The International POPs Elimination Project

Fostering Active and Effective Civil Society Participation in Preparations for Implementation of the Stockholm Convention

South Africa Policy Brief: National Application of Best Available Techniques (BAT) to Eliminate POPs and their by-products

Earthlife Africa – eThekwini

South Africa
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Muna Lakhani
P.O. Box 18722
Dalbridge 4014 SOUTH AFRICA
Tel: +27-(0)843-717276
Fax: +27-31-2011 119
E-mail: muna@iafrica.com
Website: www.earthlife-ct.org.za

ABOUT THE INTERNATIONAL POPS ELIMINATION PROJECT

On May 1, 2004, the International POPs Elimination Network (IPEN http://www.ipen.org) began a global NGO project called the International POPs Elimination Project (IPEP) in partnership with the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Program (UNEP). The Global Environment Facility (GEF) provided core funding for the project.

IPEP has three principal objectives:

- Encourage and enable NGOs in 40 developing and transitional countries to engage in activities that provide concrete and immediate contributions to country efforts in preparing for the implementation of the Stockholm Convention;
- Enhance the skills and knowledge of NGOs to help build their capacity as effective stakeholders in the Convention implementation process;
- Help establish regional and national NGO coordination and capacity in all regions of the world in support of longer term efforts to achieve chemical safety.

IPEP will support preparation of reports on country situation, hotspots, policy briefs, and regional activities. Three principal types of activities will be supported by IPEP: participation in the National Implementation Plan, training and awareness workshops, and public information and awareness campaigns.

For more information, please see http://www.ipen.org

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This report is available in the following languages: English.

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ACRONYMS

DDT	dichlorodiphenyltrichloroethane
ELA	Earthlife Africa
EMCA	Environmental Management Cooperation Agreement
FAO	Food and Agriculture Organisation of the United Nations
IARC	International Agency for Research on Cancer (WHO)
IDM	Integrated Disease Management.
IPEN	International POPs Elimination Network
IPEP	International POPs Elimination Project
IPM	Integrated Pest Management
IVM	Integrated Vector Management
MDG	Millennium Development Goals
PEEM	Panel of Experts on Environmental Management for Vector Control (WHO/FAO/UNEP)
POPs	Persistent Organic Pollutants
REHW	Rachel's Environmental Health Weekly
UNCED	United Nations Conference on Environment and Development, held in 1992 Also known as the Rio Conference
UNEP	United Nations Environment Programme
USEPA	United States Environmental Protection Agency
WHO	World Health Organisation

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OVERVIEW

Title
National Application of Best Available Techniques (BAT) to Eliminate POPs and their by-products

Need for alternative policy
Currently, while work is being done on POPs in South Africa, the focus has been on unsustainable; socially and environmentally unacceptable practices such as incineration. While the use of DDT is understood, we wished to demonstrate that replacing one toxic chemical with another can be avoided, as International Best Practice has shown.

Policy proposal
That POPs from waste incineration be eliminated through the application of Zero Waste principles, and that DDT be phased out through the use of a suit of options that are proven to work, as well as using less toxic locally developed and naturally based alternative insecticides.

Consequences under current and alternative policies
Under current approaches, the valuable resources contained in what is now 'waste' are destroyed; excessive amounts of dioxins and furans are emitted; and the long-term harm of DDT is not being assessed nor calculated. By applying the BATs contained in this document, South Africa will be able to satisfy her international obligations under the Stockholm Convention; reduce the volumes and toxicity of waste being incinerated; divert resources away from incinerators to job creation and poverty alleviation; put into place physical malaria management systems, which will reduce the potential for malaria, and dramatically reduce the long term impacts of DDT on people and planet.

The proposed Policy outlines provided in this document are proven alternatives, and have been successfully carried out in many countries around the world - the Zero Waste movement is growing rapidly.

Mexico, India and the Philippines have successfully implemented alternatives to DDT, which should be repeated in South Africa.

Conclusion
That the alternatives to incineration and DDT are well-proven and successful, and that South Africa builds its capacity to implement these solutions, in the process phasing out incineration and DDT.

