

In a purely technical sense, each species of higher organism is richer in information than a Caravaggio painting, Bach fugue, or any other great work of art.  
Edward O. Wilson (1985)

POLICY

## New Environment Law for Afghanistan

In April 2005, Afghan president Hamid Karzai established the National Environmental Protection Agency (NEPA), the country's first such entity. The event was strictly ceremonial, since Afghanistan still had no legal tool for environmental management. Eight months later, however, on 18 December 2005, the Afghan cabinet approved legislation that for the first time gives Afghanistan the legal power it needs to begin bettering its environment.

Known as the Environment Act, the law clarifies administrative roles at the national level and coordination with provincial authorities. It spells out frameworks for managing natural resource conservation and biodiversity, drinking water, pollution control, and environmental education. Equally as important, say its supporters, the law provides tools for enforcement.

"It seems to be a pretty sensible act," says David Hanrahan, lead environmental specialist for South Asia at the World Bank. For example, the law's environmental impact assessment process was guided by a review of

10 countries' experience and vetted by environmental law experts at the World Bank, the World Conservation Union, and the UN, as well as by Afghan groups.

NEPA proposed the legislation based on recommendations issued in 2003 by a team of experts from the UN Environment Programme (UNEP). The UNEP findings were alarming: after two decades of conflict and drought, Afghanistan had lost nearly all of its wetlands and much of its forests, and its citizens were increasingly at risk for infections and epidemics caused by poor waste management and unequal access to fresh water. [For more on the UNEP findings, see "Environmental Triage in Afghanistan," *EHP* 111:A470–A473 (2003).]

For two years, Asif Ali Zaidi, UNEP's program manager in Afghanistan, has worked to help the government respond. UNEP facilitated consultations on the draft legislation with various agencies, citizen groups, and international officials, and funded translations of the draft law into Dari and Pashto, the country's official languages. Besides NEPA (which emerged from the former Ministry of Irrigation, Water Resources, and Environment), other agencies with key roles under the new law include the Ministry of Justice and the Ministry of Agriculture, Animal Husbandry, and Food.

In Afghanistan, more than 80% of the population relies directly on natural resources such as rangelands and water bodies for their livelihood and daily needs, and only 12% of the land is arable. Thus, widespread environmental degradation poses a threat to livelihoods and places the poorest Afghans at particular risk, wrote Zaidi and Belinda Bowling, UNEP's environmental law expert in Afghanistan, in the Fall 2005 issue of *Sustainable Development Law & Policy*.

Zaidi and Bowling linked environmental issues directly with Afghans' top concern, security, observing that environmental degradation in Afghanistan—often the consequence of socioeconomic inequities—is a factor contributing to prevalent insecurity. In one example, desperate subsistence farmers displaced by desertification and crop failure are more likely to cultivate poppies as part of the drug trade, which is intrinsically linked to insecurity in Afghanistan.

Protecting natural resources in a country lacking basic infrastructure has posed a serious challenge. The National Development Framework, a 2002 map for Afghanistan's economic development, did not mention the environment, although Zaidi says it was understood as "an important cross-cutting issue." In 2004, another approach emerged in the Afghanistan National Development Strategy, an Afghan-specific version of the UN Millennium Development Goals couched as a five-year plan. These overlapping schemes have caused confusion among planners, compounded by a lack of baseline data on forest cover, energy use, and other indicators.

According to Bowling, the new law will help spur institutional reform and the development of regimens for pollution control and environmental impact assessments, among other things. "Like most fledgling institutions," she says, "NEPA now requires time to establish itself properly within the new government structure." UNEP plans to support much of the reform through its Post-Conflict Branch.

Hanrahan is cautiously optimistic about the recent developments. Most Afghans, he says, care about their environment. He notes the people have a history of cooperative practices, for example in ancient irrigation systems, adding, "This is where civilization comes from." —David A. Taylor



**Thirsting for reform.** The extinct Hamoun wetlands (top right in 1976, while still thriving; bottom right in 2001, as a desiccated salt flat) and Kole Hashmat Khan wetlands (above) are just two illustrations of how years of drought and conflict have stripped Afghanistan of its natural resources. A new agency and guiding law offer hope that life can be breathed back into Afghanistan's environment.

