

But it is some hardship to be born into the world and to find all nature's gifts previously engrossed, and no place left for the newcomer.

John Stuart Mill

Principles of Political Economy (1848)

SUSTAINABLE DEVELOPMENT

Empowering Indigenous Peoples

Deforestation, erosion, and loss of biodiversity all directly affect Central American indigenous peoples' sustenance, health, and way of life. The new Integrated Ecosystem Management in Indigenous Communities Regional Program (IEM) aims to alleviate these problems and the extreme poverty of many indigenous groups by helping communities manage their lands sustainably. The IEM will help communities establish and manage conservation areas and finance income-generating projects like sustainable tourism, sustainable forestry, and production of handicrafts, organic coffee and cocoa, and other traditional products. The program emphasizes traditional land management practices to combat declining biodiversity, soil, and water quality.

"One objective is to strengthen local groups to prepare strategies to help with these problems," says Alberto Chinchilla, regional facilitator for the Central America Indigenous and Peasant Coordination Association for Community Agroforestry. This group, along with the Central American Indigenous Council and Central American Commission for Environment and Development (CCAD), will implement the program.

The IEM will support small projects in some 550 communities in Belize, Costa

Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama, where nearly 7 million indigenous people account for about a quarter of the population. The Global Environment Facility granted the program \$9 million through the Inter-American Development Bank (IDB) and the World Bank, cofinanced through other projects from both banks. Indigenous groups and CCAD will contribute another \$2.5 million.

Indigenous groups' environmental problems stem from their tenuous rights to the land they occupy, advocates say. Not all of the region's nations enforce or even legally recognize indigenous land rights. Nor do governments or the World Bank require indigenous groups' consent before approving projects that affect their lands or require their forced relocation, say advocates.

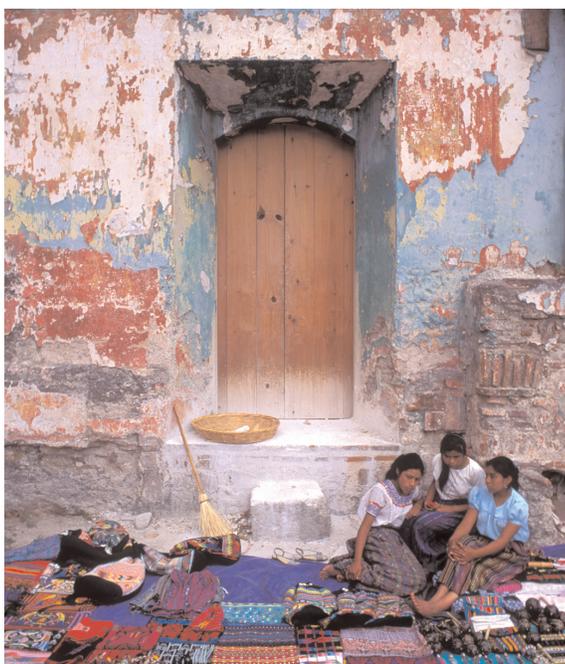
Poverty and encroachment onto their lands by ranchers, farmers and loggers wielding environmentally devastating practices has led many indigenous groups to forsake traditional land use practices for often unsustainable hunting, agriculture, and timber harvest methods. In agriculture, for instance, practices such as letting plots lay fallow for years at a time, intensive hand weeding, and cultivating a diversity of crops, often in the shade of fruit- or lumber-producing trees have in certain places given way to shorter crop rotation cycles, increased chemical use, and crop monocultures. The new practices may offer bountiful harvests in the short term, but they ultimately degrade the soil and are expensive to perpetuate. Struggling communities may also sell off timber or land for negligible sums to outsiders,

who then clear the land for agricultural use, according to IEM documents.

Indigenous groups' political influence is growing. But they continue to suffer from worse poverty, more disease, greater discrimination, and less education than other sectors of society, the World Bank concluded in its May 2005 report *Indigenous Peoples, Poverty and Human Development in Latin America: 1994–2004*.

Some indigenous activists question the IEM. "How will the [program] create sustainable development if the majority of the governments in the region don't recognize the ability of indigenous communities to administer their lands, territories, and natural resources?" asks Hector Huertas, a lawyer from the Kuna tribe with the Centro de Asistencia Legal Popular, an indigenous advocacy group. He and others cast a wary eye on the World Bank and the IDB, whose projects, they say, typically leave a heavy environmental and cultural footprint. Many also believe the agencies charged with implementing the IEM may not truly represent indigenous peoples' interests.

