

A New Global Diplomacy: Ozone Lessons and Climate Change

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Humanity has learned that the activities of modern industrial economies, driven by consumer demands and burgeoning populations, can alter delicate natural balances. We can no longer pretend that nothing will happen as the planet is subjected to billions of tons of pollutants. It is not that Earth itself is necessarily fragile. It may be, rather, that our own tenure turns out to be less secure and less inevitable as a consequence of the planet's responses to unnatural conditions created by human actions.

Experimenting with Planet Earth

The Antarctic ozone hole conveyed a warning. Nature is capable of producing unpleasant surprises. Even seemingly small interferences—in this case, an increase in stratospheric chlorine concentrations of a little more than one part per billion—could trigger dramatic and sudden reactions. Recent experience with the forests of central Europe and North America indicates that other areas may also have unforeseen thresholds beyond which natural processes are unable to absorb the assaults of contemporary economies. The world may not have the luxury of early warning signals before an irreversible collapse occurs in some other segment of the planet's ecosystem.

Forty years ago, Roger Revelle and Hans Suess, two scientists at the Scripps Institution of Oceanography, became concerned about the implications for global warming of the rapid accumulation of carbon dioxide

in the atmosphere resulting from fossil fuel combustion. They warned that "human beings are now carrying out a large scale geophysical experiment of a kind that could not have happened in the past."¹ In this unpredictable situation, could we be approaching other unknown thresholds?

Worries over climate change have moved in recent years from the restricted domain of a handful of contemplative scientists to the mainstream of international politics. A scientific consensus has developed that increasing atmospheric concentrations of carbon dioxide, along with other gases such as chlorofluorocarbons, methane, and nitrous oxide, could within a few decades cause temperatures to rise more rapidly, and to higher levels, than have occurred in previous natural cycles going back for hundreds of thousands of years.² Such a development could have portentous implications, including widespread coastal inundation as a result of rising sea levels, major shifts in agricultural productivity linked to changed rainfall patterns and increased soil erosion, greater incidence and severity of flooding, hurricanes, and other storms, extinction of many plant and animal species, the spread of tropical diseases, and the creation of tens of millions of environmental refugees. There could be profound economic and social dislocations throughout the world.

The new environmental threats to national and planetary security—of which climate change appears to be the most far-reaching—challenge both traditional science and diplomacy. A new science has evolved in recent years, made possible by advances in computer modeling, satellites, and measurement technologies. Known as earth systems science, this discipline attempts to integrate chemistry, physics, biology, geology, anthropology, meteorology, oceanography, and other subjects in order to understand more fully the interrelated forces that govern this planet. In 1986 the International Council of Scientific Unions (ICSU) launched a long-term interdisciplinary initiative that has been described as the biggest international scientific effort ever organized. Its purpose is to develop new insights into planetary processes and the ways they are being affected by human activities. Designated as the International Geosphere-Biosphere Programme, it was adopted unanimously by the more than 70 national academies and 20 international scientific unions that form the membership of ICSU—a manifestation of universal concern about the seriousness of the problems.³

Dilemmas for Policy: Striking a Balance

Because cooperation among sovereign states is essential for developing effective policies to address these issues, the new science requires an analogue in the realm of international relations.

The negotiators of the Vienna Convention and the Montreal Protocol faced issues similar to those raised by potential climate change. The science was uncertain, and the predicted harmful effects, though grave, were remote and unproven. Entrenched industrial interests claimed that new government regulations would cause immense economic and social dislocations. Technological solutions were either nonexistent or were considered unacceptable by most major participating governments.

Under these conditions, some governments at first allowed commercial self-interest to influence their positions and used scientific uncertainty as an excuse for delaying decisions. Many political leaders were long prepared to accept future environmental risks, rather than to impose the short-term costs entailed in limiting use of CFCs and halons viewed as essential to modern standards of living. Short-range political and economic concerns proved formidable obstacles to cooperative international action based on the ozone-depletion theory.

Government policymakers face a dilemma in attempting to deal with the new environmental challenges. Premature actions or regulations based on imprecise and possibly incorrect theories and data can incur costs that later turn out to be unnecessary. But postponing a decision might also not be cost free. Waiting for more complete evidence can run the risk of acting too late to prevent major and possibly irreversible damage. In the event that wishful or Panglossian thinking turns out to be erroneous, the future economic and social costs could be much higher, perhaps even catastrophic. Even with the success of the Montreal Protocol, humanity will have to endure the consequences of increased ultraviolet radiation for several decades. And it could have been much worse had action been delayed as the special interests had at first recommended.

Unfortunately, the market is essentially neutral with respect to the environment, and the current state of economics is not helpful in analyzing such situations. Relying on Adam Smith to protect the ozone layer—or to mitigate climate change—could be disastrous. Traditional methods of measuring income and growth appear increasingly irrelevant in the

modern world: the more ozone-depleting substances or coal that a country produces, the greater the growth in its gross national product.

Under current accounting standards, enterprises can avoid the “external” costs of environmental damage caused by their activities, but the bills, whether in terms of health or quality of life or depleted resources, must be paid somewhere or sometime by society. And the economist’s prescription for coping with future monetary flows is inadequate for responding to large but distant dangers: present-value discounting can reduce even huge long-term costs, in terms of harm to future generations, to insignificance, while predisposing managers to maximize short-run profits. Rather than rewarding environmental protection efforts, our financial markets regard them as irksome charges against current profits. Thus, the application by policymakers and investors of the tools of conventional economics may result in precisely the wrong decisions from an ecological perspective.⁴

The history of efforts to protect the ozone layer clearly demonstrates the crucial role played by industry in developing and implementing international environmental policy. Although the U.S. government was instrumental in first reducing CFC emissions in the 1970s and in achieving the Montreal Protocol in 1987, at several points during the ozone negotiations before and since, senior officials or legislators for largely ideological reasons came close to reversing pro-environment positions. In contrast, on every such occasion since 1985, pragmatically oriented industry forces consistently—and successfully—intervened in favor of the international regulatory regime, whether that involved supporting the original American position for strong controls at Montreal, endorsing the new financial mechanism at London, or testifying before congressmen who were intent on domestically unraveling the treaty’s controls. A key role in this respect was played by the Alliance for Responsible Atmospheric Policy, a consortium of several hundred companies that produced or were dependent on ODS and their substitutes.

