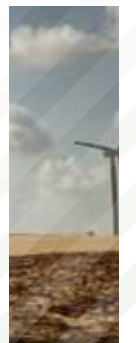




# GREEN economy

Developing Countries Success Stories





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- (1) Renewable Energy in China
- (2) Feed-in Tariffs in Kenya
- (3) Organic Agriculture in Uganda
- (4) Sustainable Urban Planning in Brazil
- (5) Rural Ecological Infrastructure in India
- (6) Forest Management in Nepal
- (7) Ecosystem Services in Ecuador
- (8) Solar Energy in Tunisia

*“Over the past two years, the Green Economy has gone from theory into practice... The inherent logic offers, perhaps for the first time, a sustainable growth paradigm that is as much a developing country agenda as it is a developed economy one.”*

**Achim Steiner, UN Under-Secretary-General and Executive Director, UNEP**





# INTRODUCTION



A Green Economy can be defined as one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities.

A Green Economy is characterized by substantially increased investments in economic sectors that build on and enhance the earth's natural capital or reduce ecological scarcities and environmental risks. These sectors include renewable energy, low-carbon transport, energy-efficient buildings, clean technologies, improved waste management, improved freshwater provision, sustainable agriculture, forestry, and fisheries. These investments are driven by, or supported by, national policy reforms and the development of international policy and market infrastructure.

These investments and policy reforms provide the mechanisms and the financing for the reconfiguration of businesses, infrastructure and institutions. Such reconfiguration could lead to a higher share of green sectors in GDP, greener jobs, lower energy and resource-intensive production, lower waste and pollution, and significantly lower greenhouse gas emissions. It can also assist in the reduction of persistent poverty through targeted wealth transfers, new employment, as well as improved access to the flow of ecosystem goods and services to the bottom of the economic pyramid.

The UNEP-led Green Economy Initiative, launched in late 2008, consists of several components whose collective overall objective is to provide the analytics and policy support for investing in green sectors and in greening brown sectors. The Initiative will assess how sectors – such as renewable energies, clean and efficient technologies, water services, and sustainable agriculture – can contribute to economic growth, creation of decent jobs, social equity, and poverty reduction while addressing climate and other ecological challenges.

**Within UNEP, the Green Economy Initiative includes three sets of activities:**

1. Producing a Green Economy Report and related research materials, which will analyse the macroeconomic, sustainability, and poverty-reduction implications of green investment in a range of sectors from renewable energy to sustainable agriculture and providing guidance on policies that can catalyse increased investment in these sectors.
2. Providing advisory services on ways to move towards a green economy in specific countries.
3. Engaging a wide range of research, non-governmental organizations, business and UN partners in implementing the Green Economy Initiative.

Beyond UNEP, the Green Economy Initiative is one of the nine UN-wide Joint Crisis Initiatives (JCI) launched by the UN System's Chief Executives Board in early 2009. In this context, the Initiative includes a wide range of research activities and capacity building events from more than 20 UN agencies including the Bretton Woods Institutions, as well as an Issue Management Group (IMG) on Green Economy, launched in Washington, DC, in March 2010.





## Success Stories

The economic analysis in the Green Economy Report builds in part on the encouraging signs and results of many initiatives around the world. A number of these come from developing countries, including emerging economies, and illustrate a positive benefit stream from specific green investments and policies, that if scaled up and integrated into a comprehensive strategy, could offer an alternative development pathway, one that is pro-growth, pro-jobs and pro-poor.

Eight of these examples, a limited selection from a growing range of experiences in different sectors, are summarized below, highlighting their economic, social and environmental benefits. While some represent established broad-based policies and investment programmes, others are newly initiated pilot projects or local ventures. In this sense the collection underlines that a green economy strategy is not limited to national or other government policy levels but can take root wherever there is the leadership and vision to make this transformation. Indeed, as this booklet will show, there is a growing body of evidence illustrating the growing interest among developing countries to seize opportunities to move to a Green Economy.

1. **Renewable Energy in China**
2. **Feed-in tariffs in Kenya**
3. **Organic Agriculture in Uganda**
4. **Sustainable Urban Planning in Brazil**
5. **Rural Ecological Infrastructure in India**
6. **Forest Management in Nepal**
7. **Ecosystem Services in Ecuador**
8. **Solar Energy in Tunisia**

*“The green economic program is part of Indonesia’s sustainable development plan which is pro-growth, pro-job, and pro-poor.”*

**Sri Mulyani Indrawati, Minister of Finance, The Republic of Indonesia**

*“We have no choice but to develop a Green Economy... There is significant opportunity for the development of a Green Economy in Southern Africa, and which extends to other parts of the continent”*

