TEN

How Precaution Kills

The Demise of DDT and the Resurgence of Malaria

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Interpretation and application of the precautionary principle by advisers and the educated elites in many developing countries are detrimental to the health and economic development in those countries. This chapter is an examination of several examples of this phenomenon, with a special focus on how unwarranted concern about adverse health and environmental impacts of DDT has caused a resurgence of malaria and deaths from that disease. Developing countries need to be very careful when employing the precautionary principle because their advisers may not appreciate the harm that can result.

Introduction

Many of our preoccupations arise from the modern paradox: although our longevity, health, and environment have never been better, we spend more time than ever worrying about all three. Concerns include both long-standing scares, such as Alar, saccharine, breast implants, passive smoking, nuclear power, pesticide residues in food, children's vaccines, and more recent scares such as mobile phone radiation, genetically modified foods, and global warming. In some cases, the concern is completely invalid, in others the scare is out of all proportion to the likely threat. For several years, my colleagues and I (at the European Science and Environment Forum www.scienceforum.net) have attempted to expose these falsehoods or exaggerations by writing in newspapers, publishing papers, and editing books. We emphasize that while the threats may be real, they are tiny. The out-of-all proportion scares they generate will, at best, divert resources and, at worst, cause significant mortality in poor countries.

This disastrous consequence comes about because intellectuals in less developed countries (LDCs), far from treating the preoccupations of the residents of economically developed countries as affectations of the very rich, adopt these same worries. Craven and Stewart provide an instructive analysis of risk issues in France and the francophone African state of Burkina Faso.[1] The medical, environmental, geographical, and political problems of Burkina Faso are radically different from those in France, but intellectuals in Burkina Faso and college students in France responded similarly to questions about risk. In fact, intellectuals in Burkina Faso had "borrowed" concerns relevant only to France, and their opinions were reflected in the national media. Thus,

1. R. Bate, ed., *What Risk? Science, Politics and Public Health* (Oxford: Butterworth-Heinemann, 1997).

such issues as the hypothetical threat of cancer from overhead power lines—against a background of a widespread lack of electricity for refrigeration of food and medicines or lighting for schools—are given a public airing, while serious but perennial problems such as lack of potable water, chronic infectious disease, and malnutrition are ignored.

Why this happens is not adequately established, but some factors are apparent. Media coverage in LDCs generally follows media coverage in powerful trading partners (such as the United States) or former colonial powers (such as France or Britain). Many university graduates in developing countries have been educated in the West and have likely acquired a Western worldview. When they return home, these graduates become opinion-formers in government, education, and the media. Moreover, international donor agencies frequently promote projects that reflect their priorities back home and not necessarily what is required or desirable in the LDCs. Seatbelt campaigns in countries where the only cars are those owned by the aid agencies are a good example.[2]

Even where local governments and media address local problems, the proposed solutions are often driven by Western concerns, which may be inappropriate to local conditions. Local government actions that differ from an unwritten consensus, a tacit international agreement about the "correct" way to deal with an issue, can run into a wall of criticism. Recent examples include Western criticism of South African President Thabo Mbeki's stance on AIDS, Chinese officials' refusal to sanction a UN convention on tobacco, and OPEC States' refusal to go along with the climate change consensus. In all three cases, dissidents have felt the opprobrium of the English-speaking media—conservative

2. R. Bate, *Life's Adventure: Virtual Risk in a Real World* (Oxford: Butterworth-Heinemann, 2000).

and liberal alike.[3] That's not to say that officials from these countries were acting in a morally correct way or in a way that will, in the long run, benefit their people, but as leaders of their nations they took actions that put their country's interests first.