The response of industry to an environmental problem is conditioned by a complex of considerations and pressures generated by the market, which is itself directly influenced by consumer preferences and by government regulatory actions; and underlying these immediate influences may be educational activities of the media and environmental organizations. The personal values of corporate leadership and stockholders, as well as general societal attitudes toward a given environmental issue, will also affect industry reactions.

In the early years of the ozone history, both American and European industrialists were resolutely opposed to controls over CFCs. It seemed almost as if business leaders simply could not bring themselves to believe that these apparently ideal chemicals, with so many benefits to society, were capable of inflicting a remote assault on the environment. American industry, however, through the Chemical Manufacturers Association, was consistently committed to resolving the uncertainties raised by the scientists, even if the results were to prove unpleasant: industry strongly promoted international scientific research and the 1985 Vienna Convention. The position of American industry toward international regulation was also conditioned by their desire for a "level playing field" with their European competitors.

During the negotiations before both the Montreal conference in 1987 and the London Meeting of Parties in 1990, industrialists almost inevitably complained that the proposed controls were too harsh and too costly to implement, while environmental groups argued that they did not go far enough. The treaty negotiators had to seek a balance in the severity of controls. If the protocol were too soft on industry, there would be greater risks to the ozone layer. However, if the reduction schedules were economically or technically unrealistic, they could engender bitter industry resistance, loss of jobs, consumer backlash, court battles to delay implementation, and noncompliance—all of which could delay the needed structural changes and commercialization of substitute products.

An important lesson of the ozone experience is that industry requires clear signals and a stable regulatory environment to give it the confidence and incentives to make long-term investments in new and safer technologies; this consideration emerged very clearly in the continuing debates over the HCFC transitional chemicals. Meaningful controls may be necessary to overcome initial inertia or preoccupation with near-term profits, and also to give a competitive boost to companies that are inclined to innovate. As German Environment Minister Klaus Töpfer (a member of the conservative Christian Democratic Union party) put it in June 1990: "I am absolutely convinced that if you give a clear cut timetable, it will stimulate industry to come up with substitutes. But if more time is allowed, I really believe they will take more time."⁵

In these circumstances, informed consumers can have a decisive influence. In the case of CFCs, aroused American consumers, through their changed purchasing habits, brought down the U.S. aerosol spray market by two-thirds in the late 1970s and thereby stimulated competi-

tive development of alternatives even before government regulations were in place. The threat of consumer boycotts against CFC aerosols in the United Kingdom, fomented by environmental groups in 1988, convinced British producers to phase out these products. Citizens of Taiwan blocked the erection of a CFC production facility in 1989. Public opinion in Germany created the conditions for the earliest phaseout of ozone-depleting substances by any major producing country—with the voluntary cooperation of private industry.

Even though large companies have substantial resources available for public relations and advertising, it becomes no longer worthwhile for them to try to resist when consumer feelings are sufficiently intense. And this same public attention can help to discourage possible temptations to evade environmental regulations, whether by exploiting loopholes or by moving production to other countries.

As it happened, the Montreal Protocol departed from the hitherto-customary accommodation of environmental regulation to commercial convenience. Rather than prescribing "best available technologies" to replace CFCs, the treaty in 1987 boldly mandated deep cuts in consumption of these useful substances with full knowledge that the technologies did not yet exist to fully achieve those reductions. The outcome was, as we have seen, an extraordinary wave of innovation. And it turned out that industry and economists had vastly overestimated the costs of solutions. By changing the rules of the market, the controls induced entrepreneurs to reexamine their familiar industrial processes, an exercise that had been unnecessary when CFCs were cheap and plentiful; in many instances, the requirement for change resulted in unexpected cost savings.

The Montreal Protocol brought change not only to industry, but also to environmental organizations. An often-overlooked legacy of the ozone negotiations was the formation of an international network of NGOs, linked by electronic media, that now regularly consult, coordinate positions, and work jointly to influence government positions on international environmental issues and negotiations. It is hard to believe that as recently as 1985 not a single environmental NGO was present at the signing of the Vienna Convention. The milestone in this development can be dated from Prime Minister Margaret Thatcher's 1989 London Conference on Saving the Ozone Layer (see page 123), which was attended by more than 90 environmental NGOs. Following this meeting, the NGOs extended their collaboration to preparations for the UN Con-

the spray market

ference on Environment and Development and to negotiations for the climate change, biodiversity, and other environmental conventions. A related element, welcomed and encouraged by NGOs from the North, was the increasing presence of their counterparts from developing countries.

NGOs became increasingly sophisticated in the negotiating process. At home, they sponsored scientific, economic, and policy research and used publications, the media, and parliamentary hearings to influence public opinion and governments. Some NGOs also organized consumer boycotts to put pressure on recalcitrant companies, or promoted demonstrations during the ozone negotiations to attract media attention; Greenpeace became a media attraction with its imaginative theatrics. At the negotiations themselves, NGO representatives buttonholed government delegates, distributed issues papers, and held press conferences, all designed to exert influence on government positions as the negotiating texts evolved. Often secretariat and government officials made use of particular data or expertise furnished by NGOs.

The commitment of environmental NGOs, both in their national context and at the ozone negotiations themselves, proved of critical importance in pushing the parties toward ever-stronger controls over ozone-depleting substances. In the final analysis, however, the enduring influence of NGOs depends on their substantive expertise rather than on showy demonstrations or emotional polemics. As the Montreal Protocol matured and most of the grand problems were solved, most environmental NGOs called it a victory and turned to other pressing issues.

It often seemed as if some of the very few NGOs remaining in the ozone negotiations had to strain to create new issues, and stretched their credibility in the process. Considering the years when 1.2 million metric tons of CFCs were finding new uses in thousands of applications and wafting up into the stratosphere, much of the recent debate seems of diminishing marginal utility. In order to keep the public's (and the media's) attention, the rhetoric has become more apocalyptic even as the danger has receded. Much of Greenpeace's recent press material, for example, relied on exploiting fear of the unknown rather than reflecting the sober, and much less sensational, scientific assessments.

This is not to deny that there are important issues remaining, particularly with respect to promoting and assisting the phaseout by the developing world, as well as the monitoring of compliance generally. Arjun Makhijani and Kevin Gurney have produced a thoughtful analysis of

what can still be done in terms of additional ODS controls, but one cannot help but wonder whether the effort is worth the cost.⁶ How much protection is enough? There are real economic and social costs, for example, of scrapping still useful capital stock, especially when the environmental benefits are nugatory. The current arguments, however sincere, represent trimming around the edges of what has already been accomplished, involving only marginal quantities of ODS—and, as the protocol's science panel has concluded, having only negligible impact on the ozone layer. Ecological perfectionism can become an industry in itself, bringing with it a danger of losing credibility and perspective in the face of environmental dangers that require more urgent attention.

