
DO ENVIRONMENTAL AND CLIMATE CHANGE ISSUES THREATEN SUSTAINABLE DEVELOPMENT?

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ABSTRACT

The atmospheric environment is presently under threat from anthropogenic emissions of pollutants and greenhouse gases to the extent that irreversible changes to the climate, the ozone layer and the quality of the air could occur. While the required changes in practice and regulations may hit economies if the induced costs are to be internalised, the impact of ignoring these requirements might even threaten the concept of sustainable development. The prospects of environmental pollution, depletion of ozone layer and climate change due to human activities have sparked a variety of controversies on many fronts. These topics are discussed with respect to the imposed threats to the sustainable development, and with particular attention paid to delays in urgent emission reductions.

Key words: atmospheric environment, climate changes, antropogenic emissions, sustainable development

1. INTRODUCTION

The risks and impacts of any development on the environment and on society are unequally distributed in space, time and severity. Thus those who receive benefits are often not the same as the ones who suffer risk. Different socio-economic structures will have very different responses to any change, and will have different requirements and resources for development, ranging from those that can invoke high technology to supply their needs to those that must make use of more easily available resources. It is highly unlikely that any universal development strategy can be found that will suit all countries equally, and each country or region must therefore be considered individually, with a particular attention paid to its use of resources that belong to all.

The common atmospheric environment is presently under threat from anthropogenic emissions of pollutants and greenhouse gases to the extent that irreversible changes to the climate, the ozone layer and the quality of the air could occur, thus threatening the concept of sustainable development. Internationally agreed legal treaties and international research programmes are addressing these issues through three basic elements: risks to the ozone layer, atmospheric pollution and its transport, and climate variability and change. This report

investigates whether such risks threaten the principles of sustainable development owing to an evident hesitation and/or delay in undertaking all necessary international preventive actions.

The oldest human activity - agriculture is a direct source of atmospheric pollution, emitting methane, nitrous oxide, carbon dioxide and other greenhouse gases (GHGs). Agricultural crops and soils can also provide a sink for greenhouse gases, and, consequently, alternative cropping and land use management practices could help mitigate increased emissions of these gases, as well as the reduction of greenhouse emissions through the promotion of more integrated and sustainable farming practices. Also there is at least twice as much carbon locked in soils than there is stored above ground in natural vegetation. Therefore, there is a great potential to reduce GHG emissions by a less intensive and more integrated farming system, which would contribute to reducing GHG emissions.

Energy use, which is central to projecting future gas emissions, has an essential role in sustainable development. This role will be particularly important in developing countries (DCs), which will account for a significantly increasing share of world energy demand on the account of their growing population. Patterns of energy demand and interactions with economic factors are complex and change over time, but there is a natural tendency to believe that the future will be like the recent past. This applies particularly for the time scale of decades to centuries appropriate for depletion of ozone layer and global warming. It is evident from figure 1 that the expected changes in the world energy mix are small and will not be sufficient to prevent further increases of GHG and other emissions, which is considered to be urgent.

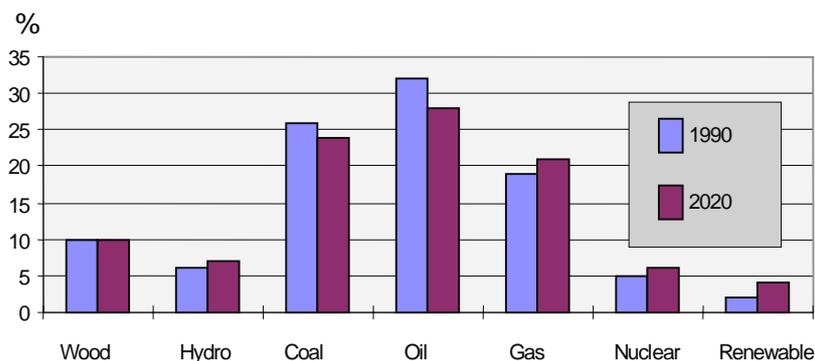


Figure1: Share of world's primary energy sources in 1990 and 2020

Such an approach might miss major new trends, turning points and technological developments, and the common assumption in energy planning that all fossil fuel resources will be used before a major shift away to new sources (while the climate stabilization requires keeping significant portions of fossil resources in the ground) is a stark contradiction to all conventional energy planning practices. A sound approach to considering future patterns which allows for possible new developments, based on a more efficient use of energy and replacement of fossil fuels with energy sources that do not involve combustion with air, either with or without climate change.

