



# UNIDO and Renewable Energy

Greening the Industrial Agenda



UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION



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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION  
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“In recent times, renewable energy has emerged as a viable supply option to provide reliable and affordable energy services that have cross-cutting influence on a nation’s ability to achieve the Millennium Development Goals. For poor communities with no regular access to reliable energy services, enhanced electrification or the availability of clean fuels based on renewable sources of energy could reduce poverty, improve health conditions and increase standards of living.”

**Mr. Kandeh K. Yumkella**  
**UNIDO Director-General and**  
**Chairman of UN-Energy**

## Growth with Quality

### UNIDO's mandate

Directly responding to international development priorities, the technical cooperation activities of UNIDO—the agency of the United Nations common system specialized in industry—focus on the following three themes:

- Poverty reduction through productive activities
- Trade capacity-building
- Energy and environment

As a part of its thematic priority on energy and environment, UNIDO promotes sustainable patterns of industrial consumption and production through cleaner technologies and processes in order to de-link the processes of economic growth and environmental degradation.

UNIDO is a leading provider of services for improved industrial energy efficiency, enhanced use of renewable sources of energy and promotion of cleaner technologies.



Volatile oil prices, the growing energy demand and climate change issues are shaping the global energy agenda today.

Against this background, energy security and the need for environmental protection have assumed special significance in the context of the Millennium Development Goals.

Renewable energy has become a viable option for enhancing access to energy at most places through on/off grid electrification, both in urban and rural areas and promoting productive uses and industrial applications in energy intensive industrial sectors, especially in SMEs.



*“In order to achieve sustainable industrial development, access to energy is a prerequisite in developing countries.”*

**UNIDO**

## Meeting the energy and climate challenges

### UNIDO’s energy strategy

Industry needs reliable and affordable energy to become productive and competitive. At the same time, it has to find an appropriate balance between its growing demand for energy and the urgent need to protect the environment.

In this context, UNIDO’s energy-related activities promote cleaner and efficient use of energy, facilitate productive activities in rural areas by providing modern and renewable forms of energy, and enhance the use of renewable energy for industrial applications.

UNIDO’s energy strategy aims at helping developing countries to achieve the following objectives:

- Enhance access of the poor to modern energy services based on renewables
- Increase the competitiveness of their industries by reducing industrial energy intensity
- Reduce their impact on climate change by decreasing the carbon emissions of their industries and by promoting renewable energy technologies
- Increase the viability of their enterprises, particularly in rural areas, by augmenting the availability of renewable energy for productive uses







According to the REN21 Report:

- Renewables, excluding large hydropower and biomass, represent 5 per cent of global power capacity and 3 to 4 per cent of global power generation
- Renewable electricity generation capacity reached an estimated 240 gigawatts (GW) worldwide in 2007
- Many renewable technologies and industries have been growing at rates of 20 to 60 per cent
- Investments in new renewable capacity reached \$US 100 billion in 2007



*Fundamental changes in the way societies produce and consume are indispensable for achieving global sustainable development.*

## Promoting renewable energy

### UNIDO's services

UNIDO pursues a multidimensional and multitrack approach to promoting productive uses of renewable energy in developing countries.

The Organization currently offers the following services:

#### Technology demonstration

- Demonstrating the technical, economic and social feasibility of using different renewable energy technologies for augmenting rural/urban electrification
- Promoting renewable energy technologies for industrial applications in energy intensive manufacturing SMEs, which have requirements for motive power, and process heat for low or high temperature applications

#### Policy support

- Enabling a policy environment that helps promote renewable energy technologies, markets and investments
- Fostering agreements between the industrial sector and the national energy and environment sector regulators, utilities and financing agencies

#### Capacity-building

- Supporting capacity-building of national institutions, public decision makers, local entrepreneurs and industry in the field of renewable energy for rural electrification and productive uses
- Strengthening manufacturing capacities of local industries and enterprises to manufacture, assemble and maintain renewable energy technologies and systems

#### Global Forum activities

- Bringing together experts, institutions and decision makers in high-level global forums to raise awareness and promote partnerships
- Discussing and reviewing current developments and trends in renewable energy technologies, lessons learned and best practices

#### Information dissemination

- Enhancing access to databases and dissemination of information on renewable energy sources and technologies and their applications
- Promoting clearing house activities for information sharing, synergies and networking

## Enhancing productive activities in rural and on/off-grid areas

### UNIDO's focus areas

As an integral part of its mandate to support sustainable energy production and use, UNIDO focuses on promoting renewable energy for productive uses and industrial applications in developing countries.

To enhance productive activities and increase competitiveness of small and medium enterprises (SMEs) in rural on/off-grid areas, UNIDO's renewable energy strategy promotes the following forms of renewable energy:

Bioenergy

Small hydropower

Solar energy

Wind energy

In addition, UNIDO is also promoting geothermal and other forms of renewable energy technologies such as marine and tidal energy.

