



**United Nations Environment Programme**  
**Regional Office for Latin America and the Caribbean**  
PROGRAMA DE LAS NACIONES UNIDAS PARA EL MEDIO AMBIENTE  
PROGRAMME DES NATIONS UNIES POUR L'ENVIRONNEMENT

**Fifteenth Meeting of the Forum of Ministers of the  
Environment of Latin America and the Caribbean**

**Caracas, Venezuela**

**31st October to 4th November 2005**

B. MINISTERIAL SEGMENT

3 - 4 November 2005

**Distribution:**

Limited

**UNEP/LAC-IG.XV/4**

Tuesday 4, October 2005

**Original:** English

# **Renewable Energies and Energy Efficiency\***

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## A. Background

1. Economic and population growth will continue to drive an expansion of the global energy market. If there is no shift in the current patterns of production and consumption (business as usual model) the projected increases in energy consumption and market developments raise serious concerns about the security of energy supplies, investment in energy infrastructure, the threat of environmental damage caused by energy use and the uneven access of the world's population to modern energy.
2. Almost 1.6 billion people in developing countries do not have access to electricity today, representing a little over one-third of world population.
3. Although both average per capita energy consumption in developing countries and the share of commercial energy will rise over 2002-2030, the number of people relying on traditional fuels for cooking and heating will grow, from just under 2.4 billion in 2002 to over 2.6 billion in 2030.
4. The United Nations Millennium Development Goals include halving the proportion of the world's people living on less than USD\$1 a day by 2015. It is highly unlikely that the UN poverty-reduction target will be achieved unless access to electricity can be provided to another half-a-billion of the people we expect will still lack it. This would cost about USD\$200 billion. Meeting the target also implies a need to extend the use of modern cooking and heating fuels to 700 million more people by 2015.

## B. The global energy situation

5. Fossil fuels will remain dominant, accounting for more than 90% of the increase in energy use to 2030. Natural gas demand will grow fastest, but oil will still be the largest individual fuel source. Though new, renewable forms of energy will grow rapidly, they start from a small base and cannot displace fossil fuels as the over-riding source of energy in this timescale.
6. On the basis of present policies global energy-related emissions of carbon dioxide will grow slightly more quickly than primary energy supply. They are projected to increase by 1.8 % per year from 2000 to 2030 reaching 38 billion tonnes in 2030. This is 16 billion tonnes, or 70% more than today.
7. Serious concerns about energy security emerge from the market trends. The world's vulnerability to supply disruptions will increase as international trade expands. Climate-destabilizing carbon-dioxide emissions will continue to rise, calling into question the sustainability of the current energy system. Huge amounts of new energy infrastructure will need to be financed. And many of the world's poorest people will still be deprived of modern energy services. These challenges call for urgent and decisive action by governments around the world.
8. If current government policies do not change, energy-related emissions of carbon dioxide will grow marginally faster than energy use. CO<sub>2</sub> emissions will be more than 60% higher in 2030 than now. The average carbon content of energy, which fell markedly during the past three decades, will hardly

change. Well over two-thirds of the projected increase in emissions will come from developing countries, which will remain big users of coal – the most carbon-intensive of fuels. Power stations, cars and trucks will give off most of the increased energy-related emissions.

**9.** Converting the world's resources into available supplies will require massive investments. In some cases, financing for new infrastructure will be hard to come by. Meeting projected demand will entail cumulative investment of some USD\$16 trillion from 2003 to 2030, or USD\$568 billion per year.

**10.** The electricity sector will absorb the majority of this investment. Developing countries, where production and demand are set to increase most, will require about half of global energy investment. Those countries will face the biggest challenge in raising finance, because their needs are larger relative to the size of their economies and because the investment risks are bigger. The global financial system has the capacity to fund the required investments, but it will not do so unless conditions are right.

**11.** Energy supply in the LAC region is basically depending on oil. However, only some countries, including Mexico, Venezuela, Colombia and Brazil have substantial oil resources to support their economies; the rest depend on imports. Hydropower resources are available in most countries. Brazil's huge electricity generating capacity and that of most Central American nations, is basically dependent on this resource. Natural gas is plentiful in countries like Argentina, Bolivia and Peru, but still needs to be developed in some of these countries. A good number of countries in the region have virtually no commercial fossil fuels. (Huacuz 2003)

**12.** Renewable energy sources as a whole will increase their share of electricity generation. The share of hydroelectricity will fall, but the shares of other renewables in electricity generation will triple, from 2% in 2002 to 6% in 2030. Most of the increase will be in wind and biomass. Wind power will be the second-largest renewable source of electricity in 2030, after hydroelectricity. Finding good sites for land-based wind turbines is becoming more difficult in some areas.