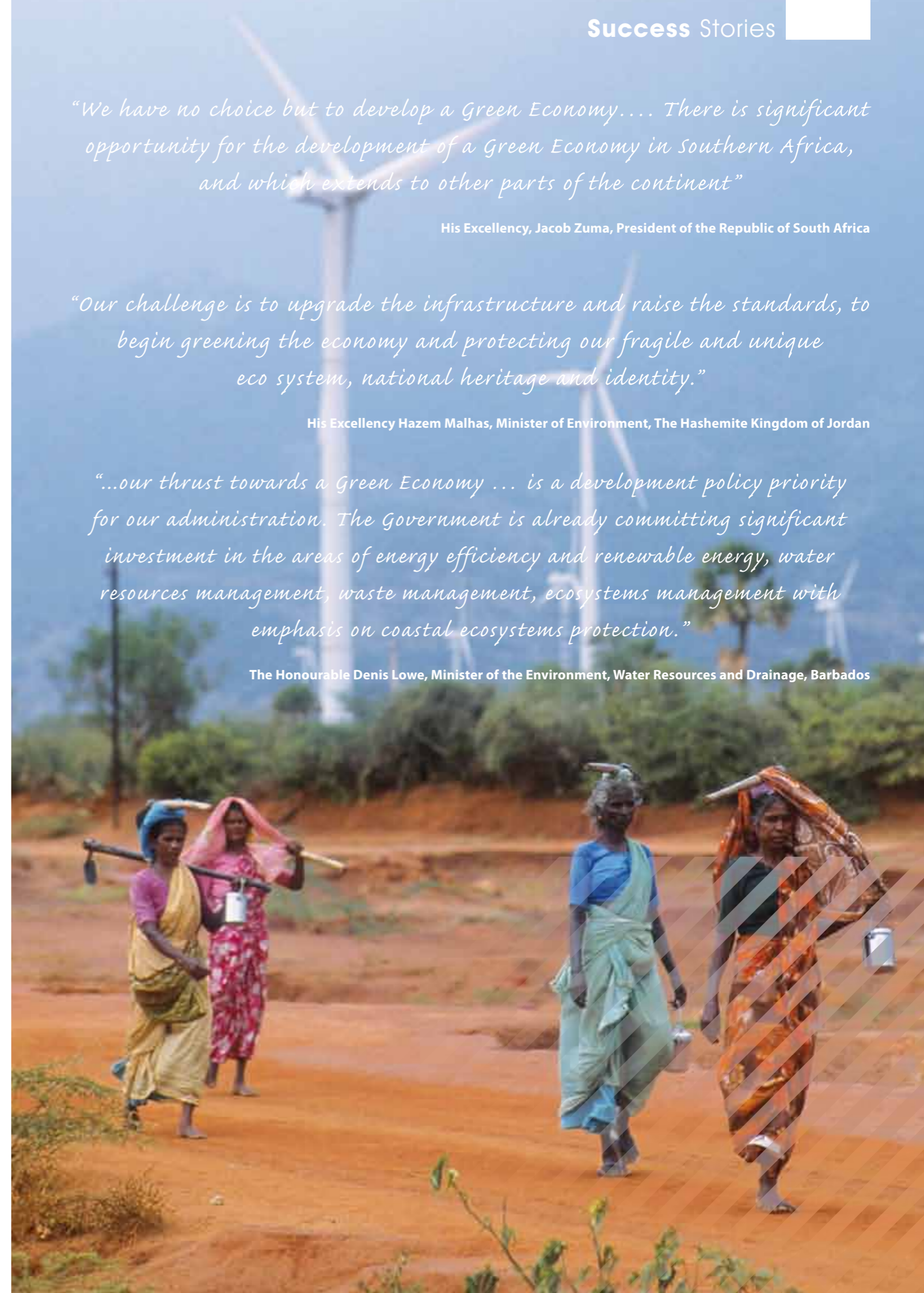
**His Excellency, Jacob Zuma, President of the Republic of South Africa**

*“Our challenge is to upgrade the infrastructure and raise the standards, to begin greening the economy and protecting our fragile and unique eco system, national heritage and identity.”*

**His Excellency Hazem Malhas, Minister of Environment, The Hashemite Kingdom of Jordan**

*“...our thrust towards a Green Economy ... is a development policy priority for our administration. The Government is already committing significant investment in the areas of energy efficiency and renewable energy, water resources management, waste management, ecosystems management with emphasis on coastal ecosystems protection.”*

**The Honourable Denis Lowe, Minister of the Environment, Water Resources and Drainage, Barbados**



# RENEWABLE ENERGY IN CHINA

**China is taking considerable steps to shift to a low-carbon growth strategy based on the development of renewable energy sources. The outline of 11th Five-year Plan (2006-2010) allocated a significant share of investments to green sectors, with an emphasis on renewable energy and energy efficiency.**

**The Plan projects that the per-unit GDP energy consumption by 2010 should have decreased by 20 per cent compared to 2005. In addition, the Chinese government has committed itself to producing 16 per cent of its primary energy from renewable sources by 2020.**



Passed in 2005, China's Renewable Energy Law serves as the principal framework for development of the sector. The law offers a variety of financial incentives, such as a national fund to foster renewable energy development, discounted lending and tax preferences for renewable energy projects, and a requirement that power grid operators purchase resources from registered renewable energy producers. The combination of investments and policy incentives has encouraged major advances in the development of both wind power and solar power.

#### Wind Power

The additional generating capacity from wind power has exhibited an annual growth rate of more than 100 per cent from 2005 to 2009. With new installations of 13.8 GW coming on line in 2009, China led the world in added capacity, and is second in terms of installed capacity, after the U.S. To reflect increasing ambition in the industry, the government has indicated its intention to increase its previous target of 30 GW of installed capacity by 2020 to 100 GW.

To directly encourage local wind turbine manufacturing, China has implemented policies to encourage joint-ventures and technology transfers in large wind turbine technology and mandated the use of locally made wind turbines. The Ministry of Science and Technology has subsidized wind energy R&D expenditures at varied levels over time, beginning most notably in 1996 with the establishment of a renewable energy fund. Domestic wind turbine makers, such as Sinovel Wind, Goldwind Science and Technology, and Dongfang Electric, have contributed an increasing share of total new installations. Together they accounted for at least half of a market dominated by foreign firms until 2008.

China's National Development and Reform Commission issued the Interim Management Measures for Renewable Power Tariff and Cost Allocation in 2006, and the Interim Measures on Renewable Power Surcharge Collection and Allocation in 2007. Together with the Renewable Energy Law, the regulations aim to encourage a reduction in the price of wind power by stipulating that a competitive pricing bidding model be used for the majority of wind power development in China.