UNIDO recognizes that linking rural energy with productive uses can create employment opportunities, raise income levels and improve quality of life in rural areas. The Multifunctional Platform, which was launched in West Africa in the 1990s, is a good example for providing access to energy to the poorest rural communities and promoting productive uses.



*Linking rural energy with productive uses can create employment opportunities, raise income levels and improve quality of life in rural areas.*





***Bioenergy is considered a cleaner alternative to fossil fuels as it reduces emissions of carbon dioxide and other gases that contribute to global warming. It can provide new markets for farmers and their products, thereby providing employment and increasing social welfare.***

## Bioenergy

Bioenergy has the potential to supply significant shares of national and global energy supplies, and can play an important role in promoting energy security, creating jobs and helping to achieve the Millennium Development Goals.

UNIDO's bioenergy programme proposes a multidisciplinary, integrated and focused approach. It focuses, among others, on the following key areas:

- Bioenergy for industry
- Biofuels and the implications for climate change
- Sustainability criteria for biofuels
- Solid biomass for heat and power: South-South technology transfer and commercialization
- Liquid biofuels: ethanol from residues and waste—demonstrating the value chain
- Liquid biofuels: biodiesel—building the local-global bridge for SMEs
- Biogas from industrial waste
- Biorefineries: providing clearing house services

UNIDO's bioenergy programme aims at ensuring that its client government institutions, private sector and industry-related organizations are able to take effective and efficient decisions on their bioenergy programmes, especially with respect to the selection of most suitable technologies, sustainability standards and linkages between trade and supply issues.

Target clients of UNIDO's bioenergy programme are governments and national institutions dealing with policy and regulatory issues, industry associations, universities and research institutes as well as banks and investment funds. The direct beneficiaries of the bioenergy programme are SMEs, institutions and enterprises involved in biomass conversion/processing or user technologies.

## Small hydropower

Micro and small hydropower schemes have little or no environmental impact and can provide a range of valuable energy services especially in rural areas. In regions with hydropower potential, this form of renewable energy is the most cost-effective opportunity to energize on/off-grid areas.

Micro and small hydropower can be applied to satisfy low to medium voltage electric needs such as lighting or telecommunication and to provide motive power for small industry.

UNIDO emphasizes small-scale hydropower (SHP) and is currently implementing projects in China, Ghana, India, Indonesia, Kenya, Mali, Nigeria, Rwanda, Sri Lanka, Uganda, the United Republic of Tanzania and Zambia.

UNIDO is developing a large umbrella regional programme with special focus on South-South cooperation in order to establish and implement about 100 SHP projects in Africa within the next three years, and replicate them in other regions such as Latin America and Asia.

Technical support for UNIDO's SHP projects is provided by the International Centre for Small Hydropower (ICSHP) at Hangzhou in China, which facilitates the execution of activities in the field of small hydropower and fosters cooperation worldwide. UNIDO's Regional SHP Centres in Trivendrum (India) and Abuja (Nigeria) provide technical assistance at the regional level.

UNIDO has established an energy kiosk (2.5 KW) consisting of pico hydro and solar PV to energize a remote village in Kenya. The produced energy is used for providing productive, communication and community services.



***Small hydropower is cost-effective, inexpensive and easy to operate. In the developing world, and in LDCs in particular, there is a huge potential to meet growing rural energy needs with the use of small hydropower.***





*For rural areas in developing countries, solar technology may offer an immediate solution for urgent energy needs such as lighting and telecommunications.*

*Solar thermal energy has huge potential to meet the requirements of SMEs to process heat applications.*

## Solar energy

### Photovoltaic technology

With the help of solar panels, the energy of the sun can be converted directly into electricity and stored in batteries. Due to ample sunshine in many developing countries, photovoltaic systems can provide alternative basic energy services in off-grid areas.

Possible productive uses include lighting, powering information and communication technology (ICT) equipment as well as energy-efficient refrigeration.

UNIDO is currently implementing solar photovoltaic projects in India, the Maldives, Uganda, the United Republic of Tanzania and Zambia.

### Thermal applications

In thermal applications, solar energy is gathered in solar thermal collectors to create high temperature steam and low temperature heat, which can be used in a variety of heat and power applications in the residential and industrial sector.

UNIDO particularly emphasizes solar thermal applications as they provide an economically and environmentally friendly alternative to conventional fossil fuel technologies in industrial applications.

UNIDO is implementing a Caribbean Solar Financing Programme (CSFP) in St. Lucia and Grenada, which aims at addressing key barriers that are hampering the development of a vibrant market for solar water heating (SWH) systems in these two countries.

### International cooperation

UNIDO has also set up an International Centre for the Promotion and Transfer of Solar Energy Technology in Lanzhou, China. The centre makes a valuable contribution to the international development of solar energy and enhances technology transfer between China and developing countries, thus contributing to increased “South-South” cooperation. In addition, UNIDO is implementing a business information centre in Mozambique, powered by solar energy.

