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INTERNATIONAL ASPECTS OF ENERGY EFFICIENCY WITH SPECIAL EMPHASIS ON THE CLIMATE CONVENTION AND THE AGENDA-21

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> "The global environment is changing more rapidly than at any time in recent centuries; as a result, surprises may be expected, and the next century could see significant environmental changes. At the same time, the human consumption of energy, water and non-renewable resources is increasing, on both a total and a per/capita basis, and shortages may ensue in many parts of the world even if environmental conditions were to remain unchanged. Social processes are subject to multiple variations across time and space, regions and culture. They both affect and are influenced by changing environmental conditions. Human factors are key driving forces in these intricate sets of relationships and exert their influence directly on global change." (Agenda-21, para. 35/10)

Introduction

The United Nations Conference on Environment and Development was held in 1992 just on the 20th anniversary of the Stockholm Conference on Human Environment which marked an important milestone in the increasing concern on environmental problems. The understanding of the risks of global changes in the Earth environment due various socio-economic activities has profoundly increased during the recent decades.

The improved observing systems and the world-wide developments in the Earth sciences have resulted in revealing the hazards from the anthropogenic influences on environment on all spatial scales. These include the effects on the urban scale air quality from the transport-related release of air pollutants, the contamination of the freshwater resources, the recurring drought incidences in certain regions which are partially enhanced by the inappropriate

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land use practices, the transboundary air pollution which is the essential cause of the acid rains and other adverse phenomena.

Beyond these local, regional and continental scale problems, the threats of the global hazards became evident even for the policy-makers during the 1980s. The most apparent phenomenon in this context became the observation of the "ozone hole", or more generally, the depletion of the stratospheric ozone layer which was followed by rapid elaboration and acceptance of the adequate international treaty.

Further on, two other global problems came to the limelight: the increase of the greenhouse gases in the atmosphere and the accelerating extinction of the biological species. The scientific uncertainty about the global character and potential consequences of these processes is still rather high, nevertheless, agreement was achieved in both cases that prompt responses are necessary to avoid the possibly irreversible developments. Following the resolutions of the UN General Assembly, the Intergovernmental Negotiating Committees prepared the relevant conventions which were opened for signature during the UN Conference on Environment and Development. As an outstanding case in the history of the international environmental treaties, more than 150 high level country representatives signed the two conventions already during the two weeks of the UNCED.

The necessary numbers of ratifications was deposited by the end of 1993 for the Framework Convention on Climate Change so that it entered already into force on 21 March 1994. Since that time the relatively fast rate of ratifications has been kept and nowadays, there are already 66 Parties to this convention.

Industry and environment

The interaction of the societies with their environment has been dramatically changed since the beginning of the industrial revolution. The use of the natural resources increased fast and the load on the environment in form of wastes, contamination, hazardous emissions also grew exponentially.

Energy generation and use was the key element in the economic progress. It became also evident that the energy sector plays an outstanding role for a large scale of the environmental impacts. It started from the local environmental effects of the mines and reached the continental scale of the adverse impacts in form of atmospheric transmission and deposition of certain

pollutants. At last, we have realized the risk from the accumulation of the carbon dioxide in the atmosphere, which is primarily emitted from combustion of the fossil fuels. We should keep in mind that the mean residential time of this gas in the atmosphere is about 100 years.

It is not only the energy sector which has large-scale and long-term environmental implications. Extensive land use practices, the increasing power of the chemical industry, the use of freons and halons or the development of the biotechnology also contributed to the man-made environmental hazards.

The intensive industrial development once being the principal generator and catalyst of the new era of socio-economic development should now profoundly change its direction and should simultaneously serve the conservation of the environment and the further needs of the societies.

Concept of sustainable development and the energy sector

The improved awareness on the environmental risks has resulted in the modifications of views on the growth perspectives. In response to these requirements, the concept of the sustainable development has been adopted at the highest levels. It was the principal message of the Brundtland commission and it served as basis for the comprehensive program of the Agenda-21 accepted by the UN Conference on Environment and Development.

The elements of this concept have appeared in the latest international environmental conventions, the updated programs of the specialized organizations of the United Nations or the various regional, scientific and industrial organizations.

Among the various sectoral issues of the sustainable development, the energy-related aspects are of vital importance. The Agenda-21 attributes special consideration to this area.

> "9.9. Energy is essential to economic and social development and improved quality of life. Much of the world's energy, however, is currently produced and consumed in ways that could not be sustained if technology were to remain constant and if overall quantities were to increase substantially. The need to control atmospheric emissions of greenhouse and other gases and substances will increasingly need to be based on efficiency in energy production, transmission, distribution and consumption, and on growing reliance on environmentally sound energy systems, particularly new and renewable sources of energy. ..." (Agenda-21)

In accordance with this program, governments should cooperate in developing economically viable, and environmentally sound energy sources to support sustainable development; to promote the development, transfer and use of improved energy-efficient technologies and practices in all relevant sectors, giving special attention to the rehabilitation and modernization of power systems; to promote the use of increasingly efficient and less polluting forms of energy, and to promote also the appropriate energy efficiency and emission standards or recommendations at the national level.