Left: UNEP, right: H. Partow/UNEP

## ASTHMA

## Bowled Over by Dust

A common substance in house dust is a major risk factor for asthma, according to work reported in the 1 December 2005 issue of the *American Journal of Respiratory and Critical Care Medicine*. The study charted room-by-room distribution of endotoxin, a lipid-like material that comes from the surface of bacteria, in the first nationwide snapshot of exposure in American homes. Then researchers looked at the relationship between household endotoxin exposure and the presence of allergic symptoms (such as hay fever) and asthma.

The field sampling showed that endotoxin exposure “isn’t something that’s only limited to inner-city homes or to homes that are dirty or to homes in certain parts of the country,” says coauthor Darryl Zeldin, a senior investigator in the NIEHS Laboratory of Respiratory Biology. “Almost all the homes in the nation have detectable levels of endotoxin in multiple locations.”

The study used data from the U.S. National Survey of Lead and Allergens in Housing, which ran from July 1998 through August 1999. In this survey, field personnel collected dust samples (and later analyzed their composition), recorded demographic and health data, and conducted visual inspections of a nationwide representative sample of 831 dwellings. Zeldin and colleagues were then able to analyze the health impacts of individual dust components from sources including not only bacteria, but also dogs, cats, rodents, cockroaches, dust mites, and fungi.

Although endotoxin was found in all of the homes studied, concentrations varied considerably from home to home and from room to room within a given home. Concentrations were on average highest on kitchen floors, but it was the bedroom exposure that was most highly associated with residents having doctor-diagnosed asthma, experiencing asthma symptoms such as wheezing, or using asthma medications.



**Nothing to sneeze at.** Endotoxin, commonly found in household dust, is a ubiquitous risk factor for asthma.

Zeldin says, “Endotoxin exists on [dust] particles that can go airborne with activity—vacuuming, sleeping on their bed or with their face in the bedding, kids playing on their beds or on the floor.” The asthma–endotoxin link persisted at all exposure levels, with symptoms more likely with higher exposure.

The relationship of asthma to endotoxin was strong for adults in the study, but not for children. However, the authors say the original survey was not designed to collect information on when or how long people had been exposed, nor did it have sufficient statistical power to examine these relationships in young children.

So far, other work in children has mostly led to more questions. The answers may lie in inflammation of the airways rather than activation of allergy’s histamine responses. “What is well understood is that endotoxin exposure worsens airway inflammation and symptoms in people with asthma,” says Andy Liu, an asthma researcher at the National Jewish Medical and Research Center in Denver. “This investigation . . . supports endotoxin’s relationship with asthma as a toxic one, and is consistent with what has been reported with infant wheezing. What is perplexing is that, in older children, the association of allergy-associated asthma with endotoxin becomes a negative one: more exposure, less disease.”

That kind of observation forms the root of the hygiene hypothesis—that exposure to infections in early life helps build an immune system that is less prone to allergic diseases in later life. But does an exposure–allergy relationship tie in with asthma?

“The question with the hygiene hypothesis is, can we extend it from ‘infection’ to endotoxin—which comes from bacteria—and can we extend it from allergy to asthma?” says lead author Peter Thorne, director of the Environmental Health Sciences Research Center at the University of Iowa. The current study suggests not, he says: “What we found is that endotoxin is causing symptoms of asthma in both those who are allergic and those who are not. So endotoxin exposure is not protecting people from asthma.”

—Victoria McGovern

## Supersized Sun Power

At the end of 2004, the United States had 397 megawatts of solar energy capacity. Now two Southern California utility companies plan to harness the state’s abundant sunshine for two solar-powered plants that will produce more electricity than all of those solar energy projects combined. The new plants will use 40-foot dishes to focus the sun’s energy onto Stirling engines, sealed systems filled with hydrogen that, when heated with the solar energy, drive four pistons. A 500-megawatt power plant of 20,000 dishes will be located in the Mojave Desert, while a 300-megawatt plant of 12,000 dishes will call the Imperial Valley home. Construction will begin on the sites in 2008.