#### Solar Power

Being the largest Solar PV manufacturer in the world, China produced 45 per cent of global solar PV in 2009. The domestic solar market has started developing more recently, with about 160 MW solar PV installed and connected to grid in 2009. But with more than 12GW of large projects in the pipeline, it could rapidly become a major market in Asia and the world. For solar PV, the government has also indicated that the target for installed capacity in 2020 could be increased from 1.8 GW to 20 GW.

China is now the world's largest market for solar hot water, with nearly two-thirds of global capacity. More than 10 per cent of Chinese households rely on the sun to heat their water with more than 160 million square metres as total collector area. The rapid development of the solar water heater sector is due to its basic profitability for both business manufacturing the units and households that install them. There are also considerable health and sanitation benefits afforded by the improved availability of hot water, made more feasible and economic with solar water heater systems. Within the context of the Eleventh Five-Year Plan for New and Renewable Energy, an Implementation Plan on Promoting Solar Thermal Utilization in China was adopted in 2007. Under this national policy, the installation of SWH systems is given priority for major hot water consumers, such as hospitals, schools, restaurants and swimming pools.

#### Job creation

The energy sector as a whole generates output worth US\$17 billion and employed an estimated 1.5 million at the end of 2009, of which 600,000 were in the solar thermal industry, 266,000 in biomass generation, 55,000 in solar photovoltaics and 22,200 in wind power. In 2009 alone, an estimated 300,000 jobs were created.

China's experience provides an example of policy-led growth in renewable energy that has created jobs, income and revenue streams for nascent low carbon industries.

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# (2)

## FEED-IN TARIFFS IN KENYA

**Kenya's energy profile is characterized by a predominance of traditional biomass energy to meet the energy needs of the rural households and a heavy dependence on imported petroleum for the modern economic sector needs. As a result, the country faces challenges related to unsustainable use of traditional forms of biomass and exposure to high and unstable oil import prices. In March 2008, Kenya's Ministry of Energy adopted a Feed-in Tariff, based on the realization that "Renewable Energy Sources (RES) including solar, wind, small-hydro, biogas and municipal waste energy have potential for income and employment generation, over and above contributing to the supply and diversification of electricity generation sources".**



A Feed-in Tariff (FIT) is a policy instrument that makes it mandatory for energy companies or "utilities" responsible for operating the national grid to purchase electricity from renewable energy sources at a pre-determined price that is sufficiently attractive to stimulate new investment in the renewable sector. This, in turn, ensures that those who produce electricity from identified renewable energy sources such as solar, wind and other renewable sources have a guaranteed market and an attractive return on investment for the electricity they produce. Aspects of an FIT include access to the grid, long-term power purchase agreements and a set price per kilowatt hour (kWh).

Kenya's FIT policy has as its objectives to: a) facilitate resource mobilization by providing investment security and market stability for investors in Renewable Energy Sources (RES) electricity generation b) reduce transaction and administrative costs by eliminating the conventional bidding processes, and c) encourage private investors to operate the power plant prudently and efficiently so as to maximize its returns. By taking a long-term commitment to the development of renewable sources of energy and stipulating a long-term power purchase agreements of a minimum of 20 years, the Kenya Government has taken a critically important step in the development of the country's significant potential for renewable energy generation, while pursuing equally important economic, environmental and social policy objectives.

In January 2010, Kenya revised the FIT policy, which resulted in the addition of three renewable energy sources: geothermal, biogas, and solar energy resource generated electricity. In addition, the revised policy extended the period of the power purchase agreements from 15 to 20 years and increased the fixed tariffs per kilowatt-hour for pre-existing wind, biomass and small-hydro power under the FIT.

### Expected benefits

The advantages of this policy include: a) environmental integrity including the reduction of greenhouse gas emissions; b) enhancing energy supply security, reducing the country's dependence

on imported fuels; and coping with the global scarcity of fossil fuels and its attendant price volatility; and c) enhancing economic competitiveness and job creation. Initially covering wind, biomass and small-hydro, the policy is planned to include geothermal sources of energy.

It is expected that the FIT policy in Kenya could stimulate about 1300 MW of electricity generation capacity. If the projected generation capacity is realized, this could contribute significantly to ensuring security of electricity supply in the country by increasing the reserve margin. Furthermore, since the resources used consist of relatively low-cost local fuels, it is likely to reduce costs for the consumer. Benefits targeted are a "triple-win" of additional renewables-based generation capacity to the country; enhancing employment and poverty alleviation in the rural areas; and increasing income opportunities for business development.

As Kenya's greatest renewable energy potential is in rural areas, the effects of the FIT policy are expected to trickle down and stimulate rural employment. This can happen through the construction of power plants, but also in the context of agro-industries, in particular sugarcane, which is predominant in the country. It is estimated that the sugar factories have directly and indirectly contributed to job creation by supporting about 200,000 small-scale farmers within the sugar belt in western Kenya, and that between five and six million people either directly or indirectly benefit from the sugar factories.

### Observed impacts

Since the announcement of the FIT policy, some sugar companies have planned to upgrade their biomass-based cogeneration potential in order to benefit from the FIT policy. While full effects have not been felt yet, Kenya provides an example of how forward-looking energy policy could contribute to matrix diversification, improved benefit streams to small rural producers, and enhanced local development.

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# (3) ORGANIC AGRICULTURE IN UGANDA

**Uganda has taken important steps in transforming conventional agricultural production into an organic farming system, with significant benefits for its economy, society and the environment. Organic Agriculture (OA) is defined by the Codex Alimentarius Commission as a holistic production management system, which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity. It prohibits the use of synthetic inputs, such as drugs, fertilizers and pesticides.**

**Uganda uses among the world's lowest amount of artificial fertilizers, at less than 2 per cent (or 1kg/ha) of the already very low continent-wide average of 9kg/ha in Sub Saharan Africa. The widespread lack of fertilizer use has been harnessed as a real opportunity to pursue organic forms of agricultural production, a policy direction widely embraced by Uganda.**



### **Economic, social and environmental benefits of organic farming in Uganda**

In Uganda 85 per cent of the population was engaged in agriculture production, contributing to 42 per cent of the national GDP and 80 per cent of the exports earnings in 2005/06. As early as 1994 a few commercial companies began deliberately engaging in organic agriculture. At the same time in Uganda, there was a general movement in the agricultural sector towards developing sustainable agriculture as a means of improving people's livelihoods.

