GLOBAL WARMING AND CLIMATE CHANGE: STRATEGIC POSITIONING FOR THE PULP AND PAPER INDUSTRY

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THE PRESENT INTERNATIONAL DEBATE OVER GLOBAL WARMING WILL CONTINUE INTO THE NEXT CENTURY. THE PULP AND PAPER INDUSTRY CAN TAKE ACTION NOW TO PLAN FOR THE FUTURE.

AS WE MOVE TOWARD THE NEW MILLENNIUM, PERHAPS no environmental or even societal issue looms as large as human-induced global warming and the potential for associated climate change. Depending on the "school" to which one belongs, global warming is either a Titanic-type natural disaster waiting in the wings or a scientific theory which remains unproven. The issue is caught in a web of political and economic entanglements. It may result in one of the most challenging international debates of the twenty-first century. As a significant emitter of greenhouse gases, the pulp and paper industry will soon be caught in the crosshairs of this debate.

This paper presents the elements of global warming science and a review of the present international debate, as well as the likely position of the United States in the future. It includes recommendations of actions that can be taken by the pulp and paper industry in order to plan and react effectively to this complex initiative.

THE SCIENCE BEHIND THE DEBATE

The physical science behind the so-called "greenhouse effect" is real. Without this phenomenon, life as we know it on the planet would not be possible. Greenhouse warming starts with energy from the sun heating the Earth's surface. A portion of this energy is radiated back out into space. Some of this outgoing radiation warms the lower part of the planet's atmosphere, known as the troposphere. This reflected energy is what produces the greenhouse effect.

There are many greenhouse gases (GHG) that contribute to global warming. Most notable are carbon dioxide (CO_2), water vapor, methane (CH_4), chlorofluorocarbons (CFCs), and nitrous oxides (N_2O). Although CO_2 is most discussed, the other substances have global warming potentials (GWPs) ranging from several to many thousand times that of CO_2. Of these compounds, methane is the most significant, having almost doubled in the atmosphere since prehistoric times.

As previously stated, the greenhouse effect by itself is not negative. It is a life-sustaining characteristic of the atmosphere. The problem is that the beneficial natural levels of greenhouse gases are being boosted by human activities, especially the burning of fossil fuels. In fact, if CO_2 emissions continue to increase at the current rate, the amount of this gas in the atmosphere will have doubled by the end of the twenty-first century.

Although there are those who believe the impact of greenhouse gas concentrations and the resultant temperature rise is linear, in actuality the effect (and associated controversy) is much more complex and uncertain. The issue involves physical effects known as "feedbacks." Feedback involve essential planetary processes such as the formation of ice, clouds, the circulation of the oceans, and biological activity. Depending on which theory one embraces, feedback mechanisms could either magnify or diminish global warming.

One of the best examples of feedback scenarios is the so called "ice-albedo." When planet temperatures rise, ice fields in cold regions melt. As this happens, part of the Earth's surface once covered with ice is now water or

land. Ice is efficient at reflecting solar radiation into space, whereas water and land absorb far more. In this scenario, the Earth's surface would trap more heat, increasing warming of the planet—a positive feedback.

Now comes the controversy. Water vapor due to greater evaporation in a warmer environment could further add to the process (water vapor is a greenhouse gas). However, this water vapor may contribute to increased cloud cover. The dominant effect of some kinds of clouds is to shroud the Earth from solar radiation—a negative feedback effect which would reduce global warming or even cool the planet. Basically, although all scientists believe in the greenhouse mechanism, the division rests on these complex issues involving feedbacks and the associated impact on the Earth's temperature. Other feedbacks frequently debated include CO_2 sinks from vegetation, ocean chemistry and dynamics, and manmade as well as natural interfaces.

THE INTERNATIONAL PERSPECTIVE

At the December 1997 climate conference in Kyoto, Japan, 159 nations agreed to establish binding limits for greenhouse gas emissions. The "Protocol" adopted by the third Conference of Parties (COP-3) to the United Nations Framework Convention on Climate Change (FCCC) proposes to limit overall net GHG emissions from the 38 Annex I (industrialized) countries during the 2008-2012 time frame. The Kyoto Protocol marks a first step in global efforts to stabilize atmospheric concentrations of greenhouse gases. Major provisions of the Kyoto accord which are important for industry to understand are summarized as follows: [1,2]

- Emission limits: The agreements would establish "differentiated" legally binding GHG limits for the Annex I countries. The combined reductions would result in a drop equivalent to 5.2% below the 1990 baseline. These emission reductions would be attained and calculated as an average over a five-year period (2008-2012). Emission reductions would vary by country, ranging from a 7% reduction for the United States to stabilization at the baseline for Russia and the Ukraine. It is important to note that the baseline and future emissions are to be determined in "net" terms, taking into account changes in GHG emissions as well as emission sinks.
- Greenhouse gases covered: The GHGs covered in the Protocol are CO_2, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). Net changes in GHG emissions from sources and removals by sinks resulting from "direct human induced" land changes will be used to meet each country's emission limit. Afforestation, reforestation, and deforestation, as well as certain agricultural activities, are included. The inclusion of forest conservation and management-related sinks is somewhat unclear and will be further defined in the future. Each country's "carbon dioxide equivalent" GHG limitation will be calculated using the global warming potential of each compound.
- Emissions calculus: The Protocol allows some flexibility to meet emissions limits. Annex I countries may satisfy individual limitations by implementing internal programs or with other nations by acquiring emission reduction credits. Compliance with emission limits will be demonstrated on a five-year average basis to allow for year-to-year variations attributed to weather, economic conditions, etc. Only emission reduction credits generated during the first budget period of 2008-2012 can be traded and used for compliance demonstrations.
- Joint implementation: The Protocol also allows Annex I countries to engage in projects within other Annex I countries designed to reduce GHG emissions. Such projects could be source reductions or enhancing the removal by sinks. The resulting emission reduction credits may be transferred among the project participants or to another Annex I country.