## Green Buses for Beijing Olympics

Beijing has signed a contract to replace 7,277 older city buses with new ones that meet higher environmental standards as part of its plan to host a “green” Olympic Games in 2008. The November 2005 decision is also in line with the city’s effort to combat heavy air pollution, which, due to temperature inversions, hangs in a cloud over the metropolis for three months of the year. Currently 17,507 buses operate in Beijing, and 4.36 billion person-rides were reported in 2004, making bus travel the city’s most popular mode of transport. The new buses will meet stringent Euro III standards for carbon monoxide, smoke, particulate matter, nitrogen oxide, and hydrocarbon emissions.

## West Africa Adopts Fishing Plan

Fish currently provides nearly a quarter of the protein in the African diet, yet sub-Saharan Africa is the only region in which the per-capita availability of fish is declining. To help ensure the security of this food source, government officials meeting at the August 2005 Secretariat of the Economic Community of West African States endorsed the Abuja Declaration on Sustainable Fisheries and Aquaculture in Africa. The declaration includes a five-point action plan to support capture fisheries, develop aquaculture, improve fish market chains, increase the benefits from the fish trade, and support government decision makers with information. Speaking at the meeting, Nigerian president Olusegun Obasanjo pointed out that for Africa’s fish consumption to remain at its already-low present level, fish production must increase by more than 250% by the year 2015.



## ECONOMICS

## The Clear Advantage of Clean Air

Regulations addressing environmental problems such as air pollution might be dismissed as a luxury for rich countries that can afford it, but members of the UN Environment Programme (UNEP) insist that such measures actually represent the most effective means of lifting countries out of poverty. At a major gathering of environment ministers in the United Arab Emirates in February 2006, UNEP executive director Klaus Töpfer cited the increasing cost and demand for fossil fuels as key reasons why many rapidly developing countries were taking a closer look at environmental degradation, which can have profound consequences. “That is now the bottleneck to future economic development,” he said.

The extent of the economic implications of this bottleneck is being outlined by researchers at the Massachusetts Institute of Technology (MIT), who have expanded a well-established economic model to put some numbers to the economic disadvantages created by unregulated air pollution. Those numbers are quite big, as it turns out. In a July 2004 report titled *Economic Benefits of Air Pollution Regulation in the USA: An Integrated Approach*, they calculated that the United States enjoyed an additional \$5.4 trillion in market consumption between 1975 and 2000 that would not have been available without the implementation of air pollution controls.

For coauthor John Reilly, associate director of research with MIT’s Joint Program on the Science and Policy of Global Change and the Laboratory for Energy and the Environment, that amount dwarfs the less than \$1 trillion that the EPA estimates the controls cost. More importantly, this financial benefit contrasts sharply with the

widespread health effects of leaving remaining air pollution unregulated. “It’s causing your workers to be ill, and your children not to be able to advance,” he argues. “It’s going to slow the economy.”

Using the Emissions Prediction and Policy Analysis (EPPA) model, which has already been used to estimate the costs of reducing carbon dioxide emissions, Reilly and his colleagues incorporated measures of human health in order to consider the benefits. Rather than employing only basic multipliers for illness, lost lives, or medical expenditures, the algorithms were broadened with published health data on the occurrence of specific diseases that could be linked to air pollution, such as asthma.

By including pollutant exposures, ability to work, and health effects on different age groups over time, the model compared actual economic performance with what would have happened in the absence of regulations. The tally wound up representing 3–4% of the entire U.S. market consumption over a quarter of a century. By comparison, the entire agricultural sector accounts for just 1%.

That result should grab the attention of observers in developed as well as developing countries, says Kristie Ebi, an epidemiologist with the scientific consultancy Exponent Health Group. “Health is often not at the table,” she says, referring to the negotiation of policies that treat the physical well-being of people as a separate priority incurring expenses that are not considered part of the general economy. “Many calculations of the costs and benefits of regulations include limited consideration of health because health is not traded in a market and so is hard to value.”