By 2003, Uganda had the world's 13th-largest land area under organic agriculture production and the most in Africa. By 2004, Uganda had around 185,000 ha of land under organic farming covering more than 2 per cent of agricultural land, with 45,000 certified farmers. By 2007, 296,203 hectares of land were under organic agricultural production with 206,803 certified farmers. This constitutes an increase of 359 per cent in terms of number of farmers and 60 per cent in terms of acreage, respectively, from 2002 to 2007.

According to IFOAM, the global market for organic foods and drinks is estimated to be around US\$50 billion, and increased by 10-20 per cent annually between 2000 and 2007. This sub-sector provides a unique export opportunity for many developing countries, owing to the fact that 97 per cent of the revenues are generated in the OECD countries, while 80 per cent of the producers are found in developing countries of Africa, Asia and Latin America.

As a significant producer of organic products, Uganda benefits from an important source of export earnings and revenue for farmers. Certified organic exports increased from US\$3.7 million in 2003/4, to US\$6.2 million in 2004/5, before jumping to US\$22.8 million in 2007/8. In terms of price premiums and income for farmers, studies commissioned by UNEP and UNCTAD indicate that in 2006 the farm-gate prices of organic pineapple, ginger and vanilla were 300 per cent, 185 per cent, and 150 per cent higher, respectively than conventional products. Through organic farming, Uganda not only gains economically, it also contributes to mitigating

climate change, as GHG emissions per ha are estimated to be on average 64 per cent lower than emissions from conventional farms. Various studies have shown that organic fields sequester 3–8 tonnes more carbon per ha than conventional agriculture.

### **Policy and systemic change to transform Uganda's agricultural sector**

On the policy side, in 2004 the Uganda Organic Standard was adopted, while in 2007, as part of the East African Community, Uganda adopted the regional standard, the East African Organic Products Standards (EAOPS) developed under a joint UNEP-UNCTAD initiative. In July 2009, the government released a Draft Uganda Organic Agriculture Policy. The draft policy describes the vision, mission, objectives and strategies to support the development of organic agriculture as "one of the avenues for delivering self-sustaining growth as it provides mechanisms for individual farmers to improve productivity, add value and access markets which are keys to achievement of the Poverty Eradication Action Plan objectives".

The strategy put in place to implement the policy is based on interventions in nine policy areas: the promotion of organic agriculture as a complementary agricultural production system; the development of a system of standards, certification and accreditation; the promotion of research, to enable technology development and dissemination; support to the development of local, regional and international markets for organic products; the generation of information, knowledge and skills through education and training; the improvement of post-harvest handling practices, preservation, storage and value addition; the sustainable use of natural resources; and participation of the special interest groups such as women, youth, and the poor and vulnerable.

In sum, Uganda has taken an apparent liability – limited access to chemical inputs – and turned this into a comparative advantage by growing its organic agriculture base, generating revenue and income for smallholder farmers.

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# SUSTAINABLE URBAN PLANNING IN BRAZIL

**Rapid growth of urban areas presents both environmental and socio-economic challenges to residents, businesses and municipalities. With inadequate planning and limited finances accommodating the increasing urban populations often results in expansion of informal housing in cities or suburban developments requiring high use of private transport.**

**Brazil has the fourth-largest urban population after China, India, and the US, with an annual urban growth rate of 1.8 per cent between 2005 and 2010. The city of Curitiba, capital of Parana State in Brazil has successfully addressed this challenge by implementing innovative systems over the last decades that have inspired other cities in Brazil, and beyond. Particularly known for its Bus Rapid Transit system, Curitiba also provides an example of integrated urban and industrial planning that enabled the location of new industries and the creation of jobs.**



## **Sustainable planning for growth in Curitiba**

Through its innovative approaches in urban planning, city management, and transport planning going back as far as the 1960s, Curitiba has been able to grow in population from 361,000 (in 1960) to 1.828 million (in 2008), without experiencing typical drawbacks from congestion, pollution and reduction of public space. The population density in the city has increased three-fold from 1970 to 2008. At the same time, the average green area per person increased from 1 km<sup>2</sup> to over 50 km<sup>2</sup>.

One of the key elements of urban planning was a choice for growth in a 'radial linear-branching pattern', which served to protect both density and green areas. This pattern encouraged - through a combination of land-use zoning and provision of public transport infrastructure - a diversion of traffic from the city centre and the development of housing, services and industrial locations along the radial axes.

## **Economic and environmental benefits**

Cities offer considerable opportunities to reduce CO<sub>2</sub> emissions when applying coordinated approaches to emission reductions in transport and buildings, which are the two of largest sources. As a result of integrated urban planning, Curitiba has the highest rate of public transport use in Brazil (45 per cent of journeys), and one of the country's lowest rates of urban air pollution.

The economic and resource efficiency benefits of such initiatives are considerable. Curitiba's fuel usage is 30 per cent lower than in Brazil's other major cities. Excessive fuel use due to severe traffic congestion - estimated at a value of US\$1 million for Curitiba in 2002 - was about 13 times and 4 times less in per capita terms than those in Sao Paulo and Rio de Janeiro, respectively. The per capita loss due to time spent in severe congestion in Curitiba is

approximately 11 and 7 times less than in those two cities, respectively.

