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Inter-Linkages Between the Ozone and Climate Change Conventions

Part I: Inter-linkages between the Kyoto and Montreal Protocols

Inter-Linkages

Synergies and Coordination among Multilateral Environmental Agreements

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Introduction

In May 2000, delegates at the 8th Meeting of the Commission on Sustainable Development agreed on a draft decision on "Preparations for the10-year review of progress achieved in the implementation of the outcome of the United Nations Conference on Environment and Development (UNCED)" (E/CN. 17/2000/L.7 of 4 May 2000).

This decision identifies the ten-year review as an opportunity to mobilize political support for the further implementation of Agenda 21, the action plan that was agreed on at UNCED in 1992. It also argues that Agenda 21 should not be re-negotiated but constitute the framework within which other outcomes of UNCED can be reviewed, assessed, and implemented. The document clearly indicates the international community's commitment to support coordinated international actions through the range of agreements reached at UNCED, known as the Rio Accords.

The ten-year review of UNCED (known as the World Summit for Sustainable Development, or WSSD) is an important milestone as we enter the twenty-first century; it calls for new and creative modes for supporting the progress achieved so far in transitions toward sustainability and effective environmental management.

Seizing this opportunity to contribute to the WSSD, the United Nations University (UNU) and United Nations Environment Programme (UNEP), working with the Massachusetts Institute of Technology's (MIT) Program on Global Accords and the Alliance for Global Sustainability / Value of Knowledge Project, proposed a set of initiatives to develop coherent and robust measures for supporting progress during the implementation of international conventions. The approach envisioned is designed to bridge the gaps between science, technological knowledge, and policy.

Focusing initially on two major multilateral environmental conventions, this initiative is motivated by the conviction that knowledge-driven strategies must be accompanied by effective on-the-ground measures, and that the interests of states and all other stakeholders involved must be taken into account.

Starting with an expert workshop, the initiative was designed to provide a framework and guidelines for its overall efforts well as its specific contributions to the WSSD. Central to the success of this first step were (a) a robust conceptual tone, (b) informative background papers, and (c) the active participation of experts who are recognized as leaders in their fields. The expert workshop was held 2-3 November 2000 at the Massachusetts Institute of Technology in Cambridge, MA. It was jointly hosted by MIT's Global Accords Program and the Alliance for Global Sustainability / Value of Knowledge Project.

Initial approach and proposed methodology

The UN Secretary-General's 1997 report*, Renewing the United Nations: A Programme for Reform*, identified the concept of "issue management" as a useful means of addressing the needs for coordination of activities that require an integrated, systematic approach to issues under the responsibility of different UN governing bodies. The approach is also aimed at involving inter-governmental and non-governmental organizations, and brings stakeholders together to address problems that have been identified and to jointly develop solutions.

This broad approach is relevant to a wide range of UN initiatives. Our purpose here is both to "test" the effectiveness of the approach in the context of UN multilateral environmental conventions, and to identify its practical as well as strategic implications. In this context, we propose to examine the inter-linkages between two major global conventions: the Vienna Convention for the Protection of the Ozone Layer and the UN Framework Convention on Climate Change.

The WSSD and its preparations provide an important opportunity and target for this work. They do not focus only on past performance, but also serve as an important venue for examining the need and potential for greater coordination during the implementation of multilateral environmental agreements (MEAs). The lessons learned from achieving coherence during the implementation of MEAs — specifically, through this case study of the conventions on ozone and climate change — should also be relevant to other areas covered by MEAs, such as biosafety and land degradation.

The participation of experts from the academic community allows for neutral assessments of possible solutions and for dialogue between stakeholders in the context of issue management.

Criteria for selection of the case study

Recognizing that the overall objectives are designed to address matters of interface among the major global environmental accords, the selection of the conventions for the ozone layer and climate change as the first "test" case was based on, and met, several key criteria pertaining to relevance:

* **Feasibility**: The issue must be results-oriented and a feasible outcome must be envisioned.
* **Knowledge:** The issue must be able to incorporate advances in knowledge, science, and technology.
* **Opportunity:** The opportunity must exist to create synergies through collaboration among the relevant players.
* **Mandate**: The intergovernmental bodies that have mandates to deal with the particular issue must be willing to work with the initiative.
* **Timing:** The issue must be relevant and "ripe" for action.

Rather than assuming, a priori, a particular pattern of connectivity (if one exists at all), or positing the necessity for linkages, expert views and perspectives were sought that could help guide the international community in taking effective steps with inter-linkages.

The selected test case: two global conventions

The Ozone and Climate Change Conventions

It is generally appreciated that the Vienna Convention for the Protection of the Ozone Layer of 1985 and its Montreal Protocol on Substances that Deplete the Ozone Layer of 1987 have been a great source of inspiration throughout the negotiations on the United Nations Framework Convention on Climate Change (FCCC) of 1992 and its Kyoto Protocol of 1997.

The Montreal Protocol is widely considered to be one of the most successful cases of international cooperation on environmental issues. In comparison to the mature regime that has been formed to address the problem of ozone depletion, international cooperation for the protection of the Earth's climate is still at an early stage.

Connectivity and linkages

At first glance a number of key linkages appear between the issues of stratospheric ozone depletion and global climate change. These connections have not yet been fully explored, nor are their implications widely understood, but the potential impacts of both issues at international and national levels are significant. Nonetheless, some common features have influenced these two sets of international responses to global challenges.

* *First*, causes and effects of both environmental problems intersect in various ways, only some of which are well understood; most still require concerted research at all levels.