## Wind energy

Wind turbines convert the energy in the wind into mechanical and electrical energy. In off-grid applications, wind generators can be combined with other energy sources, such as diesel generators.

The use of wind power is an effective alternative to conventional fossil fuels to augment electrification, and can be applied to satisfy basic energy services for productive uses in SMEs. Wind turbines provide residential and industrial electricity, and can even be used for mechanical power.

UNIDO's wind energy projects generally promote stand-alone or small-size wind farms with 1-5 MW capacity. Wind energy-based projects are currently under implementation in Cuba, India, the Maldives and Romania.

UNIDO's wind energy programme also provides assistance to Governments in promoting wind farms to augment national grids and decrease their dependence on conventional fossil fuels as well as reduce emissions of greenhouse gases (GHGs).

UNIDO is currently implementing an innovative wind energy project in Cuba, funded by the Global Energy Facility (GEF). The project proposes to install hurricane-proof windfarms on the Isla de la Juventud.



***UNIDO is implementing a wide range of wind energy projects worldwide to extend national power grids.***





*Renewables present commercially viable options to meet the industry's energy requirements for industrial and process heat applications.*

## Renewable energy for industrial applications

### Promoting the utilization of renewable energy sources in SMEs—greening the industrial agenda

The energy use of the industrial sector accounts for almost one third of total energy consumption. Given the rising prices of fossil fuels, energy intensive SMEs find it increasingly difficult to meet their energy demands and remain competitive on the global market. Against this background and considering recent technological advances, renewables present commercially viable options to meet industry's energy requirements and to replace fossil fuels.

Within its renewable and rural energy portfolio, UNIDO supports renewable energy technologies for industrial and process heat applications.

#### **Some of the key industrial applications of renewables are as follows:**

- Cogeneration potential in sugar and rice mills
- Power/process heat applications based on biomass gasification
- Biogas/power from Industrial effluents/residues
- Power generation from industrial solid waste
- Liquid biofuels—transport/power sector
- Solar thermal and photovoltaic applications

And

#### **The way forward:**

- Assessing energy requirements of manufacturing SMEs
- Designing an appropriate renewables technology package linking with local resources
- Creating awareness about the potential economic benefits of renewable energy applications
- Taking an integrated and programmatic approach would enhance the successful adoption of renewable energy-based industrial applications





UNIDO builds public-private partnerships for promoting renewable energy markets in developing countries and economies in transition. Strong partnerships promise greater effectiveness and sustainability. They enable UNIDO to leverage resources and share its unique expertise. UNIDO will continue to improve its networks and alliances through strategic partnerships and cooperation.



## Pursuing key alliances to ensure effectiveness

### UNIDO's partnerships

UNIDO is one of the 10 implementing/executing agencies of the Global Environment Facility (GEF) and has been very successful in obtaining GEF funds and leveraging co-financing for the implementation of large renewable energy projects.

UNIDO closely works with the United Nations Environment Programme (UNEP), the United Nations Development Programme (UNDP), World Bank and regional banks on formulating GEF projects, and particularly cooperates through its National Cleaner Production Centres and Technology Centres.

UNIDO is a member of the Global Bioenergy Partnership (GBEP), which promotes the sustainable development of bioenergy.

UNIDO hosts the Renewable Energy and Energy Efficiency Partnership (REEEP) in its headquarters in Vienna. UNIDO sits on the governing board and cooperates with REEEP both on projects and on global forum activities.



## Improving the coherence of the United Nations work on energy

### UN-Energy

UNIDO is an active member of UN-Energy, the coordinating body for energy programmes within the United Nations system.

UNIDO Director-General Kandeh K. Yumkella was confirmed as chairman of UN-Energy by the United Nations System Chief Executives Board for Coordination (CEB) during its meeting in New York on 26-27 October 2007.

Mr. Yumkella's chairmanship commenced on 1 January 2008. His appointment comes at a time when energy-related issues are taking centre stage in the climate change agenda. As the first head of a United Nations specialized agency to become chairman of UN-Energy, Mr. Yumkella hopes to bring greater dynamism into the work of this body and a higher level of engagement by its member organizations.

To ensure continuing collaboration and exchange of information, views and knowledge, UN-Energy conducts regular meetings and video/telephone conferences among its members and collaborating international organizations and institutions. UN-Energy also organizes side events and seminars at key international events and conferences, such as General Assembly debates and the UNFCCC climate change conferences of the parties.

Presentations and reports relevant to the work of UN-Energy in the areas of energy efficiency, energy access and renewable energy, are regularly posted at the UN-Energy web site at <http://esa.un.org/un-energy/> and at the UNIDO web site at [www.unido.org/energy-policy](http://www.unido.org/energy-policy).