Some even argue that drawing indigenous communities into the cash economy through development projects threatens their autonomy. Rudolph C. Rýser, chairman of the Center for World Indigenous Studies in Washington and a Cowlitz tribe member, says communities that provide for their own needs best exemplify sustainability. "People can say it's unrealistic for indigenous communities to take care of themselves as autonomous economic units. They'd better realize it's been going on for fourteen thousand years." —Rebecca Kessler



Sustaining themselves. Street vendors sell weavings in Guatemala (left), and a laborer picks coffee beans in Costa Rica (above). A new Central American project will finance such sustainable money-making activities to help indigenous groups prosper.

Left to right: Jeremy Horner/Panos Pictures; Fredrik Naumann/Panos Pictures

DRUG ABUSE

Meth's Pollution Epidemic

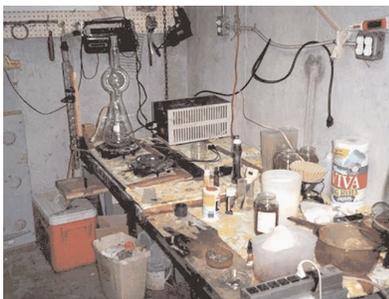
Methamphetamine problems are soaring nationwide. Nearly 60% of county officials report that meth is the largest drug problem in their county, and 87% saw jumps in meth arrests in the past three years, according to a survey released in July 2005 by the National Association of Counties. But meth isn't just a hard drug; it's also an environmental hazard.

Illicit drug makers can cook small batches of meth anywhere they can plug in a stove, microwave, or electric skillet (heat is not required, but speeds the manufacture). The ingredients include common cold medicines, ammonia fertilizer, and muriatic acid. Cooking generates a variety of noxious solvents and gases, such as hydrogen chloride, phosphine, and meth itself. According to an 8 August 2005 *Newsweek* article, for each pound of meth produced, five pounds of toxic waste are left behind.

Police and firemen report breathing problems and headaches when they bust meth labs, but no one has quantified the hazards they face. So John Martyny, an industrial hygienist at National Jewish Medical and Research Center in Denver, teamed up with law enforcement officials in Colorado. They set up controlled cooks in an abandoned motel (which was later razed) and measured the resulting pollutants.

In the unpublished studies, phosphine gas reached 2.9 parts per million (ppm), three times the occupational short-term exposure limit. Phosphine causes headache, pulmonary edema, and death. Martyny says cook fatalities are probably linked to this chemical. Hydrogen chloride fumes reached 155 ppm, more than three times the level considered by the National Institute for Occupational Safety and Health to be "immediately dangerous to life or health." Hydrogen chloride causes respiratory tract damage. Ammonia, which causes lung edema, also soared to three times the "immediately dangerous to life or health" level.

Anyone who is present during cooks is exposed to these and likely other toxicants; a third of all meth busts find children present.



Basement time-bomb. A home meth lab produces toxic waste along with illegal drugs.

"The health costs to children may not be identified for years to come," says Martyny, who predicts long-term respiratory and neurological problems.

More research is needed to determine the best ways to clean up meth labs. Meth becomes airborne during production and settles on surfaces at up to 16,000 micrograms per 100 square centimeters ($\mu\text{g}/100\text{ cm}^2$). Even six months after a staged cook, Martyny found meth levels of $300\ \mu\text{g}/100\text{ cm}^2$ on surfaces. Carpets trap meth and other pollutants, yet vacuuming dramatically raises airborne meth levels. So Martyny recommends discarding carpets.

Further, after grinding contaminated wallboard in separate unpublished studies, Stephen Lee, who supervises the Emergency Response Team at the Minnesota Pollution Control Agency in St. Paul, learned that washing walls removes less than 10% of the total meth. The rest is trapped deeper. Whether it bleeds back out to the surface and poses an exposure risk is unknown. Lee is evaluating whether a covering of oil-based paint seals meth within wallboard.

Few states have guidelines for cleaning up meth labs. "As more states deal with remediation of meth properties, they turn to us," says Carolyn Comeau, manager of the Clandestine Drug Lab Program at the Washington State Department of Health. Washington requires remediation by contractors certified by the state to decontaminate meth labs, which are often found in low-income rental properties. The state also requires that surface meth be at or below $0.1\ \mu\text{g}/100\text{ cm}^2$ before new residents can move in. Scientific evidence like Martyny's and Lee's should yield more effective guidelines, says Comeau.

