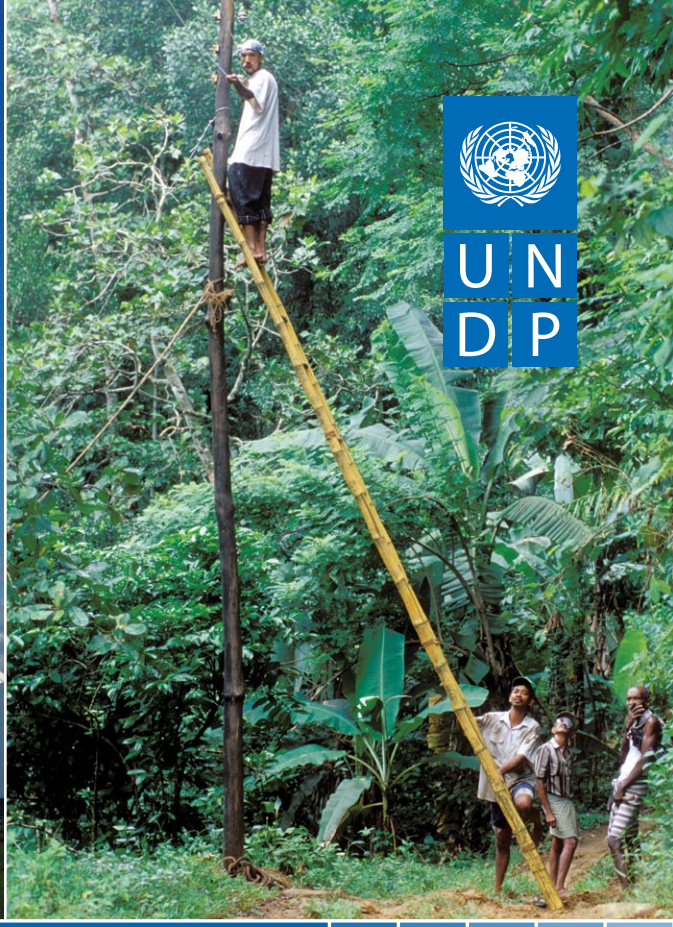

United Nations Development Programme

ENVIRONMENT AND ENERGY

ENERGY FOR PEOPLE-CENTRED SUSTAINABLE DEVELOPMENT

Acknowledgements

We would like to take this opportunity to recognize the many partners who have made financial and other contributions to the energy-sector projects described in the present brochure. These include the Global Environment Facility, the GEF's Small Grants Programme, MDG Carbon, the United Nations Development Programme and a wide range of bilateral donors. In addition, none of these projects would have been possible without the co-operation and often significant financial and technical contributions of the beneficiary countries themselves.

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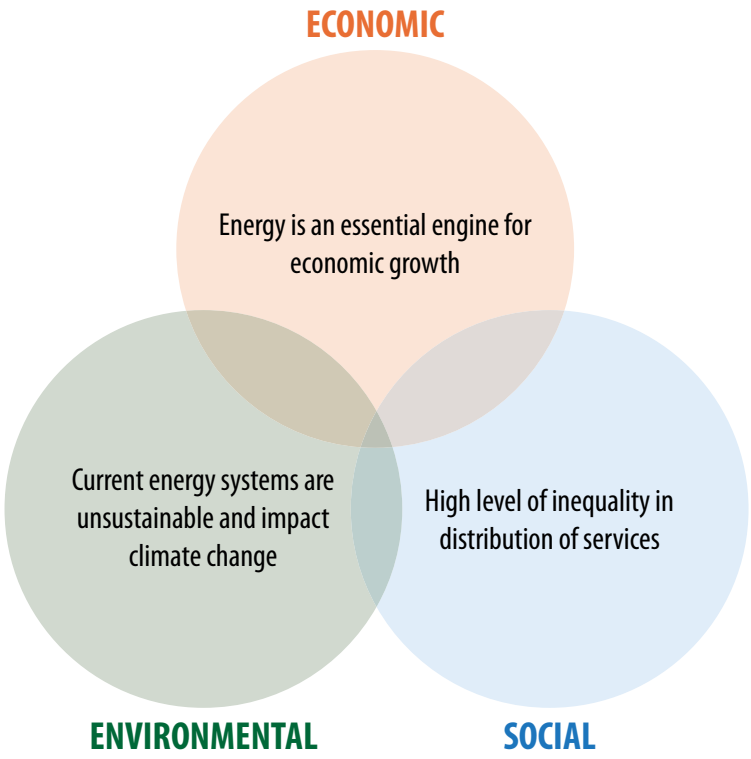
Energy as a sustainable development challenge

