Montreal protocol: mitigating ozone depletion through science and global unity es...

Business, Industries

Montreal Protocol: Mitigating Ozone Depletion through Science and Global UnityThe implication of ozone depletion is among the most devastating occurrences that have been successfully mitigated and prevented because of science and global cooperation. This has been made possible because of the Montreal Protocol, an international treaty that sought to address the issue of the depleting ozone layer.

The success of the Montreal Protocol in addressing an environmental issue is apparent in many ways including it being widely proposed for imitation in approaching other international environmental problems and the major decline in the use of ozone depleting substances. This paper is an effort to describe how the Montreal Protocol has been successful in mitigating the effects of an environmental issue through science and global cooperation. An analysis of the costs, risks and benefits of the treaty is also herein given so as to show how the treaty has remained to be cost effective in its effort to address the issue on ozone depletion. BackgroundThe breakthrough in the global concern over the depletion of the ozone layer was founded on two scientific studies: the 1970 study of Paul Crutzen who argued that the nitrogen oxides from fertilizers and supersonic aircraft can deplete the ozone layer; and that of Frank Sherwood Rowland and Mario Molina who hypothesized that the compound Chlorofluorocarbon (CFC) used in the production of plastic foams, and for coolants in refrigeration and air conditioning systems has a potential to destroy the ozone layer. According to them, CFC is so inert that they can survive in the atmosphere and reach the stratosphere where CFC molecules can be broken down by ultraviolet radiation. This would result to a release of chlorine atoms which, in turn,

would destroy large amounts of ozone molecules aggregately referred to as the ozone layer. “ Montreal Protocol”

page_#2The Ozone Depletion ProcessThe depletion of the ozone begins when ozone depleting substances (ODS) such as CFCs, HCFCs, halons, methyl bromide, carbon tetrachloride, and methyl chloroform are released into the atmosphere. These compounds are so stable they can survive in the atmosphere and reaches the stratosphere after several years.

Strong ultraviolet light in the stratosphere decomposes the ODS molecules releasing chlorine atoms or bromine atoms. Chlorine atoms and bromine atoms that were released during the decomposition of the ODS molecules then destroys the ozone layer. Since the ozone layer absorbs most of the ultraviolet-B (UV-B) radiation from the sun, the depletion of the ozone layer would have dangerous health, environmental and economical implications.

Figure 1 illustrates the process of the ozone depletion. Figure 1. Ozone Depletion Process. Source: “ The Process of Ozone Depletion”. US Environmental Protection Agency (EPA) “ Montreal Protocol”

page_#3The Birth of the Montreal Protocol The Rowland- Molina study, which was published on the journal Nature on June 28, 1974, paved way to further studies and in 1976, the National Academy of Sciences finally confirmed their hypothesis. By early 1980’s some countries, including the United States and Canada are already exerting their efforts to

mitigate the use of the CFC including imposing ban on the non- essential uses of the compound.

National efforts, however, are not enough in that the use of ozone depleting chemicals is on a global scale, and it entails a global effort to reduce the use of the ozone depleting substances. To attain this objective, an agreed international effort became necessary. Thus resulting to international negotiations and agreement that evolved into the Montreal Protocol on Substances that Deplete the Ozone Layer, " the first concrete international measure to control ozone-depleting chemicals" (Parson, 2003). According to Clark (1996), " One of the chief elements repeatedly identified as a source of the Protocol's success is its foundation in science". The study conducted by Rowland and Molina had such a significant impact not only in the making of the regime but also in its success. The precautionary principle in the Montreal Protocol has been founded on scientific studies that anthropogenic substances such as the CFCs cause the depletion of the ozone. As more " alarming" findings emerged from other studies that backed up the Rowland-Molina contentions, international cooperation and commitment to protect the ozone also increased. For example, the findings regarding an ozone hole above the Antarctica created a public concept of a looming global ozone crisis and thus, accelerated intergovernmental negotiations to concretely regulate ozone depleting chemicals.

