UNESCO's Global Renewable Energy Education and Training Program in a Latin American View

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Introduction

The Global Renewable Energy Education and Training Program (GREET) is implemented by UNESCO in the scope of the World Solar Programme with the aim to contribute to increase through education and training the capacity at national level to accomplish a sustainable energy development path.

The Latin America and Caribbean Region (LAC) are characterized by ample differences among countries in the region in relation with the energy situation, the social economic development and sustainability and capability in the society to advance in the process to meet the Millennium Development Goals.

Setting up of the GREET LAC Chapter would be a fundamental contribution to increase and consolidate the regional capacity to support the Renewable Energy development. For this reason, it is foreseen to start a consultation process that involving the key regional actors would make possible the design of the most appropriate Renewable Energy Education and Training Program for the Region. This document is a first step and its purpose is to develop a general description about how could be foreseen this program for the region.

International Commitment for a Sustainable Energy Development

The international community has expressed his commitment for a sustainable development approving the Millennium Development Goals (MDGs) during the Johannesburg World Summit on Sustainable Development (WSSD). The role of Energy for the achievement of the Millennium Goals is shown in Paragraph 19 of the World Summit on Sustainable Development (WSSD) Plan of Implementation adopted in Johannesburg. In particular request to:

> With a sense of urgency, substantially increase the global share of renewable energy sources with the objective of increasing its contribution to total energy supply, recognizing the role of national and voluntary regional targets as well as initiatives, where they exist, and ensuring that energy policies are supportive to developing countries' efforts to eradicate poverty, and regularly evaluate available data to review progress to this end.

Latin American Authorities have actively expressed their support to the conception of Sustainable Development and to meet the MDGs. Demonstration of this priority approach to the topic is the "Latin American and Caribbean Initiative for Sustainable Development", approved by the Seventh Meeting of the Inter-Sessional Committee of the Forum of Ministers of Latin America and the Caribbean on May 2002 in Sao Paulo, Brazil, that calls to adopt priority actions to address, among others, the sustainable generation of energy and the increasing participation of renewable sources. Particular significance in this context has the Brazilian Energy Initiative that called countries during the WSSD in Johannesburg to assume the compromise to "increase the use of renewable energy to 10% as a share of total by 2010".

Energy and Sustainable Development in Latin America

It is used to consider three main dimensions of the sustainable development: Environmental, Social and Economic. A brief remark about the connection of energy with every one of these dimensions in the region would be:

Environmental: Latin America is in general as for greenhouse gas emissions in particular a low emissions region. Those emissions due to burning of fuels in the region, account for less than 4% of global emissions and 7% of emissions in OECD countries (excluding Mexico). The energy system is relatively clean and emissions due to energy production, in particular, are among the lowest on the planet. However, the intense process of deforestation, overgrazing, and agricultural expansion that is seen in almost all countries in the region means carbon release, and most importantly, a decrease in the carbon sequestration capacity because of a decrease in forest coverage.

Social: In Latin America, poverty, especially rural poverty, continues to be one of the major problems assailing the region, with approximately 44% of its entire population and 64% of the rural population, living below the poverty line. The rural poor are thus generally worse off than those in the urban areas. No matter to the relative high rate of access to electricity services in the region, this fact affects significantly the affordability to theses services for greater part of the population.

Economic: In the region there is very important petroleum exporting countries like Venezuela and Mexico, 5th and 9th exporting countries in the world, and other petroleum producing countries that can satisfy a significant share of the national demand of petroleum products. Brazil, Argentina, Colombia, Ecuador and Trinidad Tobago are included in this group. But there is also an important group of countries that heavily depend of the petroleum product imports; this dependence represents a significant burden over their economies. Examples of countries included in this group are Guyana, Nicaragua, Honduras, Haiti, and Paraguay that consume 13.6, 8.3, 6.2, 5.7 and 4.2 tep/102 1995 US$ of GDP correspondingly .