Unfortunately, amid the cacophony of competing claims and data, there are no ready formulas for government policymakers to apply in achieving the right balance of risk insurance in terms of the severity of controls. A clear lesson of the ozone process is that there was no substitute for negotiators debating and analyzing alternative proposals with both industrialists and environmentalists. In the end, the negotiators had to rely on some combination of experience and instinct when it came to drawing the line. That neither industry nor environmental groups were entirely satisfied with the results at Montreal was perhaps inevitable, and may even be an indicator of a reasonable outcome.

Lessons for a New Diplomacy

The heads of the World Meteorological Organization, G. O. P. Obasi, and of UNEP, Elizabeth Dowdeswell, wrote in 1995 that "the action to defend the ozone layer will rank as one of the great international achievements of the century."⁷ Given the extraordinary nature of the danger to the planet and the extent of international cooperation mobilized, few observers would regard this statement as hyperbole.

Had there been no protocol, the expanding uses and growth in emissions of ozone-depleting substances could have induced an incredible 30 percent thinning of the protective ozone shield over heavily populated regions during the next century, with incalculable effects on human health and the environment.⁸ Recent research has indicated that, for example, in the absence of restrictions on ODS there would have been a "runaway increase" in skin cancer, up to a quadrupling of incidence by the year 2100. Even with the strengthening in 1990 and 1992 of the

original protocol, scientists estimate a peak skin cancer increase of 10 percent by the middle of the next century. This is a price that will be paid for the initial hesitancy in applying stronger measures.⁹

The experience gained from the historic ozone-protection process suggests several elements of a new kind of diplomacy for addressing such similar global ecological threats as climate change.

1. *Scientists must play a central role in international environmental negotiations.* Without modern science and technology, the world would have remained unaware of what was occurring 30 miles above the Earth, and the consequences could have been truly catastrophic. Research on the ozone layer revealed previously unrealized linkages among different scientific disciplines.¹⁰ The ozone treaty was a truly interdisciplinary effort, involving stratospheric chemists, physical chemists, meteorologists, oceanographers, biologists, material engineers, electrical and chemical engineers, soil chemists, agronomists, toxicologists, botanists, oncologists, entomologists, and more. Science became the driving force behind the formation of public policy on the ozone issue. The development of a commonly accepted body of data and analyses and the narrowing of ranges of uncertainty were prerequisites to a political solution among negotiating parties that were initially far apart. In effect, hundreds of scientists from many nations worked together with a commitment to scientific objectivity that transcended divergent national interests. In this process, the scientists had to assume new responsibilities for relating the implications of their findings to alternative remedial strategies. Close collaboration between scientists and key government officials ultimately prevailed over the more parochial and short-run interests of some national politicians and industrialists.

2. *Governments may have to act while there is still scientific uncertainty, responsibly balancing the risks and costs of delay.* By the time the evidence on such issues as the ozone layer and climate change is beyond all dispute, the damage may be irreversible, and it may be too late to forestall serious harm to human life and draconian costs to society. Politicians must therefore resist a tendency to lend too much credence to self-serving economic interests that demand scientific certainty, maintain that dangers are remote and unlikely, and insist that the costs of changing their ways are astronomical. The signatories at Montreal knowingly risked imposing substantial short-run economic dislocations even though the evidence was incomplete; the prudence of their decision was demonstrated when the scientific models turned out to have underestimated

the effects of CFCs on ozone. Governments must sponsor the needed research and act responsibly on the basis of often-equivocal results. Unfortunately, the current tools of economic analysis are inadequate aids in this task and can even be deceptive indicators; they are in urgent need of reform.

3. *A well-informed public opinion can influence hesitant politicians and private companies to act with responsibility for the environment.* The interest of the media in the ozone issue, and the collaboration with television and press by diplomats, environmental groups, and legislators, had a major influence on governmental decisions and on the international negotiations. The findings of scientists needed to be interpreted and communicated to a wider public. UNEP and WMO played important roles in disseminating information through publications and electronic media, and through other activities. Many individual governments were also particularly active in informing their constituents about the ozone science, treaty obligations, and new technologies. Informed and concerned consumers brought about the collapse of the CFC aerosol market. In their educational efforts, the proponents of ozone-layer protection—at least in the early years—generally avoided invoking apocalypse and resisted temptations to overstate their case in order to capture public attention. Exaggerated pronouncements and selective use of scientific data have a way of backfiring: damaging credibility and providing ammunition to those interest groups that want to delay action. The media have a special responsibility to educate themselves on the issues and not simply parrot conflicting claims that only confuse the public.

4. *Multilateral diplomacy, involving coordinated negotiations among many governments, is essential when the issues have planetary consequences.* The manifold activities of an international organization—the United Nations Environment Programme—were crucial in promoting a global approach to the protection of stratospheric ozone. UNEP coordinated research, informed governments and world public opinion, and played an indispensable catalytic and mediating role during the negotiation and implementation of the protocol. Other intergovernmental organizations, including WMO, the World Bank, UNDP, UNIDO, the Global Environment Facility, and the World Health Organization, were also drawn into varied aspects of the ozone-protection process. The Montreal Protocol itself generated an institutional structure of subsidiary bodies and committees that supported the decision-making responsibilities of the parties. Because of the large number of countries participating in the international

environmental negotiations—often more than 120 delegations—it is essential to have an effective secretariat and chairperson. A major role in such negotiations is played by regional or interest groups: loose associations of states, generally like-minded, that meet regularly during a negotiation to exchange ideas, resolve differences, and attempt to hammer out coordinated positions; examples include the “Toronto Group” in the early ozone negotiations; the OECD industrialized countries; the “Group of 77 and China” (actually more than 130 developing nations); the 15-nation European Union; the Arab states; Nordic nations; and regional groupings from Africa, Asia, eastern Europe, and Latin America.¹¹

5. *Strong leadership by a major country can be a significant force in developing international consensus.* The U.S. government early on reflected its concerns over the fate of the ozone layer by stimulating and supporting both American and international scientific research. Later, convinced of the dangers, it undertook coordinated diplomatic and scientific initiatives to promote an ozone-protection plan to other countries, many of which were initially hostile or indifferent to the idea. As the largest emitter of both ozone-destroying chemicals and greenhouse gases, the United States has great potential to influence the policy considerations of other governments in favor of environmental protection. In fact, because of the geographic size and population of the United States, its economic and scientific strength, and its international interests and influence, progress in addressing global environmental problems can probably not be achieved without American leadership. However, in the modern world, no single country can prevail; alliances must be forged, in particular between North and South. The European Union can also be an important force, although it has had problems forging and holding internal consensus among its 15 member nations.

