

# Derivatives Week

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## LEARNING CURVE® ENVIRONMENTAL ASSETS AND DERIVATIVES

The earth's environmental assets—its biodiversity, atmosphere and bodies of water—are currently undervalued. Part of the problem, says

Graciela Chichilnisky, UNESCO professor of mathematics and economics at Columbia University and director of the university's program on information and resources, is the lack of both organized markets and market prices for these assets. How can financial instruments be created that will allow the realization of the value of environmental assets without destroying them? She suggests derivatives may be part of the answer.

Chichilnisky explains that because the underlying assets are unpredictable and are not correctly priced, it makes them suitable for derivative products. As part of the valuation process, she proposes the creation of an "International Bank for Environmental Settlements," a clearing house for derivatives trading based on the use of the Earth's atmosphere, biodiversity—the genetic information of species that typically have forests as habitats—and bodies of water.

Currently, it is not always clear who owns environmental assets, Chichilnisky notes, adding that she is proposing that the international community establish property rights for the world's large environmental assets. The IBES would facilitate the creation of international laws regarding environmental assets, hold and distribute some property rights and produce a trading infrastructure to enforce the delivery and payment of derivative contracts to ensure the integrity of the market—a function that is crucial for liquidity. The development of a liquid derivatives market is necessary for the valuation process of the world's environmental assets to commence. Any trading of an environmental underlying would come to around USD100 billion a year, she says, noting the potential for the development of an options market.

Several environmental derivatives transactions have already taken place. Merck & Co., the world's largest pharmaceutical company, entered into a swap with INBIO, a Costa Rican government research facility that controls a significant portion of the country's forests and the biodiversity they contain, Chichilnisky says. In the swap, Merck receives a portion of the property rights of Costa Rican forests and pays INBIO USD1 million and guarantees that a portion of the profits Merck will receive from developing and marketing medicine derived from the genetic codes in the country's forests will be delivered to INBIO. In this case, INBIO and Costa Rica own the property rights on the country's biodiversity, but through the swap, they

traded a portion of those rights, Chichilnisky explains. In another transaction, Shaman Pharmaceuticals, a California company, entered into a similar profit-sharing agreement with local communities in Brazil and Argentina, because it is the communities and not the government that own the property rights, she notes.

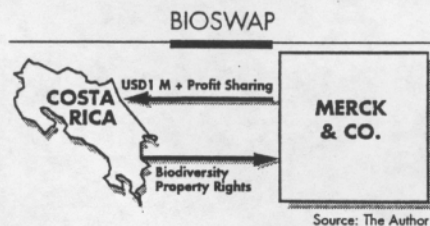
Some underlying environmental assets are more readily adopted to derivatives and trading than others. For example, the Chicago Board of Trade offers options and futures on sulphur dioxide emissions, says Chichilnisky. She notes, however, that the market is relatively illiquid and that an over-the-counter market has yet to

develop because sulphur dioxide is a gas that does not distribute evenly in the atmosphere. Therefore, the sulphur dioxide market is a localized market, meaning that under regulatory restrictions, a company that emits gas out of New York must purchase the option from a New York-based trader. If not, the end result is that if the trader were in Chicago.

Chicago may have cleaner air and New York may have dirtier air.

Chichilnisky says a carbon dioxide emissions market makes more sense. She explains that unlike sulphur dioxide, carbon dioxide is a stable gas that distributes evenly. Options, futures and swaps on carbon dioxide emissions could develop whereby a company buys the option to emit a certain amount of carbon dioxide over, say, one year. In this case, however, the derivatives are likely to be traded between countries, she says. For example, the U.S. could buy an option from Mexico to increase its consumption of fossil fuels and emit five tons of carbon dioxide in the year 2000, she explains.

Another environmental derivatives market that is currently in development is the creation of options and futures on water consumption, she says. In California, a market to buy and sell the rights to water from an aquifer or a river is developing, Chichilnisky notes, adding that in the coming years there is a potential for futures, options and swaps on water usage to develop. California has been using water from the Colorado River free of charge to the point where the river's capacity has been severely depleted, Chichilnisky explains. Once the water market develops, farmers that use the river's water for irrigation as well as private users will need to start paying—through derivatives—for the water usage, she says. Further, one region of the U.S. could enter into a swap with another region.



*This week's Learning Curve was written by Carolina Bernárdez, reporter.*