Whether viewed from a social, environmental or economic perspective, the energy sector presents a fundamental challenge standing in the way of sustainable development. Both within and among countries, high levels of inequality persist in access to, and consumption of, energy. Environmentally, expanded energy use—depending on its composition—comes at a potentially high price in terms of increased greenhouse gas emissions and resulting climate change impacts. Finally, energy supply limitations can place important constraints on economic growth of national economies. Together, these factors combine to place the energy sector at the heart of efforts to promote sustainable development.



Currently, some 1.4 billion people globally lack access to electricity, while three billion continue to rely on solid fuels like wood, charcoal and coal for cooking and heating. Meanwhile, global energy demand is projected to increase by 49% by 2035, with growth driven mainly by non-OECD countries. Under business-as-usual scenarios, conventional fossil fuels would continue to dominate the energy mix throughout much or all of this period. Shifting to a low carbon development path—necessary in order to maintain atmospheric concentrations below 450 ppm CO_2e—will require an estimated $550 billion of annual investments from now until 2030.

Of the three billion people estimated to suffer from some degree of energy poverty, a large number live in sub-Saharan Africa and South Asia. The remainder are distributed across large swathes of Central

Asia, parts of the Pacific, Latin America and the Caribbean. Worldwide, an estimated two million people, mainly women, die annually due to indoor air pollution caused by kitchen smoke.

The poor are particularly disadvantaged. The urban poor typically have some access to electricity, but its quality is poor, service is unreliable and intermittent, and their connections are often informal. Not being regular customers and not paying the normal tariffs that other customers do, their access to electricity can be expensive. They have to rely on rent-seeking intermediaries to stay connected. In rural areas, physical access is often non-existent. If the rural poor do have access to electricity, it tends to be of inadequate quality and/or quantity from stand-alone systems or poorly run and inefficient mini-grids that are expensive and prone to frequent failure.

The overall importance of energy to sustainable development is reflected in the Millennium Development Goals (MDGs). While energy was not identified as a separate MDG, it is intimately tied to the achievement of virtually all MDGs. Access to sustainable sources of clean, reliable and affordable energy has a profound impact on multiple aspects of human development; it relates not only to physical infrastructure (e.g. electricity grids), but also to energy affordability, reliability and commercial viability. In practical terms, this means delivering energy services to households and businesses that are in line with consumers' ability to pay.

Developing countries in particular need to expand access to reliable and modern sources of energy in order to reduce poverty and to improve the health of their citizens, while at the same time promoting economic growth and mitigating climate change. Investing in clean, efficient, affordable and reliable energy systems is indispensable for a prosperous, environmentally sustainable future. Ensuring energy security will require diversification of types and sources of energy, with increasing focus on consumer needs, on indigenous energy supplies, energy efficiency and regional interconnections.