## **C. Renewable energies**

**13.** Renewable energy increases diversity of energy supplies and can replace diminishing fossil fuel resources over the long run. Most renewable energies use indigenous resources enhancing a country's independence from external supplies of primary fuels. Renewable energies could be a key element in providing electricity to the rural poor. Their use in place of fossil fuels can substantially reduce greenhouse gases and other pollutants.

**14.** Growth in demand for renewable energy in industrialised countries as well as reductions in the cost of production brought about by cumulative experience are leading to economies of scale; such growth enables increased access by the developing world. While experts believe that many new markets could sustain even higher rates of renewable energy penetration, numerous barriers remain. These include limited economic resources and a limited commitment to provide

energy to the developing world's poor, and limited awareness that renewables can contribute to different dimensions of sustainable development. The cost of renewable energy technologies remains high, although it continues to fall. Some forms of renewable energy, particularly wind power, are now competitive in many market conditions. However, further price reductions are needed for renewables to compete broadly with the least costly fossil-fuel alternatives. Consumers' choices may be rationalised if appropriate price signals are attributed to value the environmental and social benefits of renewable energy.

**15.** The diffusion and deployment of newly developed renewable energy technologies into markets are particularly important, especially where small- and medium-sized companies might not otherwise be aware of them. A key strategy for market acceleration is removing trade and investment barriers between countries with significant renewable resources. Also vital is the commitment to develop a market for the technology to exploit those resources.

**16.** Contrary to the situation regarding conventional energy, all countries in the LAC region are endowed with abundant renewable energy sources. Solar, wind, biomass, small hydro and other energy resources from the ocean, are available in the region in larger or smaller quantities, depending on the geographical location and morphology of the individual countries.

**17.** Southeast Mexico and most Central American and Caribbean countries are under the influence of Trade Winds, while Southern Mexico and Central America are also exposed to strong and almost constant thermally driven winds, produced by the temperature difference between the waters of the Atlantic and the Pacific oceans. Windy places can also be found in the southern hemisphere.

**18.** Solar energy is more evenly distributed, as good portions of the region lie within the so-called Sun Belt Region of highest solar radiation. Thus, except for site specific adverse microclimates, solar energy is a predictable and reliable resource, susceptible of being transformed to heat and electricity by means of several technologies in different stages of development and commercial availability.

**19.** As a natural consequence of the solar radiation available, photosynthetic activity in most of the region of study is rather high, and hence the high production of biomass. On top of that, many countries in the region have an economy based on agriculture, so that agricultural waste, forest residues and other residues from animal raising, which constitute another form of biomass, is also abundant. These resources are difficult to evaluate, so that information in aggregate and analyzed form is scarce.

**20.** Most countries in the region use already a good portion of their hydraulic potential to generate electricity. However, most operations lie in the multi-megawatt range, seeking economies of scale characteristic of hydroelectric technologies. This practice has left a large portion of the small hydroelectric potential yet to be exploited. Given the high rainfall indices and the rough topography of many countries, small hydropower offers a good alternative to supply electricity, especially in remote sites.

21. Wave and tidal power, along with other forms of energy available in the ocean, represent an enormous energy potential for countries in the region, especially when one considers the large coastline to inland ratio of most countries under consideration. Unfortunately, technologies to tap such energy resources are still far from commercialization.

22. The down side of the renewable energy resource scenario in the region of study is the fact that little has been done to properly measure and characterize these resources (Huacuz 2003).

23. Global strategies for accelerating the market penetration and diffusion of renewable energies need to engage both developed and developing countries. Governments can employ a number of strategies to improve the competitiveness of renewable energy, such as:

- a) renewable energy should play an increasing role in the mix of fuels;
- b) examining strategies and employing market mechanisms to improve the competitiveness of renewable energies;
- c) addressing barriers to renewable energy development, promote technical standards, and reduce regulatory impediments to renewable energy trade and investment.<sup>(1)</sup>

<p><b>Renewables for Electricity Generation</b></p> <p>Renewable energy is likely to play an increasingly important role in global energy supply. The promotion of renewable energy will remain a key component of government strategies to reduce greenhouse gas emissions. Current global generating capacity, however, is a testimony to past efforts.</p>	<p>The long-term use of renewable energy will depend on technological advances that will bring further cost reductions and allow for better integration of these sources into the energy system. Another key factor for the success of some renewable energy technologies is likely to be enhanced collaboration in efforts to support technology uptake and to agglomerate technology purchases<sup>(2)</sup></p>
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## D. Energy Efficiency

