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VITAL SIGNS 2000

The Environmental Trends That Are Shaping Our Future

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Vehicle Production Increases

Michael Renner

Rising 3 percent in 1999, global passenger car production reached a record 39 million vehicles, according to estimates by Standard and Poor's DRI in London.[1] (See Figure 1.) Out of some 40 countries worldwide that manufacture automobiles, Japan, the United States, and Germany account for almost half the worldwide total.[2] (See Figure 2.) On a regional level, Western Europe is the dominant producer with 15 million cars, 38 percent of the world total; it is followed by Asia (29 percent), North America (19 percent), Eastern Europe and Russia (7 percent), and Latin America (6 percent).[3]

Worldwide, passenger car sales rose by 4.3 percent in 1999 to almost 38 million.[4] With 15 million vehicles sold, Western Europe is by far the largest market, accounting for close to 40 percent of the global total.[5] North America was second, with 9.5 million cars or 25 percent.[6] Asia continued its slow recovery from the sharp drop after the 1997 economic crisis. Its total of 6.7 million vehicles sold was equivalent to 18 percent of worldwide sales.[7] Markets in all other regions are far smaller.

The global passenger car fleet reached 520 million in 1999, according to a provisional DRI estimate.[8] (See Figure 3.) There are now 11.5 people for each car worldwide.[9] But car densities are incomparably higher in North America, Western Europe, and Japan (2–3 people per car) than, for instance, in India (224 people) or China (279 people).[10]

In the United States, so-called light trucks (sport utility vehicles or SUVs, minivans, and pickup trucks) account for a rapidly growing share of vehicle sales. From 1975 to 1999, these vehicles increased their share of new car sales from 20 percent to 46 percent.[11] Light trucks, however, are considerably less fuel-efficient than traditional passenger cars. Their growing popularity thus contributed to an erosion in fuel efficiency, from a peak of 25.9 miles per gallon (9.1 liters per 100 kilometers) in the early 1980s to 23.8 miles per gallon by 1999.[12] U.S. cars achieved 28.1 miles per gallon in 1999, but light trucks were rated a mere 20.3.[13]

Improved transmissions, fuel injection systems, and other efficiency technologies continue to be incorporated into new vehicles. But the potential efficiency gain from such technologies has been more than offset by the trend toward more powerful vehicles among cars and light trucks. Increasing vehicle weight, horsepower, and acceleration performance since 1986 have cost the equivalent of a 5-miles-per-gallon improvement.[14]

The share of transportation fuel consumed by light trucks has risen from 25 percent in 1975 to 60 percent in 1999.[15] Light trucks not only contribute disproportionately to rising fuel use, they are also far more polluting. They will be the fastest growing source of carbon emissions in the United States during this decade.[16] Concern about air pollution has led the U.S. Environmental Protection Agency to issue new rules to reduce nitrogen oxide emissions from car engines. These will be phased in between 2004 and 2009 and for the first time require that light trucks meet the same standards as regular cars.[17]

So far, the light-truck phenomenon is still largely restricted to North America. The United States and Canada produced 7.3 million passenger cars in 1999, but 15.5 million vehicles when light trucks are included.[18] In Asia, light trucks now account for one third of total vehicle production, but in Western Europe for only 11 percent.[19]

Still, sales of SUVs have also begun to pick up in Europe. Growing at a rate four times as fast as the overall car market, SUV sales there have almost doubled, from about 300,000 in 1995 to an estimated 564,000 in 1999.[20] This represents just under 4 percent of new vehicle registrations, compared with 16 percent in the United States.[21] Although European SUVs are smaller and more fuel-efficient than North American models, their growing appeal nevertheless poses a challenge at a time when combating air pollution and reducing carbon emissions are becoming ever more urgent policy goals.[22]

World Automobile Production and Fleet, 1950–99

YEAR	PRODUCTION (million)	FLEET
1950	8	53
1955	11	73
1960	13	98
1965	19	140
1970	23	194
1971	26	207
1972	28	220
1973	30	236
1974	26	249
1975	25	260
1976	29	269
1977	31	285
1978	31	297
1979	31	308
1980	29	320
1981	28	331
1982	27	340
1983	30	352
1984	31	365
1985	32	374
1986	33	386
1987	33	394
1988	34	413
1989	36	424
1990	36	445
1991	35	456
1992	35	470
1993	34	469
1994	36	480
1995	36	477
1996	37	486
1997	38	498
1998	38	510
1999 (prel)	39	520

SOURCES: American Automobile Manufacturers Association; Standard & Poor's DRI.

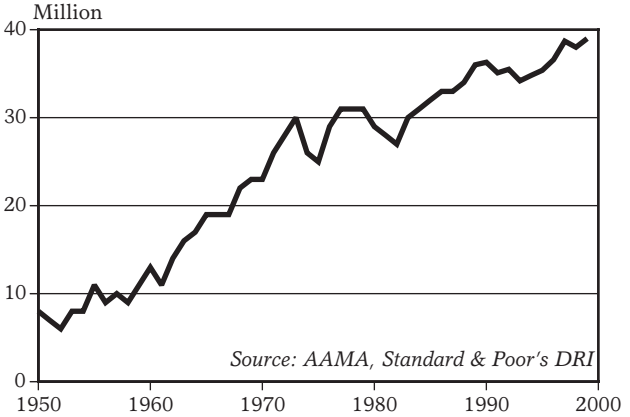

Figure 1: World Automobile Production, 1950–99

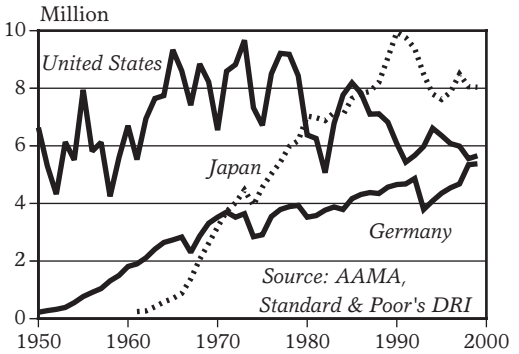

Figure 2: Leading Auto Producers, 1950–99

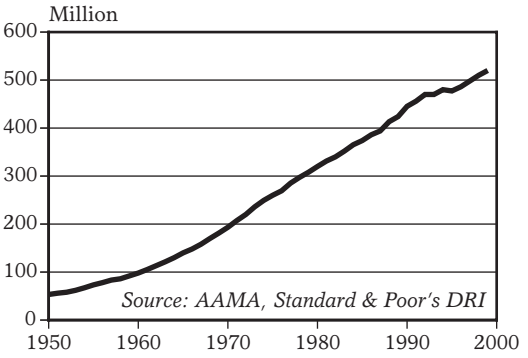

Figure 3: World Automobile Fleet, 1950–99

Bicycle Production Down Again

Gary Gardner

Global bicycle production dropped 16 percent in 1998 to 79 million units, continuing the decline in production under way since 1995.[1] (See Figure 1.) Global production now stands some 25 percent below the peak of 107 million units reached in 1995.[2] Excess inventories and sluggish demand are responsible.

Nearly all major producers reported declines, but the greatest absolute cutbacks came in Asia—traditionally the strongest producing and consuming region. China, the world's largest producer, saw output fall by 23 percent, to 23 million.[3] Chinese bicycle production has fallen by 45 percent since 1994 as trade barriers have reduced the nation's access to European and Canadian markets, and as the domestic market becomes saturated.[4]

India and the European Union, the third and fourth largest producers, saw production decline by roughly 5 percent, largely because of sluggish demand in industrial-country markets.[5] In Europe, demand for bicycles dropped by 19 percent between 1994 and 1998, due in part to a market glut produced by earlier robust sales.[6] In the United States, cycling may be on the decline. The number of people who rode a bicycle "more than once" in a calendar year fell from 53.3 million in 1996 to 43.5 million in 1998.[7]

Fifth-ranking United States reduced production by the greatest share, some 60 percent, manufacturing only 2.5 million bikes in 1998.[8] Much of U.S. production has shifted to Mexico, where lower labor costs are driving a bicycle boom.[9] Similar shifts are happening in Asia: Japanese and Taiwanese manufacturers have moved some operations to mainland China.[10]

On the bright side, sales of electric bicycles set a new record at 365,000 units for 1999.[11] (See Figure 2.) That boosted total sales since the early 1990s to well over 1 million units.[12] The trend is potentially important because electric bicycles extend biking range and allow cyclists to tackle hilly terrain that could otherwise be a deterrent to cycling.

Bicycles face a growing number of challenges in many cities. China, with some of the highest urban cycling rates in the world, has seen bike use plummet as incomes have soared and fed the demand for motorized vehicles.[13] As Chinese automobile ownership grew at roughly 15 percent a year in the 1990s, bicycles were increasingly pushed to the margins of transportation priorities.[14]

Some cities, however, are making efforts to promote cycling. Amsterdam places 250 bicycles around the city for public use in a revival of its "white bike" program of the 1960s.[15] Unlike the earlier program, which provided bicycles at no charge—resulting in heavy losses to theft within days—the new program charges 50¢ for 30 minutes of use, and features bicycles designed to deter theft and to facilitate short, crosstown trips.[16] The program is similar to one started in 1995 in Copenhagen, where more than 2,000 bicycles are now available for public use.

Such initiatives are complemented by efforts to improve cycling infrastructure in many communities. One noteworthy endeavor is the National Cycle Network, an 8,000-kilometer U.K. network scheduled to open in June 2000.[17] When completed, the network is expected to pass within 3–4 kilometers of half of the country's population.[18] Some 60 percent of trips on these paths are expected to be for commuting, shopping, and other utilitarian purposes; the remaining 40 percent are projected to be recreational.[19]

Meanwhile, Bogota is poised to give a major push to cycling. The city plans to spend more than $150 million on bicycle infrastructure and promotional efforts over nine years in an effort to boost cycling from 0.5 percent of trips to 3–4 percent.[20] More than 300 kilometers of bike routes are planned.[21]

Government interest stems from growing recognition of cycling's contributions to sustainability: bikes are efficient, inexpensive, nonpolluting, and healthy. These features prompted the Australian minister for Transport and the Minister for Health in 1999 to launch a five-year Australia Cycling campaign to combat a diverse set of societal ills: air pollution, climate change, traffic congestion, and overweight.[22]

Bicycle Production Down Again

WORLD BICYCLE PRODUCTION, 1950–98

YEAR	PRODUCTION (million)
1950	11
1955	15
1960	20
1965	21
1970	36
1971	39
1972	46
1973	52
1974	52
1975	43
1976	47
1977	49
1978	51
1979	54
1980	62
1981	65
1982	69
1983	74
1984	76
1985	79
1986	84
1987	98
1988	105
1989	95
1990	92
1991	99
1992	102
1993	104
1994	106
1995	107
1996	99
1997	93
1998 (prel)	79

SOURCES: United Nations, *The Growth of World Industry 1969 Edition*, Vol. I, *Yearbooks of Industrial Statistics 1979* and *1989 Editions,* and *Industrial Commodity Statistics Yearbook 1997*; *Interbike Directory,* various years.

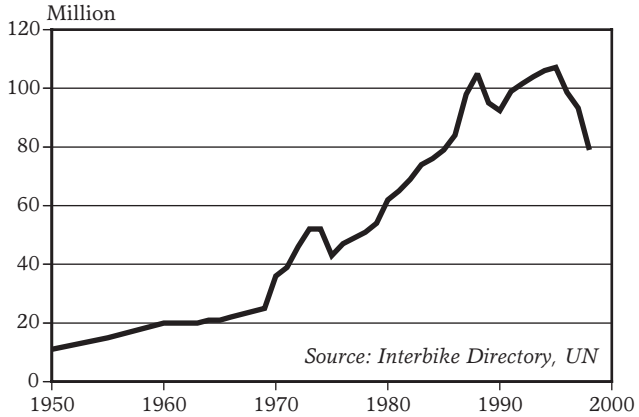

Figure 1: World Bicycle Production, 1950–98

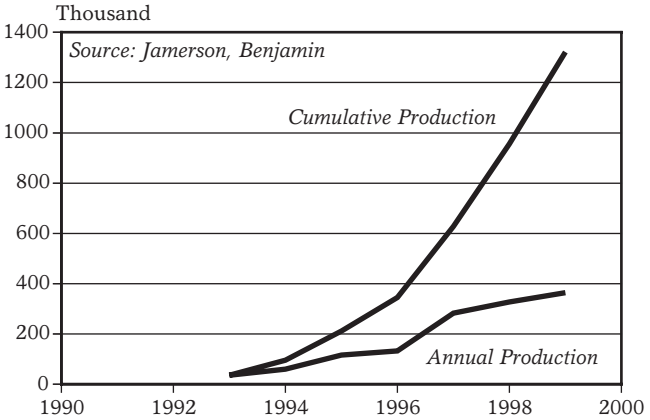

Figure 2: World Electric Bicycle Production, 1993–99

Telephone Network Diversifies

Molly O. Sheehan

The number of fixed-line phone connections worldwide increased 7 percent to 844 million in 1998, the latest year for which data are available from the International Telecommunication Union.[1] Wireline connections increased at about this rate during the 1990s.[2] (See Figure 1.)