Energy situation

Some remarks that could characterize the energy development in the region are:

The share of electricity in the total primary energy supply varies significantly from country to country. While there are countries with a share of electricity in the total primary energy that is higher than 30% (Argentina, Venezuela, Brazil, Uruguay, Chile), another group of countries shows figures less than 15% (Honduras, Nicaragua, Guatemala and Haiti).

The production of electricity using renewable energy has in the region outstanding examples with a share higher that 90% based mainly in the utilization of the hydropower (Paraguay, Costa Rica, Brasil and Uruguay), while in Mexico, Nicaragua, Cuba and Dominican Republic) is produced less than 25% of the electricity from renewable sources.

The electricity consumption per capita also shows a disperse distribution: A group of countries has a high electricity consumption per capita per year, higher than 1,5 MWh, (Venezuela, Uruguay, Mexico, Argentina and Chile), but also there is another group of countries with an annual consumption less than 0,5 MWh (Bolivia, Nicaragua, Guatemala and Haiti).

The annual conventional fuel consumption per capita indicator takes values higher than 0,9 tep/inhab in petroleum exporting countries like Mexico and Venezuela and in net importing countries like Chile, Dominican Republic and Cuba. On the other side, in countries like Colombia, Peru, Bolivia and Haiti the annual fuel consumption per capita is less than 0,45 tep/inhab.

Particular interest has the energy use of the forestry biomass. Despite the more or less uniform distribution of the biomass resources in the region, it can be also observed big differences in the forestry biomass consumption. The relatively higher forestry biomass consumption per capita in the region (more than 0,5 tep/inhab per year) is found in Paraguay, Honduras, Guatemala, El Salvador and Chile, while the lower consumption per capita (less than 0,2 tep/inhab) corresponds to Venezuela, Peru, Bolivia and Argentina.

The significance of the total biomass (fuel wood + sugar cane bagasse) consumption in the total direct fuel use has achieved different extent in the region. In countries like Haiti, Paraguay, Honduras Guatemala and El Salvador the biomass

consumption is determinant in the direct fuel use, consuming more than 1,3 tep of biomass per tep of oil products while in Argentina, Mexico, Venezuela, Ecuador and Dominican Republic the direct use of biomass is very low, in those countries it is consumed for direct use more than 4 tep of oil product per tep of biomass consumed.

In conclusion, it is clear that the pattern of energy use and renewable energy production and delivery has significant differences within the region. Even, the fact to be a country producing petroleum or to be a country where the electricity produced from renewable sources is significant do not prove any regularity in the whole energy picture for the specific country.

Development indicators: But the challenges to meet the Millennium Development Goals in the region also are different from country to country. Some of the basic indicators included in the Human Development Report 2001 produced by UNDP can be used to confirm this assertion. The selected indicators are the GDP per capita, live expectancy at birth and the adult literacy.

The GDP per capita has the higher values (more than 8000 US$/inhab) in Argentina, Chile, Costa Rica, Mexico and Uruguay and the lower ones (Less than 3000 US$/inhab) in Haiti, Bolivia, Honduras and Nicaragua.

There are countries with a live expectancy at birth in the rank of the developed world (more than 75 years): Chile, Costa Rica and Cuba, but also with less than 66 years: Bolivia, Guatemala and Haiti.

In the case of the adult literacy, no matter that the general figures for this indicator are positive ones, there are significant differences among countries: a group of countries have reached more than 95% of adult literacy (Argentina, Chile, Costa Rica, Cuba and Uruguay) but for another group it is under 80% in this indicator (El Salvador, Guatemala, Haiti, Honduras and Nicaragua).

Sustainable Energy Development Paradigm

The relevancy of the role that renewable energy sources are called to play in the efforts to meet the Millennium Development Goals could be briefly justified by the following reasons:

- The Climate Change mitigation only can be achieved if the share of renewable energy sources in the world energy balance would be actually significant.