Despite recent progress in putting the treat of environmental pollution, depletion of ozone layer and global warming onto the international agenda, the debate over their effects

continues to be shaped by two diametrically opposed viewpoints. One is “don't act until you are certain” (“wait-and-see”), which is being supported by a minority of analysts, who believe that current scientific uncertainties are still too large to warrant costly preventive action and that more research should be pursued instead to reduce scientific uncertainties. Another is “act now to to minimize risks’ supported by these who believe that current uncertainty cuts both ways. For example, if major warming should come true, in-action could have catastrophic consequences, and that the world should therefore pursue investments and policies now to minimize such risks.

On the other hand, the agreed upon principles of sustainability oblige present generation to allow for the next generations to use the existing natural resources for development. Needless to say that the same should equally apply to all people within the same generation.

2. PRINCIPLES AND PRACTICE OF SUSTAINABLE DEVELOPMENT

Sustainability is an elusive concept considered by some as quest for a balance between man and nature and by others as a balance between man today and man tomorrow. The world's Commission on Environment and Development (the Brundtland's Commission) defines it as a development that meets the needs of the present without compromising the ability of future generations to meet their own needs. In this respect, the so called Agenda 21, which was negotiated at the 1992 UN Conference on Environment and Development (UNCED) in Rio, sets out comprehensive strategies and programs to counter environmental degradation and promote sustainable development across topics ranging from agriculture, biotechnology and business to toxic chemicals, trade unions and women. The UN Commission on Sustainable Development (CSD) was created to follow up Agenda 21.

The same (UNCED) UN Conference produced the UN Framework Convention on Climate Change (UNFCCC) which led in the well-known 1997 Kyoto Protocol on reducing GHG emissions. Unlike the Conference of the Parties (CoP) created by UNFCCC, the CSDs possible outputs do not include binding commitments or funding mechanisms. Rather, they serve to exhort and persuade, although they can create important precedents steering subsequent agreements that do establish binding commitments and financial rules.

The binding commitments are necessary now if a sustainable development is to be assured worldwide for a long-term period. However, the CSD 9 (held in New York 16-28 April 2001) was the first session of the CSD to address energy among other subjects such as atmosphere, “international cooperation for an enabling environment” and transport. It concluded that, while the economic development around the world will require substantially more energy than used today, energy resources (although differently and unevenly distributed throughout the world) are not a pressing constraint, but no mention on the environmental and climate change constraints of energy use, that, if overlooked, may threaten sustainable development.

Bearing in mind possible serious threats of those and issues associated with the depletion of ozone layer to the sustainable development, they deserve a much higher priority on the agenda of CSD. The future World Summit on Sustainable Development (WSSD), to be held in September 2002 in Johannesburg on the occasion of the the tenth anniversary of Rio Summit (Rio+10), will review the implementation of Agenda 21, and is therefore expected to strengthen the global commitment to the sustainable development, including elimination of all risks that might threaten such a development. Through its Action Plan for the Future, the WSSD is expected to give the CSD a leading role in eliminating these risks.

3. THREATS TO SUSTAINABLE DEVELOPMENT

3.1. Environmental Pollution

Power and other industries are major polluters of our environment due to their emissions of sulphur and nitrogen oxides, SO₂ and NO_x. Industrial activity is also an important cause of emissions of several minor but still important pollutants such as carbon monoxide (CO) and non-methane hydrocarbons (which are sometimes called volatile organic compounds-VOCs). Over the past 20 years industries have gained a great deal of experience with such concern as toxic waste, chemical spills, and acid rains. Their strategic response has been to make large long-term investments in reducing waste at source, minimizing toxic emissions, designing energy efficient products and recycling products and materials. Nevertheless, climate changes promises to make such strategies seem simple and effortless by comparison. Finding replacements for chloro-fluoro-carbons (CFCs) or scrubbing SO₂ out of industrial smoke are not easy, but reducing emissions of carbon dioxide and other GHG proved much more challenging and will require a fundamental restructuring of practice.