Conventional phone lines, however, represent an increasingly smaller share of the total network. Between 1997 and 1998, cellular phone subscriptions rose 48 percent to 319 million.[3] (See Figure 2.) Throughout the 1990s, the number of subscribers doubled every 20 months.[4] The number of new mobile subscribers edged past new fixed-line installations in 1996, and by 1998 the additional wireless connections were double the new wired connections.[5]

Although phone lines now reach every continent and calls can be placed from remote villages with a mobile phone that beams radio signals to a cellular tower or communications satellite, basic phone service is still inaccessible to many. International telephone traffic soared from about 80 billion minutes in 1997 to over 90 billion minutes in 1998, but almost three quarters of those calls originated in just 23 industrial countries.[6] Some of the new technologies and policies transforming the telecommunications industry could help to expand the network into less-served areas.

Digitization is one technological phenomenon driving change. Telephone networks have traditionally conveyed sound as analog waves. But now many types of information—not only sound, but also text, picture, or video—can be transmitted as compressed bits in the binary language of computers.[7] As a result, the lines separating traditional telephone companies from other industries are blurring.[8]

A related technological driver is growth in the capacity to transmit information, as computers have become more powerful and copper wires have been replaced by highly effective glass strands that transmit light signals. At a given instant, all of North America's long-distance telephone traffic could theoretically be carried on a single pair of these optical fibers, each the thickness of a human hair.[9] High-capacity digital connections allow communications to be provided in new ways—for instance, telephone bundled with television or Internet service. In 1999, several companies unveiled plans for wireless phones that allow users to browse the Internet.[10]

Governments are adopting new policies, both to accommodate technological change and to encourage competition. More than 150 countries introduced new telecommunications legislation or made changes to existing laws in the 1990s.[11] With the latest wave of market openings, the share of countries in which monopolies control basic phone service has dropped to 73 percent.[12]

In contrast, monopolies run mobile phone operations in only one third of countries.[13] Europe, with the most competition, also has the fastest growth in cellular phone use.[14] Current trends suggest that at some point between 2001 and 2007, the total number of mobile connections worldwide will surpass fixed-line ones.[15]

Mobile phones, most frequently used in wealthy nations, have many advantages for poorer countries. Cellular towers can be built in less time than it takes to lay cables and wires. And wireless systems may prove more durable than copper phone lines, which are often stolen for their scrap value or damaged by war.[16] The two countries that already have more cellular than fixed-line subscribers are Finland, a leader in the technology, and Cambodia, a war-ravaged nation.[17] Since 1992, when cell phones were introduced there, Cambodia has passed 31 other countries in the per capita number of phone connections.[18]

Despite their benefits, mobile phones also have drawbacks. For instance, the towers needed to transmit cellular signals disrupt the beauty of wilderness areas and urban parks. And dialing and driving can be a deadly combination; a University of Toronto study found that people who use phones while driving are four times as likely as other drivers to have an accident.[19] An unanswered question is whether the radio signals from mobile phones can harm human health.[20]

Telephone Lines and Cellular Phone Subscribers Worldwide, 1960–98

YEAR	TELEPHONE LINES	CELLULAR PHONE SUBSCRIBERS
	(million)	
1960	89	–
1965	115	–
1970	156	–
1975	229	–
1976	244	–
1977	259	–
1978	276	–
1979	294	–
1980	311	–
1981	339	–
1982	354	–
1983	370	–
1984	388	–
1985	407	1
1986	426	1
1987	446	2
1988	469	4
1989	493	7
1990	520	11
1991	546	16
1992	574	23
1993	606	34
1994	645	55
1995	691	91
1996	738	142
1997	788	215
1998	844	319

SOURCES: ITU, *World Telecommunications Indicators '98* (1999); ITU, *World Telecommunication Development Report 1999* (1999).

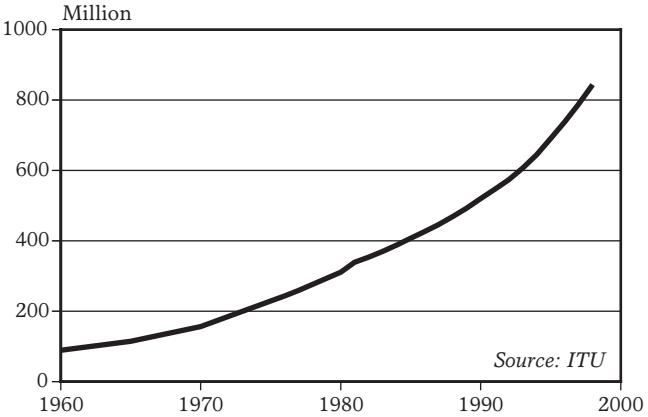

Figure 1: Telephone Lines Worldwide, 1960–98

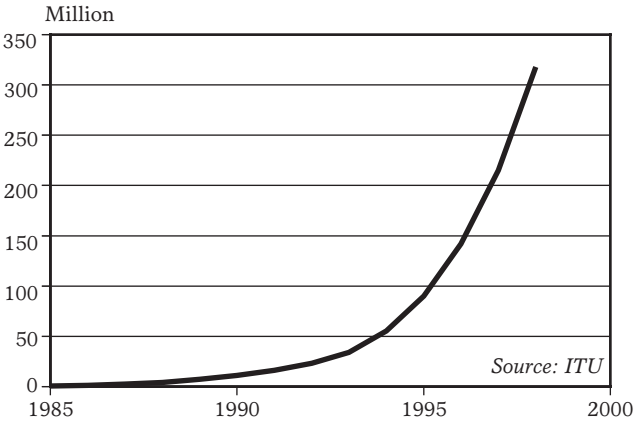

Figure 2: Cellular Mobile Telephone Subscribers Worldwide, 1985–98

Internet Use Accelerates

Payal Sampat

In 1999, some 72 million host computers were connected to the Internet, enabling 260 million people—over 4 percent of the planet—to go online.[1] (See Figure 1.) The Internet grew more rapidly in 1999 than during the previous four years, expanding by 67 percent.[2]

The United States is home to 111 million Internet users.[3] Although this one country claims 43 percent of the world's online population, its share of the total has shrunk from 61 percent in 1997.[4] Japan is next, with 18 million users, followed by the United Kingdom, Canada, and Germany, with about 14 million each.[5] Today, 72 million people in Europe and 47 million in Asia are online.[6]

The year 1999 marked a turning point for some developing nations, which made their debut on the list of countries with the most Internet users.[7] Brazil (with 6.9 million online), China (6.3 million users), and South Korea (5.7 million) overtook several European nations to join the top 10 list.[8]

Net access in developing countries grew 93 percent in 1999, outstripping the growth rate for the Internet as a whole.[9] Latin America's online population more than doubled in 1999, reaching 9 million.[10] Although Brazil still dominates the region, Mexico established a strong foothold when its host computer count nearly quadrupled and its total number of users reached 1 million.[11] China, which leads the tally in developing Asia, expanded its access more than fourfold, exceeding all projections.[12]

People in remote regions have eagerly taken to the Internet, capitalizing on its ability to connect them to the rest of the world. Host computer counts surged in many island nations, more than doubling in Cuba, tripling in Papua New Guinea, and growing sixfold in Madagascar.[13] Mongolia and Cambodia's host count each grew 150 percent in 1999.[14] And the mountain kingdom Bhutan has expanded its Internet base more than 15-fold each year since it went online in 1997.[15]

Several African countries went online for the first time in 1999, including Sierra Leone, Rwanda, and Malawi.[16] Yet this region's Internet infrastructure is still largely undeveloped. Its per capita host count is just 2 per 10,000 people, a tenth that of Latin America.[17] (See Figures 2 and 3.) Although ranked third in the region, Botswana's host computer count is less than that of the tiny island of Bermuda.[18] And even today, some 70 percent of the region's Internet users live in South Africa.[19]

Africa's unequal Internet distribution mirrors the global picture. While access is growing rapidly in some developing countries, most users—some 87 percent—live in the industrial world.[20] And while the Internet is ubiquitous in many affluent nations—more than 40 percent of the U.S., Canadian, and Swedish populations are online, for example—less than 1 percent of people in China, India, or Mexico have access.[21]

Although English still dominates, some 46 percent of users now surf the Internet in other languages, led by Japanese, Spanish, and Chinese.[22] Even as its audience has diversified, however, the Web has grown more concentrated: 80 percent of traffic goes to just 15,000 sites.[23] Some 2 million pages are added to the Web each day, bringing the total up to 1.5 billion pages by the end of 1999.[24]

In 1999, consumers and businesses spent $111 billion online—three times as much as in 1998.[25] The tourism industry was a big winner: 52 million Americans went online to plan their travel and make reservations.[26] And advertising on the Internet doubled in 1999, swelling to $2.8 billion.[27] Ironically, U.S. online companies spent more than $1 billion to advertise on television and in magazines during the year.[28]

The Internet can be a powerful engine of consumerism. But some analysts argue that where consumption levels are already high, the Internet might help reduce natural resource use. A Washington-based team of energy experts reports that by 2007, e-commerce could prevent the annual release of 35 million tons of greenhouse gases by reducing the need for up to 3 billion square feet of energy-consuming office buildings and malls in the United States.[29] And the Internet continues to aid environmental and social activists everywhere to communicate, share information, and campaign for sustainable development.[30]

INTERNET HOST COMPUTERS, 1981–99

YEAR	HOST COMPUTERS (number)
1981	213
1982	235
1983	562
1984	1,024
1985	2,308
1986	5,089
1987	28,174
1988	80,000
1989	159,000
1990	376,000
1991	727,000
1992	1,313,000
1993	2,217,000
1994	5,846,000
1995	14,352,000
1996	21,819,000
1997	29,670,000
1998	43,230,000
1999 (prel)	72,398,000

SOURCE: Internet Software Consortium and Network Wizards, "Internet Domain Surveys," <www.isc.org/ds/>, viewed 20 February 2000.

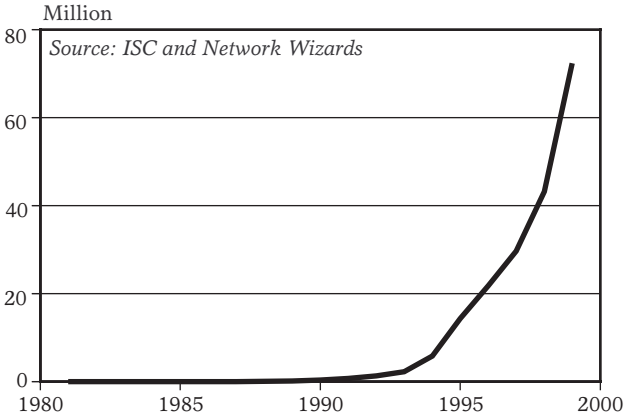

Figure 1: Internet Host Computers, 1981–99

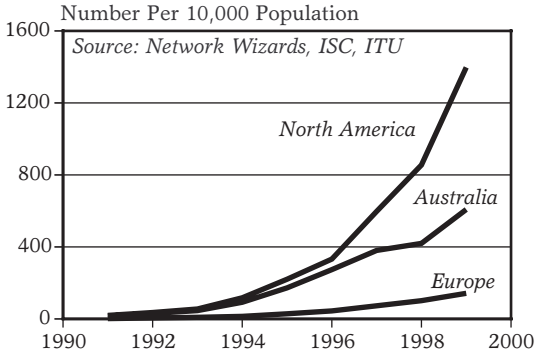

Figure 2: Internet Host Computers in North America, Australia, and Europe, 1991–99

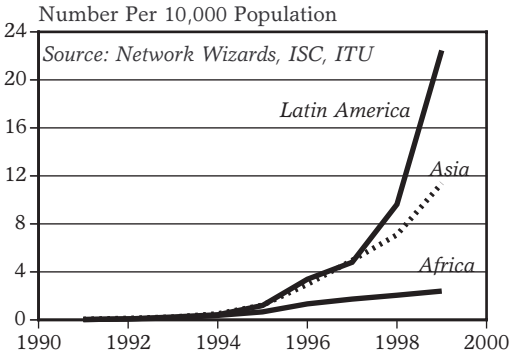

Figure 3: Internet Host Computers in Latin America, Asia, and Africa, 1991–99

Satellites Boost Environmental Knowledge

Molly O. Sheehan

In 1997, satellite images of fires in Southeast Asia helped explain why rainforests, which are supposed to be wet, were burning so quickly. Some images of Indonesia showed the fires often concentrated in areas approved for commercial land use, and often started in the morning, when land clearing began.[1] Combined with other information, the satellite data helped researchers to conclude that the forests were being systematically burned to make way for palm oil plantations.[2]

This is just one example of how satellites have augmented our ability to understand Earth systems.[3] Early milestones in systematically monitoring the environment from space include the first weather satellite in 1960 and the first land observation satellite in 1972, both launched by the United States.[4] In 1999, more than 45 Earth observation missions were operating, and more than 70 are planned during the next 15 years by civil space agencies and private companies.[5]

Satellites are unique in being able to collect detailed information about parts of Earth that are otherwise difficult to access—the far reaches of the atmosphere, the depths of the oceans, and the icy polar regions. Moreover, remote-sensing instruments aboard Earth-orbiting satellites can frequently record changes over large areas and long periods of time.