- The technological development has guided a process of price reduction for the energy that is produced using renewable energy sources. While this trend should be even reinforced in the future, it is foreseen that the prices of the petroleum products will grow incessantly. These changes of pricing will contribute to create a situation where the renewable energy should be competitive with the conventional ones in market conditions. At that moment, the commercial balance of the countries where renewable energy technologies would be introduced as bulk energy will receive a great benefit.

- Poverty reduction in rural areas is closely related to the widespread use of decentralized energy systems, most of them based on renewable energy sources.

Actually, the current technological development is enough to support a more intensive expansion of applications of renewable energy sources in commercial or close to commercial conditions. The main fields of applications for renewable energy technologies could be grouped in centralized power production, renewable commercial fuels and rural energy services.

The availability of renewable energy resources is plenty in most of the countries of the Latin American and Caribbean Region. Special significance has biomass (25% of world forestry area and 40% of the world potential production of bagasse), hydropower (20% of the world technically exploitable capability), solar and wind energy resources in the region.

But no matter to this technological development and availability of renewable energy sources, the use of these technologies is very far from the potential penetration that they could have in the mix of primary energy sources. This situation habitually is explained introducing the concept of barriers that are classified as technical, economic, financial, legal and institutional ones.

But a more thorough reason to explain why it is so difficult to introduce the renewable energy technologies is the fact that the energy development paradigm that currently is applied to evaluate the goals, ways to meet these goals, and performance indicators in the energy field appeared in the world two centuries ago with the industrial revolution. The main target at that moment was to develop energy sources and technologies that could replace the low energy intensive renewable energy technologies that were used until that time. But this energy paradigm has led the world not only to the fast economic development that the developed world enjoys today, but also to the reality of the climate changes, to a life in poverty for a great portion of the humanity and to the depletion of the petroleum reserves.

But to meet the Millennium Development Goals and to facilitate to remove the barriers to a massive renewable energy deployment, it is necessary to move from an energy development conception centred mainly in the development of national economics, to a new one centred in a world wide sustainable development and it is only possible if the energy development paradigm used by the whole society is changed.

This new development energy paradigm should recognize as its main goals among others:

- Reduce drastically GHG emissions from power producer facilities as a result of the radical increasing of renewable power production and the use of cleaner technologies for power production using fossil energy sources.

- Provide access to electricity to isolated communities to guarantee services like health care, education, communication, drinking water, etc. It should be done based on a rational sustainable use of local natural resources and the most appropriate combination of available energy technologies.

- Increase the affordability of low-income population to electricity and to quality fuels.

- Extensively introduce the use of biofuels for transport, cooking and process heat improving the energy efficiency and sustainability of these services using modern technologies with enough maturity.

The Global Renewable Energy Education and Training Programme to meet Millennium Development Goals in Latin America

The role of capacity development "understood as the process of creating, mobilizing, enhancing, or upgrading, and converting skill/expertise, institutions and contexts to achieve specific desired socio-economic outcomes, …." is critical to create the conditions for a sustainable energy development. In this scope, the role of education and training, as capacity building activities that are included in any capacity development program, is widely recognised.

The Global Renewable Education and Training Programme Latin American Chapter is called to become an agent to develop the capacity in the region to transform the individuals, institutions and the overall policy framework as a force able to meet the challenges that represent to implement the new energy development paradigm and to overcome the different barriers to renewable energy technologies expansion.

The actions of the program would be directed to relevant stakeholders involved in the framework of a renewable energy development focused to meet the Millennium Development Goals. Among those stakeholders should be included not only governmental officials, representatives from the productive, academic and specialized sectors, from financing and planning systems and from the media, but also

those linked to MDGs achievement: education, health care, sanitation, water supply and environment fields.

The aim of the program is to transform the approach of those relevant stakeholders to the Energy Development Paradigm and to the role of the RETs to meet the MDGs and to the actions that should be undertaken to reinforce it.