UN-Energy is an inter-agency mechanism on energy, which has been established primarily to help ensure coherence in the United Nations system's multidisciplinary response to the World Summit on Sustainable Development (WSSD). It aims to promote United Nations system-wide collaboration in the area of energy with a coherent and consistent approach since there is no single entity in the United Nations system that has primary responsibility for energy.



***“Currently, at least 1.6 billion people do not have access to electricity for lighting, refrigeration, mechanical power, telecommunications and other beneficial uses.”***

**UN-Energy**



## Sharing experiences and information

### Global forum activities

UNIDO organizes a number of global forum activities to bring together planners, experts and entrepreneurs on a common platform and promote information dissemination, lessons learned and the exchange of ideas.

#### Energy events

##### **Global Renewable Energy Forum, 18-21 May 2008, Brazil**

This global event, which was held jointly by the Brazilian Ministry of Mines and Energy and UNIDO, aimed at promoting a proactive dialogue between countries in the Latin America and the Caribbean (LAC) region to reduce poverty and enhance energy security through the widespread use of renewable energy. Its objective was to strengthen interregional bonds, and at the same time, foster joint actions worldwide.

##### **Regional Workshop on Renewable Energy in the Carpathian Mountains, 6-7 May 2008, Ukraine**

This collaborative initiative between UNIDO, UNEP and the Government of Ukraine aimed at establishing a viable network between EU and non-EU countries of the Carpathian region to promote renewable energy development in the region. Its main objective was to share knowledge and exchange experiences on the current status, barriers and opportunities in order to harness vast potentials of renewable energy sources in the region.

##### **International Conference on Renewable Energy in Africa, 16-18 April 2008, Senegal**

This joint activity by the government of Senegal, the African Union, the German Ministry for Economic Cooperation and Development and UNIDO provided an opportunity to examine how bottlenecks in renewable energy markets in Africa can be addressed. The conference especially focused on policies, technologies, financing and capacity-building related to renewable sources of energy.

- Identifying promising policy options
- Assessing challenges and identifying capacity needs
- Engaging stakeholders in issue-oriented discussions
- Sharing experiences and lessons learnt
- Developing common plans of action

**Regional Workshop on Sustainable Biofuels Production and Use in Central and Eastern Europe, 12-13 November 2007, Croatia**

This workshop aimed at promoting biofuels in Central and Eastern Europe. It provided an opportunity to capture the environmental and economic benefits of biofuels to increase the security of energy supply. Topics discussed included, among others, the production and use of biofuels, biofuels in Central and Eastern European countries, regional and international trends as well as industrial and technological developments.

**High-level Biofuels Seminar in Africa, 30 July-1 August 2007, Ethiopia**

This seminar explored possibilities for the development of biofuels in Africa and discussed potentials, risks and trade-offs. The meeting resulted in the Action Plan for Biofuels Development in Africa and the Addis Ababa Declaration on Sustainable Biofuels Development in Africa, calling for enabling policy and regulatory frameworks, guiding principles on biofuels, reduced risks of biofuels development for small-scale producers and the promotion of knowledge sharing.

**International Conference on Biofuels, 5-6 July 2007, Malaysia**

This conference, organized by UNIDO together with the Ministry of Plantation Industries and Commodities (MPIC) and Malaysia Palm Oil Board (MPOB) addressed issues such as global developments, supply, demand, economics and sustainability of biofuels. The conference was the first in a series that will be convened over the next three years in the context of UNIDO's biofuels programme. The second meeting in the series was the High-level Biofuels Seminar in Africa in Ethiopia. (see above)

**Iberoamerican Ministerial Meeting on Energy Security in the Latin American Region, 26-27 September 2006, Uruguay**

This event provided a forum for discussions on energy security and regional cooperation to harness the potential of renewable energy technologies. The main outcomes of the meeting were a Ministerial Declaration and a proposal to organize the Global Renewable Energy Forum jointly by the Ministry of Mines and Energy of Brazil and UNIDO in 2008.



*Providing visible leadership and commitment to common strategies for market-based scaling up of renewable energies.*

## Selected projects

UNIDO is implementing a large and diverse portfolio of renewable and rural energy projects in line with its core mandate to promote sustainable industrial development in developing countries. The following projects are selected examples of UNIDO's work in the field of renewable energy.

### **Sustainable industrial resource management in selected national priority sectors of Nicaragua**

**Location:** Nicaragua

**Project description:**

The project aims at enhancing the competitiveness and productivity of industry in Nicaragua by establishing environmentally friendly solar technologies for industrial uses. UNIDO supports the promotion and demonstration of solar thermal technology applications in the commercial and industrial sector in Nicaragua.

