN Centre for Energy: [www.aseanenergy.org](http://www.aseanenergy.org)
- Energy, Environment and Development Network for Africa: [www.afrepren.org](http://www.afrepren.org)
- Organización Latinoamericana de Energía: [www.olade.org.ec/php/index.php?arb=ARB0000001&LANG=EN](http://www.olade.org.ec/php/index.php?arb=ARB0000001&LANG=EN)
- The Energy and Resource Institute: [www.teriin.org](http://www.teriin.org)

**and on international energy programmes**

- Energie, Environnement et Développement : [www.enda.sn/energie/indexnrj.htm](http://www.enda.sn/energie/indexnrj.htm)
- Energy Sector Management Assistance Program: [www.esmap.org](http://www.esmap.org)
- Global Village Energy Partnership: [www.gvep.org](http://www.gvep.org)
- IEA Bioenergy: [www.ieabioenergy.com](http://www.ieabioenergy.com)
- reeep – Renewable Energy & Energy Efficiency Partnership: [www.reeep.org](http://www.reeep.org)
- REN21 – Renewable Energy Policy Network for the 21st Century: [www.ren21.net](http://www.ren21.net)
- UNDP, Energy for Sustainable Development: [www.undp.org/energy/index.html](http://www.undp.org/energy/index.html)
- World Bank – Energy web site: [web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTENERGY/0,,menuPK:336812~pagePK:149018~piPK:149093~theSitePK:336806,00.html](http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTENERGY/0,,menuPK:336812~pagePK:149018~piPK:149093~theSitePK:336806,00.html)

*InfoResources Focus provides a general overview of pertinent and topical subjects to guide one through the information jungle. Each issue focuses on a current theme relative to forests, agriculture, natural resources and the environment, in the context of international development cooperation. Each theme is viewed from several angles:*

- *Policies and strategies*
- *Implementation and practical experiences*

*The first section of InfoResources Focus proposes a brief introduction to each subject, highlights specific problems, compares theoretical approaches and opinions, and reports past experiences. The second section presents a selective and commented choice of documents, books, CD ROMs and Internet sites. The range of documents presented reaches from basic introductions, through instruments, methods and case studies, to conceptual texts. Back issues of InfoResources Focus can be ordered or be downloaded from the address given on page 2.*