Benefits of modern energy for the poor

Making modern energy available and accessible on a sustainable basis to the poor can have the following benefits:

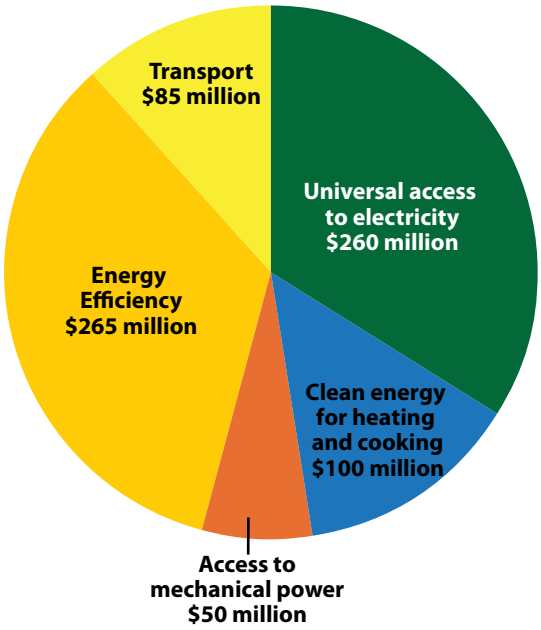
- **Reduce poverty and create jobs, in particular for poor households and entrepreneurs, spark income-generation, reduce hunger and increase agricultural productivity and business opportunities.**
- **Empower women by liberating women and girls from time-consuming tasks, freeing up time for education and economic activity.**
- **Improve health conditions of women and children by eliminating "kitchen smoke".**
- **Promote clean energy solutions that can contribute to a low carbon and climate-resilient future.**

UNDP and Energy: An overview

Given the importance of sustainable energy for achieving human development, UNDP has made the provision of sustainable energy services—particularly to the poor—a priority. Its work on sustainable energy is guided by the energy-development linkages identified above. With offices in 135 countries, UNDP is in a unique position to help developing countries tackle their energy issues.

Over the past two decades, UNDP has built up an extensive portfolio of projects and programmes in the energy sector. In the process, it has acquired a wealth of experience and expertise in supporting countries to use, expand and shift towards sustainable energy for development. Since 1992, more than 200 large (US$1 million or more) and 2,500 small (<$1 million) energy projects have channeled or brokered access to resources with a value of more than $750 million. These same projects—operating in almost every developing country of the world—have mobilized an additional US$3.25 billion in co-financing.

UNDP support to energy sector, 1992-2010



UNDP's approach has focused on achieving a low-emission, climate resilient form of development. It has aimed to achieve market transformation in order to catalyze finance. Finally, the approach has in many cases relied on innovative public-private partnerships to reduce investment risks, optimize the use of both sources of finance and pool public and private sector talents and strategic capabilities.

UNDP has promoted the use and transfer of a wide range of clean and renewable energy technologies, including wind, solar, hydro, biogas, biomass and geothermal. It has worked across a range of scales, from individual household and village up to national, regional and global. UNDP has promoted the use of many instruments, sources of funds and tools, including government budgets, ODA, GEF, philanthropic and non-traditional donors, market-based instruments and financial mechanisms such as feed-in tariffs, carbon finance, and micro-finance.

The overall goal of UNDP's energy sector support is universal access to affordable, clean and modern energy for development, with a clear focus on the poor. UNDP is working towards this goal by pursuing two interconnected objectives:

- **Universal access to modern energy for the poor** – Projects under this objective include support for access to electricity (on- and off-grid, decentralized whenever possible and based on clean energy technologies), access to clean fuel and devices for cooking and heating and increased access to and use of mechanical power.
- **Enhanced quality, security and affordability of modern energy** – Projects under this objective promote energy efficiency and conservation, as well as sustainable urban and transportation systems.

UNDP Core Principles For Energy-Sector Support

- **UNDP maintains a focus on MDGs, ensuring that its assistance directly benefits the poor.**
- **UNDP insists on national ownership.**
- **UNDP ensures that its interventions are according to national priorities and embedded in, and built on, low emission, climate resilient development strategies.**
- **UNDP makes cost-effective use of ODA by ensuring that the interventions are transformational and by catalyzing market-based instruments to achieve the scale that is required to make effective, measurable and lasting improvements.**
- **Capacity development and gender considerations are common attributes across all projects and activities undertaken by UNDP.**

Promoting Universal Access to Modern Energy for the Poor

Access to Electricity

Wind: UNDP has assisted more than 30 countries to develop their wind energy potential, building the right enabling environment, assessing the wind resource, designing appropriate financial incentive schemes and regulatory measures, building capacity, and piloting and demonstrating actual wind farms. Successful examples include South Africa, Uruguay, Tunisia and Kazakhstan.