### **Mini hydro project in Rwanda: A pilot project for rural development**

**Location:** Rwanda

**Project description:**

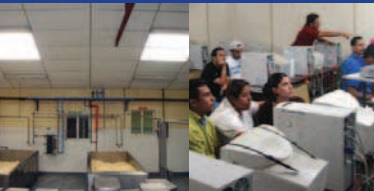
The project aims at developing a rural energy development programme based on small hydropower for productive uses in Rwanda. It reviews existing policies and strategies to promote small hydropower in Rwanda, carries out an assessment of suitable technologies and analyzes institutional, financial and technical capacities. UNIDO has set in place an operational mini hydro site in Rwanda and two more SHP facilities are scheduled to start operation in September 2008.

### **Operationalizing the small hydropower plant at Nias Island of Indonesia**

**Location:** Global

**Project description:**

This small hydropower project aims at supplying electricity and promoting productive use activities in the Nias Island of North Sumatra, Indonesia. At Nias Island, the small hydropower plant established by UNIDO electrifies nearly 200 households, supplies the Community Development Centre (CDC) with electricity and supports communication ICT systems, disaster warning, health care, education, entertainment and similar activities.



## **Biomass Conversion Technology On-line Information Platform (BIOTIP)**

**Location:** Global

### **Project description:**

The objective of BIOTIP is to enable policymakers and biofuel promotion agencies in developing countries to advise entrepreneurs to take informed decisions on the selection of appropriate and commercially available biomass conversion technologies. The project aims at providing ease of access to assessed information via a UNIDO-based internet platform.

## **Bioenergy Capacity-Building Programme (BIOCAB)**

**Location:** Global

### **Project description:**

The objective of BIOCAB is to provide policymakers, industry associations and entrepreneurs with a bioenergy training package. In a preparatory phase, implementation modalities are discussed with stakeholders and a project concept is prepared. As an introduction to the training package a Bioenergy Sourcebook is prepared as an output of the preparatory phase.

## **Observatory for Renewable Energy in Latin America and the Caribbean**

**Location:** Latin America and the Caribbean region

### **Project description:**

The objective of the observatory is to reduce poverty and increase energy security in the LAC region through the provision of sufficient and sustainable energy services based on renewable energy sources. The observatory will establish mechanisms to increase information sharing and knowledge generation and to strengthen renewable energy markets at the local, national and regional levels. The observatory will engage public institutions, private entities and civil society organizations to build a strong portfolio of projects and programmes oriented to promote productive uses and industrial applications of renewable energy technologies.

## UNIDO and GEF

UNIDO is one of the 10 implementing/executing agencies of the Global Environment Facility (GEF), and has been very successful in obtaining GEF funds and leveraging co-financing for the implementation of large renewable energy projects. UNIDO, in cooperation with UNEP, is executing two large renewable energy projects funded by GEF.

### Example 1: Generation and delivery of renewable energy-based modern energy services in Isla de la Juventud

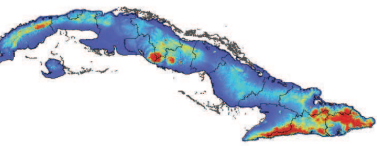
Location: Cuba, Isla de la Juventud

Project description:

UNIDO is executing a GEF/UNEP project to promote the generation and delivery of renewable energy-based modern energy services in Isla de la Juventud in Cuba.

The main objective of the project is to promote renewable energy technologies for power generation and process heat in selected industries. The project would in particular address key barriers to renewable energy development through technical assistance and targeted finance. The project aims at achieving attractive conditions for wind power and biomass gasification technology markets in Cuba.

The project will install a large (3.5 MW) biomass gasifier plant for power generation, four gasifier applications (about 6 MW thermal) to be placed at four industrial sites for heat production and a wind farm to produce 1.5 MW of electricity to augment power supply on the Island. A new and innovative financial and institutional structure to encourage private investments in the renewable energy sector will also be introduced.





## Example 2: Renewable energy-based electricity generation for isolated mini-grids in Zambia

Location: Zambia

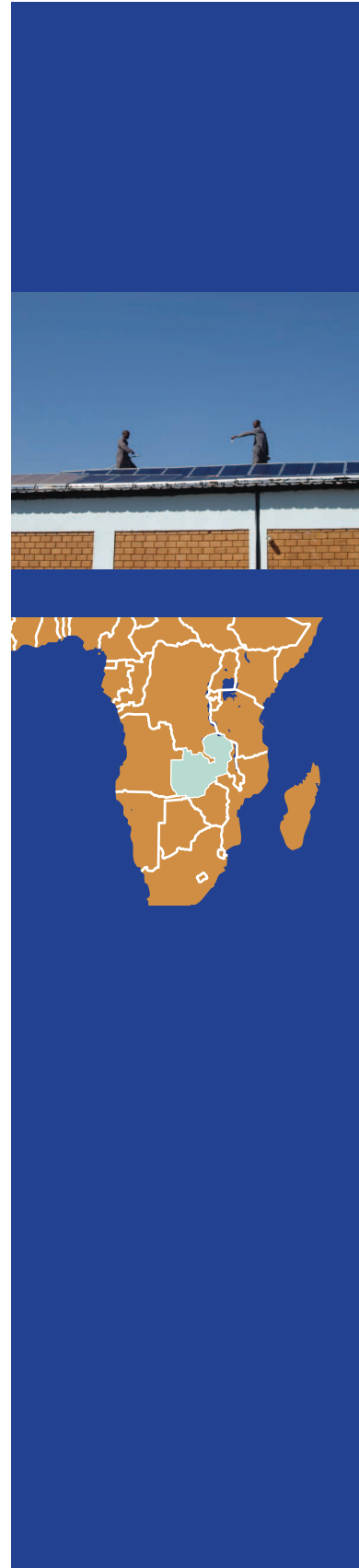
### Project description:

UNIDO is executing a GEF/UNEP project to promote renewable energy-based electricity generation for isolated mini-grids in Zambia.

The project aims at constructing three mini-grids powered by renewable energy technologies (solar, biomass and small hydro) in rural communities. The generated electricity will be used for income-generating activities in the targeted communities and other energy services. To ensure local ownership, the communities, individual consumers, the public utility and investors will actively contribute to the programme.

In all, the project would install a biomass gasifier power plant for 1 MW of electricity generation, a small hydropower station to generate 1 MW of electricity and a solar energy mini-grid with an outputs of 36 kW. The project will also contribute to a legal, institutional and policy framework to provide for a favourable environment for commercial deployment of renewable energy-based mini-grids in rural areas of the country. This is expected to sustain further expansion of the market for these technologies.

UNIDO is also currently establishing a renewable energy-powered telecentre to provide electricity for public and mobile phones, Internet access and a community cinema in rural communities in the southern part of Zambia.



## Multi-Functional Platform for Poverty Alleviation

### UNIDO's concept for improving the access to energy and promoting productive uses in rural areas

A novel multifunctional platform programme (MFP) was launched by UNIDO and its partners in the 1990s. It aims to bring energy to the poorest rural areas and thus contribute to poverty alleviation and increasing the quality of life.

Using a simple diesel engine, rural populations, particularly women, can have access to affordable, simple and modern energy services. This improved access saves time and effort that can be devoted to income-generating activities, education, health and childcare.

Such platforms were originally implemented in Senegal, Mali and Burkina Faso with the support of UNIDO, IFAD and UNDP. Between 2002 and 2005, UNIDO implemented a UNDP project "The Multifunctional Platform for Poverty Alleviation". Within the pilot phase of the project in Senegal, UNIDO installed 40 multifunctional platforms and has trained more than 200 people in promoting their productive use. It has also ensured regular technical and management monitoring of the project. The platforms, mainly owned and managed by women, have provided an appropriate solution to energy constraints in rural areas.



#### The concept

- The MFP constitutes the appropriate answer to the constraints of the rural world
- A simple, sturdy diesel engine that can power different tools
- Provides access to affordable, simple and modern energy services
- Saves time and energy to be devoted to income-generating activities, education, health and childcare

#### Success indicators

- Improved quality of life
- Creation, development and modernization of artisan jobs and creation of permanent jobs
- Higher product quality
- Increased annual income
- Increased paddy cultivation
- Higher performance and school attendance
- Improved health and education conditions
- Participative management and women empowerment
- MFP received small enterprise status

## Opportunities and challenges ahead

Given the current energy scenario at the global level, there are immense opportunities for UNIDO to promote renewable energy for productive uses and industrial applications. Renewables, including bioenergy technologies, are a clear emerging niche area for UNIDO as they have a significant potential to reduce poverty, create employment opportunities and ensure energy security. New funding mechanisms such as carbon financing, the Clean Technology Fund as well as the Adaptation Fund provide new opportunities to finance renewable energy markets.

With UNIDO's Director-General assuming the chairmanship of UN-Energy, UNIDO is playing a leading role in enhancing common approaches and strengthening synergies in the field of energy, and actively contributing to securing energy access and reducing environmental damages with enhanced use of renewable energy and industrial energy efficiency.