Many reasons, such as the expectation of a hostile media response, local political considerations, international pressures, or even personal aggrandizement can explain why poor-country politicians do not always do what is, seemingly, best for their people.[4] There are probably thousands of examples of these decisions, such as recent rejections of well-planned, needed dam construction projects because of environmental destruction that accompanied poorly planned dams in years past. Although it's relatively easy and inexpensive to discover anecdotal examples of such decisions, few such decisions have been analyzed and documented, probably because research costs are so high. Careful, properly documented analyses are particularly rare in the environmental field.

Nevertheless, many anecdotes and the few analyses of the application of the precautionary principle (PP) in developing countries point to a pattern of decisions that harm the citizens of those countries.[5] The PP, which lacks any consistent definition, can be paraphrased (and usually is) by saying that where there is a threat of harm from a technology, lack of scientific knowledge shall not be used as a reason for postponing cost-effective measures to prevent harm. It is reasonable to everyone to "look before you leap," but the practical interpretation of the PP in many Western country policies means that only "looking" is allowed, even

3. Ibid.

4. R. Thurow, "Choice of Evils: As a Tropical Scourge Makes a Comeback, So, Too, Does DDT," *Wall Street Journal*, July 26, 2001.

5. L. Mooney and R. Bate, eds., *Environmental Health: Third World Problems, First World Preoccupations* (Oxford: Butterworth-Heinemann, 1999).

though "leaping" has been necessary for all humankind's progress beyond the cave.

Many publications have addressed this overprecautionary problem in the use of the principle in countries at all stages of economic development and provide examples of zealous promotion of the precautionary principle without due attention to the likely consequences.[6] My particular concern is how application of the principle is being exported from the rich nations to the poorest on the planet with fatal consequences.

Problems with the Precautionary Principle

The precautionary principle purports to be a rule for decision making in uncertainty. In practice, however, it is quite the opposite: a means of imposing arbitrary restrictions on the use of new technologies, be they products, processes, or services.

For example, previous risk management strategies have argued that non-proximate risk should be treated less seriously than proximate risk. But many proponents of the PP argue that remoteness of possible harm is not an excuse for inaction: the mere *possibility* that use of a particular technology *might* have an adverse consequence is sufficient for PP proponents to try to block or restrict that technology. This potential-harm argument is susceptible to the counterargument that preventing the action (technology) *might* also result in harm to human beings,[7] but it's harder to make. Proponents of new technologies are easily tarred and often dismissed with charges that they act only from self-interest.

Some interpreters of the PP demand that a technology should not be used until it has been proved to be harmless. This is im-

6. J. Morris, ed., *Rethinking Risk and the Precautionary Principle* (Oxford: Butterworth-Heinemann, 2001).

7. C. T. Rubin, "Asteroid Collisions and Precautionary Thinking," in ibid., pp. 105–26.

possible: it demands a level of knowledge that simply cannot be acquired. The great Aaron Wildavsky observed, "One could well ask whether any technology, including the most benign, would ever have been established if it had been forced to demonstrate that it would do no harm."[8]

The increasing use of the PP in United Nations Conventions is also proving problematic. Proponents of the PP suggest that its application must be open, informed, and democratic, and include all affected parties. Although this sounds good in principle, it can be argued that the international agreements that incorporate the PP are themselves not the products of democratic processes.[9] Furthermore, many countries, lacking the financial and human capital to evaluate the consequences of these agreements, are at a disadvantage in negotiations and may suffer in the subsequent application of the agreements.[10]

The application of the PP will prevent exposure to some new risks, but it also prevents more cost-effective reduction of exposure to existing risks. New technologies generally provide net benefits: if they did not, there would be little incentive to produce them and even less to consume them.

The Danger of Precaution in the Developing World

Several examples illuminate the counterintuitive effects that can follow adoption of the PP in developing countries:

- Concerns about trihalomethanes (compounds created in wa-

8. A. Wildavsky, *But Is It True? A Citizen's Guide to Environmental Health and Safety Issues* (Cambridge, Mass.: Harvard University Press, 1995).