## **Policy and city planning for ecological infrastructure and industrial activity**

By turning areas vulnerable to flooding into parks planted with many trees, and creating artificial lakes to hold floodwaters, Curitiba has managed to address its potentially costly flooding problem, in terms of flood control and drainage. The cost of this strategy, including the relocation costs of slum dwellers, is estimated to be 5 times less than building concrete canals. Also, as a result, the property values of neighbouring areas appreciated, and tax revenues increased.

The local government established the Curitiba Industrial City (CIC) on the city's west side, taking into account wind direction to avoid polluting the central city. The CIC has strict environmental regulations and "polluting" industries are not allowed. After three decades, the CIC today accommodates more than 700 companies, including an automaker producing BRT buses and information technology companies. The CIC has already created about 50,000 direct jobs and 150,000 indirect jobs, and about 20 per cent of the state's exports are from the CIC.

Curitiba has also promoted waste management infrastructure and public awareness on waste separation and recycling. With 70 per cent of the city's residents actively recycling, 13 per cent of solid waste is recycled in Curitiba, as compared to only 1 per cent in Sao Paulo.

All in all, Curitiba presents a case study of how smart urban planning can avoid significant costs in the future and improve efficiency, productivity and quality of life for its inhabitants.





# RURAL ECOLOGICAL INFRASTRUCTURE IN INDIA

**India's National Rural Employment Guarantee Act 2005 (NREGA) is a guaranteed wage employment programme that enhances the livelihood security of marginalized households in rural areas. Implemented by the Ministry of Rural Development, NREGA directly touches the lives of the poor, promotes inclusive growth, and also contributes to the restoration and maintenance of ecological infrastructure.**

**In its first two-and-a-half years of operation, from 2006 to 2008, NREGA generated more than 3.5 billion days of work reaching on average 30 million families per year. The programme is implemented in all 615 rural districts of the country, with women representing roughly half the employed workforce. The emphasis is placed on labour-intensive work, prohibiting the use of contractors and machinery.**



## Investing in ecological infrastructure

In addition to supplementing wage employment, NREGA's secondary objective is to strengthen rural natural resource management. This is achieved by financing rural works that address causes of drought, deforestation and soil erosion, thus restoring the natural capital base on which rural livelihoods depend.

As one of the world's leading crop producers, India has seen a surge in water consumption in the agriculture sector over the years. With industrial water consumption expected to quadruple between 2000 and 2050 as well, groundwater aquifers in the four major river basins may be depleted by half by 2050. India is moving towards water scarcity due to increasing demand and a drop in supply of clean water as well, with forecasts of even a 50 per cent deficit by 2030. Increasing water scarcity is a major constraint to agriculture and livestock production affecting livelihoods and food security.

Water conservation accounts for about half of the total projects supported under NREGA, with 850,000 water conservation works funded and completed from 2006 to 2008. For example, in the District of Jalaun (Uttar Pradesh), NREGA provided training and jobs for villagers to develop solutions to their heavily silted water harvesting infrastructure, alleviating their water shortage. In 2007-2008, more than 3,000

new soak pits, together with hand pumps were constructed. This has helped conserve an estimated 5 million litres of water.

Similarly in Andhra Pradesh, NREGA supported the restoration of a network of water storage tanks dating back over 500 years in the principal arid zone. Repairs to the gates of the tanks, as well as works to desilt the channels feeding them, has restored to full capacity. This not only boosts crop and livestock production but has contributed to groundwater replenishment.

In its short history, NREGA has produced many such success stories across the country. In promoting to inclusive growth and the restoration of ecological infrastructure, the programme also has a strong impact on empowerment of poor or marginalized groups. It has contributed to boosting the average wage for agricultural labourers by more than 25 per cent over its three-year history.

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# (6)

# FOREST MANAGEMENT IN NEPAL

**Community forestry has contributed to restoring forest resources in Nepal. Forests account for almost 40 per cent of the land in the country. Although this area was decreasing at an annual rate of 1.9 per cent during the 1990s, this decline was reversed, leading to an annual increase of 1.35 per cent over the period 2000 to 2005.**

**Community forestry occupies a central place in forest management in Nepal. In this approach, local users organized as Community Forest User Groups (CFUGs) take the lead and manage resources, while the government plays the role of supporter or facilitator. Forest management is a community effort and entails little financial or other involvement on the part of the government.**



Since 1980, about 14,000 CFUGs have been formed. About one-fourth of Nepal's national forest is now managed by more than 35 per cent of the total population. Community forestry is now the second-largest forest management regime after government-managed forests.

Forest user groups develop their own operational plans, set harvesting rules, set rates and prices for products, and determine how surplus income is distributed or spent. There is evidence of significant improvement in the conservation of forests (both increased area and improved density) and enhanced soil and water management.

#### **Benefits from community forestry management**

The advantages of community forestry include employment and income generation from forest protection, tree felling and log extraction, as well as non-timber forest products. Additional economic benefits are in the form of sustained wood fuel sources, which contribute more than three-quarters of energy needs to households. Improved forest management and cover also contribute to nature conservation.

Community forestry promotes inclusive growth. Some community forest activities have initiated a scholarship programme for low income people, as well as savings and credit operations among members, including loans to finance income generation activities. Community forestry also empowers CFUGs with greater influence over decision making through participation in planning and management.