24. Roughly speaking, energy efficiency refers to the ratio between the valued service the energy provides (light, mechanical power, mobility) and energy input. Improving energy efficiency both by reducing quantities of energy consumed and by changing processes, offers a powerful means for achieving sustainable development by reducing the need for investment in energy infrastructure, by cutting fuel costs, by increasing competitiveness for businesses and improving welfare for consumers. It can create environmental benefits through reduced emissions of greenhouse gases and local air pollutants. It can offer social benefits in the form of enhanced energy security (through reduced reliance on fossil fuels, particularly when imported) and enhanced energy services.

<sup>(1)</sup> [http://www.iea.org/Textbase/subjectqueries/keyresult.asp?KEYWORD\\_ID=4116](http://www.iea.org/Textbase/subjectqueries/keyresult.asp?KEYWORD_ID=4116).

<sup>(2)</sup> [http://www.iea.org/Textbase/subjectqueries/keyresult.asp?KEYWORD\\_ID=4122](http://www.iea.org/Textbase/subjectqueries/keyresult.asp?KEYWORD_ID=4122).



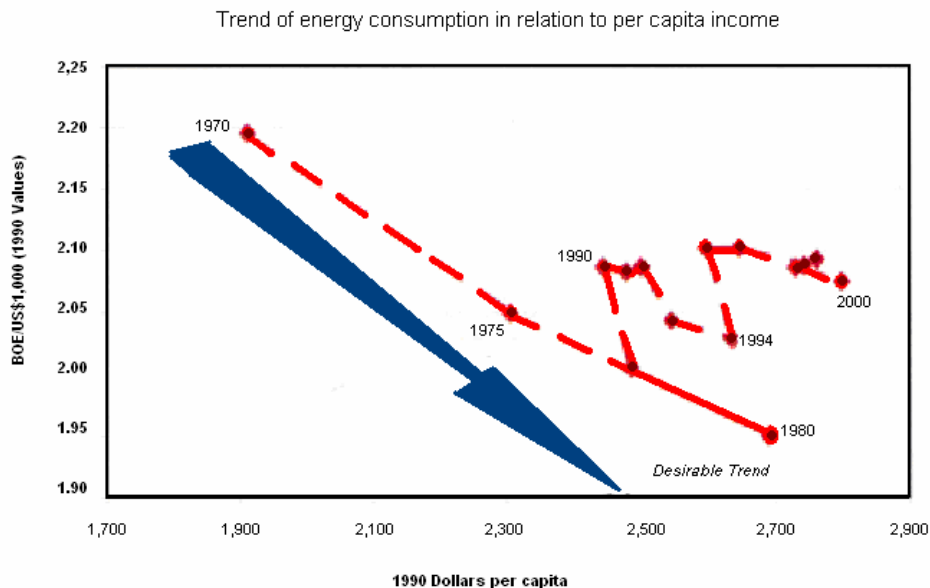
25. Effective market forces and good information can accelerate energy efficiency improvements, but market failures and barriers can inhibit efficiency gains. In such cases, certain government interventions may be useful in focusing market interest on energy efficiency. These include codes, standards, voluntary agreements, special financing arrangements and clustering small projects into investment portfolios<sup>(3)</sup>.

26. Improving energy efficiency reduces the need for investment in new infrastructure, cuts fuel costs and increases competitiveness for businesses and welfare for consumers. There is a plethora of energy efficient technologies available in the marketplace, but so far their penetration in the residential, commercial and power generation sectors is still lower than that needed to meet long term energy and environmental objectives.

27. Joint actions within countries and among countries can give stronger signals to suppliers of energy efficient technologies. Suppliers need to accelerate the introduction into the marketplace those technologies that already exist in labor<sup>5</sup> and to further refine products already in markets<sup>5</sup>. Manufacturers are concerned with reducing risks involved in development of their new products. A holistic approach to supporting energy efficiency implies focusing not only on technology but also on marketing and costs.

28. Some investments in energy efficiency offer above-normal rates of return yet may not be undertaken without some form of policy action to overcome a wide range of market failures and barriers.