6. *It may be useful for a leading country or group of countries to take preemptive environmental protection measures even in advance of a global agreement.* When influential governments make such a commitment, they legitimize change and thereby undercut the arguments of those who insist that change is impossible. Preemptive actions can also support moral suasion in encouraging future participation by other countries. In addition, action by major countries can slow dangerous trends and hence buy time for negotiations and for development of technological solutions. The 1978 U.S. ban on aerosols both relieved pressure on the ozone layer and lent greater authority to the government when it subsequently campaigned for even more stringent worldwide measures. Although en-

vironmental controls might conceivably harm a country's international competitiveness in the short run, they may also, by stimulating research into alternative technologies, give that country's industry a head start on the future. Pioneer countries—and companies—that adopt more stringent controls can provide valuable experience for others who follow on the same path; this has been an important factor in aiding developing countries to reduce their dependence on ODS.

7. *The civic sector—including citizens' groups and private industry—has a crucial role in the new diplomacy.* The activities of both environmental organizations and private industry in undertaking research, lobbying governments, and influencing public opinion significantly affected the international debate on the ozone issue. A major by-product of the ozone negotiations was the development of closer relations among hitherto-separated environmental groups around the world, reflected in their cooperation at environmental treaty negotiations and conferences in the last decade. Environmental organizations can also play an informal watchdog role in monitoring compliance by governments and industry with internationally agreed commitments. For their part, entrepreneurs are becoming aware that their corporate image is increasingly affected by environmental issues. The intellectual and financial resources of the private sector are, moreover, essential for developing the necessary technological solutions. The ozone process was in fact characterized by an unparalleled degree of collaboration among industry, environmental groups, governments, and international organizations; wide-ranging joint activities included cooperation in research and development of alternatives, participation in the protocol's technical panels, and providing information and technologies to developing countries.

8. *Economic and structural differences among countries must be equitably reflected in an international regulatory regime.* In the longer run, the developing countries, with their huge and growing populations and needs, could undermine efforts to protect the global environment. For many developing countries, the Montreal Protocol provided the first intensive exposure to environmental problems, leading to a sensitization of both private and public sectors and the development of capacity to deal with other environmental challenges. As a consequence of the ozone issue, a North-South bargain was struck that set an important precedent for future environmental accords: the richer nations for the first time acknowledged a responsibility to help developing countries to implement needed environmental policies without sacrificing aspirations for im-

proved standards of living. The Montreal Protocol broke new ground with its uniquely balanced voting procedures and with the Multilateral Fund's concepts of incremental cost funding and partnership between the World Bank and UN agencies; the MLF itself became a model for the Global Environment Facility and for financial mechanisms in the climate change and biodiversity conventions. The protocol was the first global experiment in environmental technology transfer, served by a network of formal consortia and informal connections involving governments and enterprises, reinforced by UNEP's extensive clearinghouse activities. The explicit linkage between developing countries' performance and their receipt of adequate financial and technical support was another innovative feature. Finally, the noncompliance procedure was the first to be tested in a global environmental treaty, and its sensitive handling of the CEIT issues demonstrated the equitable but effective functioning of the system.

9. *The effectiveness of a regulatory agreement is enhanced when it employs market incentives to stimulate technological innovation.* Technology is dynamic and not, as some industrialists have seemed to imply, a static element. But left completely on its own, the market does not necessarily foster the right technologies to protect the environment. Although in 1987 the ozone protocol set targets that were initially beyond the reach of the existing best-available technologies, its goals were in fact achievable for most of industry—thereby averting monolithic industrial opposition that might have delayed international agreement. The Montreal Protocol was not a “radical” treaty, as some ideologues have suggested: on the contrary, it was an expression of faith in the market system, in the system's ability to respond to incentives. The treaty actually stimulated collaboration among otherwise competing companies in research and testing that saved both time and money in the development of replacement technologies. By expeditiously getting the protocol established in international law in 1987 even with a 50 percent reduction target, the negotiators effectively signaled the marketplace that research into solutions would now be profitable—thus setting the stage for the later decisions for phaseout. For one substance and application after another, as the technology advanced, the opposition to stronger controls inevitably receded. Policymakers must be careful not to convey vague or ambiguous signals, as appeared to be happening on the HCFC issue, which could heighten uncertainty and undermine industry's confidence in the regime.

10. *The signing of a treaty is not necessarily the decisive event in a negotiation; the process before and after signing is critical.* It was extremely important to separate the complicated ozone-protection issue into manageable components. The informal fact-finding efforts during 1985 and 1986 and again after the treaty entered into force—workshops, conferences, consultations—established an environment conducive to building personal relationships and generating creative ideas, and thereby facilitated the formal negotiations. During the negotiations themselves, the use of small working groups and a single consolidated text (prepared by a legal drafting group) fostered the gradual emergence of consensus. The developments following the 1987 signing illustrated the wisdom of designing the treaty as a flexible instrument. By providing for periodic integrated assessments—the first of which was advanced from 1990 to 1989 in response to the rapidly changing science—the negotiators made the accord adaptable to evolving circumstances. In effect, the protocol became a dynamic process rather than a static solution. A guiding principle throughout was to send the right signals—and avoid the wrong signals—to industry as well as to the contracting parties themselves. Hence the Meeting of Parties and its associated institutions interpreted the treaty flexibly while not doing damage to the fabric of its obligations, as manifested in the actions on essential-use nominations, MLF issues, the CEIT problems, and data reporting. The delicate interplay between the Meeting of Parties and the various expert panels was an important factor in the protocol's success.