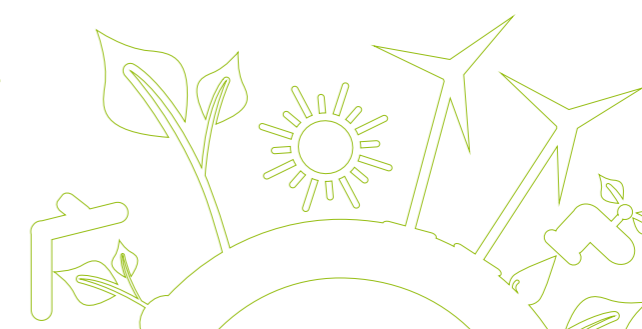
#### **Policies to protect deforestation**

The Ministry of Forest and Soil Conservation (MFSC), as the lead institution for creating an enabling environment for forest resource management, has implemented two policies, including Community Forestry and the Leasehold Forestry Policy, that have helped the government of Nepal achieve significant success in forest conservation and environmental protection.

The Master Plan for the Forestry Sector prepared in 1989, the Forest Act of 1993, the Forest Regulations of 1995, and the Forestry Sector Policy of 2000 were developed and implemented to support the community forestry programme, after earlier efforts at centralized control. The Forest Act and Forest Rules accelerated the transfer of forests to forest user groups; they provide the legal basis for the implementation of community forestry and recognize CFUGs as "self-governing autonomous corporate bodies for managing and using community forests".

The remarkable turnaround in forest management in Nepal is directly attributable to the benefits generated for community groups, in the form of environmental goods, services and welfare enhancements.

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# ECOSYSTEM SERVICES IN ECUADOR

The city of Quito offers a leading example of the potential for developing markets that channel economic demand for water to upstream areas from which it is supplied. In Quito's case, the availability of water for the city of about 1.5 million inhabitants and surrounding areas depends on the conservation of protected areas upstream, with 80 per cent of the water supply originating in two ecological reserves, the Cayambe-Coca (400,000 ha) and the Antisana (120,000 ha).

The Fund for the Protection of Water – FONAG – was established in 2000 by the municipal government, together with a non-governmental organization, as a trust fund to which water users in Quito contribute. FONAG uses the proceeds to finance critical ecosystem services, including land acquisition for key hydrological functions.



## Demand and supply

The users include farmers, hydropower companies, industries and households, who pay differentiated rates depending on use. The largest share of payments comes from the Quito water utility (Metropolitan Enterprise of Water and Sewer Systems in Quito – EMMAP-Q) which contributes 1 per cent of monthly water sales. Hydropower companies make fixed annual payments, as does the Cerveceria Andina brewery. Farmers drawing water through irrigation also contribute. The fund held more than US\$ 7 million at the end of 2009 (up from US\$ 3 million in 2005) and invested about US\$ 0.8 million in 2008. Administration costs are limited to between 10 and 20 per cent of total expenditures.

FONAG finances both watershed management projects in micro river valleys and longer-term programmes (at least 20 years in duration) oriented towards communication, environmental education, forestry, and the river basin management training. These projects and programmes are undertaken with the participation of different community actors, local authorities, educational institutions, and governmental and non-governmental organizations.

## Benefits

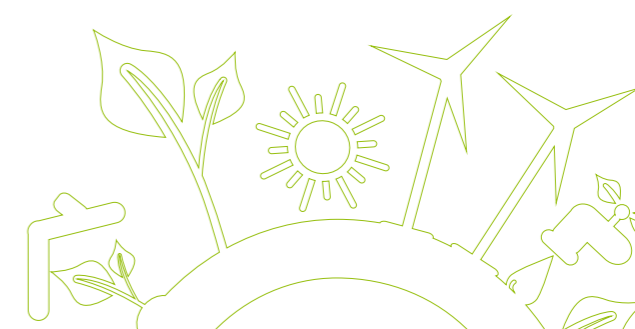
FONAG is contributing to securing present and future water supplies for Quito. Through the fund, more than 65,000 ha of watersheds are now under improved management. Upstream farmers receive support for watershed protection programmes,

as opposed to cash payments. More than 1800 people are estimated to receive increased economic benefits associated with watershed management and conservation.

FONAG has served to inspire the development of similar schemes elsewhere in Latin America and beyond. For example, in South Africa, where water forms one of the greatest constraints on development, a recently-launched initiative in the Maloti Drakensberg Mountains aims to implement a payments for watershed services programme, with support from UNEP and the BASF Social Foundation. This initiative will use payments from downstream users to support the restoration of dongas, and the improvement of grazing and veld fire management regimes in order to reduce sedimentation and increase the quality and quantity of water flows. In so doing, employment will be generated for local households and the productive potential of agricultural activities should increase.

In sum, FONAG is one of a growing number of initiatives that bring together different stakeholders in the creation of innovative mechanisms to channel economic demand for water to areas critical for the supply, in the process improving livelihoods and generating employment, while investing in key ecosystem services.

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 2. [http://www.watershedmarkets.org/casestudies/Ecuador\\_FONAG\\_E.html](http://www.watershedmarkets.org/casestudies/Ecuador_FONAG_E.html)  
 3. <http://ecuador.usaid.gov/portal/content/view/205/175/>



(8)

# SOLAR ENERGY IN TUNISIA

**To reduce the country's dependence on oil and gas, Tunisia's government has undertaken steps to promote the development and use of renewable energy.**

**A law establishing an "energy conservation system" on energy management in 2005 was immediately followed with the creation of a funding mechanism – the National Fund for Energy Management – to support increased capacity in renewable energy technologies and also improved energy efficiency. The replenishment of this Fund is based on a duty levied on the first registration of private, petrol-powered and diesel powered cars and on import duty or local production duty of air-conditioning equipments with the exclusion of those produced for exports.**



Between 2005 to 2008, clean energy plans have already allowed the government to save \$1.1 billion in energy bills, relative to initial investments of \$200 million in clean energy infrastructure. Primary energy consumption from renewables, together with savings from energy efficiency, are expected to reach 20 per cent of total energy consumption in 2011.