Solar: Thirty projects have been supported in this area, ranging from photovoltaics (PV) in rural and peri-urban areas (Sudan, Lesotho, Tanzania, Peru, Bolivia, Maldives, Mauritius, Malaysia and India), and solar water heating and solar cookers for households (South Africa and Morocco), to more cutting-edge concentrated solar power for on-grid electricity generation (Namibia and India). UNDP has an ongoing global solar water heater programme in partnership with the International Copper Association, UNEP and a number of regional solar water heating industry associations, initially targeting six countries worldwide (Chile, Mexico, Algeria, Lebanon, Albania and India).

Hydropower: Micro-hydro resources often lend themselves to servicing rural communities with electricity and mechanical power. UNDP has extensive experience in assisting countries to harness these resources, in particular in Central America (Nicaragua and Guatemala) and the Himalayas (in Nepal, India, Pakistan and Bhutan), but also in other countries including Indonesia, Georgia and Kenya. Finding the right delivery model is key. UNDP has demonstrated community-operated Renewable Energy Service Company (RESCO) concepts, with a focus on long-term sustainability.

Biomass: In many countries, different forms of biomass and bio-energy are the most abundantly available renewable energy resource. Many communities depend for their cooking and heating needs on firewood, charcoal or dung. Promoting more efficient resource use through, for example, energy-efficient cook stoves has been demonstrated successfully in a range of countries, most recently in Kenya, Pakistan and Bhutan. Other projects in UNDP's portfolio range from community-run biogas digesters (e.g. Bhutan, Tanzania, Egypt) to gasifiers for turbine-driven on-grid electricity generation (e.g. in India, Malaysia and Brazil).

Access to Clean Fuels for Heating and Cooking

This $400m portfolio (including co-financing) supports projects for solar water heating in South Africa and India, and clean fuel and stoves for safe cooking in homes in Nepal and Kenya. In Eastern Europe and the CIS, UNDP has developed an extensive portfolio of district heating projects, focused on substituting coal-fired installations with ones run on renewable biomass (wood and agricultural waste) and on improving energy efficiency (boilers, distribution systems) in more than 20 projects in Armenia, Belarus, Uzbekistan, Ukraine, Slovenia and elsewhere.

Case Study: Kenya

Scaling-up support for fuel efficient stoves

Beginning in 1996 with funding from UNDP-GEF's Small Grants Programme (SGP), 20 schools in the Mt. Kenya area planted woodlots and installed energy-efficient stoves. Finance for the purchase of the stoves was made available through a revolving fund set up with $50,000 from the SGP. Loan repayments were made within two years through savings on firewood purchases.

Based on the success of this pilot effort, the UNDP-GEF project "Market Transformation for Efficient Biomass Stoves for Institutions and Medium-scale Enterprises" was launched in 2007 with funding of $1 million. The project, which ran through 2010, led to the sale of 1,500 stoves to more than 1,000 schools, enterprises and households, along with the planting of over 500,000 trees. The project was supported through an expanded revolving fund. In March 2011, the Kenyan Government requested that the approach be scaled up via the Strategic Climate Fund's Scaling-Up Renewable Energy Program (SREP).