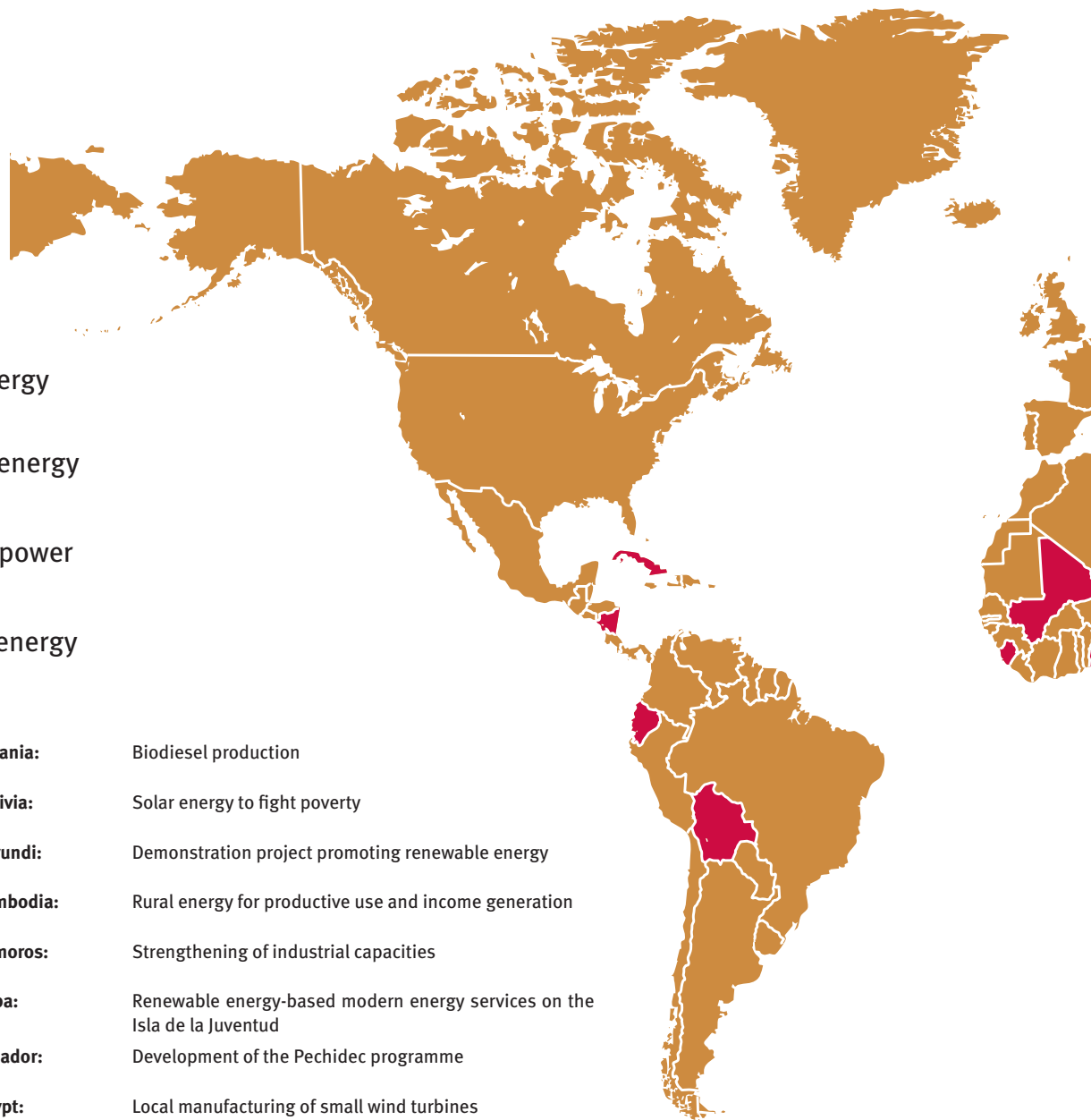
However, accessibility and affordability of energy sources remain a major challenge for developing countries, and need to be addressed as a priority by UNIDO and its partners in UN-Energy. Other challenges ahead are the strengthening of UNIDO's cooperation and networking with other United Nations/partner agencies and financial institutions in the field of renewable energy, the enhancement of its fund-raising activities and an increase in its visibility through research, analytical work, policy advice, dedicated publications and advocacy.



**There are immense opportunities for UNIDO to promote renewable energy for productive uses and industrial applications.**



# Some of the significant ongoing and



Bioenergy



Solar energy



Hydropower



Wind energy



**Albania:**

Biodiesel production



**Bolivia:**

Solar energy to fight poverty



**Burundi:**

Demonstration project promoting renewable energy



**Cambodia:**

Rural energy for productive use and income generation



**Comoros:**

Strengthening of industrial capacities



**Cuba:**

Renewable energy-based modern energy services on the Isla de la Juventud



**Ecuador:**

Development of the Pechidec programme



**Egypt:**

Local manufacturing of small wind turbines



**Iraq:**

Small hydropower programme



**Indonesia:**

Micro hydropower plant in Nias Island, North Sumatra Province



**India:**

1. Eco City—eco business partnership programme in India
2. Support energy efficiency and quality standards for small and medium-scale enterprises (SMEs) in the ceramic sector
3. PV/wind/hybrid-based rural community development centres in remote islands in Laccadives