* *Second*, the example of the Montreal Protocol has served as an important model for the design of the international regime on climate change in many respects, and it will probably continue to do so in the future. Lessons from the Montreal Protocol raise companion issues for the Kyoto Protocol such as institutional effectiveness, national capacity, and the need to incorporate "learning" into the regime as scientific advances are made in understanding the issue.

* *Third,* signs that appear as "tension-signals" have emerged between the two regimes since the signing of the Kyoto Protocol, due to the invariable connections between that Protocol and its impacts in the "real world." This tension is illustrated by fluorinated GHGs: reductions in their emissions are sought under the Kyoto Protocol as part of the solution to climate change, while on the other hand they are seen as a desirable alternative to ozone depleting substances.

* *Fourth*, the role of knowledge is fundamental to understanding the issues. The scientific foundations for both conventions are well developed and new technological responses are widely considered to be essential for their implementation.

When all factors are considered, the legal and institutional boundaries between the two conventions may not be fully congruent, due to the complexities at either the "cause" or the "effect" sides of climate change and ozone depletion. However, effective management of both conventions requires understanding of

the potential inter-linkages and a clear definition of responsibilities, at both international and national levels. These are basic facts of life, so to speak; yet they need not detract from the efforts to find greater coherence and connectivity between the two regimes.

Moving toward the WSSD

The potential for learning from the Montreal Protocol is an important opportunity that should not be missed, given the overall thrust of the WSSD. While the treaties and the treaty processes have made some progress towards managing linkages, attempts to actively create synergies between both regimes have received less attention. The case of the fluorinated GHGs points to an important opportunity, namely, to address the need for, and modes of, closer cooperation.

The international community as a whole and the WSSD process in particular, will be well served if these matters are addressed in impartial, intellectually robust, and pragmatic ways.

1. Background

1.1 Institutional background and comparison

The Montreal Protocol has been heralded as the successful result of an international process in fostering cooperation between the relevant stakeholders and achieving its set goals. Under the Protocol, the primary ozone depleting substances (ODSs), such as chlorofluorocarbons (CFCs), were phased-out in developed countries by early 1996. Developing countries, meanwhile, are to phase out CFCs by 2010. Governments that are parties to the protocol, as well as industry, consumers and society as a whole, contributed to the cooperative effort to mitigate and reverse the trend of ozone depletion. The Multilateral Fund, established under the Protocol, has been considered successful to date and an important mechanism of international cooperation that ensures implementation of the protocol in developing countries. The Kyoto Protocol, on the other hand, has been beleaguered by disagreements in its seven Conferences of the Parties (COPs). Negotiations for specific targets and timetables for reductions of greenhouse gas (GHG) emissions stalled its implementation in the year 2000.

1.1.1 Montreal Protocol (MP)

The MP was signed by 24 countries in 1987 and came into effect in 1989. It aims to reduce and phase out the production and consumption of ODSs and allows the use of alternatives such as hydrofluorocarbons (HFCs), hydrochlorofluorocarbons (HCFCs) and perfluorocarbons (PFCs). By October 2001, 181 countries were party to the Protocol. As mentioned above, the Multilateral Fund is a financial mechanism for the MP, designed to provide financial and technical assistance to developing countries to eliminate their industrial use of ODSs. UNEP, the UNDP, UNIDO and the World Bank are the implementing agencies of the Fund. Efforts to eliminate ODSs in countries with economies in transition are funded through the Global Environment Facility (GEF).

1.1.2 Kyoto Protocol (KP)

The KP was signed by 160 governments in 1997. It aims to reduce the emission of six GHGs, including carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), HFCs and PFCs. Its implementation, however, is dependent on specific agreements to be made on targets and timetables for GHG emissions reduction and ratification of the Protocol by the Parties. As of 11 December 2001, 84 Parties had signed and 46 had ratified or acceded to the Kyoto Protocol. Hoped-for progress at COP-6 in November 2000 was scuttled by disagreements on targets, timetables, and other issues such as the insistence by the United States to include carbon sink offsets against the responsibility to achieve emissions reductions. The GEF is identified as the funding mechanism for the KP. The Protocol also has provisions for a clean development mechanism (CDM) to assist developing countries in implementation.

1.2 Current institutional efforts to resolve potential conflicts between the MP and the KP

Potential for conflict exists between MP and KP implementation, due to regulations under the KP of two types of greenhouse gases (HFCs and PFCs) that are treated as ODS alternatives in the MP. In particular, HFCs are the preferred alternative to CFCs in industrial processes and products. HCFCs are to be phased out along with CFCs.

1.2.1 Following the release of research findings in 1994 and 1998 (C. Kroeze, N. Campbell) about the implications for GHG emissions of HFC-related policies under the MP, dialogue between the two protocols was initiated in meetings of Parties to the MP and KP in 1998 and 1999.

1.2.2 The technical assessment bodies of the two conventions (the Technical and Economic Advisory Panel, or TEAP, and the IPCC, respectively) initiated dialogue in an expert meeting they organized jointly in May 1999.

1.2.3 UNEP held a workshop entitled “Climate Change and Ozone Protection Policy: Two Protocols, One Response“ in September 1999, and a seminar on integrated responses to ozone layer depletion and climate change at Peking University in November 1999, and published an issue paper entitled “Promoting Integrated Approaches to Ozone Layer Protection and Crosscutting Issues with other Environmental Conventions“ in early 2000. A second workshop was held at MIT in November 2000 to discuss the findings outlined in the paper. The workshop was organized by the Alliance for Global Sustainability, the MIT Center for Environmental Initiatives and the MIT Global Accords Program.