Lee adds that a health-based standard for meth residues on building surfaces is needed to determine which properties need remediation and when a property has been adequately cleaned. All three experts support national remediation standards like those proposed in the Methamphetamine Remediation Research Act of 2005, which would establish a federal research program at the Environmental Protection Agency to study the environmental and health effects of meth labs and coordinate cleanup efforts. The bill has 55 cosponsors, and floor passage in the House is expected later this year. —Carol Potera

Watching Mines in Eastern Europe

In January 2000, cyanide from a Romanian gold mine spilled into the Tisza River, killing nearly all the aquatic life and fouling the drinking water of millions of people. To help avoid such incidents in the future, government officials from a dozen south-eastern European countries came together in May 2005 in Cluj-Napoca, Romania, and signed on to a new strategy calling for detailed site assessments for mines of concern, higher health and environmental standards for new mines, and plans for their eventual closure. The agreement also calls for early warning systems to warn countries downstream of mining-related pollution incidents. More than 150 mining operations exist in the area; more than a third have been labeled by the UN Environment Programme as posing a serious risk to human health, the environment, and regional stability.



Smoking Ends Up on Cutting-Room Floor

"Bollywood," the Indian film industry and the world's largest producer of films, has been ordered by the Indian government to cut movie and TV scenes showing actors smoking, effective October 2005. Announcement of the ban set off a flurry of dissent from Indian film makers, who see it as censorship, although some actors have expressed support for the decision. Health minister Anbumani Ramadoss said the ban could save millions of children who would otherwise start smoking "under the influence of movies." This new law, which also requires listing of tar and nicotine content on cigarette packaging, comes just a year after India banned smoking in public places and forbade tobacco firm advertising in and sponsorship of sporting events. Each year more than 800,000 Indians die smoking-related deaths.

The Power of Pachyderm Poo

The Rosamund Gifford Zoo of Syracuse, New York, is investigating a potential new source of renewable energy, one that is based on the daily output of the zoo's own residents, especially its six elephants—the zoo is looking at the half-ton of elephant manure produced each day as a feedstock to produce methane or hydrogen for a fuel cell or generator. The zoo is also studying whether it could use the manure from a number of its other large animals. Using the animal waste would not only provide fuel, but also save the zoo money in disposal fees as well as the fossil fuels used to transport the waste. Many U.S. farms already use animal waste for power production.



METAL TOXICITY

Tattoos: Safe Symbols?

A 2003 Harris Poll reported that 16% of U.S. adults are tattooed, including over a third of those aged 25–29. Despite the art's growing popularity, the toxicology of tattoos is poorly understood. Now some ink components—particularly heavy metals—have raised concerns. A lawsuit set to go to trial in October 2005 has been filed against nine tattoo ink companies for violations of California's Proposition 65, which requires that Californians be warned before exposure to chemicals causing cancer, birth defects, or other reproductive harm.

"One reason we started looking at tattoos is that the research we've done suggests teenage girls in particular are a huge market now for tattoos," says Deborah Sivas, president of the nonprofit American Environmental Safety Institute (AESI), which filed the suit. The concern is not that the inks are acutely harmful, but rather that chronic exposure to some metals—especially lead—is a known problem.

Titanium and aluminum are often used as colorants in tattoos; more worrisome, inks using nonmetal colorants may include traces of antimony, arsenic, beryllium, chromium, cobalt, lead, nickel, and selenium (AESI filed over the latter eight metals). Sivas says the ink used for a 3 by 5 inch tattoo contains 1–23 micrograms of lead, versus the 0.5 micrograms per day permitted under Proposition 65.

Understanding exposure to lead and other metals once incorporated into a tattoo is not simple. A healed tattoo is a complicated array of ink particles trapped within dermal fibroblasts, macrophages, and mast cells. "One of the biggest problems is, over the period of time, how is exposure evaluated?" says Westley Wood, president of Unimax



No clear picture. There are few health data for tattoo inks; with the growing popularity of the art, some see this as a cause for concern.

supply, a tattoo equipment supplier and ink producer, which settled out of court in the AESI lawsuit. "Should it be counted every single day for the rest of your life, or is it dissipated in the body within a month?"