9. Morris, *Rethinking Risk*.

10. R. Tren and R. Bate, *Malaria and the DDT Story* (London: Institute of Economic Affairs, 2001).

ter chlorination, which are carcinogenic in rats) in drinking water contributed to the Peruvian government's decision to reduce the chlorination of drinking water. The resulting outbreak of cholera in Peru in 1991 killed thousands, and the disease spread across South America causing a million cases. As far as is known, trihalomethane compounds, at the low concentrations present in water, have never killed anyone. "The dose makes the poison," and trace levels in drinking water are a very different proposition from the whopping, maximum tolerated doses that caused cancer in rats.[11]

- In many poor African states there is no electricity grid or coverage is very limited, but there are often dispersed locations that could use significant amounts of energy—an aluminum smelter in Mozambique, for example. A nuclear power plant could provide electricity, but South African efforts to introduce a new small-scale technology, the Pebble Bed Modular Reactor, which is far safer than previous reactors and can be controlled and shut down remotely, are being hampered by international rejection of older nuclear technologies.[12] (See Cohen, this volume, about nuclear power science and politics in the United States.)
- At Alang in the Gulf of Cambay on India's Arabian Coast, thousands of rusting old ships are run against the beach and broken apart. Instead of using expensive dry docks, Indian entrepreneurs use a readily available natural resource, the beach, to dramatically reduce the cost of recycling and employ 40,000 men, some highly skilled and all working there by

11. E. Gersi and H. Ñaupari, "Dirty Water: Cholera in Peru," in Mooney and Bate, *Environmental Health*, pp. 17–46.

12. K. Kemm, *A New Era for Nuclear: The Development of the Pebble Bed Modular Reactor* (Cambridge: European Science and Environment Forum [ESEF], 2000). Available at www.scienceforum.net.

> choice, to convert half the world's disused ships into scraps of steel to be used in Indian manufacturing. Environmentalists, instead of welcoming this approach, have pressured governments around the world to stop the practice, and the U.S. Navy no longer sends its ships to Alang. The environmentalists argue that the practice is dangerous and potentially environmentally harmful. It is dangerous for the workers, but they earn many times the income from the alternative back-breaking work in the fields and willingly make this trade-off. Similarly the localized pollution problems affect the people living and working in the region—people who are capable of making trade-offs on their own terms.[13]

My last example of disproportionate concerns making things worse involves the disease malaria, and the use of the pesticide dichlorodiphenyltrichloroethane commonly known as DDT.[14]

Malaria

Most people consider malaria to be a tropical disease, and indeed today it is, but that was not always the case. In the period called the Little Ice Age (over 300 years ago) malaria was common in England and was commonly referred to as "ague."

- William Harvey (who discovered the circulation of blood) wrote: "When insects do swarm extraordinarily and when . . . agues (especially quartans) appear early as about midsummer, then autumn proves very sickly."[15]

13. W. Langeweische, "The Shipbreakers," *Atlantic Monthly*, August 2000, pp. 31–49.

14. Tren and Bate, *Malaria*.

15. P. Reiter, *From Shakespeare to Defoe: Malaria in England in the Little Ice Age* (San Juan, Puerto Rico: Centers for Disease Control and Prevention, 2000).

- The diarist Samuel Pepys suffered chronic ague. Oliver Cromwell died of the ague in a cool September 1658.
- William Shakespeare wrote about ague in eight of his plays. Most notably in *The Tempest* (act 2, scene 2), the slave Caliban curses his master Prospero, and hopes that he will be struck down by the disease: "All the infections that the sun sucks up / From bogs, fens, flats, on Prosper fall and make him / By inch-meal a disease!"

The disease is caused by parasitic single-cell protozoa—a plasmodium (such as *P. vivax* or *P. falciparum*) carried by female Anopheles mosquitoes (such as *A. atroparvus* or *A. funestus*). Malaria is characterized by bone-wracking painful periodic fevers, followed by chills, and, in some people, death.