1.3 UNU’s Inter-linkages Initiative: research and conferences

Recognizing the potential for coordination and synergy instead of conflict, the UNU explored the MP and KP inter-linkages in a conference in July 1999. Conference papers were collected and made available online, and a report on the conference was released in 2000. In February 2001, a conference on inter-linkages to discuss regional and national applications was held in Kuala Lumpur, Malaysia. These are all part of the UNU-Global Environment Information Centre (GEIC) program on inter-linkages, a long-term research project with the goals of constructing regional and national frameworks for realizing coordination and synergy between environmental institutions, and producing toolkits to support national and local efforts to address inter-linkages.

2. Lessons and challenges: Montreal Protocol

2.1 Positive lessons from the Montreal Protocol

2.1.1 The role of science and scientists

Scientists played a crucial role not only in theorizing and uncovering the threats to the ozone layer from ODSs, but also in diplomatic efforts. They collaborated to describe the ozone problem, identify non-ODS alternatives, develop models of the mechanisms involved, and make projections. Notably, to accomplish these roles they had to leave their laboratories and become involved in political processes along with diplomats and negotiators, and to assume responsibility for the policy implications of their findings.

2.1.2 The necessity for strong leadership

Without the strong leadership of UNEP, the MP would not have become a reality. The United States also played a strong leadership role. The extensive use of scientific information and active information provision to the media, utilization of information clearinghouses and the conduct of technical workshops were effective strategies to reach and involve a large number of people.

2.1.3 Flexible design to allow for revisions

The Protocol was designed so that independent expert panels could be commissioned to periodically reassess scientific, economic and technological aspects relating to the MP, and to anticipate and examine new problems. The whole negotiation and implementation process was not rushed or overly ambitious, and was designed to minimize confrontation, to work step-by-step and to overcome opposition gradually.

2.1.4 Technological revolution emerged from public/private sector partnership

CFC replacements were unavailable for nearly all uses at the time the MP was signed. The process and the treaty were designed to allow progressive players in the free market to come up with solutions and then allow competition to take care of the rest. This arrangement resulted in technological breakthroughs.

2.1.5 Involvement of developing countries in the solution

The industrialized countries realized from the start that they would have to take earlier and stronger measures than the developing nations. There was explicit understanding that developed countries would lead the actions and the developing countries will follow with a definite time lag. Because developed countries followed through on their commitments, developing countries also moved quickly to replace CFCs, at a pace that reflected their capacity to do so. As noted above, their efforts were facilitated through an effective funding mechanism.

2.2 Experience with the MP has taught us that even with full scientific information and certainty, actual institutional changes do not happen without linkages from the global to the local, and the local to the global levels. Success in

implementation depends not only on horizontal institutional coordination and synergy but also on vertical institutional cooperation.

2.3 Challenges

2.3.1 One outstanding issue relating to ozone layer protection is getting the commitment of all countries to phase out HCFCs (substitutes that have a low ozone depletion potential, or ODP) and methyl bromide (identified as a controlled substance under the MP in 1992). About sixty to seventy countries, including India and China, have yet to make such commitments. Besides this, although U.S.$250 million to $300 million (25-30 percent of total Multilateral Fund funding) has been spent on HFCs and HCFCs as substitutes for CFCs, now the Multilateral Fund will not pay for the phase-out of HCFCs, leaving developing countries with no incentives to do so. (HCFCs are also ozone depleting substances, although their potential to deplete the ozone layer is much lower than CFCs.) According to scientists there are many possibilities in most sectors to “leapfrog” from HCFCs over HFCs to new technologies. Currently, however, under the MP developing countries are not required to phase out HCFCs until the year 2040.

2.3.2 Another outstanding issue is the fact that the MP contains no provision that facilitates the addition of new ozone-depleting substances as controlled substances. Although a few such substances have already been created, there are no legal provisions in the MP to deal with them now or in the long term.

2.3.3 Ratifying amendments

The Protocol has been amended four times — in 1990 (London), 1992 (Copenhagen), 1997 (Montreal), and in 1999 (Beijing). Each amendment is effectively a separate treaty, so a country that has not ratified a particular amendment is not bound to it. As of October 2001, only 111 countries have ratified the Copenhagen Amendment, which contains measures to control HCFCs and methyl bromide. By that time, some of the countries that had not ratified the amendment included China, India, Nigeria, the Russian Federation, and the Ukraine. The Montreal and Beijing Amendments are in a worse condition in terms of the number of countries that ratified them. By October 2001, only 69 Parties have ratified the Montreal Amendment and 16 the Beijing Amendment.

2.3.4 National focal points (NFPs) were established in most of the 131 developing country Parties to the MP, in order to provide reliable ODS data to the Ozone Secretariat, and to promote the development of country programs and projects for phasing out ODSs. The Multilateral Fund supports these activities. The most important challenge is to strengthen the capabilities of these national “ozone units” to ensure that phase-out projects are executed on time and that reliable ODS data is delivered expeditiously to the Secretariat.

2.3.4.1 One challenge facing NFPs is ensuring the reliability of ODS data provided to the Secretariat because there is very little scope within the MP for independent verification of data. As mentioned, one role of the NFPs is to ensure that this reporting is accurate.