"Metal toxicity has not been an observed problem," asserts physician Linda Dixon, president of the American Academy of Micropigmentation, a cosmetic tattooing trade group and manufacturer of Kolorsource brand of cosmetic ink. However, she adds, "Information about pigments in traditional tattoo products is usually a trade secret and not shared. We need information which is scientifically based."

Dixon suggests publishing a list of pigments that are known to be safe and those known to be toxic. "Know your colors, know your pigments," she says. "The scientists know what to avoid, and this should be common knowledge in the tattoo industries." Though tattoo inks are subject to regulation by the Food and Drug Administration as cosmetics and color additives, that agency does not currently attempt to actually regulate tattooing or the pigments involved.

Despite the upcoming court battle, among the 17% of tattooed Americans the Harris Poll say regret their indelible marks, the greatest reason for dissatisfaction is not the safety of the tattoo but having been inscribed with the wrong person's name. —**Victoria McGovern**

AGRICULTURE

Green Farming Equipment

California's San Joaquin Valley, known for its rich harvests of grapes, tomatoes, and oranges, is also prone to smog and ground-level ozone created when the equipment that works the land combines with the natural topography. Now farmers can do their part to clear the air by using "green" farm machinery that boasts greater efficiency and cleaner fuels.

In July 2004, California legislators set new air quality regulations for farmers, forcing them to significantly reduce their emissions of potential greenhouse gases and fine particles. Farmers—a tough lobbying group—were previously exempt from state

Easier on the air. The Optimizer is part of a new generation of green farm equipment.



air regulations. But the machinery, dust, pesticide use, and other facets of farming make this industry one of the worst polluters.

The American Lung Association's *State of the Air 2005* report ranked three California farm counties (Kern, Fresno, and Tulare) among the five worst in the nation for ozone and particle pollution. Such poor air quality has a major health impact, especially for young children. A study by the Central California Children's Institute found that 15.7% of San Joaquin Valley children had asthma. Statewide, Fresno and Kings counties had the worst asthma rates, with more than 20% of children diagnosed.

The "Optimizer," developed by Kevin McDonald, founder and president of Tillage International, offers one way to make farmwork more efficient. This multipurpose tiller comes in two models and does all the necessary tilling, planting, and herbicide application in one step. Farmers who once had to do multiple passes can work their fields in one or two passes, cutting down on the amount of tractor fuel needed.

McDonald says growers currently using the Optimizer estimate that the tiller, at \$149,000–\$189,000 depending on model, could pay for itself in under a year. Researchers at the University of California, Davis, tested the machinery and found that it saved 50% on fuel and 72% on time. Furthermore, the Optimizer is eligible for a

Natural Resources Conservation Service grant through the U.S. Department of Agriculture, which could significantly cut the one-time purchase cost.

Another innovative way to cut emissions is to replace petroleum fuel with biodiesel. Biodiesel is made by refining vegetable oils such as those found in soybeans and rapeseed, and can be mixed with regular diesel in varying concentrations. In October 2002 the U.S. Environmental Protection Agency analyzed the emissions of a 20% biodiesel/80% petroleum diesel blend and found reduced emissions of particulate matter (–12%), unburned hydrocarbons (–20%), and carbon monoxide (–12%).

While a diesel engine will run using 20% or even 100% biodiesel, equipment manufacturers like New Holland and John Deere recommend only 2–5% biodiesel. But even a small amount counts when you're as big as John Deere; the company announced in February 2005 it would begin using a 2% biodiesel blend as the preferred factory fill for all its diesel machinery.

If air concerns don't convince farmers to invest in new products, simple economics may. A 1989 report by the California Air Resources Board noted that grapes, cotton, oranges, lemons, and beans grown in 1985 levels of air pollution lost 16–29% in yield and size as a direct result of smog. —**Graeme Stemp**

ehpnet

Millennium Ecosystem Assessment

The Millennium Ecosystem Assessment (MA) is the largest assessment to date of the health of the world's ecosystems. Launched in 2001 by United Nations (UN) secretary-general Kofi Annan and authorized by governments through four international conventions, the MA is intended as a tool to inform decision makers and the public. The documents flowing forth from this work, which was completed in March 2005, have been prepared by 1,360 experts from 95 countries, with an 80-person independent board of review editors. The documents draw on information gathered from the scientific literature, existing data sets, and scientific models, and incorporate knowledge gleaned from the private sector, workers in the field, indigenous peoples, and local communities. Information about the MA, as well as the documents it has released, are available online at <http://www.millenniumassessment.org/>.