Recent developments in flue gas desulphurisation (FGD), modified burner components (DeNO_x devices), fluidised bed combustion (FBC), and other technologies made the environmental pollution risks to diminish, particularly so as the equipment prices on the market are lowered. International efforts and agreements in environmental protection reached so far assure that the threat to the sustainable development may be avoided, although emission limits are under constant pressure to be further reduced. For example, legislation of the European Union (EU) on the air quality (LCP Directive on limitation of emissions of certain pollutants into the air from large combustion plants) is insisting that more and more stringent standards be accepted concerning emissions of SO₂ (from 400 down to 200 mg/m³), NO_x (from 400 down to 200 mg/m³), dust (from 50 down to 20-30 mg/m³) and other polluting agents.

However, due to complexities of combustion chemistry, emissions do not always decrease in full proportion to efficiency improvements. Also, pollution control equipment can often be retrofitted to stationary equipment before it is replaced with more environmentally friendly equipment, and, to achieve the fullest reduction of pollutants, both efficiency improvements and pollution control technologies should therefore be used. These options illustrate the overlap between acid-rain oriented policies and climate stabilization policies. Thus, a joint consideration of both policy fields is necessary, since, by controlling one acid rain effluent like SO₂ at the expense of NO_x control could shift the atmospheric chemistry and increase the concentrations of radiatively active tropospheric ozone (see next paragraph). The global environmental crisis and the warming threat could bring about a realignment of international policies that goes far beyond the control of GHGs, since most of industrialised countries (ICs) find themselves in an economic and environmental trap, and will be foregoing significant welfare increments until they greatly reduce related pollutant and GHG emissions.

3.2. Depletion of the Ozone Layer

Scientific observations have demonstrated that the most of CFCs which enter the atmosphere migrate to the stratosphere (the upper atmosphere), and a mounting evidence links the use of CFCs and related compounds to the depletion of stratospheric ozone. (Stratospheric ozone filters the ultraviolet radiation that, when it reaches the Earth's surface in excessive amounts, may promote cancer and cataracts in humans and damage a wide variety of flora and fauna).

The man-made CFCs are part of a class of compounds termed halocarbons, the most important of these compounds being CFC-11 and CFC-12, which until recently were the preferred refrigerants in a host of industrial and consumer applications.

The international community reached a landmark agreement to cut emissions of certain CFCs suspected of depleting the Earth's protective ozone layer. In September 1987 representatives of 43 UN member countries signed the Protocol on Substances that Deplete the Ozone Layer (the so called Montreal protocol) to the control these chemicals. The Montreal protocol to the 1985 Vienna Convention for the protection of the ozone layer possibly was the most far-reaching expression of global concern for the environment made to that time. Emissions of CFCs were expected to decline as a result of this and the subsequent London agreement, and the Copenhagen agreement. In the meantime, further research has revealed that a major speed-up of the Montreal reduction targets is urgently needed.

The Montreal protocol called for a 50% reduction of in the use of CFCs below 1986 levels by 1992, and the London agreement called for the complete elimination of CFC use by the year 2000, while Copenhagen agreement intended to accelerate the complete phase-out of CFCs to January 1, 1996. However, after ratification of the Protocol, the production and import freeze by 1990, a production cut by 1992 was 20%, leaving a further 30% production cut by the end of 1999. Evidently, such a delay is in contradiction with the urgency mentioned above. Needless to say how serious threat might that be to the concept of sustainable development in general

Furthermore, stabilizing the ozone layer basically means stabilizing atmospheric chlorine and bromine levels, but under the Montreal protocol their concentrations would still rise due to long atmospheric residence times of these chemicals. Thus, even if assumed that every nation will participate in the Montreal protocol and subsequent London and Copenhagen agreements, the ozone layer would continue to be destroyed. Fortunately, the new scientific evidence is beginning to create an international political response and EEC countries have accepted to phase out all CFC substances. A number of DCs also have ratified the Protocol. Although DCs account no more than about 5-7% of world production at this time, major increases can be expected unless a deliberate effort is made to transfer non-CFC technology to their growing economies.