Figure 1. Latin America and the Caribbean: Energy Intensity and Per Capita Income, 1970-2000



Source: Economic Commission for Latin America and the Caribbean (ECLAC)/ United Nations Environment Programme (UNEP), "The sustainability of development in Latin America and the Caribbean: challenges and opportunities". Libros de la CEPAL series, No. 68 (LC/G.2145/Rev.1-P), Santiago, Chile, July 2002. United Nations publication. Sales No. E.02.II.G.48

(3) [http://www.iea.org/Textbase/subjectqueries/keyresult.asp?KEYWORD\\_ID=4122](http://www.iea.org/Textbase/subjectqueries/keyresult.asp?KEYWORD_ID=4122)

**29.** Financial institutions face higher transactions costs in dealing with typically smaller-scale loans for demand side as compared to supply side investments. Government investment in research and development also tends to be skewed towards supply side technologies. But achieving a greater balance in the energy investment portfolio between supply side and demand side options would bring considerable public and private benefits. Governments should ensure there is neutrality of treatment between investment options. They may need to assist financial institutions to adopt more innovative approaches to financing investment on the demand side<sup>(4)</sup>.

## **E. Challenges for Developing countries**

**30.** Almost 1.6 billion people in developing countries did not have access to electricity in their homes in 2002, representing a little over one-third of world population. It is unlikely that the UN's Millennium Development Goal for poverty-reduction will be achieved unless access to modern forms of energy is dramatically increased.

**31.** Access to electricity and other modern energy sources is a necessary, but not a sufficient, requirement for economic and social development. The escape from poverty also requires, among other things, clean water, adequate sanitation and health services, a good educational system and a communication network. Yet cheap and available energy is indispensable. Electricity provides the best and most efficient form of lighting; many household appliances require it. Kerosene and LPG are more energy-efficient cooking fuels than traditional biomass. Diesel, heating and heavy fuel oil are more cost-effective for space heating. Diesel, gasoline and LPG are, and will remain, the primary transport fuels.

**32.** The absence of efficient and affordable energy services can severely damage the health and educational opportunities of the poor in developing countries.

**33.** Developing countries can look forward to further advances in energy and human development. All developing regions can expect to experience increases in per capita energy use and improved access to modern energy services – including electricity. Yet only a few Middle East and Latin American countries will have reached the stage of energy development in 2030 that OECD countries had attained in 1971.

**34.** In the case of the Caribbean, the particular features of islands (scale, fragile environment, strong dependence on conventional resources, high power generation costs, enormous weight of energy within the G.D.P., abundance of renewable energy sources) make them the most appropriate places for implementing renewable energy sources on a large scale<sup>(5)</sup>.

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<sup>(4)</sup> See **Annex II** to current document.

<sup>(5)</sup> <http://www.eurocaribbean.org/objectives.htm>.

**35.** Under these circumstances, the development of renewable energy sources on islands is not one option more: it is the only reasonable option in the framework of island strategies in favour of sustainable development, and it should complement the generalised development of measures in favour of the efficient use of energy.

**36.** Singly considered, islands are limited by their scale for the development of an important market of renewables. But if we consider them as a whole they are without doubt one of the biggest niches within the world market of renewable energy technologies.

## **F. Key policy issues**

**37.** Over the next thirty years, developing countries are expected to account for 70% of the growth in global energy demand and for two-thirds of the growth in global emissions. Section six looks at some of the challenges regarding investment and energy access.

**38.** Security of energy supply is an important component in the planning of future technology options, because long-term security calls for a balance between energy sources and technologies. Governments have a role to play in tipping this balance.

**39.** Future trends in oil prices are a major source of uncertainty. Prices of crude oil and refined products have risen sharply since 1999, hitting all-time highs.

**40.** Energy-efficiency and conservation measures will be able to address three driving forces in a positive manner and have alone the potential to reduce energy-related carbon dioxide emissions by 60 % compared to a “business-as-usual” scenario, if dedicated policies are put in place and technologies continue to be developed. Likewise renewable energy technologies (including hydropower, biomass combustion and geothermal power) offer large opportunities to make positive contributions on all three issues, and clean fossil technologies and nuclear power will continue to play an important role at least in the coming decades.

**41.** The transport sector energy use represents a specific problem which will need to be addressed, as it is a major contributor to urban air pollution all over the world and gradually becoming one of the major sources of both GHG emissions and oil consumption.

**42.** Concerted efforts on Research, Development and Deployment (R, D & D) will be required to improve cost efficiency of existing technologies and ensure continued development in new area like biofuels, hydrogen, fuel cells, etc.

## **G. Some Regional Activities**

**43.** The issue of the sustainable generation of energy and the expansion of the share of renewable sources has been included in several technical and political discussions in the context of the Latin American and Caribbean countries.