11. *Firmness needs to be combined with pragmatism to achieve diplomatic success.* The proponents of strong controls in 1987 refrained from extreme positions but never relented in their pressure for a meaningful treaty. They did not insist on perfect solutions that might have unnecessarily prolonged the negotiations. Nor did they wait for universal participation, or even for agreement on future steps among all potential major players. Instead, they achieved an interim solution with built-in flexibility that could, on the basis of scientific and technological developments, serve as a springboard for future action. The 1987 protocol deliberately did not attempt to predetermine every future step: many issues were marked but left open for future resolution, including the financial mechanism, trade measures, and noncompliance procedures. In subsequent stages of the protocol, whenever there were large disagreements among the parties, every attempt was made to reach consensus rather than to bludgeon the minority; a useful and repeated technique was for the parties to com-

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mission studies, gradually building up the weight of scientific and technical analysis and illuminating the policy options. When differences remained, instead of postponing any action the treaty moved forward with modest short-term steps (as in the methyl bromide freeze), which set the stage for stronger future actions. The important thing was to maintain momentum and get started on the right track—a characteristic of the Montreal Protocol from its creation.

12. *Individuals and imponderables can make a surprisingly significant difference; not every element of a successful negotiation can be predicted and pre-planned.* UNEP's Mostafa Tolba provided overall personal leadership throughout the critical phases leading up to the 1987 agreement and the substantial revisions at the London and Copenhagen Meetings of Parties. He initiated critical consultations with key governments, private interest groups, and international organizations. During the negotiations, he moved from group to group, arguing for flexibility, applying pressure, often floating his own proposals as a stimulus to the participants. Individual scientists, negotiators, environmentalists, and industry officials also provided ideas, decisions, and actions that proved vital to the final outcome. A few political scientists have tried to construct elaborate, engineeringlike models of the environmental negotiations (press *this* button and *that* will happen). Real negotiations are, however, both richer and more treacherous than academic models. One can offer some "lessons," as this list of a dozen items attempts to do; but even if the lessons are applied, things may still not work out. Impasses are not always resolved. Like it or not, a lot in life still depends on the right people being in the right place at the right time—and also on Fortuna.

Toward Action on Climate Change

The relevance of the ozone treaties was not lost on the international community as it turned to address the issue of climate. In the summer of 1987, while preparing for the conclusive negotiation in Montreal, I recommended that the United States take an initiative to establish a formalized international scientific assessment of climate change, similar to what we had done on the ozone issue. Before then, scientific pronouncements on climate had emanated from a relatively small body of excellent but largely self-selected scientists under the aegis of WMO and UNEP, called the Advisory Group on Greenhouse Gases, that had originated in

the 1985 Villach meeting. My feeling was that the subject would gain more credibility and influence if a larger, more diverse group of scientists was given responsibility *under intergovernmental auspices* to coordinate systematic research, including assessment of feasible response strategies.

During U.S. interagency discussions and consultations with NGOs on this idea, I found unfamiliar allies and opponents. Within the Reagan administration, some of the same officials who a few weeks earlier had unsuccessfully tried to change the U.S. ozone position and remove me from the negotiation leadership (see Chapter 5) now endorsed this proposal, viewing it as a way for the government to have more control over the science. Conversely, some environmental groups opposed the initiative, fearing that governments would subvert the process and distort the findings for political reasons. My own belief, strongly based on the ozone experience, was that the scientists would not permit themselves to be influenced by transitory political or commercial considerations of their governments, and that, in fact, the governments were more likely to be co-opted by the science than vice versa.

Others shared the idea, and the Intergovernmental Panel on Climate Change (IPCC) was created in 1988. As it turned out, governments could not prevent the scientists from pursuing their independent and sometimes politically uncomfortable conclusions. Drawing on the ozone experience, the IPCC became a continuing process of roundtables and workshops involving hundreds of scientists and experts from many nations, organizations, and industries in a productive, informal mode of fact-finding, analysis, and debate. (Coming full circle, the parties to the Montreal Protocol later directed its own assessment panels to offer to work with IPCC and subsidiary bodies of the climate convention.)¹²

In December 1990 the United Nations General Assembly established the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change (INC), aiming at a treaty that could be signed at the 1992 UN Conference on Environment and Development in Rio de Janeiro. Because of the scope and politics of the climate issue, the INC was a creature of the General Assembly rather than of UNEP, and a separate secretariat was established with headquarters in Geneva (moved in 1996 to Bonn).

Five negotiating sessions were held over the ensuing 17 months, a fast timetable by any standard of diplomacy, particularly considering the complexity of the issues. These were big negotiations, involving an average of 120 governments (approximately 90 from the South), plus more

than 40 observers from industry and from environmental and civic groups.¹³

The negotiations were very difficult, as greenhouse gas emissions were inextricably linked with energy, industrial, agricultural, and transportation policies—the very foundations of modern economies, North and South. Because of the many interconnected aspects of the problem, there were no quick and easy solutions: it would be necessary to take actions on many fronts that could involve substantial changes in the ways people lived, worked, and consumed. Nations would need to reduce their dependence on fossil fuels, which accounted for more than half of greenhouse gas emissions from human activities. Agricultural practices that caused emissions of nitrous oxide and methane would have to be modified. Measures would also have to be taken to halt the massive destruction of forests, which not only released carbon dioxide into the atmosphere but also diminished a major natural sink for absorbing carbon dioxide from other sources. Since most forest destruction was related to the needs of poor people in the developing countries, issues of poverty and population growth were also crucial to climate change.

Widely varying national interests had to be reconciled in the climate negotiations. Regions and countries differed considerably in their probable vulnerability and in their ability to adapt to climate change. Generally, the prospects were least favorable in already ecologically fragile and poor parts of the world, notably arid areas of Africa, parts of South America and southeast Asia, and low-lying island states that were threatened by a rise in sea level. Indeed, the climate negotiations stimulated the formation of a new bloc in the United Nations, a group of about 40 countries comprising the Alliance of Small Island States (AOSIS).

The heavily industrialized North, including the economies in transition in central and eastern Europe, were the major emitters of greenhouse gases, particularly carbon dioxide from fossil fuels. But within this group there were also major differences in industrial structure that influenced respective national positions on controls. For example, the United States, eastern Europe, Russia, and Australia were heavily dependent on coal; Norway, Australia, and other developed countries were major coal exporters. New Zealand, with a large sheep population, was concerned about controls on methane emissions. The United States, with its powerful coal, oil, and transportation sectors, was the main opponent to early and strong limits on carbon dioxide emissions.