The cure for malaria, quinine powder, was first shown to be effective against malaria as long ago as 1660; this is why we know ague was malaria, because the symptoms were the same, as was the cure. Quinine became known as Jesuit's Powder, and helped cure French King Louis XIV's son. Protestants, viewing quinine as a Catholic cure, didn't like to use it.

Even though quinine was widely used and efforts to eliminate the mosquito's habitat through better drainage (often by planting water-loving eucalyptus trees) reduced the importance of the disease, major epidemics still broke out throughout Europe during the first four decades of the twentieth century. There were epidemics in Russia as far north as Archangel on the Arctic Circle, and outbreaks in Holland, Britain, and many states in the United States. Malaria was endemic to southern U.S. states as well as to Italy and Greece. These countries completely eradicated malaria after World War II. Better access to treatment and reductions in mosquito habitats played a role in eradication, but the major change in control projects that made them successful was the use of insecticides—especially DDT.

History of DDT

DDT was first synthesized in the 1870s, but its insecticidal properties were discovered only in 1940 by the Swiss chemist Paul Muller, who won a Nobel Prize in 1948 for his work. The U.S. military had introduced DDT for control of malaria, typhus, and other insect-carried disease by 1944, and after the end of World War II, DDT was used widely around the world for vector (mosquito) control and in agriculture.

The differences between current vector control practices and past agricultural uses of DDT are important. Vector control relies on spot-spraying inside homes, shops, and other contained spaces. Agricultural use often included widespread sprayings from backpacks, trucks, or aircraft in the open environment.

Success for Some

The successful use of DDT led to enormous optimism that malaria could be eradicated from the entire globe. The reasons for this optimism were clearly apparent. DDT was, and is, highly effective in killing the malaria vector and interrupting the transfer of the malaria parasite, and it is also cheap and easy to use, putting it within reach of even the poorest countries' health budgets.

The early successes of DDT were nothing short of spectacular. In Europe and North America, DDT was widely used and malaria had been eradicated from both continents within a few years. It is thought that the transmission of malaria in Greece was halted in the course of one year. One historian even suggested that malaria eradication "was the most important single fact in the whole of modern Italian history."[16]

16. D. Mack-Smith, *Italy: A Modern History* (Chicago: University of Chicago Press, 1959).

Perhaps the most remarkable success story was in Sri Lanka (then Ceylon). DDT spraying began in 1946 and was an instant success with the island's death rate from malaria falling dramatically. Within ten years, DDT use had cut the prevalence of malaria from around three million cases to 7,300 and had eliminated all deaths from malaria. By 1964, the number of malaria cases had been reduced to just seventeen and at the time, it was assumed that Sri Lanka had won the war against malaria.

India also used the pesticide to great effect. When India started its malaria-control program in 1953, almost the entire country was malarial, except for the mountainous areas, and there were, and still are, six different species of Anopheline mosquito vectors. Using DDT, India managed to bring the number of cases down from an estimated 75 million in 1951 to around 50,000 in 1961 and to reduce the annual mortality from malaria from about 800,000 to a few thousand. The achievement of reducing the number of infections to this degree cannot be overstated. India's success persists today because the country continues to use DDT. Reductions in malaria in many other countries were short-lived when they discontinued its use.

No Complete Victory over Malaria

Only ten countries achieved complete eradication of malaria, four in Europe and six in the Americas and the Caribbean. A variety of reasons account for the absence of such successes elsewhere.

International malaria eradication programs got off to an optimistic beginning in the 1960s. Pushing for rapid implementation of DDT spraying to eliminate the pool of parasites in humans before mosquito-resistance to DDT developed, the World Health Assembly adopted the Global Malaria Eradication Campaign in May 1955. But a variety of failings—complacency about the level of planning necessary for successful eradication, poor training,

poor DDT formulation, poor medical detection of cases, poor entomological data, and lack of political will—led to the demise of program by the mid-1960s.