The findings of the MA are grim. Over the past 50 years, humans have changed ecosystems faster and more extensively than during any other comparable time period in human history. These rapid changes have grown out of increasing demands for natural goods and services, such as food, fresh water, timber, fiber, and fuel. The MA also finds that ecosystem changes have brought about substantial gains in human well-being and in economic development, but that these gains have come at the cost of degrading ecosystem services and increasing poverty for some groups of people. The report predicts that ecosystem change could accelerate during the next 50 years and contribute to nonachievement of the UN Millennium Development Goals.

Yet, there is some hope that this situation can still be reversed, and the report sets forth options for improving ecosystems by 2050. These fall under three scenarios: "Global Orchestration," "Adapting Mosaic," and "TechnoGarden." The Global Orchestration scenario reflects a globally connected society focused on international trade and economic liberalization that also takes strong steps to reduce problems such as poverty and inequality and to invest in public infrastructure and education. The Adapting Mosaic scenario focuses on local-scale activities, and investments in human and social capital emphasize education to bring about a better understanding of the nature of ecosystems. At the core of the TechnoGarden scenario is the use of technology and highly managed, often engineered ecosystems to deliver ecosystem services. A fourth scenario, "Order from Strength," emphasizes heightened security and a fragmented society, to the detriment of the environment.

The MA homepage provides the latest news related to the project, while links along the right side of the page access the numerous partners in the MA. These partners include the UN Development Programme, the UN Environment Programme, the World Bank, multiple universities, and others.

The Reports section of the site provides links to the major documents produced by the MA. Each report can be downloaded for free in English and several other languages; there is also information on how to order printed copies. The Resources section assembles slide presentations, figures, tables, maps, posters, logos, and brochures that can be used by the media. All are available to download for free.

The About the MA section of the website provides a thorough history of how the work came about, how it was funded, how it was undertaken, and how it may continue in the future. This section also includes a page devoted to the many subregional assessments that are being carried out in conjunction with the MA. Links to each provide details of the areas covered by the assessments, the institutions carrying out the assessments, the features of the ecosystem being assessed, key features of the assessments, and the time frame and budget for the work. —Erin E. Dooley



Millennium Ecosystem Assessment

Herbal Answers for Deadly Diseases

Ohio State University researchers have found that extracts from two Mojave Desert plants can kill the parasites that cause leishmaniasis and African sleeping sickness. These diseases afflict millions, primarily in developing nations, and are usually fatal if left untreated. Drugs based on chemicals from the dotted dalea and the Mojave dalea may offer a cheaper, safer, and more expedient alternative to the costly and sometimes nephrotoxic drugs currently used to treat the diseases.

About 2 million new cases of leishmaniasis are reported each year. Sleeping sickness affects an estimated 50,000–500,000 people, mainly in rural sub-Saharan Africa.



Nanotech to the Rescue?

A new study by the University of Toronto Joint Centre for Bioethics shows just how useful new nanotechnologies could be in helping developing countries overcome urgent problems such as extreme poverty, hunger, environmental degradation, and diseases such as malaria and HIV/AIDS. The study, published in the April 2005 *PLoS Medicine*, ranks nanotechnology applications by their potential contribution to development and meeting the eight UN Millennium Development Goals. The top 10 applications were deemed to be energy storage, production, and conversion; agricultural productivity enhancement; water treatment and remediation; disease diagnosis and screening; drug delivery systems; food processing and storage; air pollution and remediation; construction; health monitoring; and vector and pest detection and control. The study also noted that nanotechnology research and development initiatives have been launched in several developing countries.

Africa Afire

By 2030, smoke from wood-fueled cooking fires will cause about 10 million premature deaths among African women and children, and by 2050, such fires will release 7 billion tons of carbon into the environment, according to a study published 1 April 2005 in *Science*.

Sub-Saharan Africans consumed nearly 470 million tons of wood (in the form of firewood and charcoal) in 2000. Moving to petroleum-based fuels such as kerosene and propane gas would prevent the most premature deaths, but a more feasible strategy would be to adopt more modern methods of producing cleaner-burning charcoal. Such a shift could prevent 1–2.8 million premature deaths.