2.3.4.2 Another challenge facing NFPs is the issue of promoting national policies and regulations that cover the phase-out of ODSs. The investment projects funded by the Multilateral Fund and executed by the implementing agencies are not

enough to completely stop and maintain a ban on the production and consumption of ODSs. For total ODS phase-out it is the responsibility of countries themselves to introduce policies and regulations that limit or ban their use.

3. Lessons and challenges: Kyoto Protocol

3.1 The Framework Convention on Climate Change was signed by over 150 nations in Rio de Janeiro in 1992. It was immediately criticized by environmental groups because it failed to mandate reductions in greenhouse gas emissions in a way comparable to the Montreal Protocol's treatment of CFCs. Instead, its Article 4 contained a very ambiguous obligation for industrialized countries to adopt national policies and take measures with the "aim" of returning by the year 2000 to emission levels of 1990. As we now know in hindsight, only a handful of those Annex 1 countries actually returned to 1990 levels, with that achievement being mainly for reasons unrelated to climate change policies.

3.2 The Framework Convention contains some very strong elements, such as rigorous national reporting, mandates to periodically reassess the adequacies of the commitments, and recognition of the Precautionary Principle. It also contains commitments for all Parties to develop national programs to mitigate climate change.

3.3 At the first COP in 1995 in Berlin, the Parties decided that the existing commitments were inadequate, and since an agreement could not be reached at that time, they decided to enact by 1997 a protocol with targets and timetables for reductions in GHG emissions. Setting up timetables and targets in the resulting Kyoto Protocol without adequate deliberation and consensus has, in retrospect, turned out to be a mistake. This is because even industrialized countries differ widely in geography, population, growth rates, natural resource bases, climatic conditions, and industrial structure — and because the negotiations were not able to fully take these differences into account, compliance to targets and the timetable has thus been eroded by unresolved contentions and the ambiguity of that agreement.

3.4 Governments were unwilling to directly confront the powerful industrial interests by enacting sector-specific measures to limit the use of fossil fuels. Instead, they opted for arbitrary, short-term projects that would not be strongly opposed by those interests.

3.5 Thus, the KP turned out to be simultaneously far too strong and far too weak — far too strong in the short run because most countries will be unable to fulfill their commitments; and far too weak to adequately address the long-term problem of climate change.

3.6 Evaluating the KP based on lessons learned from the MP

3.6.1 The IPCC is making good progress by working towards achieving international consensus on key issues relating to climate change. However, scientific knowledge relating to climate change still involves many uncertainties. If GHG concentrations continue to grow indefinitely, the potential consequences could be calamitous. Yet no one can predict when such a calamity might happen, and much uncertainty remains about possible offsetting or delaying factors, and about the impacts of climate change.

3.6.2 No strong leader or leadership has emerged in the KP negotiations and Conferences of the Parties. Instead the COPs have been dogged by contentions led by two camps — the European Union and the United States.

3.6.3 The KP was designed to begin a process. However, it is basically a short-term approach to deal with a long-term problem, and may prematurely lock countries into investments that would inhibit the development of the next generation of technologies that are actually needed to properly address the climate change issue.

3.6.4 Unlike the negotiations for the Montreal Protocol, from the very start negotiations on climate change did not adequately consider technological factors and alienated the private sector, because the discussions exaggerated the warnings of an impending catastrophe rather than providing market signals that would induce broad technological innovation. Meanwhile, a disturbing inconsistency appeared: at the same time that the governments of developed countries were making commitments to short-term targets that would probably prove to be unrealistic, they were reducing their investments in research and development for energy-related technology.

3.6.5 Commitments by developing countries relating to climate change are conspicuous by their absence. Yet, in contrast to their very minor responsibility for ozone depletion prior to negotiations on ozone layer protection, they are already a significant part of the total problem of climate change. For example, propelled by rapid population growth and industrialization, China's emissions are now second only to those of the United States, and India's emissions exceed those of Germany.

3.7 Can the climate negotiations be re-invigorated?

3.7.1 Negotiations on climate change mitigation should "return to basics." A greater effort should be made to focus on technology — micro-technology, carbon re-capture and sequestration technologies, for example — even though some of these may still be at theoretical development stages.

3.7.2 A small tax on emissions (e.g., one U.S. dollar per ton) could easily triple current investments in research and development for energy-related technology.

3.7.3 Any decisions or activities relating to technology should contain provisions to bring in and involve the developing countries. Technologies should be transferred in order to make it possible for them to benefit from the new technologies in new factories and power plants.

3.8 Challenges

3.8.1 Agreement on the Montreal Protocol was probably facilitated by the issue of human skin cancer, which increases as depletion of the ozone layer worsens. Because the consequences of ozone depletion are tangible for the individual, the pressure of public opinion would not allow governments to be inactive. With climate change, countries appear ready to take action only when they are convinced that the consequences are too severe for them. The short-term goals of the Kyoto Protocol appear to have been too ambitious. Nevertheless, unless developing countries take action in the long term to limit GHG emissions, little progress will be made in addressing the problem of climate change.

3.8.2 With the ozone issue, the solution is a relatively simple matter of eliminating emissions of ODSs. With climate change, solutions are not so simple, and industry is not recognizing the importance of the problem and the need to take action. The lobbying interests of the oil industry are bigger and more powerful than those of the industries that affect ozone layer depletion.

3.8.3 If one values equity and recognizes the need for countries to take responsibility for their past GHG emissions, the levels of per capita emissions of developing and developed countries must converge at some time in the future. Thinking this out fully, it is clear that developed countries must take action.