In December 2009, the government presented the first national Solar Energy Plan and other complementary plans with the objective of increasing the share of renewable energy sources from just under 1 per cent to 4.3 per cent in 2014. The plan includes the use of solar photovoltaic systems, solar water heating systems and solar concentrated power units for electricity generation.

Total financial resources to implement the plan have been estimated at \$2.5 billion, including \$175 million from the National Fund, \$530 million from the public sector, \$1,660 million from private sector funds, and \$24 million from international cooperation, all to be spent by 2016 on 40 renewable energy projects. Approximately 40 per cent of the resources are devoted to the development of energy export infrastructure.

The energy savings expected to result from the Solar Energy Plan could reach 22 per cent for 2016, with a reduction of 1.3 million tonnes per year of CO<sub>2</sub>.

### Solar water heating systems – the PROSOL programme

The Tunisian Solar Programme (PROSOL) – a joint initiative of the Tunisian National Agency for Energy Conservation (ANME), the state utility Société Tunisienne de l'Electricité et de Gaz (STEG), the United Nations Environment Programme and the Italian Ministry for the Environment, Land and Sea – provides an example of solar thermal market development.

Financial and fiscal support combines a capital grant qualifying for a VAT exemption, customs duty reduction and a bank loan with a reduced interest

rate. Repayment of the loan is organized through the regular utility bill of the state electric utility STEG, with local banks receiving support that allows them to finance SWH projects with reduced interest rates.

This arrangement has generated direct financial benefits for the end users, when comparing the size of the monthly instalments for a SWH system to the earlier electricity bills. A complementary interest rate subsidy was available during the first 2 years (2005-2006) of the programme, reducing the interest rate of the loan to 0 per cent to the final end user. This support was removed in 2007 and annual interest rates for loan repayment have been 6.5 per cent.

The government provides a subsidy of 20 per cent of the system cost or \$75 per square meter, while customers are expected to finance a minimum of 10 per cent of the purchase and installation costs.

Over 50,000 Tunisian families now get their hot water from the sun based on loans amounting to more than \$5 million in 2005 and \$7.8 million in 2006 – a substantial leverage to PROSOL's initial cost of \$2.5 million. With installed surface of the programme reaching 400 000 m<sup>2</sup>, the government has now set a more ambitious target of 750,000 m<sup>2</sup> for the period 2010-2014, a level comparable to much larger countries such as Spain or Italy. As of 2008, PROSOL helped avoid 214,000 tonnes of cumulative CO<sub>2</sub> emissions. Jobs have been created as 42 technology suppliers were officially registered and at least 1000 companies installed the systems.

In conclusion, the experience in Tunisia demonstrates the potential returns on investing in renewable energy, creating new jobs, and reducing dependency on fuel imports.

1. Agence National de Maitrise de l'Energie, December 2009  
2 <http://www.medrec.org/en/download/PROSOL%20TUNISIA%202007.PDF>.