**44.** At the Thirteenth Meeting of Ministers of Environment of Latin America and the Caribbean, in October 2001, participants expressed the “need to diversify energy supply and to foster energy efficiency, assessing the potential of conventional sources and increasing the share of renewable sources, where it is expected that financing organisms will provide a broader support in accordance with the needs of each country”;

**45.** The Latin American and Caribbean Initiative for Sustainable Development (ILAC) agreed to at the first special meeting of the Forum of Ministers of the Environment of Latin America and the Caribbean, held in Johannesburg, South Africa, on 31 August 2002, and approved by the World Summit on Sustainable Development, recognizes the important contribution that bilateral, sub-regional, and regional activities can make to the promotion of sustainable development in Latin America and the Caribbean, within the framework of the Platform for Action towards Johannesburg 2002, approved in Rio de Janeiro, Brazil, in October 2001.

**46.** In early 2002, within the preparatory process for the World Summit on Sustainable Development, in Johannesburg, the Brazilian Energy Initiative (BEI) was put forward, suggesting that countries commit themselves to achieving a goal of 10% of renewable energy sources in their total energy supply mix by the year 2010.

**47.** In May 2002, at a meeting held in São Paulo, the Forum of Ministers of Environment of Latin America and the Caribbean approved the document on the Latin American and Caribbean Initiative for Sustainable Development (ILAC), including the goals proposed by the Brazilian Energy Initiative.

**48.** During the Johannesburg Summit, in spite of the support of the European Union, the strong resistance of some industrialized and oil-producing countries prevented the goals of the Brazilian Energy Initiative from being globally approved. ILAC, however, was incorporated into the Johannesburg Plan of Implementation with its goals for expanding the use of renewable energies in the region’s energy supply mix.

**49.** Still further in regard to the Johannesburg Conference, and given the impossibility of approving the Brazilian Energy Initiative, the United Kingdom and Germany proposed initiatives that are providing needed and significant dimensions to the issue, translated, in the case of the UK, in a proposal for the Renewable Energy and Energy Efficiency Partnership – REEEP, and in the case of Germany, in a proposal for holding an International Conference for Renewable Energies, in Bonn, in June 2004;

**50.** In April 2003, the United Nations Commission on Sustainable Development adopted, in its Eleventh Session, a program that provides for dealing with the issue of energy for sustainable development in its second work cycle – 2006/2007, reinforcing the importance of the debate and including the issue in national, regional and global spheres; and the UK and German initiatives were welcomed by the region, and the Brazilian Government held the preparatory regional conferences for both proposals. Thus, in August 2003, a Latin American and Caribbean regional meeting for the REEEP Initiative was held in the town of

Campos do Jordão, in São Paulo. One important outcome of the meeting was the declaration of the "Brasilia Platform on Renewable Energies" In this declaration, the countries of Latin America and the Caribbean, stress the goal of covering ten per cent of the region's total energy consumption through renewable energies by the year 2010. They also reaffirm their intention of specifying an effective regulatory framework in each country and call for the creation of new financing models.

**51.** During the XIV Meeting of the Forum of Ministers of Environment of Latin America and the Caribbean a DECISION on Renewable Energy was agreed. The decision promoted the fulfillment of the goal set by the ILAC to ensure that by the year 2010 the region, considered as a whole, will be using renewable energy in at least 10 per cent of its total energy consumption and urged the financial institutions to finance national, sub-regional and regional renewable energy projects.

**52.** In a more specific scenario, restricted to the small island developing states (SIDS), the Johannesburg Plan of Implementation mentions the need to "support the availability of adequate, affordable and environmentally sound energy services for the sustainable development of small island developing states (SIDS), by, inter alia (a) strengthening ongoing and supporting new efforts on energy supply and services, by 2004, including through the system and partnership initiatives; and (b) developing and promoting efficient use of sources of energy, including indigenous sources and renewable energy, and building the capacities of small island developing States for training, technical know-how and strengthening national institutions in the area of energy management".

**53.** Some of the main international commitments on the issue of renewable energies are summarized in Annex 4. We should highlight that the large-scale adoption of renewable energy sources is essential for meeting the provisions of the United Nations Framework Convention on Climate Change and the Kyoto Protocol, in so far as the introduction of renewable energies in the supply mix of each country reduces carbon emissions.

