



NREL International & Environmental Programs *work to bring renewable energy technologies to developing nations and to improve health, local economies, community development, and the environment.*



NREL International Programs

NREL's International Programs apply world-class expertise in technology development and deployment, economic analysis, resource assessment, project design and implementation, and policy formulation to promote the use of energy efficiency and renewable energy as a tool for sustainable development. NREL has assisted more than 30 countries in the design and implementation of renewable energy and energy efficiency technologies and associated programs.

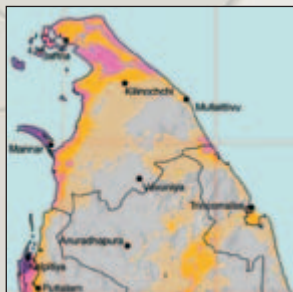
Rural Energy

NREL's International Programs work to integrate technologies with services to meet basic human needs, such as providing access to adequate clean water supplies, health services and education, and promoting productive uses of energy that foster rural development. For example, NREL provides key assistance to some of the world's largest rural electrification efforts, such as China's \$240 million Township Electrification Program, the Luz Para Todos Program in Brazil, and World Bank and United Nations Development programs around the world.



Integrated Resource Assessment

To generate reliable, accurate wind, solar, biomass and hydro resource data and maps, NREL researchers have developed advanced techniques that make use of meteorological and satellite data, models, custom computer software, and state-of-the-art geographic information system methods. Planners can use these data and maps to identify the best sites for wind, solar, and hybrid renewable energy systems. The resource maps can be combined with geographical, demographic and economic data to identify appropriate technologies and assist planners and developers on deployment options. NREL is completing solar and wind resource assessments, available on the NREL Web site, for more than 20 countries.



Technology Options Analysis

People throughout the world use NREL's analysis tools to analyze the performance and reliability of designs for renewable energy systems and their maintenance costs and

performance. Models, available on the NREL Web site, are useful for simulating and optimizing the performance of wind/photovoltaic/diesel hybrids. For example, HOMER, the micropower optimization model, makes it easier to evaluate and select the optimal off-grid or grid-connected power systems. Thousands of people in government, academia, and development work across the world testify that HOMER helps them maximize their available resources and make efficient and sound decisions about energy systems.

Training

NREL works with country partners to provide technical content and assist with the preparation of training materials and organization of



training workshops. NREL's training topics range from renewable energy for policy makers and energy planners to rural electrification strategies for managers and engineers. Materials include the popular RE101, an overview course on renewable energy technologies. Modules include renewable energy technologies and resource assessment, software tools for technology options analysis, hybrid system design and monitoring, and policy design and implementation.

Policy Assistance

NREL's International Program works with partners in developing countries to provide assistance in the development and assessment of policy measures that support the deployment of renewable energy technologies. These activities include strategic planning for national level renewable energy development, identification and evaluation of policy options, tools for decision makers seeking to advance grid-connected renewables, and provision of technical input and expertise to country partners in the development of renewable energy programs. In addition to policy work that cuts across technology types, NREL has also developed and implemented technical assistance and policy guidance targeted at specific sectors such as grid-connected wind in a number of countries including China, Mexico, Morocco, and Sri Lanka.



NREL Environmental Programs

Major components of NREL's Environmental Programs include implementation of domestic and international air pollution programs and climate change programs and development of integrated energy and local environmental protection strategies.

Integrating Environmental Strategies (IES)

Air pollution and greenhouse gas reduction efforts create both public health and environmental benefits. The IES Program supports analysis of these co-benefits, evaluating the human health benefits of greenhouse gas mitigation and air quality improvements in developing countries. NREL, which is the technical implementer of the IES Program for the Environmental Protection Agency, is currently working in Argentina, Brazil, Chile, China, India, Mexico, Korea, and the Philippines to evaluate the environmental, public health, and economic benefits of integrated climate change and local environmental protection strategies. NREL's IES analysis in Shanghai, China showed that reduced air pollution emissions from clean energy technologies could avoid between 650–11,000 deaths per year between 2010 and 2020, which translates to a societal benefit of between \$0.1–3 billion a year. Results of this analysis were incorporated by the Shanghai Municipal Government into their 10th Five-Year Environmental Plan.



Protecting Domestic Air Quality

NREL contributes its expertise to projects and programs, policy formulation, and air quality planning to use energy efficiency and renewable energy to control emissions of air pollutants in the United States. NREL provides technical expertise for state implementation plans, supplemental environmental projects, and air pollution analysis to quantify effects of energy technologies. Application of HOMER's air emissions optimization supplement NREL's technical capability to protect domestic air quality.

Advancing Clean Energy Technology Solutions

NREL works through programs such as the Climate Technology Partnership and the Climate Technology Initiative to advance investment in clean energy technologies. For example, NREL has successfully facilitated a number of Energy Service Company (ESCO) projects in Mexico by linking U.S. and Mexican companies. NREL works with the Mexican government to advance the ESCO market by assisting with ESCO project identification and development of financing mechanisms, bringing about \$50 million to clean energy and energy efficiency projects in Mexico's hotel and industrial sectors.



NREL International & Environmental Programs *provide expertise and assistance throughout the world in the following areas:*

- *Rural energy*
- *Integrated resource assessment*
- *Technology options analysis*
- *Training on renewable energy topics*
- *Renewable energy policy*
- *Greenhouse gas mitigation*
- *Clean energy technology transfer*
- *Air quality protection*

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Current Partners and Programs

Asia Pacific Economic Cooperation
Climate Technology Initiative
Energy Efficiency for Sustainable Development
Global Environment Facility
Global Village Energy Partnership
United Nations (UN) Development Program
UN Environment Program (UNEP)
UNEP Collaborating Center
UN Framework Convention on Climate Change
US Agency for International Development
US Department of State
US Environmental Protection Agency

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Contacts

National Renewable Energy Laboratory
International & Environmental Programs
1617 Cole Blvd
Golden, CO 80401-3393
Phone: 303-384-7537
Fax: 303-384-7411

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National Renewable Energy Laboratory
1617 Cole Boulevard
Golden, CO 80401-3393
303-275-3000 • www.nrel.gov

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