Satellite sensors can also open up various parts of the electromagnetic spectrum to human observation by recording heat and reflected energy invisible to the human eye. For instance, emissions in the near-infrared range can be used to assess the health of vegetation (because healthy green vegetation reflects most of the near-infrared radiation it receives), and thermal radiation can reveal fires that would otherwise be obscured by smoke.[6] Some sensors use radar, transmitting short bursts of microwave energy to Earth and recording the strength of the reflected energy that comes back. Microwaves can penetrate the atmosphere in all conditions, so radar can "see" in the dark and through haze, clouds, or smoke.

Meteorological satellites form the backbone of the most effective global environmental monitoring program to date: the World Weather Watch. Operated by the World Meteorological Organization, this network combines satellite observations with ground, sea, and air monitoring stations, telecommunication links, and computer analysis centers.[7] In recent years, optical sensors that collect data on sea surface temperature and radar sensors that estimate ocean height have proved useful in understanding and predicting El Niño events, which bring warmth and wetness to much of the west coasts of South and North America and drought to Southeast Asia, Australia, and parts of Africa.[8]

In the 1990s, researchers began to delve into satellite archives to study longer-term climate patterns. For instance, satellite images have helped reveal a lengthening growing season in northern latitudes and the breakup of major ice sheets.[9] Radar sensors have been used to construct topographical maps of the ocean bottom, which in turn provide better understanding of the ocean currents, tides, and temperatures that affect climate.[10] Not until recently, however, did space agencies begin to design satellite systems dedicated specifically to climate research. In 1999, the United States launched Terra, which carries five different sensors for recording climatic variables such as radiative energy fluxes, clouds, water vapor, snow cover, land use, and the biological productivity of oceans.[11] It is to be the first in a series of satellites that will create a consistent long-term data set.

International organizations and national governments can use remote imaging to give more teeth to environmental laws. One leading fishing nation, Peru, is monitoring its coastal waters to prevent the kind of heavy overfishing that has caused fisheries to collapse.[12] In Italy, the city of Ancona plans to buy satellite images to detect illegal waste dumps.[13]

Governments have launched most of the current global fleet of Earth observation satellites, but private companies are now beginning to enter the picture. (See Table 1.) One of the first was OrbImage, a U.S. company

TABLE 1: SELECTED SATELLITE SYSTEMS PRODUCING COMMERCIALLY AVAILABLE IMAGERY

SATELLITE	LAUNCH DATE	OWNER	SPATIAL RESOLUTION[1]
Landsat series	1972	NASA (U.S.	30–120 meters
Landsat-7	1999	space agency)	15–60 meters
Terra	1999	NASA	15 meters–22 kilometers
SPOT series	1986	CNES (French	10–30 meters
SPOT-4	1997	space agency)	
AVHRR	1979	NOAA (U.S. agency)	1.1 kilometer
IRS-1D	1997	Indian remote sensing agency	6 meters
Ikonos	1999	Space Imaging Corp.	1–4 meters
OrbView-2/SeaWiFS	1997	OrbImage Corp.	1 kilometer
OrbView-3	2000		1–8 meters
OrbView-4	2000–01		1–8 meters
QuickBird	2000	Earthwatch Corp.	1–4 meters
Radarsat-1	1995	Canadian space agency	8–100 meters

[1]The lower end of the range usually applies to panchromatic (black and white) images, whereas the higher end applies to multispectral (color) images.

SOURCE: Web sites of various space agencies and companies.

that launched a satellite called SeaWiFS in 1997. Originally designed to measure ocean color and temperature, this satellite has monitored fires in Indonesia, floods in China, and dust storms in the Sahara and Gobi Deserts.[14]

In September 1999, U.S.-based Space Imaging launched the first of a new generation of high-resolution satellites, which will produce the most detailed images that can be bought on the open market.[15] OrbImage and Earthwatch, another U.S. company, are planning similar systems.[16] Whereas one picture element—or "pixel"—in a SeaWiFS image corresponds to 1 square kilometer on the ground, in the newer systems a pixel corresponds to just 1 square meter.

Different tasks require different levels of detail. Whereas the wide coverage provided by lower-resolution satellites has proved useful in understanding large-scale natural features, very detailed imagery may be best able to reveal niche habitats important for protecting biodiversity and constructions such as buildings, tanks, weapons, and refugee camps. The new high-resolution imagery may be a powerful tool for watchdog groups that monitor arms control agreements and government military activities.[17]

Ultimately, an educated global citizenry will be needed to make use of the flood of data being unleashed from satellites. As Ann Florini of the Carnegie Endowment writes, "With states, international organizations, and corporations all prodding one another to release ever more information, civil society can take that information, analyze and compile it, and disseminate it to networks of citizen groups and consumer organizations."[18] The newest generation of "eyes in the sky" can produce highly detailed images—but many brains on the ground will be needed to make sure that these are put to good use.

HIV/AIDS Pandemic Hits Africa Hardest

Brian Halweil

Thirty-six million people—nearly two thirds of them in Africa—entered the new century infected with HIV, the virus that causes AIDS.[1] Since the early 1980s, the cumulative number infected has almost reached 50 million (see Figure 1), and there are now nearly 6 million new infections each year.[2] A record number of deaths from AIDS in 1999, 2.6 million, pushed the cumulative death toll to 16 million—nearly as many people as live in New York City.[3] (See Figure 2.)

Sub-Saharan Africa remains the center of the global epidemic, with AIDS now causing one out of five deaths there each year.[4] Eastern and Southern Africa have been hit particularly hard: home to just 5 percent of the human population, these two regions contain over half of the people who are HIV-infected, and more than 60 percent of those who have died of AIDS.[5] Life expectancy in southern Africa, which climbed from 44 years in the early 1950s to 59 in the early 1990s, is expected to drop back to 45 in this decade.[6]

A newly emergent and highly virulent subtype of the virus, HIV-1C, is driving HIV prevalence to between one fifth and one third of the adult population in Botswana, Namibia, South Africa, and Zimbabwe.[7] In Africa's two most populous nations, Nigeria and Ethiopia, prevalence is growing but remains lower, at 4 and 9 percent, respectively.[8]

About 12.2 million African women are infected, compared with 10.1 million men.[9] Greater ease of male-to-female transmission, as well as greater exposure to risky sexual situations, threatens women worldwide.[10] Most of these women will unknowingly pass the virus to their babies, adding to the half-million children born infected each year in Africa.[11]

Outside of Africa, adult prevalence has topped 1 percent in only a handful of nations. The hardest hit are in Central America, the Caribbean, and Southeast Asia, and include Guyana and Cambodia, where 3 percent of the adults are infected, and Haiti, where 6 percent are HIV-positive.[12] In most of the world high infection rates are still found only in high-risk, urban populations—providing an excellent opportunity for prevention.

But continued low public awareness, the spread of intravenous drug use, and widespread unsafe sexual behavior portends explosive epidemics elsewhere.[13] For instance, although adult prevalence in Asia is a small fraction of that in Africa, the adult population is five times larger, and the number infected in Asia jumped by 25 percent in 1999.[14]

Perhaps spurred by the devastating spread of the virus in Africa, some Asian nations have pursued aggressive prevention programs, focusing on sex education, needle exchange, and reproductive health services. Thailand and the Philippines now appear to have stabilized or reduced HIV prevalence rates.[15] In the Indian state of Tamil Nadu, a mass media campaign promoting safe sex cut the rate of casual sex among factory workers in half between 1996 and 1998, while condom use rose from 17 to 50 percent.[16]

HIV/AIDS strikes hardest at the most sexually active—the young breadwinners, parents, students, and professionals who underpin household, community, and national development. In nine African nations, UNAIDS found that one fifth to one third of the children are likely to be orphaned by AIDS over the next decade.[17] By 2010, Africa could be home to 40 million AIDS orphans.[18]

In Zambia, colleges graduated 300 new teachers in 1999, but AIDS took the lives of 600 teachers.[19] In Kigali, Rwanda, 34 percent of people with a post-secondary education are infected with HIV, nearly three times the rate for the population at large.[20] In some hospitals in South Africa, AIDS patients occupy 60 percent of the beds.[21] By 2005, treatment, care, and support related to HIV/AIDS are expected to account for a third of all government health-spending in Ethiopia, more than half in Kenya, and nearly two thirds in Zimbabwe.[22]

Despite these daunting prospects, national and international responses have fallen short. In Zimbabwe, the government each month spends just $1 million on HIV/AIDS prevention and $70 million on the war in the Congo.[23] UNAIDS recently reported that the global epidemic is expanding three times faster than the international funding to prevent it.[24]

Cumulative HIV Infections and AIDS Deaths Worldwide, 1980–99

YEAR	HIV INFECTIONS (million)
1980	0.1
1981	0.3
1982	0.7
1983	1.2
1984	1.7
1985	2.4
1986	3.4
1987	4.5
1988	5.9
1989	7.8
1990	10.0
1991	12.8
1992	16.1
1993	19.7
1994	23.8
1995	28.3
1996	33.5
1997	38.9
1998	44.1
1999 (prel)	49.9

YEAR	AIDS DEATHS (million)
1980	0.0
1981	0.0
1982	0.0
1983	0.0
1984	0.1
1985	0.2
1986	0.3
1987	0.5
1988	0.8
1989	1.2
1990	1.7
1991	2.4
1992	3.3
1993	4.4
1994	5.7
1995	7.3
1996	9.2
1997	11.3
1998	13.7
1999 (prel)	16.3

SOURCE: Neff Walker, UNAIDS, Geneva, e-mail to author, 20 March 2000.

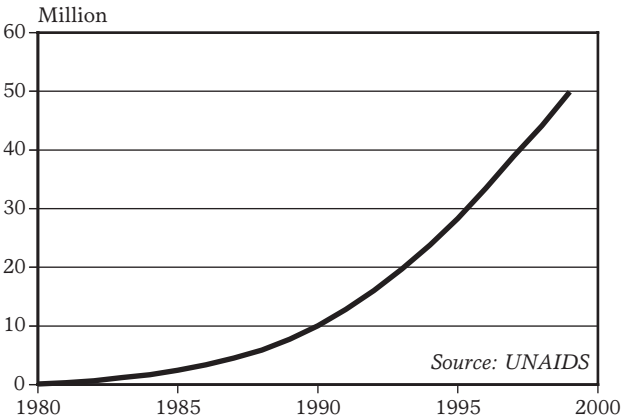

Figure 1: Estimates of Cumulative HIV Infections Worldwide,1980–99

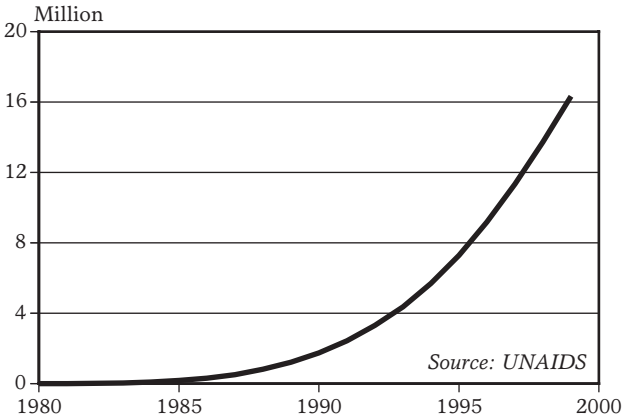

Figure 2: Estimates of Cumulative AIDS Deaths Worldwide, 1980–99

Tuberculosis Resurging Worldwide

Lisa Mastny

In the last few decades, tuberculosis (TB) has experienced a dramatic resurgence worldwide. Some 1.8 billion people—nearly one third of the world—now carry the TB bacteria, *Mycobacterium tuberculosis*.[1] The World Health Organization (WHO) predicts that if control is not strengthened, nearly 1 billion more will be infected by 2020—many of whom will die from TB.[2]

This age-old disease is spread when an individual with active pulmonary TB coughs or sneezes, releasing tiny infectious droplets into the air.[3] Once inhaled, the bacteria can lie dormant in someone's body for years—even a lifetime.[4] It attacks when the immune system is weak, and affects most tissues and organs, but particularly the lungs.[5] Each sick person infects on average 10–15 new people a year, although only about 5–10 percent of the individuals carrying TB actually come down with the disease.[6]

TB kills nearly 2 million people a year and is the leading cause of death among women of reproductive age.[7] In the developing world, an estimated 60 percent of TB cases occur in the most productive age group, ages 15 to 44.[8] Families must pay not only the direct costs of TB prevention and treatment, but also the indirect costs of lost labor time from the illness.[9]

Tuberculosis was a leading cause of death in northern Europe and the Americas until about 1900.[10] During much of the twentieth century, improved living conditions and new anti-TB drugs and other effective treatments helped vanquish the disease in most industrial nations.[11] But in the mid-1980s, TB again surged in many of these countries, including the United States.[12] The disease has spread rapidly in the former Soviet Union and Eastern Europe, where the number of reported cases jumped by more than 25 percent between 1994 and 1996 alone.[13]

Yet the developing world continues to bear the brunt of the epidemic. Of the estimated 8 million new TB cases reported worldwide in 1998, roughly 95 percent were in developing countries—with 3 million in Southeast Asia (two thirds of them in India alone); 2 million in the western Pacific region, which includes China; and 1.6 million in Africa.[14] (See Table 1.) These regions also register the most TB deaths.