Among the developing countries, AOSIS and many African countries joined some European nations in advocating strong greenhouse gas controls. China, with 1.2 billion people on a fast trajectory of economic growth, possessed roughly one-third of the world's coal reserves, an energy source it was not likely to willingly forgo in the absence of economical options. Other rapidly industrializing countries, such as Brazil, India, and Mexico, shared similar perspectives on energy use. Countries with large forests, including Brazil, Indonesia, Malaysia, and Zaire, were wary of the North imposing limitations on how they could use their national patrimony. And the members of the Organization of Petroleum Exporting Countries (OPEC), led by Saudi Arabia and Kuwait, worked together with well-organized oil and coal interests of the North to obstruct and weaken the climate negotiations at every turn.

Nevertheless, the United Nations Framework Convention on Climate Change (FCCC) was signed on schedule in Rio and has since been ratified by approximately 160 nations. Some observers and journalists were disappointed that the FCCC did not impose stringent controls on carbon dioxide and other greenhouse gases similar to what the Montreal Protocol effected for ozone-depleting substances. However, contrary to conventional wisdom, the climate convention was actually a much stronger agreement than its analogue framework treaty on ozone, the 1985 Vienna Convention. Whereas the Vienna Convention was limited to cooperation in research and exchange of information on the ozone layer, and did not even contain any mention of CFCs, the FCCC embodied commitments to reduce greenhouse gas emissions, with specific reference to carbon dioxide. Certainly the American coal and oil interests and anti-environmental ideologues, who had opposed the negotiations every step of the way, clearly understood what had happened and were furious with the Bush administration for its last-minute concessions.

A number of elements testify to the comparative strength of the FCCC as a "framework convention"; the term itself clearly implied that further actions, presumably more specific and stronger, would follow, as the Montreal Protocol had followed the Vienna Convention. Perhaps most significant was the FCCC's "ultimate objective," against which all actions would be measured: "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (article 2). The precautionary principle was also prominent as a guiding principle of the convention: "Where there are threats of serious or irreversible damage,

lack of full scientific certainty should not be used as a reason for postponing such [precautionary] measures . . ." (article 3.3).

What made the FCCC totally different from the Vienna Convention, however, were commitments by industrialized countries to limit greenhouse gas emissions. The operative clauses were cloaked in creative ambiguity for purposes of diplomatic face-saving for the United States, which had held out for a weaker treaty. But each industrialized country was required to "adopt national policies and take corresponding measures" that would "aim" at returning anthropogenic emissions of carbon dioxide and other greenhouse gases not already controlled by the Montreal Protocol (CFCs and HCFCs) to 1990 levels by the year 2000 (articles 4.2a and 4.2b). While the sensitive words "target" and "timetable," anathema to the United States at that time, were avoided, the effect was the same.

By way of reinforcement, the treaty also required rigorous reporting on these national measures and their results (article 12). Perhaps most important, there will be periodic reviews of the "adequacy" of these commitments "in the light of the best available scientific information" (article 4.2d) and a procedure for amending them (article 15). Taken together with additional clauses dealing with financial assistance and technology transfer, data reporting, research, education, and public awareness, the FCCC was, like the Montreal Protocol, clearly conceived as a dynamic long-term process.

At the First Conference of the Parties to the FCCC in Berlin in March–April 1995, the parties were compelled by the "best available scientific information" to agree that the article 4 industrialized-country commitments were inadequate because they would not achieve sufficient progress toward the convention's ultimate objective. However, the parties could not agree on new actions to prevent or minimize climate change. Since the fanfare at Rio, the countries of the North had learned that reducing fossil fuel emissions was more difficult and complicated than many had anticipated. Indeed, many industrialized countries—including the United States—were, despite earnest efforts, not expected to reach the article 4.2 "aim" of returning to their 1990 emission levels by the end of the decade.

The main reason for this situation was not a lack of technical means, or even the prospect of unacceptable short-term costs at this stage. Rather, it was based on political difficulties.¹⁴ Most politicians, businessmen, and the general public simply did not share the judgment that

immediate stronger measures were needed to address the potential future danger of climate change. Despite concerted efforts at public education, climate change was not a high priority either in most industrialized or in most developing countries.

Underlying this implicitly low-risk evaluation was a complex of uncertainties and concerns. On the scientific side, most people seemed prepared to accept the greenhouse theory as well as the IPCC's considered judgment in 1995 that there was now a "discernible human influence on climate change."¹⁵ However, there remained considerable imprecision and controversy in scientists' predictions of possible future adverse consequences, notably regarding the severity, timing, and regional and local impacts. Some regions, such as Siberia, might even benefit from a warming trend.

Concern over climate change among the general public in the United States reached a zenith during the recordbreaking heat wave in the summer of 1988, but when the calamities were not repeated in subsequent years, attention waned. Notwithstanding warnings of scientists, the subtleties of long-term, slow-moving temperature trends, with movements occurring both above and below the trend line, did not generate a sense of crisis or urgency. The powerful industry opponents of action capitalized on this situation with well-organized publicity campaigns, which created intense mistrust and polarization. Public opinion was assailed and ultimately confused by exaggerated claims and distortions of the science on both sides of the issue. In the absence of clearly life-threatening consequences, public apathy prevailed. This condition was unlikely to change absent some dramatic climatic event or catastrophe. The prospect of milder winters in the northeastern United States did not occasion alarm.

Political opposition to stronger actions was also conditioned by economic considerations. As energy use was pervasive, there was uncertainty about the costs of limiting greenhouse gas emissions at different levels in terms of possible implications for growth, employment, and international competitiveness, along with impacts on specific industrial sectors and regions. Concerns about energy security and the availability of domestic fossil fuel energy sources were additional factors. There were also analytical gaps and uncertainties about the effectiveness of any given policy measure or instrument; for example, what amount of carbon or energy tax would produce what reduction in carbon dioxide emissions? In addition, it was not yet known what level of atmospheric

greenhouse gas concentrations might constitute “dangerous anthropogenic interference with the climate system”—in other words, how much further could concentrations rise and remain consistent with the convention’s article 2 ultimate objective? Such lacunae diminished the perceived urgency of short-term preventative measures.

A further limiting factor to stronger international action was the growing awareness of structural differences among the industrialized countries in their ability to implement greenhouse gas commitments. Such differences included stage of development, industrial base, intensity of energy use, domestic availability of fossil fuel and alternative energy sources, geography, and “starting point” in terms of already achieved energy efficiency. All these factors made international comparisons and allocation of responsibilities very difficult and served to complicate the negotiations.