For Ebi, the expanded EPPA model provides all the more reason to make health an integral part of such negotiations and look closely at the potential advantages conferred by environmental regulations. “There’s very little work out there that you can take to policy makers and say ‘if you don’t regulate, this is the cost,’” she concludes. “It’s really nice to see that taken up in a rigorous way.” —**Tim Lougheed**

## SMOKING

## Bans, Bans, Good for the Heart!

Could moving to Pueblo, Colorado, be a new way to reduce the risk of suffering a heart attack? A study reported at the American Heart Association’s Scientific Sessions 2005 Conference in Dallas last November suggests that the city’s ban on smoking in all public buildings helped reduce the local heart attack rate by 27% over a year and a half. The finding appears to bolster recent decisions to ban smoking in workplaces and other public buildings across the United States, Spain, Ireland, and parts of the United Kingdom.

Tobacco smoke—including secondhand smoke—activates blood coagulation pathways that could lead to coronary thrombosis, or heart attack. Smoke is particularly dangerous for people whose arteries are already hardened by age, cholesterol deposits, or smoking itself. Indeed, some 30% of heart attacks are thought directly related to smoke-induced

thrombosis. In the United States, the annual direct medical cost of coronary heart disease caused by secondhand smoke alone is some \$2.45 billion, according to the U.S. Society of Actuaries.

In an attempt to reduce the incidence of heart attacks and other smoking-related illnesses, Pueblo introduced a ban 1 July 2003 on smoking in all indoor public areas within the city limits. Eighteen months later the Pueblo Public Health Department instigated an observational study to determine whether the ban had had any effect on the incidence of coronary events.

“We recorded the number of heart attacks that occurred in the city for the eighteen months before and after the introduction of the ban,” explains Mori Krantz, director of the Prevention Department of the Colorado Prevention Center in Denver, “and found a post-introduction fall of around twenty-seven percent. This was significantly greater than the small reduction we saw among the population living outside the city limits, and much greater than the virtually unchanged rate among residents of [adjacent] El Paso County, which does not have such an ordinance.”

Similar findings were reported in an earlier study published 24 April 2004 in *BMJ* after a smoking ban was imposed in Helena, Montana. “Our study builds on this work by involving a sample three times as large, and suggests that these ordinances may be having a positive effect on cardiac health,” says Krantz.

“This observational study is limited in that it does not distinguish between smokers and nonsmokers, and did not check the medical records of those involved,” remarks Jose Ramón Banegas, a professor of preventive medicine and public health at the Universidad Autónoma in Madrid, Spain. He adds, however, that “even if the effect were half that reported, it would mean this type of ban could save many lives while reducing health spending.”

Banegas points out that the results are also relevant given the new Spanish ban, enacted 1 January 2006, which still allows restaurateurs to declare their locales either smoking or nonsmoking. “Unfortunately,” he says, “ninety-eight percent are scared of losing income by going smoke-free.”

—**Adrian Burton**

ehpnet

## Wellcome Trust Sanger Institute

The Cambridge, United Kingdom–based Wellcome Trust Sanger Institute (WTSI) was founded in 1993 to provide a center for research on the genomes of humans and other organisms. The institute has been a leading contributor to the Human Genome Project and now focuses much of its work on studying human DNA sequence variations and how these correlate with genetic diseases. The institute has developed a website located at <http://www.sanger.ac.uk/> to serve as a central repository for information on its varied areas of study.

The densely packed website offers a wealth of scientific resources related to its research on human genetics, model organisms, pathogens, bioinformatics, sequencing, and proteomics. Visitors also have several points of access to databases including Ensembl, COSMIC, Pfam, GeneDB, Wormbase, Vega, MEROPS, and DECIPHER.