In recent years, the single largest factor behind the TB surge has been the spread of AIDS, particularly in Asia and Africa.[15] Because AIDS weakens the immune system, an HIV-positive person is up to 30 times likelier than someone else to develop TB.[16] In 1998, an estimated 20 percent of the world's TB victims were HIV-positive.[17] This combination has been deadliest in Africa, where nearly 60 percent of TB victims also had HIV.[18]

Another factor behind the rise in TB has been the emergence of new drug-resistant strains, which are harder to control and up to 100 times costlier to treat.[19] These strains can emerge when patients cut short their treatment or take the wrong mix of drugs, enabling the bacteria to develop resistance, which is then passed on.[20] An estimated 50 million people may now be infected with drug-resistant TB, with the highest rates in the Baltic States, Russia, the Dominican Republic, and Côte d'Ivoire.[21]

The boom in international travel and tourism, as well as increased migration, have also contributed to the spread of TB.[22] Airplanes provide ideal environments for transmission, as they often are crowded and poorly ventilated.[23] On one Paris–New York flight in 1998, a Ukrainian man sick with TB may have infected 13 of the 40 passengers sitting nearest to him, although the direct transfer could not be verified.[24]

TB has spread quickly among the world's rising refugee and immigrant populations, who are highly mobile and often face conditions of malnutrition and overcrowding.[25] As they move from place to place, they may carry the disease with them—in many industrial countries, foreign-born persons account for at least half of all TB cases.[26]

TB is also rampant among the world's 10–30 million prisoners, who show TB rates 5–20 times higher than national averages.[27] An estimated half of Russia's million prisoners

TABLE 1: TUBERCULOSIS INCIDENCE AND DEATHS, AND CO-INFECTION WITH HIV, 1998

REGION	INCIDENCE			DEATHS		
	TOTAL INCIDENCE (thousand new cases)	SHARE OF WORLD TOTAL (percent)	SHARE HIV-POSITIVE (percent)	TOTAL DEATHS (thousand)	SHARE OF WORLD TOTAL (percent)	SHARE HIV-POSITIVE (percent)
Southeast Asia	3,002	37	2	717	38	5
Western Pacific	1,984	25	< 1	360	19	1
Africa	1,557	19	33	514	28	59
Eastern Mediterranean	611	8	1	142	8	2
Europe	39	5	2	64	3	6
Americas	421	5	6	68	4	21
World	8,012	100	8	1,863	100	20

SOURCE: World Health Organization, *World Health Report 1999* (Geneva: 1999). Figures are preliminary estimates.

are infected with TB and one tenth have the active disease, often a drug-resistant strain.[28] Prison rooms are typically unclean, overcrowded, and poorly ventilated, and prisoners face high rates of malnutrition, drug use, and HIV infection.[29] Rapid prison turnover also means that an estimated four to six times the prison population passes through a facility each year, increasing the chance of infecting new arrivals as well as people on the outside.[30]

Fortunately, TB is both preventable and treatable.[31] The BCG vaccine, invented in 1921, now has 85-percent global coverage and can help prevent certain types of TB in infancy.[32] But it has proved less effective in stemming TB in adulthood, particularly in AIDS-prone areas, and scientists are seeking to develop a more comprehensive alternative.[33]

One of the most cost-effective strategies for combating TB is DOTS: Directly Observed Treatment, Short-course.[34] Adopted by WHO and its partners on a global scale in 1994, DOTS involves treating patients with up to four drugs for six to eight weeks, for as little as $11 per person.[35] Since 1990, more than a million people have been treated this way.[36] The number of countries using the strategy has risen 10-fold to more than 100—including 20 of the 22 most TB-afflicted countries.[37] DOTS has a consistent cure rate of about 85 percent, and in some countries, such as Peru, Bangladesh, and parts of China, treatment success has neared 95 percent.[38]

Still, only some 15 percent of the world's TB patients receive DOTS, according to WHO.[39] Impediments to implementation include a lack of political commitment or funding by governments, political turmoil and war, erratic drug supplies, and deteriorating public health care systems.[40] In Russia and Eastern Europe, only some 5 percent of TB patients are treated with DOTS, largely because of insufficient health care funding.[41]

But DOTS alone may not be enough to stem the global TB onslaught—particularly in countries with high rates of HIV or drug-resistant TB. In these areas, tougher control strategies will be needed that allow for more rigorous treatment and that address underlying social issues such as health care and poverty.[42]

Endocrine Disrupters Raise Concern

Anne Platt McGinn

Recent research has confirmed that a growing number of synthetic chemicals—in everything from pesticides to industrial compounds—are hormonally active compounds.[1] Some chemicals can mimic, disrupt, or otherwise interfere with the body's network of hormones and receptors, known as the endocrine system.[2] (This regulates many biological processes in the body, including reproduction, metabolism, and development from conception to death.)[3] Other endocrine disrupters are associated with delayed intellectual development and immunological effects.[4]

Global production of synthetic chemicals has skyrocketed since the 1930s, from near zero to nearly 300 million tons in the late 1980s.[5] It continues to grow today, although estimates of global totals are unavailable.[6] At least 75,000 different chemicals are now used in pesticides, pharmaceuticals, plastics, and countless industrial and consumer products.[7]

Beginning in the late 1980s, mounting evidence showed that a subset of synthetic chemicals can cause long-term reproductive problems at small levels of exposure. In the early 1990s, toxicologists identified 45 pesticides and industrial chemicals as known or suspected endocrine disrupters.[8] By 1998, other chemicals were added, bringing the total to nearly 60, including several heavy metals and industrial compounds.[9] (See Table 1.) One recent estimate identifies 250 such compounds.[10] The list is likely to grow as testing and screening continue on thousands of compounds found in everything from pharmaceuticals to consumer products.[11]

Some endocrine disrupters, such as DDT and PCBs, persist in the environment and the food chain.[12] Even though these chemicals have been banned for several decades, they continue to collect in sediments and food. They amass in body fat and are carried up the food chain from prey to predator, bioaccumulating at ever higher concentrations. When people and animals eat fish, meat, milk, and other animal products, they may consume high levels of these chemicals, which can then stay in their bodies for long periods. Sometimes exposure to endocrine-disrupting chemicals can be more direct, such as when phthalates leach from a teething ring directly into an infant's mouth.[13]

Much of the evidence of the health effects of endocrine disrupters comes from animals in the wild. After a series of marine mammal die-offs in the Baltic, Mediterranean, and North Seas during the 1970s and 1980s, researchers looked at whether chemical pollution might be responsible for the reproductive failures. In one experiment, scientists found that females who ate clean fish bred normally with males 83 percent of the time, whereas only one third of the females who consumed highly contaminated fish mated successfully.[14] Findings of hormonal and immunological harm have been confirmed in other species, from eagles in the Great Lakes to alligators in Florida and fish in the United Kingdom.[15]

One of the first signs of the impacts of endocrine disrupters on humans came during the 1950s and 1960s. Nearly 1 million pregnant women in the United States took an artificial hormone, diethylstilbestrol (DES), to prevent spontaneous abortions.[16] The drug had severe side effects. DES daughters suffered from fertility problems, abnormal pregnancies, reproductive organ malfunctions, immune system disorders, and higher rates of a rare vaginal cancer typically only seen in women over 50.[17] DES sons reported cryptorchidism (undescended testicles), abnormal semen, and hypospadias (abnormal urethral openings).[18]

More subtle are the developmental and neurological effects that are linked to some endocrine disrupters. In the United States, more than 200 children whose mothers ate PCB-contaminated salmon and lake trout from Lake Michigan while pregnant suffered from impaired intellectual development.[19] By sixth grade, these children lagged up to two years behind their classmates in reading ability and word comprehension.[20] Researchers confirm similar effects among children exposed to PCBs and dioxins in the Netherlands.[21]

Some scientists maintain that endocrine disrupters are linked to significant drops in

sperm counts over the past 60 years in industrial countries. In 1992, a report in the *British Medical Journal* noted a 50-percent drop in sperm production between 1938 and 1991 among European and American men.[22] Other studies have cited a rash of related male reproductive health problems in industrial countries since the 1960s, including higher incidences of testicular cancer, cryptorchidism, and hypospadias.[23]

But the debate over male reproductive health is highly controversial. Sperm counts collected in Brazil, Hong Kong, India, Israel, Kuwait, Nigeria, and Thailand show no clear trends since monitoring began in 1978, and even an increase in some areas.[24] Moreover, some urban populations in Europe and the United States experienced no drop in sperm counts.[25] Several long-term projects are now under way to analyze the trends and determine what role—if any—endocrine disrupters may be playing.

Although the process of simply identifying these chemicals and understanding their effects is gaining momentum, more than 1,000 new chemicals are introduced to the global market each year without any prior testing for endocrine effects.[26]

TABLE 1: SELECTED ENDOCRINE DISRUPTERS BY CHEMICAL CATEGORY, PRODUCTION DATA, AND HEALTH EFFECTS

CHEMICAL	GLOBAL OR NATIONAL PRODUCTION	HEALTH EFFECTS
Pesticides		
Atrazine	377 tons in United States in 1996	Spermatoxicity, birth defects, low birth weight, spontaneous abortions
DDT	3 million tons since 1942	Weakly estrogenic, feminization
Endosulfan	817 tons in United States in 1995	Male infertility, hormonal effects
Industrial Chemicals		
Dioxins (byproduct from waste incineration, paper and pulp making, industrial processes)	10.5 tons International Toxic Equivalency of dioxins and furans combined, 1995	Interferes with enzymes and hormones; affects reproduction and sex organs; carcinogenic
PCBs (used in electrical transformers, hydraulic fluids)	1–2 million tons since 1929	Mimic estrogens, interfere with thyroid hormones; decreased birth weight and delayed brain development
Phthalates (used in plastics for industrial. medical, and household uses)	Most abundant synthetic chemicals; 454,000 tons a year in United States alone	Hormonal effects, male infertility, birth defects, spontaneous abortions
Heavy Metals		
Lead (paint, construction materials, electronics, ceramics)	2.7 million tons in 1995	Male and female infertility, spontaneous abortions; neurological effects, developmental delays, birth defects
Manganese (gasoline, coal-fired power plants)	22 million tons in 1995	Low birth rates, slowed fetal development, neurological toxicity

SOURCE: Ted Schettler et al., *Generations at Risk: Reproductive Health and the Environment* (Cambridge, MA: The MIT Press, 1999); DDT production data from Paul Johnston, David Santillo, and Ruth Stringer, "Marine Environmental Protection, Sustainability, and the Precautionary Principle," *Natural Resources Forum*, May 1999; lead and managanese production data from Gary Gardner and Payal Sampat, *Mind Over Matter: Recasting the Role of Materials in Our Lives*, Worldwatch Paper 144 (Washington, DC: Worldwatch Institute, December 1998).

Refugee Numbers Continue Decline

Michael Renner

For the fourth consecutive year, the number of people qualifying for and receiving refugee assistance from the U.N. High Commissioner for Refugees (UNHCR) declined.[1] As of January 1999, the figure stood at 21.5 million—22 percent below the January 1995 peak of 27.4 million.[2] (See Figure 1.)