Through science, the public has been informed that ozone depletion can result to damage to agriculture and fisheries, and health risks. Science has mobilized public opinion on the dangers of a thinning ozone layer and thus,

governments become pressured to take action.“ Montreal Protocol”

page_#4Science has also made possible the measures demanded by the Protocol in that it has sought to find alternatives to the ozone depleting substances. The importance of science in the Montreal Protocol is that the regime itself is a science and as such, it “ established the need for international action, impels international action, and contributes to the discovery of alternatives to CFCs” (Clark 1996). The Objectives of the Montreal ProtocolThe initial objectives of the Montreal Protocol is to control and to regulate the phase out schedule of eight substances, five CFCs (numbers 11, 12, 113, 114, and 115) and three bromine compounds (halons 1211, 1301, and 2402). The treaty embodies a framework in that in ten years and through three stages, the production and consumption of the CFC’s have to decrease to 50 percent of its 1986 level while, following the unavailability of relevant substitutes, the production and consumption of halons would be halted for three years with few essential exceptions. Figure 2 illustrates the phase out schedule of developed countries for CFCs under the Montreal Protocol and other US and European regulations. Developing countries have been given an additional 10 -year period to reach compliance.

CFC Phase out Schedules: Allowed Productionand Consumption for Developed Countries(percent of baseline)1987Original Montreal Protocol1990London Montreal Protocol1992Copenhagen Montreal Protocol1990U. S. Clean Air Act Amendments1994European Community

Schedule199019911992199319941995199619971998199920001 00%100%100%80%80%80%80%80%80%50%50%100%100%80%80%50%50%15%15%15%0%25%25%0%85%80%75%25%25%0%50%15%0%Figure 2. CFC Phase out Schedules: Allowed Production and Consumption for Developed Countries (percent of baseline). Source: Alternative Fluorocarbons Environmental Acceptability Studies (AFEAS)“ Montreal Protocol”

page_#5Impact of the Montreal ProtocolThe Montreal Protocol, to date, has been able to minimize the production and use of ozone depleting chemicals, which has fallen 95 percent from its peakin the late 1980s and continues to decline (Parson 2003).

Although a wide opening in the ozone layer still exists, scientists have already predicted that it will heal, unless some newer threats prove too serious (Driesen 2002). The regime is also a success in terms of global participation in that according to a 2006 report on the status of ratification, 189 countries are already parties to the Montreal Protocol. According to Kretzmann (1994), the political turning point in the Montreal Protocol negotiations is largely attributed to the chemical industry’s endorsement of the treaty. The industrial participation paved way for the evolution and funding of the Protocol in that the chemical industry made available to public use the alternatives that science has designed for the protection of the ozone. Thus, the success of the Montreal Protocol is largely due to compliance by a small number of large CFC producers (Liebermann 1998) through science and research.

. The Cost- Benefit AspectThe phasing out of the ozone depleting substances evidently incurred costs especially among countries that have relied on ODS. The Montreal Protocol should therefore offer benefits adequate enough so as not to exceed the loss that can be incurred in complying with its measures. In a 1997 study " Global cost and benefits of the Montreal Protocol", which was an assessment of the benefits and costs of the protocol, it was indicated that the benefits of the protocol outweigh the costs, calculated in terms of the measures taken globally to protect the ozone layer including the replacement of technologies using ozone depleting substances. The total costs of the measures were calculated to be 235 billion US dollars whereas the effects avoided worldwide, though less quantifiable were estimated to be" Montreal

Protocol"

page_#6almost twice the amount (Bornman & Van der Leun, 1998). The estimate on the benefits refers only to the economical benefits of the protocol such as the reduction of damage to fisheries, agriculture, and materials and do not include the health benefits such as the avoidance of cases of skin cancer and cataract formation.

As such, the benefits can far outweigh the loss that can be incurred in the adoption of the protocol. ConclusionMany view science as a subject dealt with only in laboratories, research centers and classrooms but science is most active and most useful when the knowledge gained from it can address social issues such as environmental problems and global cooperation. The

Montreal Protocol establishes science in this premise because science helped mitigate and even prevent the negative implications of ozone depletion.

The Montreal Protocol has also shown that science can commence global cooperation and unity. This is shown by the unified efforts of almost all the countries in the world in solving the problem of ozone depletion. References AFEAS: Montreal Protocol. (2006, June 2). Retrieved November 21, 2006 from the Alternative Fluorocarbons Environmental Acceptability Studies Website.: http://www.

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