**Kenya:**

Zero-emission community power centre



**Mali:**

Small hydropower station



**Maldives:**

Spv/wind/hybrid-based rural community development centres in remote islands



**Madagascar:**

Small hydropower development



**Montenegro:**

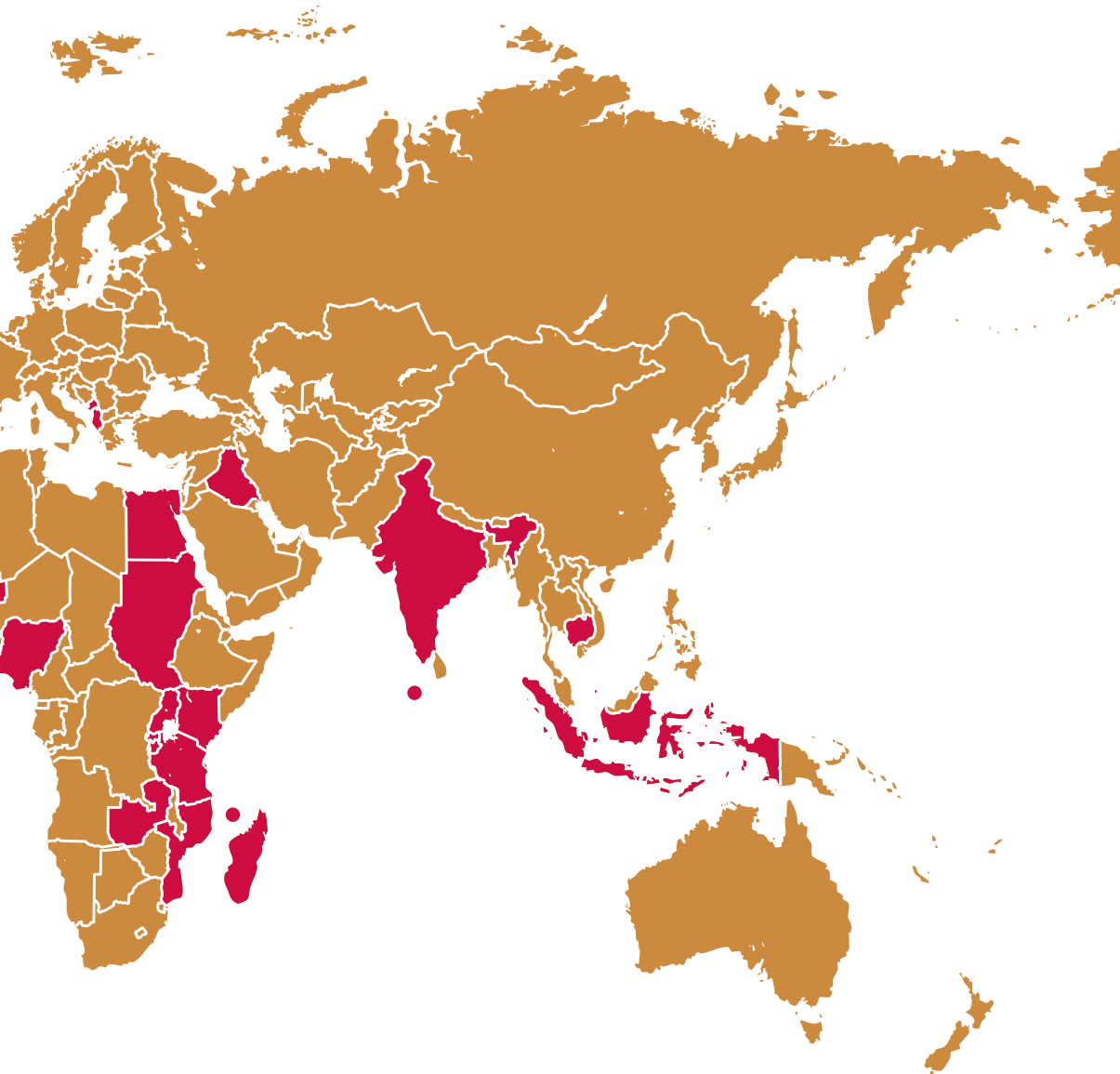
National energy development strategy



**Mozambique:**

Renewable energy-powered rural business support centres (ICTS) for small rural enterprises and communities in off-grid regions

# pipeline renewable energy projects



**Nigeria:**

1. Rice husk-fired power plant
2. Energy generation from agricultural waste
3. Local manufacturing facility for micro hydro turbines
4. Agrowaste-based plants



**Nicaragua:**

Heating Nicaragua with solar thermal energy



**Rwanda:**

Mini hydro demonstration projects



**Sudan:**

Solar cooking: promotion, dissemination and local production



**Sierra Leone:**

Small hydropower development at Bankasoka River, Port Loko



**United Republic of Tanzania:**

1. Sisal waste to produce organic fertilizer and green electricity
2. Biomass fuel and agro processing waste-based electricity generation for rural areas



**Uganda:**

Feasibility study for mini hydropower plants to reduce climate change impacts



**Zambia:**

1. Renewable energy-powered rural pilot demonstration telecentre
2. Renewable energy-based electricity generation for isolated mini-grids in Zambia

UNIDO's Renewable Energy Programme also implements interregional and global as well as regional projects in Europe, Africa, Asia and the Pacific and Latin America region.







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