UNHCR has four categories within this total population "of concern": 11.5 million refugees (down from more than 18 million in 1992; see Figure 2), 1.3 million asylum seekers, 2.4 million recent returnees (refugees and internally displaced persons) who continue to need assistance, and 6.3 million "others of concern," including internally displaced persons.[3]

The Palestinians are the largest single refugee group, with an estimated 3.8 million.[4] The second largest group contains 2.6 million Afghanis uprooted by two decades of nearly uninterrupted internal warfare triggered by the Soviet invasion of 1979.[5] Other major sources of refugees are Iraq, Burundi, Somalia, Bosnia-Herzegovina, and Sierra Leone.[6]

Asian countries hosted the largest number of persons of concern to UNHCR—7.5 million at the beginning of 1999.[7] (See Figure 3.) African countries were second, with 6.3 million—a significant decrease from the previous year—closely followed by Europe (6.2 million).[8] Among individual countries, Iran continued to carry the heaviest burden, with almost 2 million persons in its territory.[9] It was followed by Bosnia-Herzegovina, Pakistan, Russia, the United States, and Germany, all of which hosted slightly more than 1 million people.[10]

UNHCR primarily deals with caring for international refugees—those fleeing war and persecution who have crossed a border.[11] It can look after the internally displaced only when a national government gives its consent. Yet the plight of these people is often far worse than that of recognized refugees. Not only are they not protected under international refugee law but, as the U.S. Committee for Refugees notes, "many are actively attacked by their own governments and remain largely inaccessible to outside monitors."[12]

The U.N. agency uses a rough estimate of 30 million for the number of internally displaced persons worldwide.[13] (The U.S. Committee for Refugees lists 41 countries with a combined population of internally displaced of 17–19 million as of December 1998, but notes that the total may be much higher).[14] The countries with the largest numbers of internally displaced persons are Sudan, Angola, Colombia, Afghanistan, Myanmar, and Turkey.[15] Although UNHCR's involvement with this group has increased substantially in recent years, its assistance extends only to about 5 million people, 10 percent of whom have recently returned to their homes and still receive assistance.[16]

Another group, people in "refugee-like situations," typically live in conditions similar to those of refugees although they have not received official recognition. Some are ignored or tolerated by host governments, others harassed as illegal aliens. Estimates of their numbers are fragmentary, but a tally of 30 host countries by the U.S. Committee for Refugees suggests that there were at least 5 million at the beginning of 1999.[17]

All in all, there may be some 57 million refugees and internally displaced persons, although the figure is likely considerably higher.[18] Hence, it seems that nearly one out of every 100 persons on Earth is affected.

During 1998, almost 1 million refugees returned to their home countries either with UNHCR's help or on their own.[19] By far the largest repatriations took place in Liberia, Bosnia-Herzegovina, and Afghanistan.[20] At the same time, however, tens of thousands of people elsewhere faced expulsions from their host country or were otherwise forced to return home involuntarily.[21]

There is continued concern about the erosion of the right to asylum worldwide. Instead of offering refuge abroad, western countries increasingly prefer establishing internal "safe havens." These areas are often anything but safe and there are no international rules governing them. In effect, the richer countries just shift the burden of caring for displaced people.[22]

Refugee Numbers Continue Decline

Refugees Receiving U.N. Assistance, 1961–99[1]

YEAR	TOTAL (million)
1961	1.4
1962	1.3
1963	1.3
1964	1.3
1965	1.5
1966	1.6
1967	1.8
1968	2.0
1969	2.2
1970	2.3
1971	2.5
1972	2.5
1973	2.4
1974	2.4
1975	2.4
1976	2.6
1977	2.8
1978	3.3
1979	4.6
1980	5.7
1981	8.2
1982	9.8
1983	10.4
1984	10.9
1985	10.5
1986	11.6
1987	12.4
1988	13.3
1989	14.8
1990	14.9
1991	17.2
1992	17.0
1993	19.0
1994	23.0
1995	27.4
1996	26.1
1997	22.7
1998	22.4
1999 (prel)	21.5

[1]All data are as of January of the year indicated.
SOURCE: United Nations High Commissioner for Refugees, various data series.

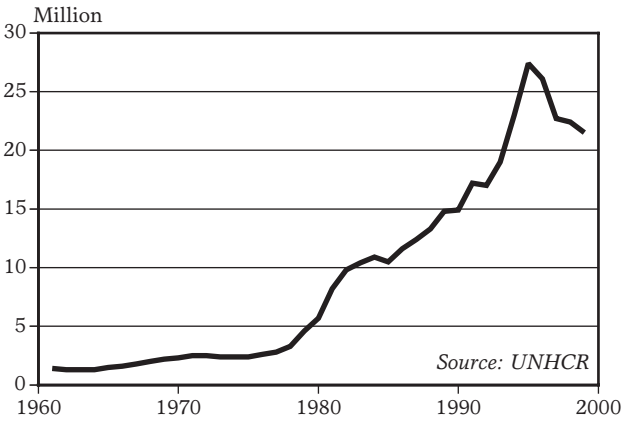

Figure 1: Refugees Receiving U.N. Assistance, 1961–99

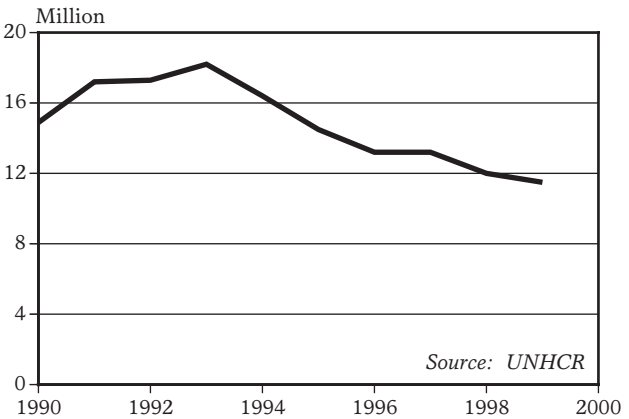

Figure 2: Internationally Recognized Refugees, 1990–99

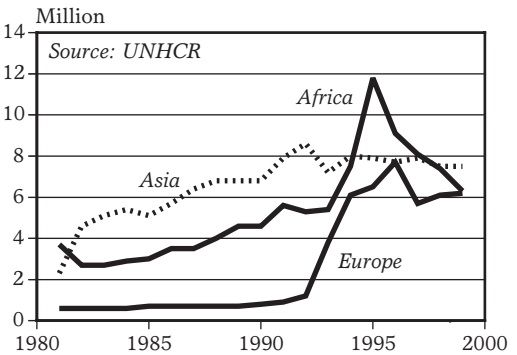

Figure 3: Refugees Receiving U.N. Assistance in Asia, Africa, and Europe, 1981–99

Cigarette Death Toll Rising Anne Platt M

In 1999, an estimated 1.15 billion smokers worldwide lit up 14 cigarettes a day each.[1] Global cigarette production declined just two tenths of 1 percent between 1998 and 1999 to 5,485 billion, down 3 percent from an all-time high of 5,679 billion pieces in 1996.[2] (See Figure 1.) Global production per person dropped to 915 cigarettes in 1999, down 7 percent from 1996.[3] (See Figure 2.)

Despite the leveling off in total production and drop in per capita supplies, annual deaths from smoking-related causes are expected to jump from 4 million in 1998 to 10 million in 2030.[4] In 30 years, the world's leading killer will not be a disease but a consumer product.[5] And by 2020, one out of three adult deaths worldwide will result from smoking—more than the deaths expected from malaria, tuberculosis, and maternal and childhood illnesses combined.[6]

With 80 percent of the world's current smokers living in developing countries, where smoking rates are climbing by 3.4 percent a year, many of the illnesses and premature deaths will hit hardest in areas that can least afford to treat more than 25 known tobacco-related diseases, including heart disease, respiratory ailments, and cancer.[7] Worldwide, the costs of treating smoking-related illnesses are estimated at $200 billion a year, more than 10 times the tobacco industry's profits in 1999.[8]

China is the world's largest cigarette producer, accounting for 1,675 billion cigarettes or 31 percent of global supply.[9] More than 300 million men and 20 million women there currently smoke 30 percent of the planet's supply, making this country also the world's leading consumer.[10] Despite the popularity of smoking, public awareness of related health risks is extremely low: one in every two smokers in China surveyed in 1999 did not know that smoking can cause cancer.[11] In China alone, health experts predict that 2 million people will die prematurely each year from tobacco-related causes by 2020.[12]

The United States remains the world's second largest supplier, producing 12 percent of the world's 1999 supply.[13] Indonesia ranks third among global producers, contributing 4 percent of world supplies, having overtaken Japan in 1998.[14] (Japan ranks third in total cigarettes smoked, after China and the United States.)[15]

In contrast to the situation in developing countries, consumption has been declining by about 1 percent a year in many industrial nations. During the past decade, the number of smokers in Europe dropped by 10 percent, a trend that is expected to continue.[16] By 2006, the European Union will become the first region in the world to ban all cigarette advertising.[17] Per capita consumption in the United States declined to 1,634 in 1999, a 9-percent drop from 1998.[18] (See Figure 3.)

As a result of higher retail prices and taxes, tough anti-smoking laws, and increased public awareness of the hazards of smoking, U.S. tobacco companies have shifted their focus from meeting domestic demand to promoting their lethal products to consumers in Asia, Africa, and Latin America.[19] In 1998, these firms spent nearly $5 billion in advertising outside the United States.[20] When adjusted for inflation, advertising overseas has tripled in the last 20 years, according to the U.S. Federal Trade Commission.[21] Consequently, the United States continues as the world's leading cigarette exporter.[22]

Partly as a result, more than a dozen countries in Latin America, Europe, and the Pacific have filed lawsuits against U.S. tobacco companies seeking to recoup payment for smoking-related illnesses.[23] Modeled on U.S. cases that awarded $251 billion to state governments in 1998, these lawsuits claim similar damages.[24]

And in 1999, the World Health Organization set the stage for the first legally binding international treaty on a global public health issue.[25] With more than 190 countries involved in negotiations, the Framework Convention on Tobacco Control will help lay the foundation for stricter regional and national measures to address the social and economic costs of smoking.[26]

WORLD CIGARETTE PRODUCTION, 1950Ð99

YEAR	TOTAL (billion)	PER PERSON (number)
1950	1,686	660
1955	1,921	691
1960	2,150	707
1965	2,564	766
1970	3,112	840
1971	3,165	836
1972	3,295	853
1973	3,481	884
1974	3,590	895
1975	3,742	916
1976	3,852	926
1977	4,019	950
1978	4,072	946
1979	4,214	962
1980	4,388	985
1981	4,541	1002
1982	4,550	987
1983	4,547	969
1984	4,689	983
1985	4,855	1,001
1986	4,987	1,011
1987	5,128	1,022
1988	5,250	1,026
1989	5,258	1,013
1990	5,419	1,027
1991	5,351	998
1992	5,363	985
1993	5,300	960
1994	5,478	978
1995	5,599	985
1996	5,679	986
1997	5,631	964
1998	5,497	929
1999 (prel)	5,485	915

SOURCE: USDA, Special Report: World Cigarette Situation, August 1999; data for 1950Ð58 are estimates based on U.S. data.