Almost all the funding for the World Health Organization's (WHO) international strategy to eliminate malaria came from the United States. The U.S. contributed $17.5 million of the total $20.3 million budget of the WHO program between 1956 and 1963; all other countries combined contributed only $2.8 million. Independently of the WHO program, the U.S. Agency for International Development (USAID) spent $1.2 billion on its own malaria-control operations between 1950 and 1972.

Vector control efforts were never fully implemented in Africa, even though that continent bore the greatest burden of disease. Many African countries had neither the infrastructure nor the human capacity to carry out spraying programs systematically and effectively. However, today the infrastructure is better and eradication programs would be more likely to succeed, if they were reinstituted.

DDT was remarkably successful in almost all the countries in which it was used, but it was not a magic bullet. A number of factors, including rainfall and the migration of people, influence the spread of malaria, and building a malaria-control strategy solely reliant on vector control, and in particular on the use of one pesticide (DDT), was optimistic at best and foolish at worst. When vector control programs failed, DDT became associated with failure, although the failure was of policy, not of the chemical. In addition to the failings already listed, rapidly rising donor fatigue and some limited resistance to DDT that developed in mosquitoes contributed to the demise of DDT. Perhaps more important, environmental and health concerns about DDT (many of which have since been shown to be exaggerated) shifted the issue away from science and toward emotionalism.

Green Backlash and Its Impact Today

Perhaps the most well known attack on DDT was Rachel Carson's book *Silent Spring*, published in 1962. The book popularized DDT scares and claimed that the insecticide would have devastating impacts on bird life, particularly those higher up the food chain, such as eagles and falcons. The publisher's summary on the back of the 1972 edition of *Silent Spring* says:

> No single book did more to awaken and alarm the world than Rachel Carson's *Silent Spring*. It makes no difference that some of the fears she expressed ten years ago have proved groundless or that here and there she may have been wrong in detail. Her case still stands, sometimes with different facts to support it.

In reality her case does not stand, and as the summary states, it is largely alarmist.

Despite the fact that many of the fears surrounding DDT were unfounded and based on inadequate, unscientific studies, the U.S. Environmental Protection Agency (EPA) banned DDT in 1972. In deciding to ban, the EPA administrator, William Ruckelshaus, overturned scientific reports, including one from the U.S. National Academy of Sciences claiming that DDT had saved millions of lives, and evidence from numerous expert witnesses that firmly opposed a ban of DDT and argued in favor of its continued use. Ruckelshaus's preoccupations with potentially negative environmental and health impacts (despite all the evidence to the contrary) and his refusal to accept the offered scientific advice condemned millions to death in malarial countries by denying them access to this life-saving pesticide.[17] Without ever uttering the words "precautionary principle" and probably without ever hav-

17. K. Mellanby, *The DDT Story* (Farnham, Surrey, Eng.: British Crop Protection Council, 1992).

ing heard them, Ruckelshaus put the principle into operation, eliminating a proven beneficial insecticide because of perceived risks and without consideration of alternatives to banning DDT.

The green movement's attitude to DDT in disease control was (and is) nothing short of callous and couched in a neo-Malthusian idea that global populations are growing out of control and that resources are running out. Malaria is therefore bizarrely seen as a saving grace from impending environmental disaster to be brought about by overpopulation.

Critically, the EPA failed to emphasize that the amount of DDT used in vector control is tiny compared with the amount used in agriculture. There simply is no danger to the environment or human beings from using DDT in vector control, even if there was from its use in agriculture.[18]

DDT is Banned

Following the U.S. lead, most developed countries soon imposed outright bans on DDT for all uses. Some developing countries imposed a complete ban on the pesticide, as Sri Lanka did in1964, when officials believed the malaria problem was solved. By 1969 the number of cases had risen from the low of seventeen (when DDT was used) to over a half million. Other developing countries —South Africa, for example—banned DDT for agricultural use (in 1974).