Notwithstanding all the difficulties and the absence of leadership by either the European Union or the United States, the 1995 Berlin Conference of Parties was rescued from stalemate—and the future course of the convention dramatically influenced—by some of the least powerful states in the United Nations, aided by a hardworking coalition of NGOs from North and South. The AOSIS countries, finally joined by the rest of the developing world (save for some OPEC members), were finally able to persuade the OECD nations to agree on a “Berlin Mandate” that established a process and a timetable for negotiating further actions.

The Berlin Mandate required the annex I parties (industrialized countries) to “elaborate policies and measures” and “set quantified limitation and reduction objectives within specified time-frames, such as 2005, 2010 and 2020,” for their anthropogenic emissions of greenhouse gases. The process would be conducted by an open-ended working group, aiming for the adoption of a “protocol or other legal instrument” at the December 1997 Third Conference of Parties in Kyoto.

Following the Berlin conference, several inconclusive months of further negotiations were marked chiefly by obstructing tactics by Saudi Arabia, Kuwait, and other OPEC states, and by temporizing on the part of several industrialized nations, notably Australia, Russia, and the United States. Events took a surprising turn, however, at the Second Conference of Parties in Geneva in July 1996. In an unexpected policy reversal, U.S. Under Secretary of State Timothy Wirth announced support for a legally binding agreement to lower greenhouse gas emissions. The United States remained vague on the magnitude of reductions and

placed great emphasis on devising a system of internationally tradable emission permits, which many observers believed would prove too complicated to be workable. Encouraged by the movement, however, the EU returned to the next session in December 1996 with a formal proposal for carbon dioxide emission reductions by 2010.

It is noteworthy that the developing countries, in contrast to the ozone history, have steadfastly refused to consider any limitation of their own rapidly rising greenhouse gas emissions. Certainly the industrialized countries will have to demonstrate credibility by implementing meaningful controls, as they did under the Montreal Protocol, before they can expect reciprocity from the South—and in addition there will be a need for effective mechanisms for financial aid and technology transfer, as in the ozone treaty.

Against this background of complexity, uncertainty, and frustration, some observers have contended that the ozone experience has little relevance to the climate convention. Especially to apologists of inaction on the climate front, the Montreal Protocol can be portrayed as either too simple or not replicable. But although it is obvious that the climate change issue is more complicated and difficult than that of the ozone layer, the differences are quantitative rather than qualitative.

With the benefit of hindsight, the Montreal Protocol seems to have acquired an aura of inevitability. For those who were not actually involved, there is a tendency not to remember how difficult it actually was to reach an agreement in 1987 to control ozone-depleting substances. One forgets that, like climate change, ozone also was a long-term global issue fraught with unproven theories and scientific controversies. One forgets the persistent uncertainties, the absence of evidence of either ozone-layer destruction or increased ultraviolet radiation at Earth’s surface. One forgets the political opposition to controls by the European Community, Japan, and the Soviet Union, a phalanx so powerful that CFCs could not even be mentioned in the 1985 Vienna framework convention. One forgets the hostility of the scores of industries producing or dependent upon CFCs and halons, from chemicals to plastics, from transportation to food processing. One forgets the lack of alternatives to the ubiquitous CFCs in thousands of applications across the economy. The success of the Montreal Protocol was definitely not foreordained; there were problems and pitfalls every step of the way.

The climate convention negotiations have already benefited in many ways from the ozone experience: the use of independent scientific as-

Southern
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history

assessments, the periodic reviews of commitments, the “peer review” of detailed national reporting, the differentiated responsibilities between North and South, the provisions for financial assistance and technology transfer. Perhaps the outstanding difference at the present time is the fact that much of the industrial sector, dominated by fossil fuel producers and motor vehicle manufacturers, has simply refused to enter the process in a constructive manner. Represented by the Global Climate Coalition, and in alliance with Saudi Arabia and Kuwait, this part of industry has deliberately and skillfully tried to obstruct any movement toward meaningful controls. This stance contrasts starkly with the genial role played—after initial opposition—by the Alliance for Responsible CFC Policy and the many firms that engaged themselves in the ozone history with a confident spirit of entrepreneurial innovativeness.

A relatively heartening development is the evolution of a small but perceptible countermovement in the industrial sector. Companies engaged in renewable energy systems (solar, wind, biomass), appliance manufacturers, public utilities, and natural gas producers have joined in business councils for sustainable energy recently established in Europe, the United States, and Australia and have endorsed greenhouse gas emission controls. Significantly, a consortium of some 60 international insurance companies, concerned about the growing incidence of extreme weather events, has also joined those governments and NGOs calling for stronger action to mitigate climate change.

The lessons outlined earlier in this chapter are applicable to the climate change negotiations but are no guarantor of success. At the present juncture, the best recommendation for the climate negotiators would be to cut through the complexities and without further delay adopt some initial quantitative target, however modest. A target, any target, will provide experience and can always be adjusted. It is essential, as in the Montreal Protocol, to send unambiguous signals to the market in order to stimulate competition, innovation, and decisions to invest in less carbon-intensive technologies. But emission reduction targets alone will not be sufficient to accomplish this. If targets are set unrealistically high, for example, they may encourage resistance and noncompliance or may inhibit key nations from ratifying the protocol. Targets must in any case be complemented by policies to create the conditions for a technology revolution in energy similar to that which occurred for ozone-depleting substances. Only in this way can market forces be mobilized to work to diminish fossil fuel use and to expand sinks for carbon dioxide (for example, through reforestation).

Governments should not be overwhelmed by the fact that energy affects all sectors of the economy. All sectors are not equally important. It could be advantageous to disaggregate and concentrate on the most important energy users, such as transportation, heating, and energy-intensive industries. Quantitative targets could be complemented by “no regrets” policies that generate other benefits besides reducing greenhouse gases; examples include energy conservation, reducing dependence on imported fossil fuels, and more efficient burning of coal. Other feasible policy instruments toward emissions reduction include removing subsidies (both direct and indirect) for fossil fuels, increasing research and fostering market expansion for renewable energies, raising energy efficiency standards, changing government procurement policies to promote energy conservation and alternative energies, and enacting a small but gradually rising energy tax.