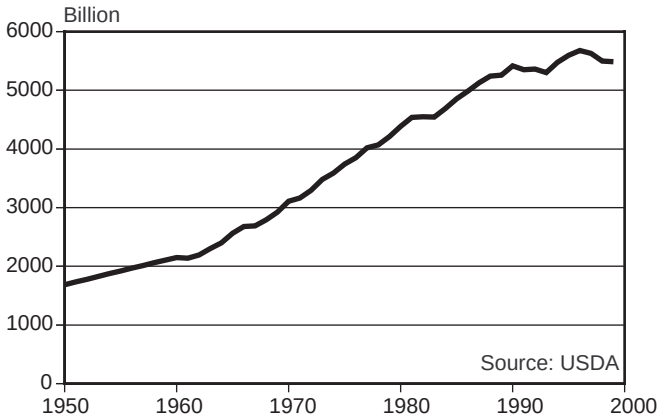

Figure 1: World Cigarette Production, 1950Ð99

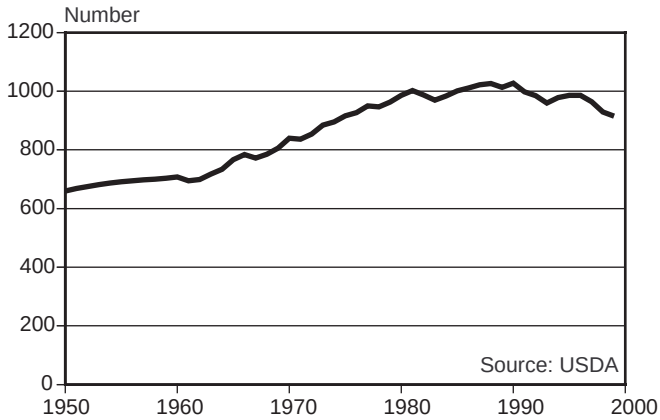

Figure 2: World Cigarette Production Per Person, 1950Ð99

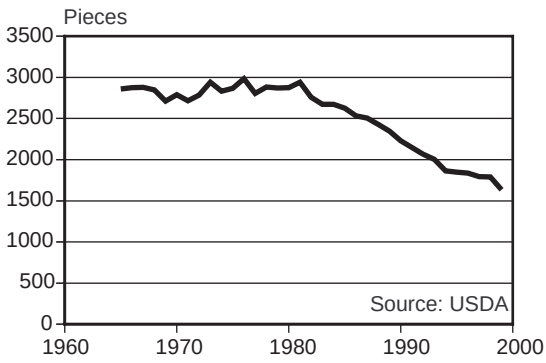

Figure 2: U.S. Cigarette Consumption Per Person, 1965Ð99

Number of Wars on Upswing

Michael Renner

According to AKUF, a study group at the University of Hamburg, the number of wars worldwide rose to 35 in 1999—continuing an upswing since 1997.[1] (See Figure 1.) The 1999 number is still one third below the 1992 peak, when 51 wars were under way.[2] Since 1945, there have been at least 212 wars around the world.[3]

During each year from 1992 to 1997, more wars were ended than new ones started.[4] Many long-standing conflicts ended in peace agreements. This triggered tremendous hope about a future with far fewer wars. But these expectations were quickly dashed. Ethnic and religious disputes, social and economic inequities, failures of governance, environmental degradation, and other factors continue to fuel the flames of violent conflict. Conflict prevention and peacekeeping still remain marginal endeavors.[5]

A total of eight new armed conflicts broke out during 1999, according to AKUF.[6] Hostilities in Chechnya and East Timor received wide coverage in the world's media, but fighting in Aceh (Indonesia), Tripura (India), Nepal, Kyrgyzstan, the Solomon Islands, and Nigeria went largely unreported and received little attention from diplomats.[7]

For the decade from 1989 to 1998, the Conflict Data Project at the University of Uppsala, Sweden, tallies a total of 108 armed conflicts in 73 different locations.[8] The vast majority of these—92 of the 108—took place exclusively within the boundaries of a single country.[9] Another nine involved intra-state conflicts with foreign intervention.[10] Just seven wars during that decade took place between opposing states.[11]

In 1999, three such inter-state wars were active: the border war pitting Ethiopia against Eritrea, Indian-Pakistani clashes over control of Kashmir, and an on-again, off-again U.S.-British aerial bombing campaign against Iraq.[12] In addition, the Chechen and East Timorese conflicts are hybrid cases: Chechnya had de facto become an entity separate from Russia after the 1996 war, but was not internationally recognized as a sovereign state. East Timor, on the other hand, was never part of Indonesia, even though it had been occupied since 1975.

With just one exception (in Kosovo), all armed conflicts during 1999 took place in the Third World.[13] According to the Uppsala Conflict Data Project, Asia and Africa were the two regions with by far the highest number of armed conflicts—15 and 14, respectively—in 1998.[14] (See Figure 2.)

In terms of human lives lost, the costliest ongoing wars are those in Afghanistan and Sudan, with 1.9 million and 1.5 million dead, respectively.[15] They are followed by Rwanda (500,000–1 million), Angola (more than 500,000), Algeria, Burundi, Congo (formerly Zaire), Iraq, and Sri Lanka (100,000–200,000 each).[16] These conflicts are claiming primarily civilian lives—not so much directly in battle than as a result of famine and social upheaval.

The nature of war has changed tremendously. It is becoming difficult to define armed conflict, as the distinction between political and criminal violence blurs. Increasingly, fighting involves not the uniformed armed services of a state but warlords, ethnic militias, private armies, and criminal organizations. And in 87 percent of the wars active in 1998, child soldiers were used—as many as 300,000 worldwide.[17]

The violence of many contemporary armed struggles is less an expression of clear political or military objectives (such as defending a border or annexing territory) than an indication of "the social chaos borne of state failure," in the words of Ernie Regehr of Project Ploughshares.[18] An underlying factor is the failure of states to create or maintain conditions conducive to the welfare of their populations. A Project Ploughshares analysis found that 41 percent of the states in the bottom half of the U.N. Development Programme's Human Development Index in 1998 experienced war on their territories within the previous decade.[19]

Number of Wars on Upswing

ARMED CONFLICTS, 1950–99

YEAR	CONFLICTS (number)
1950	12
1955	14
1960	10
1965	27
1970	30
1971	30
1972	29
1973	29
1974	29
1975	34
1976	33
1977	35
1978	36
1979	37
1980	36
1981	37
1982	39
1983	39
1984	40
1985	40
1986	42
1987	43
1988	44
1989	42
1990	48
1991	50
1992	51
1993	45
1994	41
1995	36
1996	31
1997	29
1998	32
1999	35

SOURCE: Arbeitsgemeinschaft Kriegsursachenforschung, Institute for Political Science, University of Hamburg.

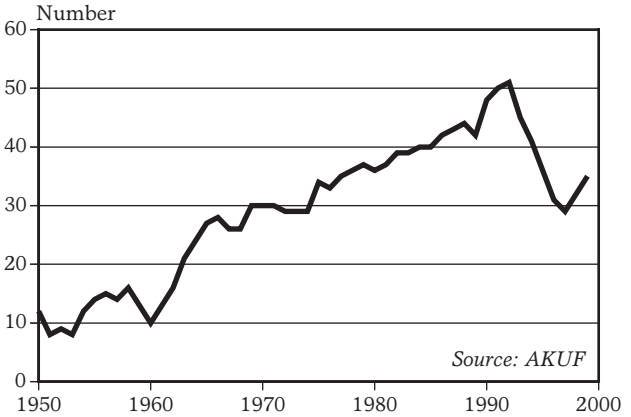

Figure 1: Armed Conflicts, 1950–99

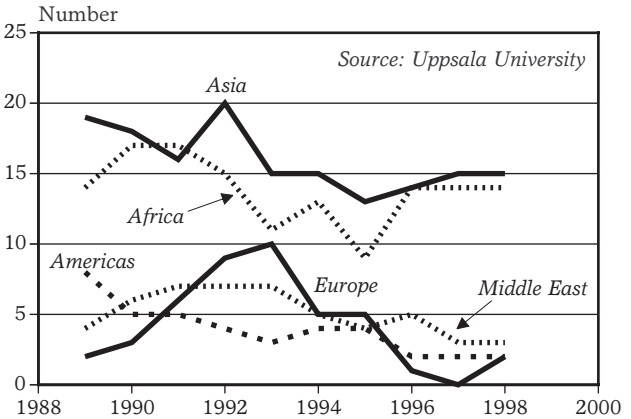

Figure 2: Armed Conflicts by Region, 1989–98

Peacekeeping Expenditures Turn Up

Michael Renner

For the first time since 1996, the United Nations expects to spend more on peacekeeping than in the previous year. For July 1999–June 2000, projected expenditures are at least $1.4 billion, and may increase to $1.8–2 billion.[1] (See Figure 1.) This is up from $860 million a year earlier, although still substantially below the peak levels of the mid-1990s. Some 14,615 soldiers, military observers, and civilian police from 84 countries served in peacekeeping missions in early December 1999 (in addition to 9,284 civilian personnel).[2] (See Figure 2.) As a few recently established missions scale up to their authorized strength, however, this figure is expected to reach about 34,000, and possibly as many as 40,000, during 2000.[3]

In recent years, U.N. peacekeeping has been overshadowed—in terms of funding and personnel—by operations run by NATO and other regional military organizations. The growing prominence of non-U.N. operations is the product of real and perceived U.N. failures in Bosnia and Somalia, an unwillingness among western governments to make adequate resources available to the United Nations, and an intent to bypass the U.N. Security Council, as in the 1999 Kosovo crisis. Operations outside U.N. purview are more concerned with a heavy-handed imposition of peace than with impartial peacekeeping, and they may serve the interests of individual countries or regional military alliances more than the interests of humanity as a whole.

During 1999, a total of 17 U.N. missions were active, including 4 new ones: a transitional administration to assist East Timor's path to independence, an interim administration for Kosovo, a peacekeeping force for Sierra Leone (upgraded from a small observer mission), and an observer mission in the Congo.[4] But 1999 also saw the end of a failed, decade-long peacemaking effort in Angola and the termination of a promising effort at conflict prevention in Macedonia.[5]

The newest missions are poised to become the largest current U.N. operations. When they reach their authorized levels, there will be 10,790 peacekeepers in East Timor, 11,100 in Sierra Leone, 4,756 in Kosovo, and 5,537 in the Congo.[6] The first three missions are working closely, though not without some friction, with non-U.N. forces. The Kosovo mission is principally a police force working in conjunction with the NATO-led KFOR military force. The Sierra Leone mission, working alongside ECOMOG (a Nigerian-led West African force), is supposed to oversee a shaky peace agreement that ended a brutal rebellion. And the East Timor mission is taking over from an Australian-led force that intervened, with U.N. blessing, to stop the rampaging of anti-independence militias.[7]

Since the beginnings of U.N. peacekeeping in 1948, a total of 53 missions have been initiated, at a cost of about $20 billion, and sent to 36 different countries, territories, or border areas.[8] Of these, 18 went to Africa, 10 to Europe, 9 to the Middle East, 8 to Asia, and 8 to Central America and the Caribbean.[9]

U.N. peacekeeping continues to struggle under the cloud of financial crisis. As of mid-December 1999, U.N. members owed the organization $1.7 billion for peacekeeping operations.[10] (See Figure 3.) The United States is still the most in arrears, with $1.05 billion in unpaid dues (61 percent of the total).[11]

Non-U.N. missions now cost seven times as much as U.N. operations and they deploy four times as many soldiers and observers. Even as Washington expresses concern about the cost of U.N. peacekeeping, the U.S. and other western governments continue to pour huge amounts of money, personnel, and equipment into operations not directed by the United Nations and far less accountable to the international community.

Two NATO-led forces, SFOR in Bosnia and KFOR in Kosovo, fielded more than 88,000 soldiers in 1999, costing an estimated $11 billion.[12] Altogether, some 35 non-U.N. missions were active that year.[13] Reliable cost and personnel data are not available for several, but collectively they deployed at least 125,000 troops and observers and their expenditures ran to at least $12 billion.[14] This is up from about 55,000 personnel and $1.4 billion as recently as 1993.[15]

Peacekeeping Expenditures Turn Up

U.N. Peacekeeping Expenditures, 1986–99

YEAR	EXPENDITURE (mill. 1998 dollars)
1986	338.3
1987	325.9
1988	348.2
1989	797.0
1990	558.3
1991	567.4
1992	1,991.4
1993	3,359.1
1994	3,584.3
1995	3,527.1
1996*	1,338.0
1997*	1,002.0
1998*	860.0
1999*	1,435.7

*July to June of following year.

SOURCES: U.N. Department of Peacekeeping Operations; Office of the Spokesman for the U.N. Secretary-General.