3.3. Irreversible Climate Change

Climate stability is a limited resource as the global climate can tolerate only a certain amount of perturbation before it will irreversibly deteriorate. This climatic resource takes the form of buffering capacity against GHG releases. Relative to populations, cumulative historic GHG emissions from ICs are more than an order of magnitude as high as those from DCs. With reference to the concept of sustainable development, if the remaining global budget to the irreversible climate change were shared according to strict person-year equity including historic emissions, ICs would have no emission rights left. Bearing in mind that the concept of sustainability has put in focus the equal rights of the future generations for their development based on the existing natural resources, it appears that the climatic resource is not even equally available to all in DCs and ICs within the same generation.

The fundamental policy choice is to decide the level of risk that society is willing to accept in the face of the fact that the only certain proof of the climate change theory will come after the atmosphere has itself performed a full-scale experiment. In fact that experiment is probably being performed, since the scientists believe that they are able to detect climatic change from CO₂ increase, and that the warming predicted is a large enough signal to exceed the noise of

natural fluctuations in the climate. Implementing the GHG emission reductions requires both unilateral initiatives and cooperative international action. The UN Framework Convention on Climate Change signed in 1992 at Rio Summit is now entering into effect, which commits ICs to limit their GHG emissions. The GHG emission reduction targets were set in 1997 by signing the Kyoto Protocol to the UNFCCC at the UN international conference in Kyoto, Table I.

Table I: Kyoto GHG Targets

Country	% of 1990 emissions
Australia	+ 8
Bulgaria	- 8
Canada	- 6
Croatia	- 5
Czech Republic	- 8
Estonia	- 8
Hungary	- 6
Island	+ 10
Japan	- 6
Letonia	- 8
Liechtenstain	- 8
Latvia	- 8
Monaco	- 8
New Zealand	0
Norway	+ 1
Poland	- 6
Rumania	- 8
Russian Federationa	0
Slovakia	- 8
Slovenia	- 8
Switzerland	- 8
Ukraine	0
United States	- 7
European Union:	- 8
Average	- 5.2

sumed in Bonn in July 2001 (CoP-6bis). However, instead of an expected consensus of ICs on their Kyoto Protocol emission reductions targets to prevent an irreversible (beyond repair) climate change, the agreement established a special Climate Change Fund to help DCs to adapt to climate change impact, obtain clean technologies and limit the growth in their emissions. In addition, there were adopted general rules governing the Clean Development Mechanism (CDM), through which ICs can invest in climate-friendly projects in DCs and receive credits for the emissions avoided by these projects. Other rules address the International Emission Trading (IET) regime, which enables ICs to buy and sell the emission credits amongst themselves, and the Joint Implementation (JI) regime, under which OECD countries can invest in projects in countries with economies in transition.

Prior to CoP6bis there were no restrictions on GHG emissions and thus no economic value to this avoidance. The Bonn Agreement is thus considered to be a major step forward,

allowing widespread coordinated restrictions in GHG emissions. Indeed, the Bonn (CoP-6 bis) agreement emphasises that all three of the above mechanisms should be supplemented to domestic action, and that the domestic action shall thus constitute a significant element of the effort made by each Party. However, as the Kyoto Protocol will become legally binding after it has been ratified by at least 55 countries representing at least 55% of the total 1990 CO₂ emissions, only 36 countries (including one IC) ratified it so far. The most controversial issue of the CoP-6bis is the USA repudiation of the Kyoto Protocol thus causing GHG emissions to be reduced only 2% below their 1990 level, causing another delay in comparison with the original agreements on reducing the emissions of CFCs and GHGs, as shown in figure 2.