When applying pressure against the use of DDT, Western donors sometimes supported their arguments with statements that resistance was rendering it ineffective.[19] Recent evidence shows, however, that even where resistance to DDT has emerged

18. A. Attaran et al., "Balancing Risks on the Backs of the Poor," *Nature Medicine* 6 (2000): 729–731.

19. Ibid.

the "excito-repellancy" of DDT causes mosquitoes not to enter buildings that have been sprayed.[20] Simply put, mosquitoes don't like settling on areas sprayed with DDT. Hence it is unlikely that malaria rates would have increased (significantly) even if resistance became a factor.

Malaria Recovery

Malaria rates have bounced back, as explained above. Some health specialists have asserted a linkage between global warming and this resurgence.[21] But according to world expert Dr. Paul Reiter, former head of Vector Control at the U.S. Centers for Disease Control in Puerto Rico and now at Harvard University's School of Public Health:

> Increase has been attributed to population increase, forest clearance, irrigation and other agricultural activities, ecologic change, movement of people, urbanization, deterioration of public health services, resistance to insecticides and anti-malarial drugs, deterioration of vector control operations, and disruptions from war, civil strife, and natural disasters. Claims that malaria resurgence is due to climate change ignore these realities and disregard history.[22]

According to WHO (http://www.who.int/inf-pr-2000/en/pr2000-78.html), malaria kills about one million people annually, mostly children, and mainly in Africa. There are between 300 and 500 million new cases annually, meaning that between one in

20. J. P. Grieco et al., "A Comparison Study of House Entering and Exiting Behavior of *Anopheles vestitipennis* (Diptera: Culicidae) Using Experimental Huts Sprayed with DDT or Deltamethrin in the Southern District of Toledo, Belize, C.A," *J. Vector Ecol.* 25 (2000): 62.

21. A. J. McMichael, *Planetary Overload: Global Environmental Change and the Health of the Human Species* (Cambridge: Cambridge University Press, 1993).

22. Reiter, *From Shakespeare to Defoe.*

twenty and one in eight of all the six billion people in the world are infected each year.

Economic Costs

Controlling malaria is obviously vital for immediate humanitarian reasons, but the disease's economic burden adds to developing countries' woes by crippling development. Professor Jeffrey Sachs and colleagues at the Harvard University Center for International Development analyzed the effects of malaria on twenty-seven African economies between 1965 and 1990 and found that the disease cut economic growth rates by one percentage point a year.[23] The cumulative impacts are staggering. If malaria had been eliminated in 1965, Africa's annual gross domestic product would now be $400 billion, rather than $300 billion.

Sachs and his colleagues did more than assess only the costs of disease treatment and losses associated with death. They also estimated the losses from tourists and foreign investors avoiding malaria-prone countries, the damage done by large numbers of sick children missing school, and the increase in population and impoverishment that ensues when parents decide to have extra children because they know some will die. Sachs and his colleagues' study confirms research done by Richard Tren of the NGO (nongovernmental organization) Africa Fighting Malaria, which shows that the cost to Southern Africa is several billion dollars a year, and that this figure was far higher in the past.[24] (AFM is a registered NGO in South Africa, and I serve on its board of directors.)

It is important to note that countries that have continued to

23. J. L. Gallup and J. D. Sachs, "The Economic Burden of Malaria," *Am. J. Trop. Med. and Hyg.* 64 (2001): 85–96.

24. R. Tren, "Economic Costs of Malaria in South Africa: Malaria Control and the DDT Issue" (1999). Available at http://www.iea.org.uk.

use DDT have lower death rates and lower economic losses than those that have tried to manage without. For example, Ecuador increased its use of DDT after 1993 and during the next six years saw a 60 percent decline in new malaria cases. By contrast, Bolivia, Paraguay, and Peru, which stopped spraying DDT altogether in 1993, saw new cases rise by 90 percent over the same period.[25]

Indeed, some developing countries, including South Africa, Botswana, Ecuador, Indonesia, and India, have quietly used DDT for the past three decades, without exciting much comment. In 1997, however, the United Nations Environment Program (UNEP) decided to promote a treaty—a framework convention—that would ban twelve persistent organic pollutants (POPs), including DDT, in all countries.