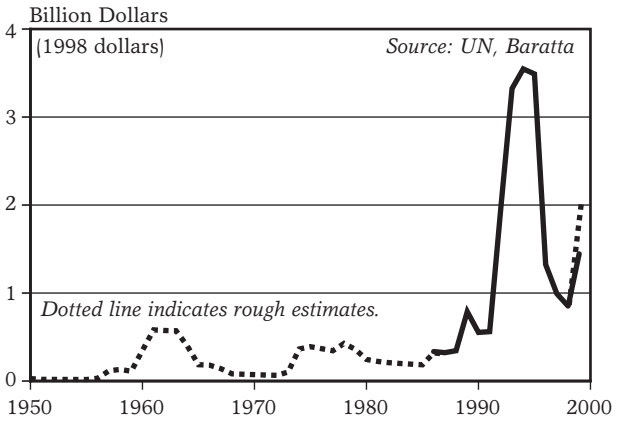

Figure 1: U.N. Peacekeeping Expenditures, 1950–99

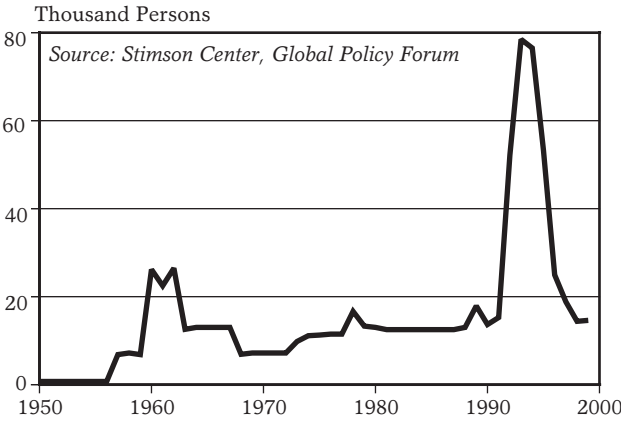

Figure 2: U.N. Peacekeeping Personnel, 1950–99

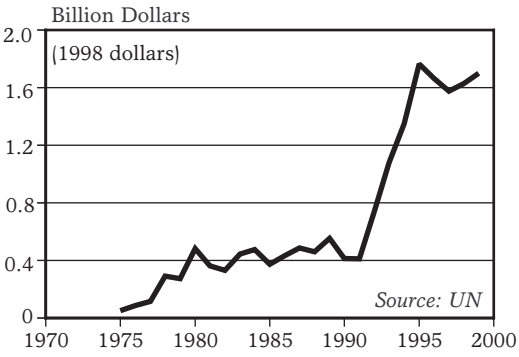

Figure 3: Arrears of U.N. Members for Peacekeeping Expenses, 1975–99

Women Slowly Gain Ground in Politics

Molly O. Sheehan

As of December 1999, women accounted for 13.2 percent of the representatives in the lower or popular chambers of national legislatures worldwide, according to the Geneva-based Inter-Parliamentary Union.[1] Women have slowly been gaining ground in this arena since World War II (see Table 1), with the proportion of women in the lower chambers of parliaments nearly quadrupling from 3 percent in 1945 to 11.6 percent in 1995.[2]

Although women constitute more than half of world population and play an important role in environmentally sustainable development, until well into the twentieth century many nations denied women the right to vote and run for office.[3] New Zealand in 1893 and Australia in 1902 were the first to grant electoral rights to women but these laws applied only to women of European descent; today, only Bahrain, Kuwait, and the United Arab Emirates continue to bar women from full political participation.[4] In Kuwait, the Emir introduced a measure in 1999 to allow women to vote and run in elections, but the nation's all-male Parliament rejected the plan.[5] Although most countries now allow women to vote and stand for election, there is a long way to go to achieve equal political participation.

Some regions of the world boast a greater percentage of women politicians than others. A worldwide ranking of the number of women members in the lower chamber of national parliaments taken every 10 years between 1945 and 1995 found Finland and Sweden consistently in the top 15.[6] As a group, the Nordic countries have the highest share of women in national legislatures. (See Table 2.)

Women have attained the top posts in national governments only recently. Of the 35 women heads of state in the twentieth century, 28 were elected in the 1990s.[7] In June 1999, lawmakers in Latvia made Vaira Vike-Freiberga the first democratically elected woman president in Eastern Europe.[8] In Indonesia, Megawati Sukarnoputri was the front-runner in the nation's first democratic election, in 1999.[9] Although she won a majority of the popular vote, she could not summon enough electoral votes in the parliament, which eventually elected her Vice President.[10]

In a few countries, the profile of women has risen in the latest round of elections. For instance, a record number of women candidates for parliament and local councils were on the ballots in Turkey's

TABLE 1: WOMEN IN NATIONAL LEGISLATURES, SELECTED COUNTRIES, 1955–99[1]

COUNTRY	1955	1975	1985	1999
		(percent)		
Sweden	12.2	21.4	31.5	42.7
Germany[2]	8.8/24.5	5.8/31.8	9.8/32.4	30.9
South Africa	1.9	0.6	1.1	30.0
Cuba	—	—	22.6	27.6
Namibia	—	—	—	22.2
China	12.0	22.6	21.2	21.8
Costa Rica	6.7	5.3	7.0	19.3
United Kingdom	3.8	3.6	3.5	18.4
Mexico	2.5	6.0	11.0	18.2
United States	2.7	3.7	5.0	13.3
France	3.7	2.7	7.1	10.9
Soviet Union/Russia	24.0	30.5	31.1	10.2
India	4.0	4.1	7.8	8.4
Brazil	0.3	0.3	1.5	5.7
Japan	1.7	1.4	1.6	4.6

[1]Percent who are members of single-chamber parliaments or in the lower chamber of two-chamber systems. Dashes indicate that elections had not yet been held. [2]Figures for 1955, 1975, and 1985 are for West/East Germany.

SOURCE: IPU, *Women in Parliaments 1945–1995: A World Statistical Survey* (Geneva: 1995); IPU, "Women in National Parliaments: Situation as of 5 December 1999," <www.ipu.org>.

TABLE 2: WOMEN IN NATIONAL LEGISLATURES, REGIONAL AVERAGES, 1999[1]

REGION	SHARE (percent)
Nordic countries	38.9
Americas	14.7
Asia	14.6
Rest of Europe	12.3
Sub-Saharan Africa	11.2
Pacific	10.9
Arab States	3.6

[1]In countries with bicameral systems, includes both houses.
SOURCE: IPU, "Women in National Parliaments: Situation as of 5 December 1999," <www.ipu.org>.

1999 elections.[11] Voters in Mexico City in 1999 elected a woman mayor, considered the second most powerful post in the nation after the presidency; during the same year, a woman was elected president of a national political party there, the Party of the Democratic Revolution, for the first time.[12] And although the 46 women running for election to the Northern Ireland Assembly in 1998 represented only 15 percent of the field, it was still a greater share than ever before.[13]

Some gains have also been made at the level of national ministers. Italy now has twice as many women Cabinet ministers as in any previous government.[14] After the 1999 election in South Africa, women constituted 38 percent of the 42-person cabinet.[15]

Barriers to female participation in politics vary from country to country. A recent study in the United States found that newspapers cover women candidates for executive-branch positions in state and national government differently from their male counterparts. Coverage of women tends to focus more on the candidates' personal characteristics and less on their positions on issues.[16]

Some countries have used quotas to boost the number of women in power. In India, following a 1993 amendment reserving one third of all seats in local elections for women, more than 800,000 women were elected.[17] Similarly, a surge of women candidates entered Brazil's local elections in 1996 after a law required that at least 20 percent of each political party's candidates be women.[18] Other countries with some form of quota system include Argentina, Finland, Germany, Mexico, South Africa, and Spain.[19]

Various groups have arisen to promote female leadership.[20] For example, Sisterhood is Global, a network of more than 1,300 individuals and organizations in 70 countries, educates women about their rights.[21] In many Islamic countries, such groups are helping to create a momentum for change.[22] A Council of Women World Leaders, established at Harvard University's Kennedy School of Government in 1996, draws on the experience of current and former women heads of state to encourage women to participate in politics.[23]

A number of international decisions have helped legitimize the political involvement of women. Relevant treaties include the 1952 Convention on the Political Rights of Women and the 1979 Convention on the Elimination of Discrimination Against Women. In 1995, the United Nations sponsored the fourth world conference on women in Beijing. With 189 governments and 2,600 nongovernmental groups in attendance, this was one of the largest U.N. conferences ever.[24] Delegates agreed to a set of strategic objectives and actions, including efforts to advance the role of women in politics and environmental stewardship.[25] A special session of the United Nations in New York in June 2000 will assess progress toward these goals.

Ice Cover Melting Worldwide

Lisa Mastny

From the polar regions to high mountain glaciers, Earth's ice cover is melting at an astonishing rate.[1] (See Table 1.) Global ice melt accelerated rapidly during the 1990s—the warmest decade on record.[2] Scientists suspect that the enhanced melting is related to the unprecedented release of greenhouse gases by humans during the past century.[3]

The ice-covered polar regions are warming faster than the planet as a whole, and melting rapidly.[4] The Arctic sea ice, covering an area roughly the size of the United States, has lost an average of 34,300 square kilometers—an area larger than the Netherlands—each year since 1978.[5] But the ice has thinned even faster than it has shrunk. Between 1958–76 and the mid-1990s, the average thickness dropped from 3.1 meters to 1.8 meters, a decline of some 40 percent.[6]

The massive Antarctic ice cover, which

TABLE 1: SELECTED EXAMPLES OF ICE MELT AROUND THE WORLD

NAME	LOCATION	MEASURED LOSS
Arctic Sea Ice	Arctic	Has shrunk by 6 percent since 1978, with a 14-percent loss of thicker, year-round ice. Has lost 40 percent of its thickness in less than 30 years.
Greenland Ice Sheet	Greenland	Has thinned by more than a meter a year on its southern and eastern edges since 1993.
Columbia Glacier	United States	Has retreated nearly 13 kilometers since 1982. In 1999, retreat rate increased from 25 meters per day to 35 meters per day.
Wilkins Ice Shelf	Antarctica	Lost nearly 1,100 square kilometers in area in early March 1999. Ice front is back 35 kilometers from previous extent.
Tasman Glacier	New Zealand	Has thinned by more than 100 meters in the past century. (Overall, New Zealand glaciers shrank some 26 percent between 1890 and 1998.)
Gangotri Glacier	India	Average rate of retreat is now 30 meters a year, compared with 18 meters a year between 1935 and 1990 and 7 meters a year between 1842 and 1935.
Caucasus Mountains	Russia	Glacier volume has declined 50 percent in the past century.
Tien Shan Mountains	China	22 percent of glacial ice volume has disappeared in the past 40 years.
Mt. Kenya	Kenya	Largest glacier has lost 92 percent of its total mass since the late 1800s. Some 40 percent of this decline has occurred since the 1960s.
Alps	Western Europe	Overall glacial extent has declined 30–40 percent since 1850. Ice has lost 50 percent of its mass in the past century.
Glacier National Park	United States	Since 1850, the number of glaciers has dropped from 150 to fewer than 50. The remaining glaciers could disappear completely in 30 years.
Upsala glacier	Argentina	Has retreated 60 meters per year over the last 60 years, and rate is accelerating.

SOURCE: See endnote 1.

averages 2.3 kilometers in thickness and represents 91 percent of Earth's ice, is also melting—although there is disagreement over how quickly.[7] One study estimates that the Western Antarctic Ice Sheet (WAIS), the smaller of the continent's two ice sheets, has retreated at an average rate of 122 meters a year for the past 7,500 years—and is in no near danger of collapse.[8] But other studies suggest that the sheet may break more abruptly if melting accelerates. They point to signs of past collapse, as well as to fast-moving ice streams within the sheet that could speed ice melt, as evidence of potential instability.[9]

For now, most Antarctic melting has occurred on the continent's edges, on the ice shelves that form when the land-based ice sheets flow into the ocean and float.[10] Within the past decade, three ice shelves have crumbled: the Wordie, the Larsen A, and the Prince Gustav.[11] Two more, the Larsen B and the Wilkins, are in full retreat and expected to break up soon, having lost more than a seventh of their combined area since late 1998—a loss the size of Rhode Island.[12] Icebergs as big as Delaware have also broken off Antarctica, posing threats to open-water shipping.[13]

Outside the poles, most ice melt has occurred in mountain and subpolar glaciers, which respond much more rapidly to temperature changes.[14] As a whole, the world's glaciers are now shrinking faster than they are growing, and losses in 1997–98 were "extreme," according to the World Glacier Monitoring Service.[15] Scientists predict that up to a quarter of global mountain glacier mass could disappear by 2050, and up to half by 2100—leaving large patches only in Alaska, Patagonia, and the Himalayas.[16] Within the next 35 years, the Himalayan glacial area alone is expected to shrink by one fifth.[17]

The disappearance of Earth's ice cover would significantly alter the global climate—though the net effect remains unknown. Ice reflects large amounts of solar energy back into space and helps cool the planet.[18] When ice melts, however, this exposes land and water surfaces that retain heat—leading to even more melt and creating a feedback loop that accelerates the overall warming.[19] But excessive ice melt in the Arctic could also cause cooling in parts of Europe and the eastern United States, as the influx of fresh water into the North Atlantic may disrupt the northward flow of the warming Gulf Stream.[20]

As mountain glaciers shrink, large regions that rely on glacial runoff for water supply could experience severe shortages.[21] The Quelccaya Glacier, the traditional water source for Lima, Peru, is now retreating by some 30 meters a year—up from only 3 meters a year before 1990—posing a threat to the city's 10 million residents.[22] And as the Himalayas melt, the glacier-fed Indus and Ganges rivers are expected to initially swell and then fall to dangerously low levels, affecting the crops and drinking water of the estimated 500 million people who live along their tributaries in northern India.[23]

Rapid glacial melting can cause serious flood damage in heavily populated regions such as the Himalayas.[24] In Nepal, a glacial lake burst in 1985, sending a wall of water rushing 90 kilometers down the mountains, drowning people and destroying houses.[25]

Large-scale ice melt would also raise sea levels and flood coastal areas, currently home to half the world's people.[26] Over the past century, melting in ice caps and glaciers has contributed on average about a fifth of the estimated 10–25 centimeter (4–10 inch) global sea level rise.[27] But ice melt's share in sea level rise is increasing, and will accelerate if the larger ice sheets crumble.[28] Antarctica alone is home to 70 percent of the planet's fresh water, and collapse of the WAIS, an ice mass the size of Mexico, would raise sea levels by an estimated 6 meters—while melting of both Antarctic sheets would raise them nearly 70 meters.[29] (Loss of the Arctic sea ice or of the floating Antarctic ice shelves would have no effect on sea level because these already displace water.)[30]