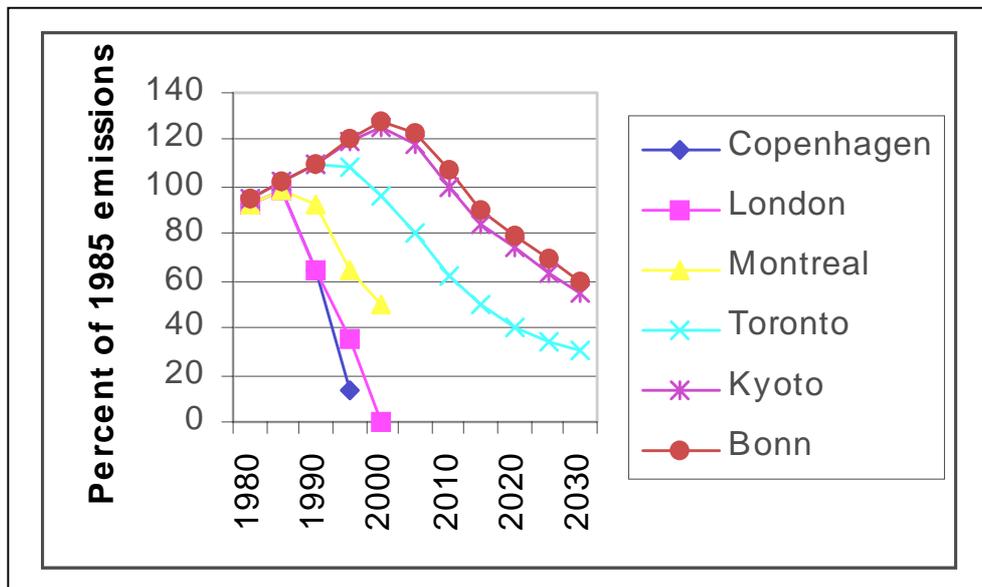


Figure 2: Delaying of agreed upon reductions of CFC (left) and GHG (right) emissions

Although final details must still be worked out at forthcoming CoP7 in Marakesh, Morocco, and entry into force is more difficult without US (the largest emitter of CO₂ accounting for 36% of total emissions), it is certainly possible if all countries supporting Bonn Agreement ratify the Protocol. Nevertheless, the anniversary of the World Summit on Sustainable Development (WSSD) in Johannesburg, (Rio+10) is expected to add pressure for efficient ratification of Kyoto Protocol to assure entry into force by then.

Unlike the USA, the EU is insisting that all member countries and other major industrial countries should comply with the Kyoto targets. In parallel, the European Commission has established an EU Sustainable Development Strategy that calls for an “urgent” action to secure a better quality of life for present and future generations. This Strategy requires a sustained economic growth, which supports social progress and respects the environment. Key priorities of the Strategy include limiting climate change and increasing the use of clean energy, with a goal to reduce atmospheric GHG emissions by an average 1% per year over 1990 levels up to 2020. However, similar actions are needed worldwide to secure a

better quality of life for present and future generations as Agenda 21 sets out. While the required changes in practice and regulations may hit economies if the induced costs are to be internalised, the impact of ignoring these requirements might even threaten the concept of sustainable development. Successful climate stabilization will ultimately depend on a broader compact among ICs and DCs to reform the world economic and ecological order and to promote sustainable development worldwide.

4. CONCLUSION

If principle of sustainable development means rights to use natural resources for development of the present and future generations, such principle of sustainability should first be applied among the same generation, which is not the case yet. The principle of sustainable development is under serious threat from environmental pollution, depletion of ozone layer and global warming. While the real risk of the environmental pollution seems moderate and controlable, this is less so with the risk of continuous depletion of ozone layer. However, the risk of climate change beyond repair appears to be very serious one due to the complexity of global warming and very high prices to be paid for reduction or avoidance of GHG emissions.

Climate stabilization actions are urgently required and must be seen in a broader global development context. To succeed, it must be approached by a joint effort of ICs and DCs to achieve global sustainable development. ICs should drastically reduce their disproportionate emissions and (direct and indirect) consumption of global environmental resources, while DCs should find alternative development paths that avoid repetition and magnification of ICs impact. Of course, ICs should provide capital, technology and debt and trade relief to help the DCs development in a sustainable direction. This seems to be the only way to avoid a serious threat to the sustainable development from global warming and its possible catastrophic consequences.

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