Clicking on any of the topic headers in the center of the homepage leads to an assemblage of resources,

project information, and laboratory homepage links related to the WTSI's six main areas of study. Clicking on Human Genetics, for example, takes visitors to a lengthy menu of team links, each of which leads to information on what that team is working on, along with relevant references and illustrations. The Model Organisms link yields resources categorized by organism: mouse, zebrafish, *Caenorhabditis elegans*, *Schizosaccharomyces pombe*, and *Xenopus tropicalis*. The Pathogens link leads to organism-specific sequencing information for more than 100 bacteria, fungi, protozoa, helminths, vectors, and plasmids, as well as a variety of computational tools. The Bioinformatics header leads to links for downloading a number of programs, including packages for production sequencing, physical mapping, informatics analysis, and special data descriptions and specifications used at the WTSI. The Sequencing link pulls together in one area those resources specific to sequencing of various organisms. And the Proteomics link offers information on three groups at the institute that are working in this field of study.

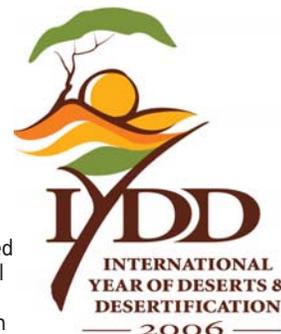
Visitors can also navigate through a bar down the left-hand side of the homepage, which offers quick links to biological resources, the database resources mentioned above, and news releases from the institute. Biological resources listed here include the Mutagenic Insertion and Chromosome Engineering Resource and the Sanger Institute Gene Trap Resource (both of which aid in developing genetically modified animal models), the WTSI Microarray Facility (which produces arrays for a range of organisms largely for use by Sanger researchers), and Clone Ordering (which allows external scientists to order mouse and human clone cells free of charge).

Delving deeper into the site through the Site Map, visitors will find a page on Functional Genomics projects including the Human Epigenome Project (HEP), a public–private consortium of the WTSI, Epigenomics AG, and France's Centre National de Génotypage. The goal of the HEP is to locate, identify, and catalog methylation variable positions within the human genome. The partners have conducted a pilot study of the methylation patterns within the major histocompatibility complex, a region of chromosome 6 that is associated with more diseases than any other region of the human genome. An overview of this pilot study is available within the HEP section, along with a look at the data analysis process employed by this study, information on epigenotyping, and links to the HEP partners. –Erin E. Dooley

Top to bottom: UN; WTSI; Corbis

## International Year of Deserts

Arid land covers one-third of the Earth's surface. Each day, more arable land is lost to advancing deserts and more people fall victim to drought. In recognition of these problems, the UN has declared 2006 the International Year of Deserts and Desertification. Planned activities, including a week-long film festival, will explore ways to protect the biological diversity of areas affected by desertification as well as the knowledge and traditions of the 2 billion people living in those areas. The UN Convention to Combat Desertification reports that desertification and drought shave \$42 billion off agricultural production each year. The resulting food insecurity, famine, and poverty foster social, economic, and political tensions that perpetuate the cycle of degradation.



## Mercury Warnings Go Multilingual

In November 2005, the San Francisco Board of Supervisors unanimously passed an ordinance requiring that markets and restaurants post warnings in English, Chinese, and Spanish that certain fish may contain harmful levels of mercury. The measure is authorized under California's Proposition 65, which requires that consumers be warned of toxicants in the products they buy; it is the first to mandate multilingual warnings. Mercury is a potent neurotoxicant, and fetuses and young children are particularly sensitive to its effects. Studies have demonstrated that low-level exposures are linked with small changes in learning and intelligence.

## Detoxifying Dust Bunnies

Nearly one-fourth of the housing units in the United States have significant levels of lead present in dust, soil, or paint. Now researchers at the Saint Louis University School of Public Health report in the 15 January 2006 issue of *Environmental Science & Technology* that all-purpose floor and counter detergents remove lead-bearing dust from wood, wallpaper, and vinyl flooring as effectively as detergents developed specifically for removing lead. These findings contradict earlier recommendations that only lead-specific cleaners or high-phosphate detergents are effective for this purpose. According to lead author Roger Lewis, these findings will be incorporated into new HUD guidelines to be released in 2006.