## **H. Conclusions**

**54.** Two-thirds of the increase in global energy demand will come from developing countries. By 2030, they will account for almost half of total demand, in line with their more rapid economic and population growth. More households will live in towns and cities and so will be better placed to gain access to energy services.

**55.** Achieving a truly sustainable energy system will call for technological breakthroughs that radically alter how we produce and use energy. The pace of technology development and deployment in renewable energies and other areas is the key to making the global energy system more economically, socially and environmentally sustainable in the long term. But consumers will have to be willing to pay the full cost of energy – including environmental costs – before these technologies can become competitive.

**56.** The issue of sustainable energy generation and the increase of the share of renewable energies in the environmental agenda of Latin America and the Caribbean is directly related to two other regional priorities: poverty reduction and the pursuit of sustainable development alternatives. The Energy and Social issue has become part of the development agendas of developing countries and is being translated into assigning priorities to topics like poverty alleviation, population growth, education, urbanization, health and living conditions and the lack of opportunities for women.

**57.** Governments must decide today to accelerate this process. Governments must act decisively to accelerate the transition to modern fuels and to break the vicious circle of energy poverty and human under-development in the world's poorest countries. This will require increasing the availability and affordability of commercial energy, particularly in rural areas. Good governance in the energy sector and more generally will be critical to improving both the quantity and quality of energy services. The rich industrialized countries have clear economic and security interests in helping developing countries along the energy-development path.

**58.** Latin America and the Caribbean committed themselves to achieve the goal of 10% of renewable energies in the total energy supply mix by the year 2010. To meet this target, each country is to prepare an assessment of their real perspectives of achieving this goal and to define, if appropriate, their priority needs and the required external support

**59.** Comparison of available experiences and ongoing actions with planned initiatives in Latin American and Caribbean countries shows an obvious deficit in implementation deriving from low priority attached to this issue by some countries. In others cases, fragile institutional installed capacity is identified as the main cause for the sector constraints. Notwithstanding, institutional arrangements prevailing in the region place the environmental and energy sectors on opposite sides, making it difficult to carry out harmonized action and negotiations that this issue requires.

**60.** Energy is critical to world economic growth and development. The outlook for energy use over the next thirty years, however, indicates that global CO<sub>2</sub> emissions will continue to rise. The current rate of energy use is not sustainable. The global energy system needs to be transformed into one that relies extensively on advanced, efficient, low-emission technologies. The sooner these clean technologies are developed and used, the greater are the prospects for controlling atmospheric greenhouse gas concentrations without affecting economic growth.

**61.** If existing policies were strengthened to improve energy efficiency and to increase the demand for renewable energy, the reduction in energy-related emissions would be considerable. Improving energy end-use efficiency is economically attractive, but more needs to be done to achieve a effective policy framework and to allow more efficient end-use technologies to be deployed in the market. The promotion of renewable energy will also remain a key component of government strategies to reduce greenhouse-gas emissions.

**62.** Additional investment in research and development in cleaner and more efficient technologies will be critical in finding a way to balance the effects of energy consumption with the need to protect the environment and to reduce emissions. This challenge must be met jointly by governments and industry. When possible, market mechanisms should be selected, in the framework of a specific and carefully drafted regulatory system.

**63.** Many uncertainties remain about how to make competitive markets function in such a way that security of supply is ensured in a cost-effective manner. Governments need to monitor developments closely and assess the need for changes to market rules and regulations. They also need to create more stable, transparent and predictable regulatory conditions in order to enable players in competitive markets to evaluate those risks and to ensure that market structures do not impede investment.

**64.** Energy and environmental policies at both the national and international level need to reflect the full cost of environmental damage and energy security in investment and consumption decisions. The Kyoto Protocol is one such attempt, and efforts to meet its objectives need to continue. International collaboration is important to accelerate the pace of development of cleaner and more efficient technologies. But different regions and countries will have to choose the mix of technologies that best serves their needs and best exploits their indigenous resources.

**65.** The Latin American region shows large disparities in terms of availability of conventional energy resources. At the same time, the region is endowed with abundant renewable energy resources, albeit up until now grossly underutilized. The main reasons for this situation are found in the lack of the proper elements for the large scale and sustainable deployment of the technologies necessary to tap these resources. Few countries in the region are actively working to develop policies, institutional settings, financing schemes, industrial infrastructure, human resources and other necessary elements, to facilitate the introduction of renewable energy as part of their energy supply options. Joint collaborative activities between two or more countries to achieve this objective are even more difficult to find. The largest efforts in this respect are being induced by international organizations or bilateral aid agencies through a number of programs, aimed at identifying and removing the barrier that impede the use of renewables in the region. Results to date have been modest, but encouraging (Huacuz 2003).