As it stands now, the Kyoto Protocol became available for signature starting in March 1998. The Protocol will enter into force 90 days after ratification by the legislative bodies of at least 55 countries, including a calculated minimum number of Annex I counties. There is no deadline for individual countries to ratify the Protocol.

CLIMATE CHANGE AND THE UNITED STATES

Under the business as usual scenario, GHG emissions in the United States are projected to grow by more than 30% above the 1990 level by the year 2010. With the protocol goals, the reality is that the United States will have to reduce GHG emissions by more than one-third by 2010. In order to meet these goals, emission reductions would have to commence in the near future. In order to position the country, President Clinton initially announced a three-stage plan. First, a tax credit and incentive program were proposed to promote research and development in the area of GHG reduction. The second component was to pursue industry-specific voluntary reduction programs. Finally, the desire of the Administration to have GHG emissions reduced as part of utility deregulation was announced. At this writing, all of the initiatives are bogged down in the legislative process.

What is the future of Protocol ratification in the United States? From the onset, the principal issue has been involvement by developing nations in GHG reduc-

[1] Kyoto Protocol on Climate Change, Fact Sheet released by the Department of State, Bureau of Oceans and International Environmental and Scientific Affairs. January 15, 1998.
[2] Matai, C.V., "Global Climate Change: The Kyoto Protocol," *Environmental Managers Journal*, Air & Waste Management Association, February 1998.

tions. The Administration and Congress believe that without the participation of developing countries in an overall GHG reduction program, the objective of stabilizing atmospheric concentrations of GHGs cannot be achieved. Just as important to the government is the concern of the global competitiveness of U.S. industry if other nations are not required to make reductions. Since the Kyoto Protocol did not compel developing nations to reduce GHG emissions, it is expected that the U.S. government will embark on a series of bilateral and multilateral negotiations with other nations in order to obtain assurances that enforceable reductions will occur before the United States ratifies the Protocol. Certainly, the Administration will not submit the Protocol to Congress prior to the COP-4 meeting scheduled in Buenos Aires in November 1998. One fact is certain: there will be substantial political maneuvering before the Protocol is submitted to Congress for the ratification process. The outcome of COP-4 will have a direct impact on this national debate.

PLANNING FOR THE FUTURE

The greenhouse gas of concern to the pulp and paper industry is CO_2. Principal sources of emissions at mills include power boilers, recovery boilers, and lime kilns. Methane, which is emitted primarily from wastewater treatment operations, is of secondary significance.

The first and essential planning step for any company is to perform a comprehensive assessment of corporate greenhouse gas emissions. The investigation should be performed at both domestic and international facilities in which a firm has full or part ownership. This assessment will provide the benchmark for validating baseline emissions on which all future emission reductions will depend. The assessment could be made for the current year or historically determined for their 1990 baseline year identified in the Protocol. With baseline GHG emissions documented, a company can enter the strategic planning phase for managing the greenhouse gas emissions calculus.

A unique position which could benefit the pulp and paper industry is in relation to "emission sinks" associated with forest management. There are four basic forestry management practices which could be potentially employed to maximize carbon storage. The first is to conserve native forests or replace them with plantations. Another practice would be to choose species and forest types based on carbon storage potential. A third technique would be to manage the intensity and frequency of logging or clearcutting. Finally, the adoption of conservation and management techniques for soil carbon could provide a substantial benefit as a carbon sink activity. The industry could invest its technical resources towards the development of a scientific basis for determining the potential CO_2 reductions associated with such natural resource management activities. Although this task would not be a simple one, it could provide significant future economic benefits for the industry.

Other potential strategic actions which could benefit the position of individual companies include:

- Evaluate the greenhouse gas advantages of burning biomass fuels.
- Perform energy efficiency studies in order to reduce energy consumption and related GHC emissions associated with combustion-based energy sources.
- Weigh the options of reducing different types of GHGs in varying percentages, bearing in mind the variation in global warming potentials.
- Determine the economic advantages of being an emission credit "buyer" versus an emission credit "seller."
- Target countries and international entities which would be prime for Joint Implemental (JI) relationships.
- Evaluate both source, fugitive, and mobile sources of air emissions. Emission reductions from all sources would be fair game. An example would be to consider the options of converting fleet vehicles to cleaner burning alternative fuels such as natural gas or propane.
- Consider the public relationship and stockholder benefits associated with a proactive GHG reduction program.
- Develop scenarios in which a company could profit or be at a competitive advantage to the competition by developing an intelligent GHG strategy.
- Acknowledge the humanitarian benefits of funding pollution reduction programs (while obtaining credits) in developing nations.

CONCLUSIONS

With uncertainty comes opportunity. Although many companies may take the tactic of fighting global warming legislation to the bitter end, an alternative approach is to understand the issues, work to insure that the final requirements are technically and economically sound, and develop an effective and flexible implementation plan. As we move toward the new millennium, there is one certainty: global warming agreements and the resultant greenhouse gas management will have a direct impact on how the countries of the world conduct business. **TJ**

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