The negotiators should not lose sight of the fact that their ultimate objective is the stabilization of greenhouse gas *concentrations* at a reasonable level (still to be scientifically determined) sometime before 2100. A given concentration is determined by cumulative (rather than year-by-year) emissions and therefore may be reached by alternative trajectories of emission reductions. One could start with steep reduction targets—20 percent or more—as many environmental NGOs are proposing, but this strategy appears to be politically unacceptable to many key governments, which fear prohibitive costs due to a need for premature scrapping of existing long-term capital stock of both energy suppliers and energy users (for example, power plants, transportation, buildings). Alternatively, major emission reductions could be delayed in order to permit a technology transformation that could be introduced gradually as old facilities expire; this approach would lower costs but would require much steeper emission reductions in future years in order to attain the desired concentration level. Flexibility in the timing of emission reductions under a climate protocol could thus substantially reduce the costs of mitigating climate change. While such a delay is politically tempting, it is environmentally justifiable only if it is not used as an excuse for a do-nothing policy.

The current climate protocol negotiations are marked by hesitancy on the part of major present and potential future emitters of carbon dioxide, notably the United States, Russia, China, and India, to commit to significant near-term emission reduction targets, mainly from fear of adverse economic implications. At the opposite pole, represented by some northern European countries, AOSIS, and the environmental NGOs, is

an implicit assumption that reasonably priced carbon-free technology will automatically follow stringent requirements. Both positions carry serious environmental risks.

Researchers at the Battelle Pacific Northwest Laboratory in the United States have suggested that a technological transformation strategy may be explicitly integrated in the climate protocol, aimed at both developing and diffusing advanced low-carbon-intensive energy technologies. In the absence of a technology research strategy, there is little prospect that politically negotiated emission reduction targets alone can achieve stabilized greenhouse gas concentrations at a level that would avoid significant climate disruption. Battelle scientists point to several areas of basic and applied research—molecular, biological, chemical, materials, engineering, carbon sequestration—that have the potential for breakthroughs in energy supply and demand that could significantly reduce future carbon emissions. A technology research strategy would focus on a range of potential research investment options in light of regional energy projections, and would include an appraisal of the most efficient use of the existing fossil fuel resource base as a bridge to a lower carbon economy. Current world funding for research in energy and related fields is, however, at a derisory level. It would be essential for the strategy to be implemented through public-private partnerships in basic and applied research and technology diffusion; research efforts could be pooled in public-private consortia similar to the experience of the ozone treaty, but on an expanded scale.¹⁶

Like the Montreal Protocol, the climate convention already has the built-in flexibility to reexamine and gradually ratchet up the stringency of commitments on the basis of periodic scientific, economic, and technical assessments. The situation is far from hopeless, if the political will is present. The measures need not be draconian: the important thing is to get started—as we did in Montreal.

Global Stewardship

Mostafa Tolba has described the Montreal Protocol as “the beginning of a new era of environmental statesmanship.”¹⁷ Yes, it was, even though most other global environmental initiatives have not yet achieved similar fruition. When the Vienna Convention in 1985 set the stage for the Montreal Protocol, we could never have imagined the multiplicity of

environmental conferences, negotiations, and workshops that lay ahead. We did not foresee the transformation of governmental bureaucracies to focus more attention on the environment, and the creation of special ambassadors for environmental negotiations. There was no indication of the expanding scope of national reporting to freshly created international secretariats, the growing influence of citizens' groups, the surge of industrial innovation in environmental technologies.

The protocol's influence was perceptible in the 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes; the establishment in 1991 of the Global Environment Facility; the 1992 UN Conference on Environment and Development and its offshoots, Agenda 21 and the Commission on Sustainable Development; the 1992 Framework Convention on Climate Change; the 1992 Convention on Biological Diversity; the 1993 UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks; the 1994 UN Conference on Sustainable Development of Small Island Developing States; the 1994 Convention to Combat Desertification; the 1994 International Conference on Population and Development; and numerous intergovernmental working groups on such subjects as sustainable forest management, land and water resources, economic instruments, and biotechnology. These were not one-shot events, but rather constituted ongoing institutional arrangements and continuing negotiations to appraise the effectiveness of commitments made and to address evolving conditions. Taken together, they represent a system for international environmental governance.

The story of the ozone treaty reflects the new reality that nations must work together in the face of global threats, because if some major actors do not participate, the efforts of others will be vitiated. The process of arriving at the Montreal agreement, and the developments that followed its signing, represented new directions for diplomacy, involving unconventional emphasis on science and technology, on market forces, on equity, and on flexibility. For all of this, the Montreal Protocol should prove to be a lasting model of international cooperation.

In the realm of international relations, there will always be resistance to change, and there will always be uncertainties—political, economic, scientific, psychological. The ozone protocol's greatest significance, in fact, may be as much in the domain of ethics as environment: its success may help to change attitudes among critical segments of society in the face of uncertain but potentially grave threats that require coordinated action by sovereign states. The treaty showed that even in the real world

of ambiguity and imperfect knowledge, the international community is capable of undertaking difficult cooperative actions for the benefit of future generations. The Montreal Protocol has proven to be the forerunner of an evolving global diplomacy, as nations seek ways of accepting common responsibility for stewardship of the planet.

Against this multifaceted background, it may not be fanciful to imagine that in future eras the story of the protection of the ozone layer might acquire almost a mythic character. Certainly there has been nothing like it before or since. The elements of mythology were there: a mysterious and remote phenomenon that threatened life on Earth; the sheer good luck that led pioneering scientists to follow their curiosity, bringing at first derision and, two decades later, for three of them, the Nobel Prize; an ideal chemical, finding ever more uses, that turned out to be a subtle menace to life; a diplomatic struggle that ended in unprecedented international cooperation and helped to inspire the launching of a new system of global environmental governance. The "spirit of the protocol," often invoked by participants in this process, reflected genuine feelings of solidarity and partnership to protect the ozone layer, in what was regarded as a noble and historic global movement.

Perhaps the most poignant image of our time is that of Earth as seen by the space voyagers: a blue sphere, shimmering with life and light, alone and unique in the cold blackness of the cosmos. From this perspective, the maps of geopolitics vanish, and the underlying interconnectedness of all the components of this extraordinary living system—human, animal, plant, water, land, and atmosphere—becomes strikingly evident. This realization must determine the global diplomacy of the future.

Chronology

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OZONE
Diplomacy

New Directions
in Safeguarding the Planet

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Richard Elliot Benedick

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