## **I. Proposed Discussion Questions for Ministers**

- What is the regional potential of wind energy?
- What is the future for biomass energy?
- Are biofuels a solution for the region?
- Does geoennergies have a good potential in the region?
- Successful energy efficiency experiences in the region

- What precautions are necessary regarding the large-scale development of bioenergy? Are there tradeoffs between bioenergy development and biodiversity, food production, water requirements, and so on?
- How can we gain consensus on the approach to developing hydropower resources in an environmentally and socially acceptable manner?
- How can energy and environment policy making be integrated more closely? What specific steps can ministers take to ensure that policy planning is not conducted in separate “silos”?
- To what extent can renewable energy sources meet the growing energy needs of the region? Are there specific steps governments can take to foster renewable energy uptake, particularly through the creation of robust renewable energy markets?

## J. References

*Report Renewable Energy and Energy Efficiency Partnership*, Latin America and Caribbean Regional Meeting August 12-13, 2003 Campos do Jordão, State of São Paulo, Brazil

IEA, 2004, *World Energy Outlook 2004*

IEA, 2003, *Integrating Energy And Environmental Goals Investment Needs And Technology Options*

Huacuz J. 2003, *Overview of Renewable Energy Sources in Latin America*, International Electrical Research Exchange. Central American Forum. San José Costa Rica, November 2003.

PNUMA, 2003, Final Report of the Fourteenth Meeting of the Forum of Ministers of the Environment of Latin America and the Caribbean. Panama City, Panama. 20 to 25 November 2003.



## Annex I Biofuels for Transport

1. Petroleum transport fuels currently dominate transportation worldwide. But energy security and environmental concerns are compelling governments to identify and support alternative transport fuels. Over the past two decades, a variety of alternative fuels have emerged, such as compressed natural gas (CNG), liquid-petroleum gas (LPG) and electric vehicles. These fuels have a number of benefits over petroleum, but they also have a number of drawbacks that limit their ability to capture a significant share of the market. They require costly modifications to vehicles and the development of separate fuel distribution and vehicle refueling infrastructure. Biofuels can leapfrog these traditional barriers to entry because they are liquid fuels compatible with current vehicles and blendable with current fuels. They share the long-established distribution infrastructure with little modification of equipment. Low percentage ethanol blends, such as E10, are already dispensed in many service stations worldwide. Biofuels support several major policy objectives:

- d) *Energy security*: biofuels enhance supply diversification;
- e) *Environment*: *biofuels* are more climate-friendly than petroleum fuels, and can have significantly lower emissions of CO<sub>2</sub> and other greenhouse gases over the complete fuel chain.
- f) *Energy efficiency*: refiners and automakers are discovering the benefits of ethanol in order to boost fuel octane, especially when other potential octane enhancers, such as MTBE, are discouraged or prohibited
- g) *Sustainable transportation*: biofuels are derived from renewable energy sources, which can assist the broader effort to achieve sustainable transportation objectives.

2. Given current feedstock and technology, the CO<sub>2</sub> emission reduction potential from using biofuels rather than fossil fuels is high. Shifting to ethanol from cellulosic biomass could reduce CO<sub>2</sub> emissions even further. If improvements in the balance of trade, energy security benefits, octane enhancement and air quality benefits were also valued, the cost/benefit ratio of biofuels over petroleum would be even more attractive. As with renewable energy for electricity generation, the benefits are higher depending on the value that governments place on reducing dependence on imported fossil fuels.

3. For biodiesel and ethanol from grain and sugar beets, the technologies involved are fairly mature and further cost reductions are liable to be small. For biofuels to play a larger role, substantial improvements in biofuel production technologies or changes to land use would be necessary. Future cost reductions lie in advanced technologies to convert cellulosic feedstocks to ethanol and to hydrogen. But until several commercial-scale production facilities are built and more real-world experience is gained, the production costs of fuels based on cellulosic feedstocks will not change.

4. There is a need to assess biofuels production potential in various parts of the world. This kind of assessment would allow policymakers to develop a general picture of the potential for international trade so that countries could meet production and consumption targets at lower costs.

5. Some countries, like Brazil, have made considerable advances in bioenergy technologies and are expanding biofuel production to address air quality and energy supply security concerns. International collaboration will enhance technological development and market deployment in all countries.