Access to Mechanical Power

A final element in UNDP's support for universal energy access is access to mechanical power, with a portfolio of UNDP projects (1992-2010) valued at $100 million (including co-financing). UNDP has promoted programmes such as solar power for agricultural water pumps in Namibia, renewable energy programmes for natural resources in Guatemala and energy efficiency in steel and tea production in India. These projects have helped countries to use power more efficiently and achieve improved industrial and agricultural results. In many parts of sub-Saharan Africa and South Asia, expanding access to modern energy services through mechanical power technologies such as micro-hydro power, multifunctional platforms (stationary engines), wind-mills and pumps often results in high

Scaling up energy access efforts

Clean-Start – expanding clean energy finance for low-income households

Approximately 25% of the world's population, or some 1.6 billion people, lack access to electricity; 40%, or 2.4 billion, rely on biomass to serve their energy needs for cooking and heating. UNDP is increasingly prioritizing access to modern energy services for the poor. Between 2001 and 2007, UNDP projects supported over 6.5 million people in 102 developing countries.

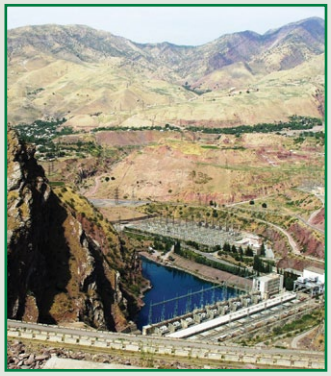
The upfront costs of equipment and recharging/refilling are major obstacles to clean energy uptake by the poor. Evidence indicates that efforts to expand the provision of clean energy now depend less on the technology and more on improved financing models to make energy accessible and affordable to low-income consumers.

The UN Capital Development Fund (UNCDF), working in collaboration with UNDP, has agreed to raise $22 million over the next 6 years to establish and operate a Capital Fund for Clean Energy Empowerment of Low-Income people in Asia and Africa. This program, called CleanStart, will expand the finance available to the poor to meet their energy needs and aims to support at least 2.5 million people to move out of energy poverty by 2017. The program will use a combination of micro-finance, price subsidies, grants and buy back programs to help furnish the poor with the equipment they need. Simultaneously, the poor will receive training and education on energy efficiency and on ways in which to best utilize the equipment. Through this combination, CleanStart expects to see a reduction in household and institutional expenditures through fuel savings and thereby contribute to an overall decline in household emissions.

direct development impacts on the poor. In Burkina Faso, Ghana, Guinea, Mali, Senegal and Uganda, for example, some 2.4 million people have benefited from access to mechanical power for water pumping, agro-processing, income-generating productive uses and other value-adding local level activities.

Case Study: Tajikistan

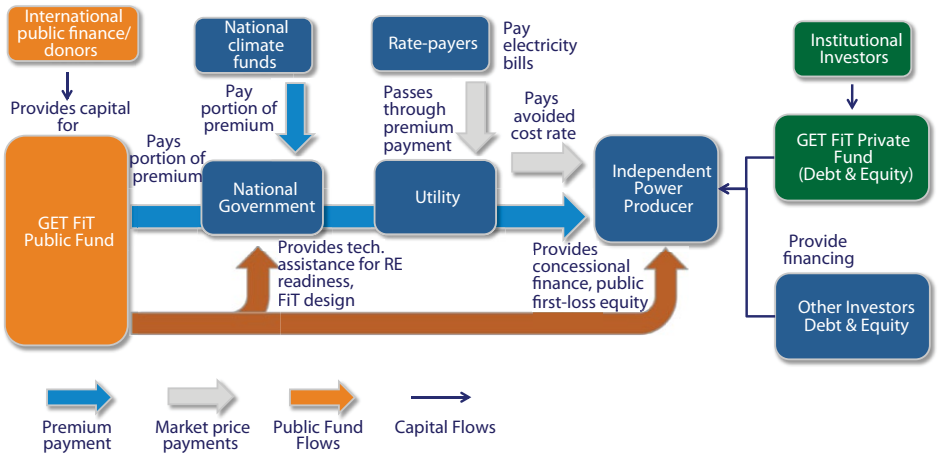
Sustainable energy to support the MDGs



Tajikistan presents an interesting case study of UNDP sustainable energy support. Tajikistan's population has one million people who go six weeks in winter with no power, and four-five million people who only receive two-six hours of power per day in the winter. Overall, the bottom 73% of the population consumes a mere 8.5% of the total power supply. These problems stem in large part from inefficient energy supply and use. Women spend up to eight hours a day collecting wood to heat poorly insulated homes and treat the dysfunctional water supply used for cooking. This has resulted in health risks from cooking indoors on inefficient cook stoves and deforestation from wood collection.