3.8.4 Promising technologies do exist today that could be applied effectively by 2010 or 2020, but in many cases they may not be utilized because of the failure to introduce the required policies, and because of time wasted in blaming other parties and arguing about the premises for action in the context of climate change. Multiple strategies are needed to reinforce efforts to achieve the objective of the Framework Convention as stated in Article 2 (the stabilization of GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system). The Kyoto Protocol need not be considered to be the only vehicle to achieve this objective.

3.8.5 There is a need to pull together what is known about mechanisms of networking, knowledge networking and management, etc., to help reduce gaps in current knowledge and to eliminate the barriers to applying this knowledge in policies and debates. The issue of the provision of local knowledge is one of the most important problems that have to be dealt with. The ideal solutions strategy that is ultimately adopted to address climate change should have all players collaborate using a common platform for knowledge. It should not be forgotten that national governments really do confront a serious problem: even though they have “signed on the bottom line” of the relevant treaties, their ability to comply with their commitments by modifying the behavior of individual citizens is very limited.

4. Conflict: Initial realization of inter-linkages

4.1 The potential conflict between the MP and the KP in HFC-related policies opened the way to recognize and realize interconnections between the Protocols.

4.2 Current HFC emissions are small compared to other GHGs, but they are projected to be of concern in the future. As a reference, from 1990 to 1995 HFC emissions grew tenfold in Germany, by 72 percent in Netherlands, 86 percent in UK and 74 percent in the United States.

4.3 Restrictive national regulations on the use of HFCs where there are no alternatives could delay the global phase-out of HCFCs in both developed and developing countries, by creating uncertainties for businesses. The intention of businesses to use HFCs as alternatives when the phasing-out of HCFCs begins, could be scuttled by the possible cancellation of investments, which could lead to the prolonged use of ODSs, a consequence of which could be reduced product performance and increased energy use. The prolonged use of HCFCs also has consequences on GHG emissions.

4.4 In the case of PFCs and SF_6, no alternatives exist for their use in semiconductor manufacturing and high-voltage electric power distribution. Restrictions on these substances under the KP could affect these industries in a negative way.

4.5 While the interconnections between the KP and the MP can be a cause for potential conflict, they can also be a vehicle for coordination and cooperation not only between the Protocols but also between environmental institutions.

5. Mitigating potential conflicts due to HFCs

5.1 There are positive factors relating to the use of HFCs and PFCs as alternatives to ozone depleting substances.

5.2 PFCs are so stable that they can remain in the environment for tens of thousands of years or longer. Thus, their presence in the air is essentially a permanent change in the composition of the atmosphere. However, industrial use of PFCs is limited and under the Montreal Protocol, a phase-out may become mandatory except in applications where no alternatives exist.

5.3 HFCs are energy-efficient, which means a smaller indirect contribution to GHG emissions compared to other non-ODSs that are not energy efficient.

5.4 The most commonly used HFC is HFC134a, which has a relatively low global warming potential (GWP) of 1,300. Other HFCs are HFC23, with a GWP of 11,700, HFC125 (2,800) and HFC152a (140). It would be wise to orient policies towards the utilization of HFCs with lower GWP. HFC152a is a non-ozone-depleting substance. It is an attractive potential replacement for CFCs. It is less expensive than HFC-134a (the primary alternative), has a much lower GWP, and is a better solvent. However, HFC-152a is flammable.

5.5 Technology currently exists to recover and recycle HFC refrigerants. It is also technically feasible to destroy HFCs from insulating foams.

5.6 Other non-ODS alternatives to HFCs exist that are either not GHGs or have a low GWP. Alternatives to HFCs for use as refrigerants are hydrocarbons, ammonia, and a process of absorption and evaporation. For aerosol sprays, compressed gas, pump sprays and dry powder inhalers can replace HFCs (although no HFC-alternatives exist for some medical uses). Vacuum insulation panels, fiberglass, rock wool or cellulose and hydrocarbons can replace HFCs in foam applications. Hydrocarbons, alcohol, aqueous and “no-clean” technology can replace HFCs as solvents.

5.7 Considerations about energy efficiency (which has implications on indirect emissions), toxicity and safety, and economic feasibility should guide decisions about the utilization of non-HFC alternatives. European companies have commercialized hydrocarbons as refrigerants.

6. Inter-linkages beyond HFC policy conflicts

6.1 The MP and the KP are linked not only because of conflicting policies on HFCs but also for the reasons outlined below.

6.1.1 Physical and chemical processes in the atmosphere link the problems of ozone depletion and global climate change. Ozone disturbances affect climate and climate changes affect the stratospheric ozone.

6.1.1.1 ODSs are long-lived chemical compounds that contain either chlorine or bromine. They get into the stratosphere and as they decompose inevitably by one process or another, they release the bromine and the chlorine, which ultimately destroys the ozone layer. Many of the ODSs are also greenhouse gases. As greenhouse gases, they do two things: they warm the air near the surface, and that warming actually leads to cooling in the stratosphere. This is one connection that is causing somewhat of an offset between the effects of these substances. By cooling the stratosphere these substances help mend the ozone layer by slowing down the rate of some of the atmospheric chemical reactions outside of the polar regions. In the polar regions, the opposite occurs. Stratospheric ozone itself is an important greenhouse gas. When we deplete it we are actually offsetting the greenhouse effect, and when we remove the ozone depleting substances we are augmenting the greenhouse effect.