Some of the expected outputs of the program could be formulated for some of these relevant stakeholders as:

Governmental officials: They will understand the predicted evolution of the conventional energy supply, the connection between energy and climate changes and the role of renewable energy technologies in a future sustainable energy scenario.
They will be aware about the decision making process related to energy services necessities to meet the MDGs and will conduct analysis not only using strictly techno-economic indicators.
They will recognize the priority to create an appropriate legal and regulatory framework to promote the widespread use of renewable energy.
They will accept the need to introduce the question about the sustainability of the energy development in the national political agenda.

Planning sector: The understanding of the performance of RETs and its potential to be integrated in the energy systems will be improved.

The capacity to use new planning tools will be developed to consider the introduction of renewable energy sources into the planning process to meet country energy demands and MDGs.

The personnel from the sector will be aware of the need to increase the use of specific indicators for sustainability in the planning of the energy development.

Utility personnel: They will be updated about technological development and performance of RETs.

They will be trained to evaluate integration of renewable energy technologies into the power grid.

They will have a better understanding about decentralised power systems and the use of hybrid solutions.

Specialised sector: Company staff will be trained in the design, installation and maintenance of RET facilities.
The capacity to make the renewable energy resource assessment will be developed.

Finance sector: Specialists will be aware of the specific characteristics of the renewable energy technologies.
The capacity to develop specific instruments for financing investments in the renewable energy sector will be achieved.
The skills to evaluate renewable energy project risks and revenue streams will be developed.

Science and technology sector: Science and technology people will have achieved a good understanding about the renewable energy equipment and technologies and will be ready to adapt and to develop them to the specific conditions in countries of the region.

The regional capacity will be developed to execute non-technology research and development studies of issues related to public awareness, economic and financial assessment, legal and regulatory supportive frameworks, policies to promote RETs, etc.

Some of the possible actions to be implemented to achieve expected outputs described before would be:

- Establish national training programs in vocational schools, universities and other appropriate institutions.
- Provision of specialized courses on renewable and a consensus with academic institutions to include a stronger coverage of renewable energy technologies in traditional academic courses.
- Provide information at all levels of education (from primary schools to universities) about the potential and benefits of renewable

energy, state of the technologies, and other relevant issues.
- Development of guidelines on public education and certification schemes.
- Creation of internationally recognized academic and vocational qualifications in renewable energy technology design, installation, and maintenance.
- Dissemination activities, actions and programs geared towards demonstrating the importance of the renewable energy development at policy decision-making levels and, above all, creating the awareness about the fact that to establish a new sustainable development paradigm should become a priority for the whole society.
- Training courses for local authorities to help them identify opportunities for renewables.
- Establishment of regional networks of universities and even virtual R&D institutions.
- Short courses, workshops and updating seminars directed to maintaining governmental institutions' human resources up-to-date.
- Implement courses and develop graduate programs for the technical-scientific sector.
- The promotion of academic and professional exchanges with developed countries, and between countries within the region, including capacity of experts. The development of joint international programs and networks in thematic fields

Action Plan

The aim of this action plan is to design and to make operational the GREET LAC Chapter. The main activities that have been identified are:

Activity 1: Education and training needs
- Diagnosis of priorities for sustainable energy development to meet MDGs and increase renewable energy share in the national energy balance;
- Identification of relevant stakeholders and its functions to fulfil identified priorities;
- Formulate education and training needs of relevant stakeholders to be able to perform their functions.

Activity 2: Educational and Training capacities
- Survey of training and education capacities and expertise in the region;
- Formation of clusters of countries using the criteria of the similarity of education and training needs;
- Design of activities to meet E&T needs;
- Improving of regional capacity to E&T activities.

Activity 3: Establishment of Partnerships for program implementation with
- Ongoing regional projects that include activities related to E&T;
- Regional and sub regional organizations (CEPAL, OLADE, CARICOM, etc.);
- Professional associations involved in renewable energy technology;
- International Centres of Excellences.
- National Energy Agencies.

Activity 4: Program Implementation

The first action to implement the activity 1 will be a Meeting in Havana on December 2004 with the main regional stakeholders to launch the Latin American and Caribbean Chapter of the Global Renewable Energy Education and Training Program.