UNDP's approach to this problem is to develop, pilot and scale-up an integrated rural development model based on provision of renewable energy and energy efficiency. One hundred test families were provided with enough power to meet their basic needs, while hospitals and schools were better insulated. At the same time, local government was given the instruction and resources to set up a management agency for local power and water. A hydro system was set up to sell power at attractive rates and the government received assistance in setting up a more comprehensive energy policy for providing power to the citizenry.

Support for increased energy access has also included regional-level and multi-country efforts. In Africa, regional policies have been developed and adopted by member countries of Economic Commission of West African States (ECOWAS) and the East Africa Commission (EAC). The ECOWAS target, in support of the MDGs, is to expand access to modern energy to 36 million more households by 2015. Many of the member countries have mainstreamed energy access into their poverty reduction strategies, committing scaled-up energy investments at the national level. Similarly, in the Pacific, UNDP has supported the strengthening of national energy policy frameworks in Fiji, Marshall Islands, Nauru, Niue, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. In cooperation with the World Bank and the Alliance of Small Island States (AOSIS), UNDP will soon begin implementing a project aimed at supporting Small Island Developing States (SIDS) in transitioning to low-carbon economies through development and deployment of renewable energy resources and promotion of greater energy efficiency.



Source: Deutsche Bank, adapted by UNDP

Scaling up the use of renewable energy technologies

GET FIT – De-risking clean energy business models: a public-private partnership between UNDP and Deutsche Bank

Feed-in tariff policies are designed to encourage the adoption of renewable energy sources and to help accelerate the move toward grid parity. The Global Energy Transfer Feed-in Tariff (GET FiT) initiative, introduced by Deutsche Bank in early 2010, aims to catalyze large-scale investment in the renewable energy sector in developing countries. GET FiT will support both renewable energy scale-up and energy access through new international public-private partnerships.

As part of this initiative, UNDP and Deutsche Bank are exploring the establishment of a GET FIT Facility, with two complementary funds—a public fund and a private fund. Acting across a number of developing countries, the public fund would provide technical assistance to address non-financial barriers (policy, regulatory, skills), offer financial de-risking instruments (loan guarantees, first loss equity) and finance a portion of the country's FiT premium. The aim of the public fund would be to create a fully enabled, FiT-based environment for renewable energy investments. The private sector fund would provide a source of dedicated private capital for direct investment in renewable energy projects. The GET Fit Facility would be a critical first step in establishing a workable sectoral approach for renewable energy in the context of international climate finance. While a first phase of the GET-FiT public fund would be funded by bi/multilateral donors, a second phase could be funded by longer-term sources, such as the Green Climate Fund, as well as innovative financial mechanisms and carbon finance.

Enhancing quality, affordability and security of energy

Energy Efficiency

Without doubt, some of the most cost-effective ways to increase access to energy are through energy efficiency and conservation, helping simultaneously to enhance energy security, reliability and quality. UNDP has, therefore, made this an area of particular focus and attention, and has major programs ongoing in energy efficient buildings (34 projects) and in appliances such as white goods and lighting (33 projects). The latter includes a global initiative on phasing-out the incandescent light bulb in partnership with Philips and Osram.

Case Study: Mauritius

Sustainable energy solutions

The Government of Mauritius has a long-term vision for transforming Mauritius into a sustainable island nation. An important part of this vision is to increase the country's use of renewable energy and to promote energy efficiency (EE) measures, both of which would help to reduce dependence on fossil fuels and to achieve energy security. The Government has recently adopted a "Long Term Energy Strategy, 2009-2025," which seeks to diversify the country's energy supply, improve energy efficiency and modernize the energy infrastructure.