6.1.1.2 Looking at the substances covered by the Kyoto Protocol, four of the GHGs in the basket of gases used for emissions targets — CO_2, HFCs, PFCs and compound sulfur hexafluoride (SF_6) — are gases that do not directly cause any adverse chemical reaction or transformation in the stratosphere that would lead to the depletion of the ozone layer. These are greenhouse gases that cool the stratosphere, and lead to the same effects inside and outside of the polar regions as the substances covered by the Montreal Protocol.

6.1.1.3 Two other GHGs on the Kyoto Protocol substance list — methane and nitrous oxides — are very important sources of catalysts that destroy ozone in the stratosphere. Lowering emissions of these two helps add to the protection of ozone in the stratosphere.

6.1.1.4 The decrease of air pollutants decreases the amount of tropospheric ozone, a greenhouse gas, produced as a secondary product of the initial emissions. At the same time, by reducing ozone, the capacity of the lower atmosphere to oxidize the chemical plumes from industrial activity is lowered. This could actually extend the atmospheric life of compounds like methane, HFCs, etc.

6.1.1.5 Aerosols present an additional complication. When we burn coal, the combustion process produces sulfur dioxide, and aerosols that are reflective. They reflect sunlight to space and may help make existing clouds more reflective. These effects would be considered to be beneficial as far as the greenhouse effect is concerned. In addition, sulfuric particles are the core of acid rain. Thus, air pollution is also a part of this story.

6.1.2 Responses to these issues of ozone depletion and climate change, which are systematically linked as described above, must replicate such linkages at the institutional level or else face conflicts and failures in policy design and implementation.

6.1.3 Efforts for ozone layer and climate protection are financially linked in the sense that coordinated investments are highly cost effective. They can encourage shifts to non-ODS alternatives that also demonstrate good life cycle climate performance (LCCP).

7. Challenges for developing countries

7.1 A serious dilemma that has not been addressed adequately is the difference or divergence of agendas between industrialized and developing countries, as reflected in the protocols. It has been suggested that such a problem will not be resolved unless a common ground of interests is established that respects the circumstances faced by developing countries, without prejudice in terms of translating these situations into an inferior level of participation.

7.2 From a developing country's perspective regarding the ozone and climate change conventions and other environmental issues, coordination of negotiations and implementation of commitments is a challenge because each convention or issue is handled internationally by a different group of agencies.

7.3 Another problem is weak national implementation of convention commitments. This occurs despite the presence of knowledgeable negotiators because they often do not stay in charge of the issues they negotiated. Developing countries constantly face a loss of expertise. Thus, major challenges are how to maintain continuity and how to bring experienced people back into a particular forum to use their expertise and knowledge in order to create institutional structures to implement the various protocols.

7.4 In many cases, the agency that makes the national commitments to conventions is not the one that does the implementation. Often, a mechanism for institutions to take charge of implementation does not exist.

7.5 For institution-building, the preparation of a national communication to the secretariat of a given convention is a very useful exercise in creating structure, because in the process countries are able to identify institutional roles, responsibilities and gaps. This institution-building is more important than simply training people and "soft" capacity building, which do not create institutional structures. A critical mass of people is needed at the national level that can participate with the rest of the world in addressing the issues relating to an environmental convention or protocol.

7.6 Efforts to link from the global level to local issues like pollution are especially valid. The linkage between global issues and how they affect the local population is very important; otherwise it is very difficult to build support and comply with commitments made. Unfortunately, local problems are often not linked to global issues.

7.7 In terms of finance, it is difficult to secure funding for issues other than for substances controlled by a convention or protocol. It would be desirable to encourage a more holistic financing approach, where the linkages between climate change and ozone depletion are recognized and supported together.

7.8 There is general agreement that technology transfer is crucial for developing countries to contribute solutions to ozone layer and climate problems, and the lack of it is a problem. Some people hold the view that technology transfer is occurring, but it seems more like a promotion of some specific technologies instead of promoting technological development. Concerted efforts and a greater sense of urgency are needed in order to accelerate the process of

technological transfer. Investment should be made to help developing countries find viable means to utilize renewable technologies like solar power.

8. Considerations for adaptive approaches and responses

8.1 Institutional issues

8.1.1 Ozone and climate linkages involve certain problems and friction, which are symptoms of a larger problem: the international institutions concerned have been very fragmented over the last ten to fifteen years. This situation has resulted in a high cost to the international community. A step in the right direction would be to develop more institutional linkages — internationally and with people in areas other than environmental specialties, such as finance. There is a need to think holistically about many major issues at the same time.

8.1.2 Consensus appears to exist that scientific dialogue and cooperation should be promoted between the Parties to the Ozone Convention and Climate Change Convention. The Parties need to direct the respective Secretariats to continue the dialogue.

8.1.3 When asking the question “What are the institutional mechanisms for coordination between two conventions?” one must also ask what the points are that need coordinating? Is there a need for such coordination? Because it seems that top-down coordination is challenging, perhaps there is a need to consider supporting this coordination from the bottom-up, at the national level.

8.1.4 Obviously, a major problem exists with communication. Some expressed views that the various institutions and people involved in climate change and ozone issues and conventions do not communicate adequately with each other, and that there is also a lack of communication at the local level. Universities can play a positive role institutionally because they are not really defined by politics or industry, but exist on the cutting edge, and are somewhere in the middle. They could contribute on methodological issues for such questions as inter-linkages. Putting universities together in partnerships could be very important in the future for systems integration, management change, and knowledge systems relating to the issues of inter-linkages.