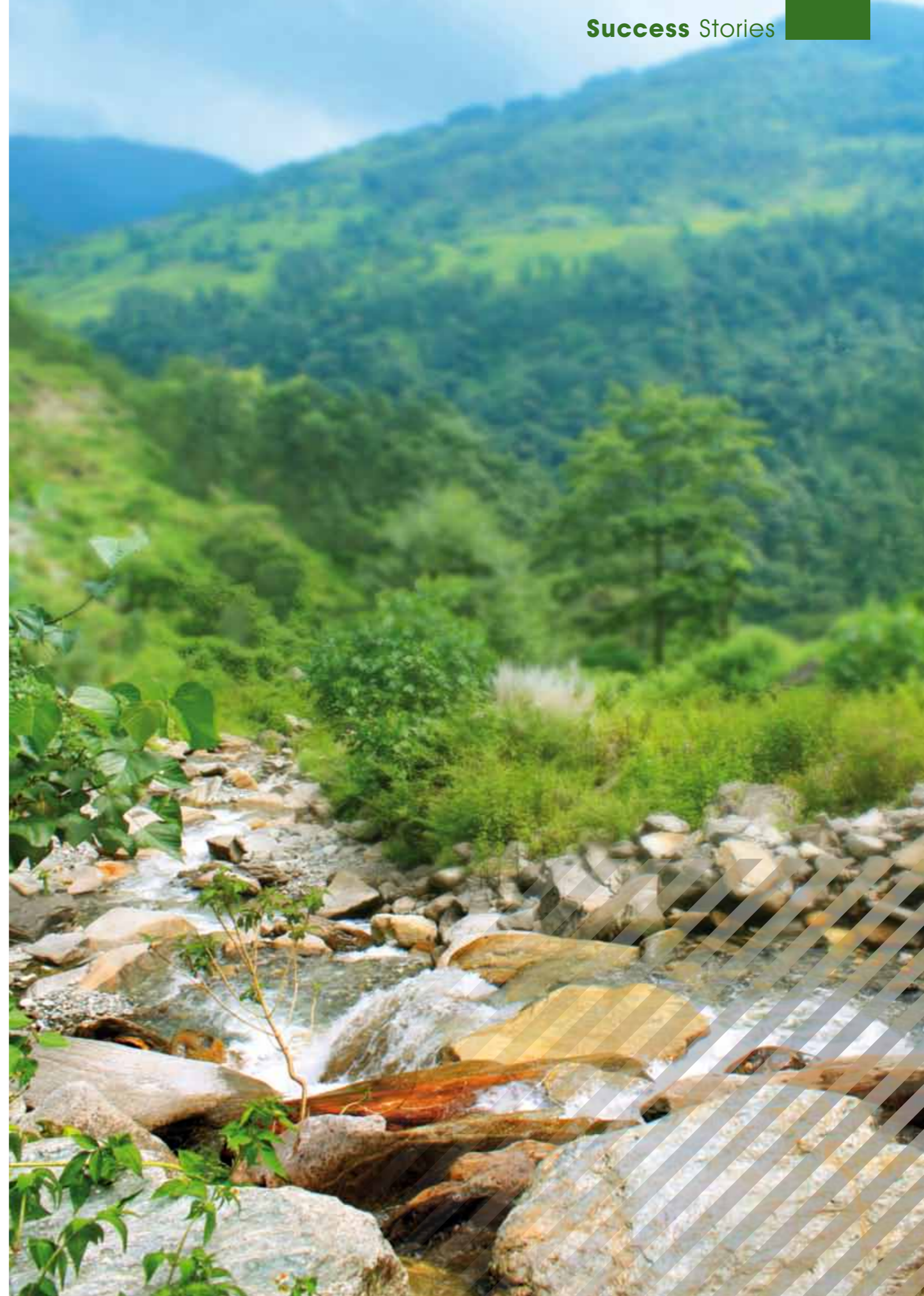




## Moving Towards a Green Economy: An Overview

Scheduled to be released in 2010, "Moving Towards a Green Economy" focuses on the following 11 sectors:

- 1) **Agriculture** is the largest contributor to GDP in many developing countries and employs an estimated 1.3 billion workers globally. Sustainable agriculture and food system practices will increase the number of attractive, safe and knowledge-intensive jobs in farming operations, non-farm (pre- and post-harvest) supply chains and market access infrastructures.
- 2) **Buildings** are responsible for a third of the world's total primary energy consumption. Retrofitting existing buildings has huge market potential and employment opportunities in developed countries. New green buildings can help developing countries meet additional demand for residential and commercial buildings while reducing energy consumption at low incremental investment cost.
- 3) **Cities** are where more than half of today's world population lives. Well-designed cities have great opportunity for greening through proximity of urban functions, modal shifts in transportation, and increased efficiency in provision of infrastructure, utilities and energy.
- 4) **Energy** renewables currently supply nearly 15 per cent of the world's primary energy demand. Renewable energy investments can play a substantial role in meeting the Millennium Development Goals while adding significant co-benefits such as improved public health, energy security and economic activity.
- 5) **Fisheries** currently deliver annual profits to fishing enterprises worldwide of about US\$8 billion, and directly and indirectly support 170 million jobs and US\$35 billion in fishing household income a year. The sector, however, is underperforming. Rebuilding depleted fish stocks and putting in place effective management could increase marine fisheries catch from about 80 million tonnes to an estimated 112 million tonnes a year.
- 6) **Forests** are being cleared or degraded at a rapid rate because of over-harvesting and pressure from other land uses, including agriculture and cattle. Action at international and national levels to negotiate a REDD+ regime and develop forest carbon projects open up the prospect of new types of forest related employment, livelihoods and revenues; where local communities can be guardians of forests and forest carbon/ecosystem services.
- 7) **Manufacturing** consumes one-third of the global energy supply, emits a quarter of the total world greenhouse gas emissions, and represents a significant part of primary resource extraction. This chapter explores potential gains from investing in improved resource efficiency across a range of key industrial sectors.
- 8) **Tourism** is assessed in partnership with the World Tourism Organization (UNWTO). This chapter focuses on how investments in sustainable tourism solutions can contribute to the sustainable development of the sector and the transformation to the Green economy at the national and global level.
- 9) **Transport** costs, which can add up to nearly or over 10 per cent of a country's GDP, are likely to grow further under the current trends of ever-increasing motorization. Investment in green transport could support cities by reducing congestion, air pollution and other costs through the creation of green jobs, particularly through the development of public transport infrastructure and operations, and by alleviating poverty through increased affordability of transport and improving accessibility to markets and other essential facilities.
- 10) **Waste** generates economic, social, and health-related costs and liabilities around the world. Solid waste services consume up to 2 per cent of GDP in developing countries and up to 50 per cent of cities' administrative budgets. By turning waste into a resource and encouraging the reduction, reuse and recycling of waste, significant gains can be achieved in decoupling waste production from economic growth.
- 11) **Water** scarcity is becoming a global phenomenon that will challenge the future of nations. Current water allocation, pricing and investment policies and practices are undermining opportunities for economic and social progress. Demand for access to water is rapidly increasing. Many supplies are becoming less reliable. Policy regimes that facilitate rapid adaption to changing supply conditions and changing demands are essential.





## About the UNEP Division of Technology, Industry and Economics

The UNEP Division of Technology, Industry and Economics (DTIE) helps governments, local authorities and decision-makers in business and industry to develop and implement policies and practices focusing on sustainable development.

The Division works to promote:

- > sustainable consumption and production,
- > the efficient use of renewable energy,
- > adequate management of chemicals,
- > the integration of environmental costs in development policies.

### The Office of the Director, located in Paris, coordinates activities through:

- > **The International Environmental Technology Centre** - IETC (Osaka, Shiga), which implements integrated waste, water and disaster management programmes, focusing in particular on Asia.
- > **Sustainable Consumption and Production** (Paris), which promotes sustainable consumption and production patterns as a contribution to human development through global markets.
- > **Chemicals** (Geneva), which catalyzes global actions to bring about the sound management of chemicals and the improvement of chemical safety worldwide.
- > **Energy** (Paris and Nairobi), which fosters energy and transport policies for sustainable development and encourages investment in renewable energy and energy efficiency.
- > **OzonAction** (Paris), which supports the phase-out of ozone depleting substances in developing countries and countries with economies in transition to ensure implementation of the Montreal Protocol.
- > **Economics and Trade** (Geneva), which helps countries to integrate environmental considerations into economic and trade policies, and works with the finance sector to incorporate sustainable development policies.

***UNEP DTIE activities focus on raising awareness, improving the transfer of knowledge and information, fostering technological cooperation and partnerships, and implementing international conventions and agreements***

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