Rise of Conventions—the International Environmental Community Has Its Way

A UN Framework Convention sets the ground rules and tone of UN treaty processes. It usually establishes conditions that the parties can readily agree on. In the POPs treaty process (as in all UNEP treaties), the developed world, mainly European and American interests, are promoting the agenda and draft text. Because these countries do not produce any of the twelve targeted chemicals, it was easy for them to promote a total ban (and a PP approach) and for Green groups and politicians to claim an important victory, showing that they were changing the world—and, they didn't say, helping them to raise revenue and attract voters.

Three factors account for language of the convention not being so completely prohibitionist as it appeared in early drafts.

- Western industries argued that the earlier language would

25. Mooney and Bate, *Environmental Health*.

have opened the door to pressures from environmental organizations and the treaty secretariat on chemicals that are produced and used in the West.

- Officials from developing countries that produce and use some of the twelve chemicals argued for exceptions for certain uses of those chemicals.
- Pressure from two or three pro-DDT anti-malaria groups who are concerned about the fate of DDT.

The Malaria Foundation and the Malaria Project coordinated a pro-DDT letter signed by over 400 malaria specialists around the world, including three Nobel laureates, which received publicity in the *New York Times* and other important media outlets. Africa Fighting Malaria maintained a media campaign in South Africa to remind politicians of the importance of DDT and the potential harm of the POPs Convention. AFM brought some of the world's foremost malaria specialists to a meeting in Johannesburg and hosted a press conference about the meeting. The experts bolstered the position taken by the host nation in favor of DDT use and they isolated the environmentalists opposed to DDT use, who eventually dropped their demands for a global DDT ban by 2007.

The Status of DDT Under the Convention

In May 2001 in Stockholm, ninety-one countries signed the United Nations Persistent Organic Pollutants Convention to ban twelve organic chemicals over the next decade. Most of the chemicals will be phased out relatively quickly, but DDT has been reprieved for use in controlling malaria for the foreseeable future.

Malthusian environmentalists may be privately relieved to know that the reprieve is not really working. Even though DDT use is accepted, both under the treaty and by the World Health

Organization, the insecticide is becoming harder to procure. Simply listing DDT under the treaty has been sufficient to discourage its production and use in malarial countries, and mistaken concerns about DDT are depriving residents of LDCs, especially countries in Africa, of safer and longer lives.

DDT was probably harmful to wildlife when used in massive doses on cotton farms in the 1950s in America (although not so harmful as Carson and her followers made out), but it has never been proved to harm humans except those who tried to commit suicide with it. In any event, any harm to wildlife in America and Europe has been reversed. In contrast to its agricultural use, malaria control requires only that the insides of houses be sprayed; used properly, little DDT is released into the environment. Yet myths persist about the harms it causes. Many Zambians think it causes male impotence. Most Westerners think it causes cancer. Nearly everyone forgets that only in massive doses can DDT cause problems.

Why Countries Do Not Act in Their Own Interests

The several reasons that developing countries are not doing the best they can to fight malaria are interrelated.

1. Western Green pressure groups have maintained a PP campaign for thirty years against DDT.
2. Aid agencies, staffed by environmentalists who accept the PP arguments, have not approved funds in recent years for procurement of DDT. Indeed, some agencies, such as USAID, have even pressured countries (notably Bolivia) not to use it.[26]
3. Governments of the developed world, and increasingly of poor countries, stopped producing DDT, so that only India

26. Attaran et al., "Balancing Risks."

and China currently produce it in any quantities.[27] No private companies still produce DDT. Some former producing companies, such as Montrose Chemical of California, are still in court fighting charges about the alleged affects of DDT production, but Montrose has not produced DDT since the 1980s and it's a shell of a company compared to what it was.