8.1.5 The complexities of the linkage issues point to the need for mechanisms, methodologies and appropriate strategies to provide feedback on the actions and policies that are put in place. This is probably the single most important immediate priority. It appears that not enough thought has been given yet to ways for developing the methodologies and tools, given the available resources and platforms, to produce feedback for steering and learning, and to avoid repetition of mistakes.

8.2 Financial considerations

8.2.1 The Ozone national focal points mentioned above are funded by the Multilateral Fund, which is concerned with the ozone layer, not climate change. The Fund would likely oppose the use of its funds by NFPs for work relating to inter-linkages with climate change. Although many ozone coordinators are also involved in climate change and have the expertise in both, institutionally, it would be difficult to have them officially working on climate change issues as well. Funding for climate change focal points is more difficult to obtain.

8.2.2 Financially linking efforts for ozone layer and climate protection would result in coordinated investments that are highly cost effective. Such efforts can encourage the shift to non-ODS alternatives that also demonstrate good life cycle climate performance (LCCP).

8.3 Diffusion of ozone and climate change science

8.3.1 The view has been expressed that many negotiators from developing countries that were involved in negotiations did not understand the inter-linkages and the complexities of the climate problem. One of the best solutions to many of these problems is an enhanced initiative where negotiators and policymakers come together to communicate information and share experience at the pre-negotiation stage. This could happen in forums at the national, regional and international levels and include scientists, policy-makers, trade and economic specialists, to help in understanding each other's contexts. A conscious effort is also needed to synthesize the inter-linkages in the face of bureaucratic pressures that promote compartmentalization of responsibilities. Other challenges to information sharing to create a "level playing field" for negotiators include the lack of resources and lack of will. The use of technology, such as the Internet and visual, graphic informational materials from non-biased sources, would assist in leveling the playing field for negotiators. Once negotiations occur on the right footing, implementation will be more likely to follow smoothly.

8.3.2 Efforts relating to the ozone layer and climate protection should be organized around a concept that implies linkages, but the architecture for thinking about linkages is also important. A key concept is that of a knowledge network. One crucial question is how to mobilize and organize a system of discreet actors, who all produce knowledge, while retaining autonomy in the face of the complexity, as well as interconnectivity of the network. Another question is how to reduce gaps between the processes, the methodologies, the interactions and the stakeholders, etc., in the context of the problems being addressed.

8.4 Technology leapfrogging and transfer

8.4.1 Two key concepts can be identified in the realm of technology-related policy: cost sharing, and task sharing. In addition, a new concept could be called "option sharing," which goes beyond the other two, by empowering the whole community to look at solutions as equal partners for long-term development, rather than seeing this as simply an issue of transferring technologies in one direction, from one place to another.

9. Policy guidelines and recommendations

9.1 Adoption of the “issue management” approach is viewed as a practical method for promoting coordinated and cooperative management of environmental issues, and to improve the rationality and flexibility of existing systems, without requiring deep institutional changes. The framework for issue management is the concept of a task force made up of representatives from the UN, international and non-governmental organizations closest to the issues at hand. One organization is generally chosen to lead, and the rest provide substantive input and act in supportive roles.

9.2 In regard to the problem of the lack of fundamental capacity in dealing with an issue as serious as climate change, it is useful to consider the analogy of the General Agreement on Tariffs and Trade and its successor, the World Trade Organization. With trade, involving very complex issues that have far-reaching impacts across society, it took half a century to get to the present institutional situation. Similarly, taking into account the seriousness of global environmental issues, it is essential to consider capacity building with a time horizon of decades.

9.3 Other issues that are often overlooked, but should be taken into consideration, include the energy efficiency and energy requirements of replacement gases in relation to the creation of air pollution. In early discussions, this analysis was not done on alternatives to CFCs, for example, to see if they would create more or less air pollution. Such comparative analysis should be done on alternative gases before making decisions — it is inadequate to simply consider releases of alternatives in absolute terms.

9.4 In decision-making, one must strive to look at the totality of the effects of regulations, but such attempts greatly increase the complexity of consideration. Thus, issues must be labeled in order of priority, and sometimes compromises must be made, balancing short and long-term costs and benefits. In general, there is a need for other regulations related to the different issues (e.g. air pollution, the greenhouse effect, stratospheric ozone, etc.) to function independently. But as many have come to recognize the inter-linkages of these issues in terms of their effects, it has become clear that more cooperation should parallel this independent functioning. This means that it is necessary to screen gases that affect more than one environmental issue even more vigorously. The principle that should be employed is that pollution of one type should not be used to solve the pollution of another type.

9.5 Concerns have been expressed that the financing of the Multilateral Fund and long-term investments by industry into HFCs have already so thoroughly “steered the ship” in certain directions that options for technological alternatives that would also satisfy the KP are no longer available. There is a need for intelligent and serious analysis, not only by industry, but also by the responsible governments.

9.6 Developing countries cannot be involved effectively unless they are provided technological choices. Conversely, public opinion in developed countries regarding actions to solve global environmental problems cannot be swayed unless solutions become economically feasible. If the United States were to put a $4 per ton tax on carbon, it would barely be noticed by consumers, as it

would amount to one cent per gallon of gas. This would raise $5.6 billion and allow more than a tripling of investment in research and development for clean energy.

9.7 There also appears to be a need to support countries that in many cases do not even have ministries to address these issues. As suggested by requests to the US EPA for information about its structure and strategic plans, it would be a great initiative if countries that are developing integrated environment ministries could receive support in setting up systems and infrastructures that integrate protocols such as the KP and MP.