Wildlife is already suffering as a result of global ice melt—particularly at the poles, where polar bears, penguins, seals, and other creatures depend on food found at the ice edge.[31]

Stresses on Amphibians Grow

Ashley T. Mattoon

Global amphibian decline emerged as a serious scientific possibility in 1989 at the first World Congress of Herpetology in Canterbury, England.[1] Biologists at the meeting began comparing notes and discovered that amphibian populations all over the world seemed to be disappearing. In many cases, amphibians were vanishing in remote protected areas, where there was no direct evidence of human influence.[2]

Amphibians—frogs, toads, salamanders, and the lesser-known "legless salamanders" called caecilians—are the world's oldest terrestrial vertebrate class, but because most of them are inconspicuous, relatively little is known about them. At the time of the Canterbury conference, for example, it was not clear whether scientists were observing natural population fluctuations or a more insidious global phenomenon.[3] Today, a wealth of new evidence has convinced nearly all specialists that a catastrophic decline is indeed occurring.[4] Large-scale disappearances have been documented in places as diverse as Costa Rica, Australia, and the United States. (See Table 1.)[5]

Virtually every major type of environmental stress has been identified as a cause for the decline of one amphibian species or another. Perhaps the most obvious reason has been the loss or degradation of habitat. In the United Kingdom, populations of all six native amphibian species have dropped precipitously due to the loss of breeding ponds—in some places, 80 percent of these ponds have been filled in the last 50 years.[6] Habitat degradation is thought to be the primary reason the Arroyo toad of southern California is missing from 75 percent of its historic range.[7] And in the national forests of western North Carolina, it is estimated that clearcutting results in the demise of nearly 14 million salamanders a year.[8]

Another leading culprit is epidemic disease.[9] The chytrid fungus, for example, has recently been linked to catastrophic die-offs in Australia, Costa Rica, Panama, and the United States.[10] Iridoviruses have been found responsible for the deaths of amphibians in the United Kingdom and the United States.[11]

In 1999, new evidence from Costa Rica suggested that the disappearance of the famous Golden Toad could be the first documented extinction due to modern climate change.[12] The toad, last seen in 1989, inhabited a cloud forest atop a mountain range. Scientists found that a long-term rise in sea surface temperatures caused the mountains' cloud bank to lift, so it was no longer depositing the amount of moisture that the Golden Toads depended on.[13] The resulting drier conditions are thought to be a primary reason behind the toad's disappearance.

Other identified causes of amphibian decline include the intentional or accidental introduction of non-native predators or competitors, ultraviolet radiation, acid rain, and agricultural pollution.[14] Rarely is only one of these many stresses acting in isolation, however. It is more likely that many disappearances have been due to a combination of threats.

For example, a pathogenic fungus may not be lethal under normal conditions, but if immune systems are weakened due to changes in climate or increased exposure to ultraviolet radiation, amphibians would be more vulnerable.[15] In some cases, the combined effect of non-native species introductions and epidemic disease have been lethal.[16] Some scientists hypothesize that the international trade in aquarium fish is to be blamed for the arrival of the chytrid fungus in Australia.[17] In the Ural Mountain region of Russia, the combined influence of species introduction and industrial pollution has caused the demise of many natives: *Rana ridibunda*, an introduced frog, has been able to displace native species because it is more tolerant of pollution.[18]

Amphibian decline is probably bad news for many other organisms. Many scientists argue that amphibians are important bioindicators—a sort of barometer of Earth's health, since they are more sensitive to environmental stress than other organisms.[19] For instance, amphibians rely on both aquatic and terrestrial

TABLE 1: LARGE-SCALE LOSSES OF AMPHIBIANS

LOCATION	SPECIES	STATUS	SUSPECTED CAUSE
Montane areas of eastern Australia	14 species of frogs, including the southern day frog and the gastric brooding frog.	Sharp population declines since the late 1970s. Four species are thought to be extinct.	Parasitic fungus, possibly introduced through international trade in aquarium fish and amphibians.
Monteverde region of Costa Rica	20 species of frogs and toads (40 percent of total frog and toad fauna), including the Golden Toad.	Disappeared after synchronous population crashes in 1987. Missing throughout 1990–94 surveys.	Climate change combined-with other factors, such as parasites.
Yosemite region of California	5 of the region's 7 frog and toad species—including the mountain yellow-legged frog and the foothill, yellow-legged frog.	Severe declines—one species has disappeared entirely, another has declined to a few small populations.	Overall cause unknown. Introduced predatory fish combined with drought-induced loss of habitat contributed to the decline of some species.
Montane areas of Puerto Rico	12 of 18 endemic amphibian species	Three may be extinct, the others are in decline or at risk.	Unknown. Possibly climate change.

SOURCE: See endnote 5.

environments and are therefore vulnerable to stresses in both realms. They are vegetarians as juveniles and carnivores as adults, which can make them especially susceptible to changes in the food web. They have thin, permeable skin that can readily absorb contaminants from water, air, or soil. They do not have fur or feathers, and their eggs are not enclosed by protective shells that would shield them from ultraviolet radiation or pollution.

And amphibian decline itself is likely to become a form of ecological degradation, since amphibians play a critical role in many eco-systems. In some habitats, the biomass of amphibians can exceed that of all other vertebrates combined.[20] Amphibians are often vital links in food webs—they eat plants and animals and they are also a major food source for birds, reptiles, fish, and mammals. Many of the creatures that amphibians eat are often thought of as pests to humans—mosquitoes, for example.

Amphibians are an incredibly diverse group of organisms; in fact, there are more species of amphibians than there are of mammals.[21] The rich and largely unknown diversity undoubtedly embodies a great deal of useful information, so the loss of amphibians is a tragedy for society as well. Many important medicines have been discovered from chemicals found in amphibians, including painkillers and treatments for victims of burns and heart attacks.[22] For generations, indigenous tribes in Ecuador have used a secretion from the skin of a local frog that produces a painkiller 200 times more powerful than morphine without negative side effects.[23] A U.S. pharmaceutical company is currently developing a drug modeled on the active chemical found in the secretion.[24]

As the list of documented losses grows every day, important conservation efforts are gaining steam. An essential objective is to improve understanding of the status of amphibians through the collection of long-term data. A task force of the World Conservation Union–IUCN has been compiling data from monitoring programs around the world and plans to release a comprehensive summary of the declining amphibian phenomenon in 2002.[25]

Environmental Treaties Gain Ground

Hilary French

Five new environmental agreements were forged in 1999, bringing the list of international environmental accords to nearly 240. (See Figure 1.) More than two thirds of these pacts have been reached since the first U.N. conference on the environment was held in Stockholm in 1972.[1]

As environmental diplomacy matures, negotiators are increasingly strengthening existing treaties rather than devising entirely new accords. In keeping with this broader trend, all the agreements made in 1999 built on existing treaties.

Many environmental treaties are regional, involving issues such as management of shared river systems and air corridors or the protection of migratory bird species. This was the case for three of the agreements finalized in 1999, two of which were negotiated under the auspices of the U.N. Economic Commission for Europe (ECE).

The ECE cooperated with the World Health Organization's Regional Office for Europe to broker a protocol on water and health that was adopted in London in June. This addition to a 1992 ECE convention on transboundary waterways aims to reduce water-related disease by requiring signatories to provide adequate sanitation and safe drinking water.[2]

And in November, negotiators reached agreement in Gothenburg, Sweden, on a groundbreaking protocol to the 1979 ECE Convention on Long-Range Transboundary Air Pollution. The new accord takes an innovative multifaceted approach, setting emissions reduction targets for four different pollutants. Specific targets vary by country, but the overall goal is to reduce Europe's sulfur emissions 63 percent from 1990 levels by 2010, nitrogen oxides emissions by 41 percent, volatile organic compounds by 40 percent, and ammonia emissions by 17 percent.[3]

In the Caribbean region, 16 countries agreed in October to a protocol on reducing land-based sources of marine pollution; this agreement falls under the 1983 Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region.[4]

In addition to many developments at the regional level, the last few decades have seen steady progress toward developing international rules governing the "global commons," including the atmosphere, the ocean, and biological diversity.[5] In line with this trend, two of the accords reached in 1999 are global in scope.

In early December, negotiators agreed to a Beijing Amendment to the 1987 Montreal Protocol on ozone depletion that adds a new chemical, chlorobromomethane, to the list of controlled substances and strengthens limits on another, hydrochlorofluorocarbons.[6] And in mid-December, governments adopted a protocol to the Basel Convention on the hazardous waste trade that put in place a system of liability and compensation for accidents during waste shipment.[7]

Judging from the number of treaties, environmental diplomacy appears to have been a spectacular success. And many of these accords have in fact yielded important results. Among other achievements, air pollution in Europe has declined dramatically as a result of

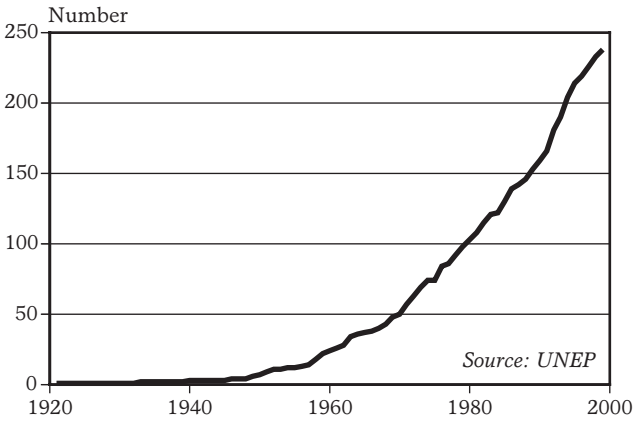

Figure 1: International Environmental Treaties, 1921–99

the 1979 treaty on transboundary air pollution; global chlorofluorocarbon (CFC) emissions have dropped by nearly 90 percent as a result of the 1987 Montreal Protocol on ozone depletion; and mining exploration and development have been precluded in Antarctica for 50 years under a 1991 accord.[8]

Yet even as the number of treaties climbs, the condition of the biosphere continues to deteriorate. Carbon dioxide levels in the atmosphere have reached record highs, scientists are warning that we are in the midst of a period of mass extinction of species, the world's major fisheries are depleted, and water shortages loom worldwide.

The main reason that many environmental treaties have not yet turned around the environmental trends they were designed to address is because the governments that created them permitted only vague commitments and lax enforcement.

One implementation tool that many environmental treaties do rely on heavily is transparency, including detailed reporting of actions taken at the national level to put agreements into practice. If this information is made freely available, then other countries as well as nongovernmental organizations can use it to shame countries into compliance.[9]

But governments often fail to provide secretariats with accurate, complete, and timely information. For example, only 63 percent of the parties of the Convention on Biological Diversity had submitted the required reports as of December 1999.[10]

The mini-institutions set up by each treaty play a key role in the implementation process. At a minimum, each treaty spawns a conference of the parties (COP) and a secretariat. The COPs are regular meetings of treaty members; they provide an opportunity to strengthen the agreement and review problems in implementation. Secretariats are the small offices set up to service these meetings of governments. Environmental conventions also commonly include scientific bodies, which provide advice on new scientific and technological information relevant to the implementation of the accord.[11]

Despite their importance, governments all too often give secretariats limited resources and authority. For instance, the secretariats generally do not have the wherewithal or authority to verify the information that governments are supposed to supply on implementation efforts. A typical secretariat has fewer than 20 staff and an annual budget of $2–11 million—a drop in the bucket compared with the budgets of the agencies charged with implementing domestic environmental laws in major countries.[12]

Although transparency can be a powerful enforcement tool, tougher medicine is sometimes required. One option is to use trade restrictions to encourage countries to participate in international environmental accords, or to abide by those they have signed on to. The Montreal Protocol on ozone depletion, for example, restricts signatories from trading in CFCs and products containing them with countries that have not joined in the accord. These provisions are widely credited with helping to bring about near universal participation in this landmark treaty.[13] But the use of trade levers as an enforcement tool is controversial, in part because of possible conflicts with the rules of the World Trade Organization.

The punitive approach embodied by penalties and sanctions has its place, but it is not always appropriate or effective. Shortages of money and governmental capacity can make it difficult for countries to comply with treaty requirements, particularly in the developing world. A critical issue for the success of most treaties is whether adequate funding and technical assistance is made available to help developing countries implement them.[14]

The last few decades of the twentieth century were a period of unprecedented activity in environmental diplomacy. The challenge for the early years of the twenty-first century will be to build upon this legacy, primarily by strengthening existing accords and ensuring that they are put into widespread practice around the world.

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