4. Countries, such as Botswana in 1998, switched to other pesticides when they could not procure any DDT from dwindling world markets, even though this meant buying less of a more expensive alternative.
5. The elites in even the poorest countries, such as Mozambique, think it almost unseemly to use a pesticide that has been banned in the North and is due for elimination under the POPs treaty.[28]
6. Most people cannot believe that DDT is still the best pesticide to control malaria vectors, even though its use began nearly sixty years ago.

Only countries with political clout and political sense about DDT, notably South Africa, China, and India, still use it. South Africa had stopped using DDT in 1996 under pressure to join the world's Green community and switched to the next best alternative, the synthetic pyrethroids, which are three times the price and are effective over a shorter time span. Four years later, in 2000, South Africa decided to resume DDT spraying after malaria cases jumped by 1,000 percent because of mosquito resistance to the synthetic pyrethroids.

The only real hope for expanded use of DDT comes from some companies operating in countries that allow DDT to be used. The

27. Tren and Bate, *Malaria*.
28. R. Bate, "DDT Saves Lives," www.TechCentralStation.com, February 14, 2002.

malaria-control programs run by the metals company Billiton, in Richard's Bay, South Africa, and by various mining companies in Zambia provide examples of the continuing efficacy of DDT. In all places where DDT is being used, malaria rates are falling back to the low levels not seen for over a decade. It is possible that current supplies of DDT will run out and that manufacturers will not produce any more. Should that happen, the excellent operations that now use DDT will be forced to switch to the more expensive and less effective alternatives. This will mean that fewer lives may be protected in the future.

While the delegates of the countries who signed the POPs treaty think they have been magnanimous in exempting DDT from an immediate ban, they have unwittingly consigned many children to death in Africa. Simply listing DDT in the treaty has been sufficient for that.

Conclusion

The increasing use of the precautionary principle is stifling development in Europe and to a lesser, but increasing, extent in America and around the world.[29] In rich countries, the precautionary principle costs money, and because of its inflexible application, it is unlikely to provide benefits. In poorer countries, it is likely to be harmful, sometimes causing catastrophic effects on human health. Concerns about chlorination and the push for a DDT ban are the most obvious examples of this phenomenon.

In my opinion, the PP should rarely be used to make decisions, and never by Western advisers to LDCs. If the PP is to be adopted more broadly, decisions about adoption must genuinely be made by those worst affected by its implementation, with full accounting of cost-benefit and risk-risk trade-offs.

29. Morris, *Rethinking Risk*.

Making such changes is easier said than done. The initial reason for using the PP was to enable decisions to be made when there was considerable uncertainty about the impact of a technology. As use of the PP expands, attempts to be rational, to use the best science available, and to balance the possible outcomes are essential.

It is far from certain who will do the job of being rational, using the best science, and balancing the outcomes. It is fairly obvious that Western multinational companies, which have much to gain from the use of sound science in the developing world, will not be the vehicle to promote science as the basis of policy because they are easy targets for discrediting by environmental organizations and the media. Neither can it be expected that Western NGOs or governments, which have staked their policies on regulation of new technologies, will be prepared to question the application of the PP.

The most likely promoters of sound science and opposers of the PP will be pro-growth activists and scientists from the developing world. For example, pro-biotech female Kenyan scientists make a far more compelling case for the benefits of the technology to the world's media than do white male directors of Monsanto. Similarly, media-aware rural doctors' groups in India, demanding the use of DDT to prevent malaria, are more effective than predominantly white pro-market people like me.

The organized self-interest of the poor is the best hope against the widespread use of the PP. It is essential for those who value the use of science in policy to help these interests organize: the pro-DDT campaign is perhaps something of a template.