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## **Annex II**

### **Reducing Households Energy Consumption**

- 1.** Demand for household electrical appliances is expected to grow rapidly over the next three decades, driven mainly by rising incomes and fewer persons per household. There is considerable potential to reduce electricity consumption and GHG emissions from residential appliances and equipment cost-effectively. The most cost-effective technologies can be established through life-cycle cost analysis.
- 2.** Governments should strengthen policies to target the least life-cycle cost for each appliance class. The most effective approach to capture benefits from energy efficiency is to have a comprehensive basket of policies supported by an active and effective institutional framework, with voluntary and partnership measures building upon a solid foundation of minimum energy performance standards and labeling.
- 3.** Energy efficiency standards ensure that efficiency is incorporated into product design. International collaboration on appliance policy is also important because of the increasing globalization of appliance and technology markets. This is particularly true for information and communication technologies where the rate of innovation and product development is such that regulatory or economic policy may be too slow or ineffective and where there is a high degree of product uniformity globally.
- 4.** Action today could greatly reduce future growth in standby power.

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### Annex III Transport in the Caribbean

1. The enormous burden represented by inland transport within the island energy budget suggests transforming the measures of rational use of transports into a key piece of the energy sustainability strategy. New transportation technologies are obviously essential to improve both efficiency and emissions of vehicles, providing cleaner-burning alternative fuels, and reduce the distance that individual vehicles travel on the roads and highways.
2. But together with the introduction of LEV (Low Emission Vehicles) and ZEV (Zero Emission Vehicles) it is necessary to adopt measures, allowing the use of transports really suitable to island realities and sustainable mobility strategies that avoid absurd situations where the increase in the ratio km of built road/number of vehicles is directly proportional to decrease in accessibility.
3. A variety of approaches can be employed to slow the growth of vehicles on the road and reduce the vehicle distance traveled. Since most vehicle kilometers are used for commuting, proper urban planning - for instance, with centrally located services and a good public transportation system-can minimize or eliminate the need to use a vehicle.
4. Encouraging carpooling is an inexpensive approach to reducing vehicle traffic. One incentive is to set up high-occupancy vehicle lanes to smooth the commute for those in carpools.

**Mass Transit Systems:** Mass transit systems are the ideal urban transportation mode, and include bus and rail systems, among others.

**Alternative Transportation:** One way to reduce vehicle traffic is to encourage alternative modes of travel, including biking and walking. Bike paths and pedestrian paths are essential components of encouraging alternative transportation. <http://www.eurocaribbean.org/efficiency.htm> renewable energy sources.

**Annex IV**  
**Table 1. Millennium Development Goals (United Nations),  
Johannesburg Plan of Implementation, and Environmental, Social  
and Economic Impacts of these Measures**

United Nations Millennium Development Goals	Johannesburg Plan of Implementation	Environmental, social and economic impacts of the measures <sup>(*)</sup>
<p>Eradicate extreme poverty and hunger</p> <p>Achieve universal primary education Promote gender equality and empower women</p> <p>Reduce child mortality. Improve maternal health. Combat malaria and other diseases</p> <p>Ensure environmental sustainability. Reverse the losses of environmental resources. Halve the proportion of people without sustainable access to safe drinking water</p> <p>Develop a global partnership for development. Includes the commitment to good governance, development and poverty reduction – both nationally and internationally. Address the special needs of the least developed countries. More generous ODA for countries committed to poverty reduction</p>	<p>Improve access to reliable and affordable energy services to achieve sustainable development and to facilitate the achievement of the Millennium Development Goals, including the goal of halving the proportion of people living in poverty by 2015</p> <p>Promote education to provide information for both men and women on available energy sources and technologies</p> <p>Facilitate, with the financial and technical assistance of developed countries, the access of the poor to reliable energy services to improve the standards of living of their populations</p> <p>Develop and disseminate alternative technologies with the aim of giving a greater share of the energy mix to renewable energies</p> <p>Utilize financial instruments and mechanisms to provide financial resources to developing countries to meet their capacity needs for training and technical know-how, including promoting energy efficiency and conservation, renewable energies and clean technologies</p>	<p>Renewable energies provide a substantial amount of local jobs</p> <p>Indirect impacts, such as providing evening courses in small villages due to the availability of local electricity</p> <p>Health benefits reflected in well being and a cleaner atmosphere</p> <p>Cleaner, more sustainable and long term energy; well-being provided by access electricity services</p> <p>Energy self-sufficient countries; meeting the special needs of isolated communities; shared global responsibility</p>

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<sup>(\*)</sup> Contained in the Brazilian Energy Initiative, 2002.