9.8 Another important issue that needs to be addressed is the issue of assigning international customs codes for controlled substances that have impacts on the ozone layer and climate change, so that customs authorities can properly identify them.

9.9 One of the biggest upcoming issues is the desire of some countries to put tax levies not only on the Clean Development Mechanism but on all financial mechanisms, so that all developing countries could fund integrated ministries of the environment.

9.10 At the national level, experience shows that coordination requires enormous resources. It took $26 million for the Ozone Convention to create the national focal points for the MP. It may be possible for UNEP, with the assistance of the Global Environment Facility, to coordinate at the regional level for conventions such as those that relate to climate change, ozone, chemicals, etc.

9.11 The IPCC for climate and the Technical and Economic Advisory Panel (TEAP) for ozone layer issues are the “workhorses“ of the two Conventions, but they are entirely different in structure and operate with different people. Many have expressed the view that greater efforts must be made to get the two groups communicating and working together in order to better advise the Parties to the Conventions. Using the advice, ideally national governments should produce national strategies for sustainable development, and environmental impact assessments should be applied immediately to all projects and plans that could affect the climate or ozone layer.

9.12 The strategy of establishing partnerships is the most effective, cost-cutting, efficiency-enhancing strategy for moving forward. This strategy recognizes the needs and strengths of geographically dispersed, distributed networks that allow work to be done where capacity exists, and encourages localization that enhances the diversity of users, interests and priorities.

9.13 One difficulty is that both the ozone issue and the climate issue are often being treated as classic pollution problems, when in fact they are really issues relating to development for both developing and industrialized countries. If one turns the KP around, from a set of restrictions defining what can and cannot be done, to a description of the kinds of issues that need to be addressed for sustainable development, it becomes a blueprint for sustainable development. This includes aspects such as technology choices, lifestyle choices and poverty alleviation.

9.14 Using the concept of issue management, based on the goal of sustainable development rather than separate pollution prevention treaties, might be a

useful way to identify the linkages and potential conflicts between these treaties and other treaties and organizations.

9.15 Universities should be utilized as platforms for dialogue, by organizing the dialogue of different stakeholders in society and acting as a type of "superglue." The institutional design of the university insures cohesion but also diversity. This "superglue" strategy in the universities is far more fertile than it could be in the general international arena. Some see universities as a very good ground for international democracy, far more suitable than international negotiation halls, which are restricted to certain key players, as long as universities are willing to provide access to different stakeholders. Universities have the ability to anticipate trends, which helps in terms of identifying sustainable directions that provide options for the future. They are a locus of analysis well-suited for developing tools to assess policy and technological options. They are also good for trend analysis to come up with change and adjustment strategies before changes become entrenched and too costly to revise. Universities are able to fulfill many of these functions and thus solve some of the problems of the lack of resources. They are seen as promising pools of resources — resources that are often not available in industry and elsewhere.

9.16 An effort should be made to include the inter-linkages concept and issues in the WSSD process. Possible contributions to the WSSD would be to submit a document listing highlights of inter-linkages for the UN Secretary General's report or contribute to the UN Agencies Report. Other opportunities for input will be at the Preparatory Conferences, and finally at the WSSD.

9.17 Inter-linkages

9.17.1 In the face of the complexities of the relevant sciences, it is important to use the inter-linkages approach (e.g. linking air pollution, ozone, and greenhouse gas issues) in assessing the harmonization of policy, international agreements and the scientific assessment processes.

9.17.2 One aspect missing initially in discussions on inter-linkages is a useful theoretical framework and a methodology to move forward to identify "entry points" for consideration that would be useful for policy-makers. The need exists to develop a conceptual framework to take the inter-linkages issue out of the policy-making realm and into the academic realm.

9.17.3 Regarding how to move forward on making recommendations to the WSSD, the first thing to do is to make the point that the issue of inter-linkages is an important component that is missing in discussions. It is also important to demonstrate how this approach can save resources at the regional, national and international levels. Included in this input should be the criteria for evaluation, and a scoping project using, for instance, the issue management approach.

9.17.4 As a legal point, one should consider the inclusion in international agreements of a provision relating to the facilitation of linkages between international treaties, in order to signal that these linkages are important.

9.17.5 When new agreements are negotiated, a review of linkages with other treaties could be built into discussions, in order to draw attention to the importance of such linkages.

9.17.6 After an international agreement has been negotiated, the issues that arise include capacity-building, incentives for compliance, providing for transparency, etc. Thus, implementation plans for the agreement should include a review of linkages within the government of other agencies and ministries that might be affected by these issues.

9.17.7 It would be beneficial for NGOs and the private sector to identify and address linkages that relate to their involvement.

9.17.8 Multilateral development banks could play a role in raising the profile of inter-linkages and to facilitate capacity development activities.

9.17.9 Civil society also has a role for helping to build a base within countries to support inter-linkages, both as recipients and facilitators of information flows, but the relevant issues must be made more understandable to a broader base of society.

9.17.10 Some express the view that there has been a great deal of activity in raising awareness of the inter-linkages between treaties, but it is time to move past that step. The next step is to find concrete examples of how to create the desired collaboration. The Secretariats of the Conventions don't have all the answers in this context, as the complexity of the problems being addressed is so large that it is virtually unmanageable. Entry points for solutions must be sought at international, regional and national levels. One of the best ways to such find entry points may be at the national level. For example, one could take a cluster of international environmental conventions (e.g., biodiversity, ozone, and climate), identify how they are being implemented at the national level, determine a baseline for later comparison, and then work with that particular country to find a strategy to interlink them.

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