Specific attention should also be paid to sectors and activities which are the main areas of energy consumption such as the transportation (through the development and promotion of cost effective, more efficient, less polluting and safer transport systems), or the industrial production in general (inter alia, through the increasing resource and materials efficiency in industry, installing or improving pollution abatement technologies, or by reducing wastes and by-products).

Cross-cutting issues of various environmental problems

Several environmental issues are at least partially related to the energy production and consumption. Such problems can be mentioned as the sulphur, nitrogen or VOC emissions, the enhancement of the greenhouse gas concentrations in the atmosphere, the management of wastes, including the radioactive wastes from this sector.

For multitude of these environmental problems, the cross-cutting or overlapping character of these effects and also the common areas of the planned response policies should be taken into account. In other words, an integrated approach is necessary, in particular, in the impact assessment or the cost-efficiency evaluation of the new technologies and investments.

Objective of the climate convention

The need to stabilize and reduce the greenhouse gas concentrations in the atmosphere seems to be the potentially most demanding environment-related criteria for the strategy planing of the key sectors of the economies. We should evaluate the importance of the Framework Convention on Climate Change from this perspective.

The international negotiations were initiated by the increasing concern about the accumulating amounts of the greenhouse gases in the Earth atmosphere, a tendency which has been developed since the industrial revolution. Most of these gases are natural components of the atmosphere and were there in a dynamic equilibrium for a long time, however, as side effects of certain socioeconomic activities and the very long residential time of some of these substances, the emissions and the concentrations of several gases have been substantially increased.

The more the amount of these greenhouse gases in the atmosphere, the higher the risk of the global climate change. In turn, the higher the rate of this anticipated global climate change, the less chance is provided for the societies and the ecosystems to accommodate to these changes in their environmental conditions.

The main objective of the Convention just reflects the recognition of this hazard, and reads as follows:

> "The ultimate objective ... is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change ... and to enable economic development to proceed in a sustainable manner." (UN-FCCC)

Thus, it is neither the natural greenhouse effect of the atmosphere, nor the variability or slow shifts in the global environmental conditions, but the potential high rate changes caused by man-made effects should be avoided.

The scientific uncertainty and the precautionary principle

The threat of the climate change is mentioned, however, there is a high level of scientific uncertainty about the evolvement, extent and rate of this process.

Despite the century scale of accumulation of the greenhouse gases in the atmosphere, its effects on the climate system could not yet been clearly identified. The climate models offer scenarios and not real predictions. Nevertheless, the enrichment of these gases in the atmosphere is absolutely evident from the observations, and the convention expresses the general

agreement to limit the further accumulation of these gases, that is to manage or reduce the hazard of the potential consequences and their adverse impacts.

This concept is expressed by the Convention in form of the precautionary principle:

> "The Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures ..." (UN-FCCC).

The greenhouse gases: their sources and sinks

Our interferences with the global cycle of the greenhouse gases include both the additional sources and the decrease in the capacities of the sinks and reservoirs so that the net anthropogenic emissions are of main points of concern in terms of the climate convention. Of the greenhouse gases, the primary importance are the carbon-dioxide, the methane, the nitrous oxide; the greenhouse effect of the chlorofluorocarbons (the CFCs) are especially high, however, these gases are already under the control of another international convention.

The convention calls for actions related to the sources and the sinks as well:

> "4.1. (c) Promote and cooperate in the development, application and diffusion, including transfer, of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases not controlled by the Montreal Protocol in all relevant sectors, including the energy, transport, industry, agriculture, forestry and waste management sectors;
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> 4.1. (d) Promote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases not controlled by the Montreal Protocol, including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems;" (UN-FCCC).

As concerns the energy sector - including all forms of energy production, transformation and consumption -, it is responsible mainly for the carbon-dioxide emissions, and also to a more or less extent for the nitrous oxide, carbon monoxide, methane or VOC emissions.

Mitigation and adaptation

It is clear that the changing consumption patterns and the related technological development have resulted inadvertently in the present hazardous situation. We have two options: either we stop this forcing to the global atmosphere and the global climate system or we prepare for the supposed impacts of the changes. Both approaches mean great challenge for the societies. Both options in principle are considered by the Convention.

The cuts in the increasing emissions, their stabilization or even more, their profound reduction are understood by mitigation. It is generally accepted that the reduction of the potential environmental change, that is, the mitigation of the anthropogenic influence on the nature should be the highest priority area of our actions. It is also related to the fact that we are certain in the increase of the greenhouse gases in the atmosphere, however, there is significant scientific uncertainty on the rate and extent of the increase in the greenhouse effect and the subsequent consequences for the natural ecosystems and the societies.

Nevertheless, the need of analysis and preparations for the adaptation to the long term changes in the environmental conditions is acknowledged by the convention. Especially, the importance of potential impacts of the sea level rise or the vulnerability of certain regions to the climate change is highlighted.

