Ozone depletion and the Montreal Protocol

If I had a billion dollars to save the ozone layer ...

The scene: A backyard barbecue on a lazy Sunday afternoon. After downing too many burgers too quickly, Pat, Riley, Tory, Sasha, and Vic are shooting the breeze. A house cat wanders through, settling down on Riley's lap, and immediately, Pat reaches for an asthma inhaler.

***Riley**:* Pat, are you still using one of those evil ozone-destroying metered dose inhalers? If I had a billion dollars to save the ozone layer, I'd spend it all to get rid of those asthma inhalers. With every puff you take, you're ejecting more Freons into the atmosphere, bringing the rest of us one step closer to succumbing to skin cancer.

***Pat**:* You're right. This is still the same old prescription inhaler, and I do feel guilty. I'm stuck, because the FDA has only approved a couple CFC-free inhalers, and my allergist doesn't think that either of them would be right for me. But asthma inhalers are really only a tiny source of ozone destroying chemicals. If I had a billion dollars to save the ozone layer, I'd worry more about methyl bromide, which is not only an ozone destroyer but also toxic to humans.

***Tory**:* Don't dump on methyl bromide. It may destroy ozone, but methyl bromide is also an important pesticide and fumigant. It's on target to be banned completely by 2005, and after that date, it will be allowed through "critical use exemptions" only when no other technology exists. That means it will probably be used only for emergency fumigation to meet import/export requirements and keep businesses in operation. I don't think methyl bromide is such a big problem.

If I had a billion dollars to save the ozone layer, I'd worry more about forcing individuals and U.S. corporations to really adhere to the rules laid out by the Montreal Protocol. In the U.S., air conditioners and refrigerators built before 1996 use CFCs, but the CFCs aren't a problem as long as they don't leak out into the atmosphere. Current EPA rules prohibit venting refrigerant to the atmosphere, yet every year there are plenty of violations. In June 2001, a hotel in Salt Lake City was fined $216,000 for cutting a bunch of old refrigerant lines. But for everyone who is caught violating the laws, there must be dozens more who get away with destroying the ozone layer. I'd put my money

into enforcement.

***Sasha**:* I agree that enforcement matters, but the problems in the U.S. are trivial compared with what developing nations face. If you remember, developing countries never wanted to adhere to the Montreal Protocol in the first place. They complained that developed countries in North America and Europe had the privilege of building their powerful economies in whatever ways they could, polluting as much as they wanted as they went. Not surprisingly, developing countries think they shouldn't have to suffer economic hardship to help the planet recover from problems that they didn't create.

Developing countries negotiated a special status for the Montreal Protocol. They are allowed an extra 10 years before they have to stop using CFCs. Developing countries also receive considerable economic aid to help them develop CFC-free industries. But nobody is really adhering to the new rules. Developed countries are dumping old technology in developing countries. For example, second-hand European refrigerators were sold in Zambia for years after they were banned in Europe. And phasing out CFC production is taking more time than it should. According to Greenpeace, India says that, "unless the North (developed countries) compensates it for not building new CFC plants, it will go ahead and build them." If I had a billion dollars to save the ozone layer, I'd put my money into United Nations aid programs.

***Vic**:* Forget saving the ozone layer. We can talk all we want about what should we done, but the political process is functioning well. The Montreal Protocol is renegotiated regularly. New technology is coming on board. To my mind, the biggest problem now is that the ozone layer isn't going to recover nearly as fast as scientists initially thought. We might have to wait 45 years before we even see signs that the ozone layer is recovering, and unfortunately global warming could slow the recovery. If I had a billion dollars, I'd spend it on education. We should be staying inside, wearing big hats and slathering on sunscreen to protect ourselves from the Sun's harmful rays. Speaking of which, could you pass that bottle of Coppertone?

Objectives: By the end of this case study, you should know what the Montreal Protocol is, be able to explain the causes of ozone depletion, and be able to identify several possible reasons why ozone can be destroyed.

Questions:

(1) This dialogue mentions two types of ozone destroying chemicals: methyl bromide and CFC (technically chlorofluorocarbon and also known by its trade name, Freon). What uses of each are mentioned here? What other uses do you know of?

(2) What international treaty was written to preserve the ozone layer? Why is the ozone layer important?

(3) What five points of view are presented in this dialogue by Pat, Riley, Tory, Sasha, and Vic? As in the previous case studies, each of you should choose one of these perspectives to represent within your groups.

(4) Based on what you know now, if you had a billion dollars, what strategies would you recommend to "save the ozone layer"? What additional information do you need to more thoroughly consider this question?

(5) As you did for the previous case studies, make a list of questions for which you want to find answers, and come prepared next week to debate this topic in greater detail? You'll find web links to serve as starting points for your investigations on the web site identified below, but don't feel limited to the links on the web - you're own searches (at the library or on the web) may stir up some interesting perspectives.

Click here for supplemental material, including a pdf version of the case study and web links.

The photograph at the top of this page shows a garbage barrel made from a recycled freon can. It was taken at the site of the Oracle of Delphi, Greece, December 1997.

Case study prepared by Sarah Gille, University of California, San Diego, La Jolla, CA 92093-0230.

For further information about this case study and its companion learning units, see

(Gille, 2004) - Gille, S., Integrating Science into Policy in the Classroom: Three Case Studies on the Atmosphere, *Journal of Earth System Science Education, 1* (Article + Case Studies), JESSE-04-300-07, 2004 http://jesse.usra.edu/archive/jesse04-300-07