SOLAR AND WIND ENERGY RESOURCE ASSESSMENT PROJECT (SWERA) AND ITS IMPLICATIONS ON GLOBAL CHANGE.

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Modern lifestyles demand a continuous and reliable supply of energy. It is in the heart of our mobility, our prosperity, our alimentation and our comfort (healthy care, leisure, education, etc). The human development is strongly related with the per capita consumption of energy and, as a consequence of improvement of the life quality in the developing countries, it is expected an annual growth of the energy demand of 4% in those countries, i.e. a duplication in the next 17 years [1]. It is possible to establish a cause/effect relation linking energy use and development with environmental damage as has been demonstrated by many researches. The third report produced by IPCC [2] confirmed that the Earth's climate is changing as a result of human activities, mainly from fossil fuel energy use. The increase in energy demand, the reduction of the supply of conventional fuels caused by political crises in producing areas, and the growing concern with the preservation of the environment lead to the necessity of a sound survey for alternative energy resources. The IPCC report stated that alternative energy sources should be implemented over the next 20 years to help reduce greenhouse gas emissions [3].

Significant business opportunities will result from near term potential for renewable energy and related new industries. The mid and long-range energy planning require reliable information on many natural resources focusing the renewable energy policy. Without reliable information about existing resources, potential investors tend to avoid the risk of activities dealing with the development of solar and wind energy projects. Investors, risk capital enterprises, and independent energy producers are not aware of available renewable energy options.

The main barriers to investments in renewable energy production are:

a) the lack of reliable assessment of in-country renewable energy resource potentials,
b) the lack of long time series of ground data with adequate space distribution for studies of uncertainties and time trends,
c) the limited knowledge of the variability and confidence levels linked to several natural and non-natural variables such as climate, topography and man-made impacts in environment,
d) the need for geographically-integrated data base (GIS) such as population, energy demand, grid distribution, local access, social and economic data, etc.

The "Solar and Wind Resource Assessment" (SWERA) project, financed by Global Environmental Facility (GEF) and United Nations Environmental Programme (UNEP), aims at providing a reliable, consistent and easily available database (GIS, CD, WEB, and hardcopies) to increase confidence at decision centers in order to foster the insertion of renewable energies on the energy matrix of a country. The SWERA products will reduce uncertainties on investments and developments of solar and wind energy projects in South America and other developing countries. The project will influence investment decisions by promoting alternative business scenarios in addition to those taken up by energy entrepreneurs themselves, working directly with banks and project development managers to overcome information barriers for financing.

There are thirteen countries involved in the pilot phase of the SWERA project. These countries were divided into 3 great regional groups: Africa, Latin America and Asia. In Latin America there are six countries participating in the leading phase of the project: Brazil, Cuba, El Salvador, Guatemala, Honduras and Nicaragua. Table 1 shows the main activities developed by Regional Agency for Latin America under INPE's coordination. The SWERA in Latin America is now at the stage of assembly of national information and data processing. The cross validation of solar

models are now completed and, in some cases, a draft version of the high-resolution solar assessment has just been released for internal evaluation (Central America and Cuba). Regional data files containing model input data in GIS format necessary for the implementation of charts of national and regional solar and wind energy resources are being assembled and processed. An operational website for the Latin America Regional Agency is available at: http://www.cptec.inpe.br/swera where the reader can have an almost real time update on the development status of SWERA.

Table 1. Activities developed by Regional Agency for Latin America in SWERA Project.

Task	Short description
Coordinate between SWERA team and national partners of Latin American	Host technical meetings, help regional mapping integration and follow-up visits to verify outcomes and schedules
Assistance to national partners	Assist national agencies in gathering and qualifying relevant in-country data sets and organize training programs
Develop maps and receive incremental capacity building in assessment techniques in partnership with SWERA's team	Develop BRASIL-SR radiative transfer model, generate solar and wind high resolution maps derived from satellite data, generate time-series data for TMY, relate short-term satellite-derived solar with long-term ground-based data sets, coordinate regional review of existing national solar and wind surveys and assessment methods, cross-model and model validation for wind and solar
Assist SWERA team in developing geospatial datasets	Identify in-country partners based on the ability to implement the GIS component of the project – if not, INPE will perform such activity or provide the necessary training.
Dissemination of SWERA products and outreach to investors	Assist UNEP and SWERA team in establishing of global archives data sets and technical notes/reviews, assist UNEP/GRID in establishing of an Internet site and help distributing SWERA's products
Provide capacity building in use of resource maps and tools	Work in partnership with CBEE, CEPEL, and LABSOLAR/UFSC to put forward case studies in energy planning, assist UNEP and regional agencies in marketing and presentation of the alternative energy development projections to investors, help in customization of the auxiliary data (electric grid lines, energy demanding centers, social, etc.) to participating agencies.

References

1. Goldemberg, J., 1998. **Energia, meio ambiente e desenvolvimento**. São Paulo: EDUSP, Brazil.
2. IPCC, 2001. **Climate Change 2001** (3 vols). United Nations Intergovernmental Panel in Climate Change. Cambridge University Press, UK. (available from www.ipcc.ch).
3. Sims, R. E. H., 2004. **Renewable Energy: a response to climate change**. Solar Energy, 76, 9-17.