Commitments under the convention

The Intergovernmental Panel on Climate Change in its first assessment called for a drastic reduction in the greenhouse gas emissions. Among others, it would mean a 60 % cut in the carbon dioxide emissions which was seen as necessary step to stabilise the atmospheric concentration of this gas.

As compared to this huge demand for reduction, the non-developing Parties to this Convention committed themselves to stabilize the emissions by the turn of this century at their 1990 levels.

To implement these commitments, countries first review their present sources and sinks of the greenhouse gases, then they start planning for the various options to stabilize or reduce these emissions sector by sector.

In this task, the energy sector will have the leading role. Both the supply and the demand side should be addressed. On long term, the innovative

research for the various alternative, environmentally sound energy sources became of tremendous importance more than ever. In many countries, more intense use of natural gas is started instead of the coal-based energy generation (partially for the reason that the specific carbon coefficient for natural gas is about one half of that for the coal). The renewable energy resources are of special significance for the objective of the Convention.

The more effective utilization of the presently available energy sources is a prompt option. At last, but not least, various approaches might address the demand side by further developing energy efficient residential appliances, introducing special economic measures, increasing public awareness on the need for better energy conservation and so forth. This field includes the rationalisation of the residential energy demands, the lighting appliances etc. The transport related energy consumption is also an important target from this point of view.

Use and transfer of environmentally safe and sound technologies

For the sustainable development in general, and the climate policy, in particular, the use of the environmentally safe and sound technologies - "the environmentally friendly technologies" - is of primary importance. The general guidelines for these terms were given by the Agenda-21.

> "34.1. Environmentally sound technologies protect the environment, are less polluting, use all resources in a more sustainable manner, recycle more of their wastes and products, and handle residual wastes in a more acceptable manner than the technologies for which they were substitutes.
> 34.2. Environmentally sound technologies in the context of pollution are "process and product technologies" that generate low or no waste, for the prevention of pollution. They also cover "end of the pipe" technologies for treatment of pollution after it has been generated.
> 34.3. Environmentally sound technologies are not just individual technologies, but total systems which include know-how, procedures, goods and services, and equipment as well as organizational and managerial procedures. This implies that when discussing transfer of technologies, the human resource development and local capacity-building aspects of technology choices, including gender-relevant aspects, should also be addressed. Environmentally sound technologies should be compatible with nationally determined socio-economic, cultural, and environmental priorities." (Agenda-21)

The development and introduction of such technologies are also necessary for the effective implementation of the climate convention. In

particular, it is valid for the energy generation, transformation and distribution utilities.

It is not only the development of the environmentally sound, advanced technologies, but also their wide application is essential. Supportive measures are needed to promote the availability and large-scale use of the relevant soft and hard technologies. The international and cross-sectoral co-operation in this field is one of the key guaranties for the improved access to the adequate information and capacity-building in all interested countries.

> "34.4. There is a need for favourable access to and transfer of environmentally sound technologies, in particular to developing countries, through supportive measures that promote technology cooperation and that should enable transfer of necessary technological know-how as well as building up of economic, technical, and managerial capabilities for the efficient use and further development of transferred technology. Technology cooperation involves joint efforts by enterprises and Governments, both suppliers of technology and its recipients. ..." (Agenda-21)

Joint implementation

One potential special mechanism in addressing the greenhouse gas emissions is the joint implementation of the commitments under the climate convention. It is mentioned in the convention text and it was also discussed during the sessions of the intergovernmental committee and various workshops. In this relation, different points have been raised, including the questions of cost-efficiency, tradable emissions, technology transfer, accounting procedures, ethical aspects of intergenerational equity, etc.

In simple terms, the joint implementation would mean an emission reduction investment by a donor country in a host country to be considered (accounted) as part of the implementation of the convention's commitments in favour of the former country.

Despite the popularity of the various aspects of this mechanism, no consensus has been achieved on its application within the near future. Pilot experiments were initiated among several countries and some principles were accepted by the intergovernmental committee during the recent sessions. The general view was that the basic commitments on stabilisation of the emissions by the non-developing countries would not be touched by such a mechanism. Most probably, after collecting a certain amount of experience, joint

implementation can have its full potential only after fulfilling the basic commitments, that is, after 2000.

Conclusions

The hazard of the enhanced atmospheric greenhouse effect became a new global challenge for the societies. It has turned from a scientific topic into very hard problem that should be tackled by the policy makers.

The solutions revealed and offered by the further research and technological development for all forms of the energy supply and use are basic elements for the adequate strategy planning and the formulation of the response polices.

An integrated approach should be applied in the research and evaluation of the new technologies with the comprehensive assessment of all effects of their potential introduction - with particular consideration of their explicit or implicit contribution to the net emissions of the greenhouse gases.

In general, the societies should follow less carbon-intense path of development as one specific criteria of the sustainability which is a key message of the climate convention.

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