UNDP is supporting the Government of Mauritius to implement its national energy strategy through a mix of assistance for the enactment of critical (upstream) policies and institutional structures, together with targeted initiatives to facilitate investments in renewable energy and EE measures at the community and household (downstream) levels. These initiatives demonstrate the effectiveness of a comprehensive and holistic approach to energy security through a combination of macro-, meso- and micro-level interventions.

Once energy is brought to an area, UNDP helps to put in place a program to promote energy efficiency. Many countries do not have energy efficient buildings or standards for energy efficiency on appliances or industrial applications. UNDP has launched programs to retrofit buildings with energy efficient materials and establish and improve district heating systems. There are also programs to work with national and local governments to establish strict standards and labels for energy efficiency. These projects help put in place appropriate policies and regulations and promote the use of proven and effective tools, such as mandatory standards, labels and building codes.

One area of energy efficiency in which UNDP has placed significant effort is energy use by buildings. With support from GEF, UNDP is promoting the introduction of energy efficient building codes for new construction and improving the energy efficiency of existing building stock through retrofits, resulting in significant reduction of greenhouse gas emission levels. This includes efforts to reduce demand for energy services, increase technical energy efficiency, and integrate passive and active renewable sources of energy in the building system itself. The program will target building design, performance of equipments and human behavior.

UNDP, in cooperation with UNCDF, is also working with municipalities to use green bonds to finance improved energy efficiency in both old and new buildings. The periodic interest payments and principal on the bond are repaid through energy cost savings. The bond overcomes the upfront financing barrier to energy efficiency investments.

Transport

The mobility of people, goods and services is essential for economic growth, poverty alleviation and human development. However, the present transport paradigm based on petrol- and diesel-fuelled private vehicles generates serious economic, social, health and environmental costs. Inefficient vehicles, especially motorbikes and three-wheelers, contribute heavily to air pollution and emit high levels of CO_2 per unit distance traveled. On the other hand, alternatives such as fuel-cell vehicles, which produce water as their only emission, could yield major reductions in air pollution and result in higher fuel efficiency as compared with conventional vehicles.

Over the years, UNDP has supported at least 22 projects in this area, cumulatively valued at some $85 million. The majority of these have been targeted interventions aimed at improving energy use and efficiency in urban areas worldwide. One major initiative, funded by GEF, has supported commercial demonstration of fuel cell buses (FCBs) and re-fueling systems in the large bus markets of major emerging economies (China, India, Brazil, Egypt and Mexico).

More recently, UNDP has begun to shift from targeted interventions in transport to a more holistic approach based on low carbon, climate-resilient, integrated urban systems characterized by more efficient buildings, minimizing emissions through improved waste management, increased use of renewable energy, urban forestry and climate friendly transport systems.

Scaling up technology transfer efforts
'New South' clean technology centres

The overall idea behind UNDP's support to 'New South' clean technology centres is to leverage technology know-how and best practices from middle income countries to pilot sustainable business models for low-carbon development in developing countries. Institutions will be established with local (typically Government, academic or private sector) counterparts, to address thematic, technological or sectoral areas of relevance to the host countries, and to help host countries develop human and commercial capacities.

An early example of this approach is the Dubai Carbon Centre of Excellence (DCCE). In this project, UNDP is supporting efforts to reduce the carbon footprint of four Dubai parastatals through the development of projects to be financed under the Clean Development Mechanism (CDM). The project will also help to develop a prototype sectoral carbon crediting scheme for possible post-2012 engagement with the EU-ETS while also developing a Low-Emission, Climate-Resilient Development Strategy (LECRDS) for the Dubai Supreme Energy Council. Based on a road map to be developed under the project, DCCE is expected to become a regional centre of excellence in the Gulf.

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