1 BACKGROUND

South Africa is a party to the Stockholm Convention on Persistent Organic Pollutants (POPs), signed in May 2001 and ratified on 4th September 2002, which commits to the phasing out and elimination of an initial list of 12 POPs. The Department of Environmental Affairs and Tourism (DEAT) confirms that being a Party to the convention it intends to "phase out the twelve POPs[1]." Best Practices to ***eliminate*** POPs is accepted as the only sustainable way forward, as POPs are known to be a major environmental and health hazard. Current disposal practices such as incineration of waste that releases POPs and the continued use of POPs pesticides such as DDT are resulting in related cumulative negative environmental and health impacts. These negative impacts are not factored in when calculating the economic benefits of these practices. When the long-term cumulative impacts of these practices are considered during life cycle costing approaches, they are deemed to be unsustainable.

The aim of the Stockholm Convention which entered into force on 17 May 2004 is to protect human health and the environment from persistent organic pollutants. The Convention provides a framework that incorporates the precautionary principle[2] for elimination of production, use, import and export of the intentionally produced POPs, their handling and disposal and elimination or reduction of releases of certain unintentional POPs.

South Africa, while a Party to the Convention, still continues to generate POPs, mainly through incineration of waste of various sorts. DDT is also used, allegedly as the most "cost effective" solution against malaria. Of great concern is the continued attempt by business and industry to lobby government on further unsustainable practices such as burning of waste (including the possibility of burning hazardous waste and tyres in cement kilns). This implies an added hazard to people and the environment by allowing those responsible for production of these toxics to escape responsibility. This will also allow the continuation of externalizing costs for managing negative impacts with no regard for local community health, and given the propensity of dispersion of POPs, the global environment as well. The proposed practices, of course, primarily benefit the profits of companies, and not communities, who could, in the case of alternative uses of scrapped tyres, choose to create sustainable livelihoods, contributing to jobs and poverty alleviation, and assist the country in achieving its stated Millennium Development Goals (MDGs).

South Africa, as an economic leader in the African Region, has a responsibility to influence

[1] DEAT website, July2005

[2] "When an activity raises threats of harm to the environment or human health, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically." The Precautionary Principle shifts the presumptions used in decision-making. Rather than presume that a specific substance or activity is safe until proven dangerous, a process which takes substantial time and resources and is difficult (if not impossible) to reverse, the Principle places a presumption in favor of protecting the environment and public health. This switch of presumption places the responsibility for demonstrating safety and preventing harm on those undertaking potentially harmful activities. Accordingly, humans and the environment receive the benefit of the doubt under terms of scientific uncertainty and ignorance, rather than a particular substance or action. (A Map Towards Precautionary Decision-Making - Prepared by

regional practices. As one of the countries driving the New Partnership for Africa's Development (NEPAD), the influence of South Africa is very important in addressing POPs elimination strategies. A determined and consistent effort by South Africa to eliminate POPs would create a regional trend to improve the livelihoods of its people.

However, South Africa has a poor record in historical POPs management, and continues to allow creation of further POPs. In addition, there is further potential for POPs creation both through the addition of incineration and kilns, as well as the continued use of DDT.

The existing and future harm from POPs to South African society needs to be exposed, and processes developed to halt this harm, as the majority of South Africans are not aware of POPs and their detrimental effects. It is accepted that capacity within the government is also limited in this regard. A way forward for the country needs to be identified and full participation of stakeholders in the implementation of the Stockholm Convention on POPs must take place.

South African civil society, at large, are mainly unaware of these issues, as there has been limited, if any, capacity building in this regard. The proliferation of incinerators continues, albeit at a slower pace, given the historical campaigns of organizations such as many branches of Earthlife Africa, Environmental Justice Networking Forum (EJNF), groundWork, and the Wildlife and Environment Society of South Africa. Current drives by the cement industry (particularly with regard to the proposed burning of scrapped tyres and hazardous waste) are also a threat to further POPs releases.

This policy brief report provides the necessary information for decision makers to evaluate sustainable alternatives towards minimization and elimination of POPs production, use, and releases to the environment. It documents and develops a policy proposal on the National Application of Best Available Techniques (BAT) to Eliminate POPs and their by-products. It is a result of work developed in a consultative and pro-active manner, a policy that will apply to South Africa, in a way that is relevant, accurate and feasible. It covers existing policies on POPs where available and builds on work that has gone before. It presents policy directions for South Africa with regard to POPs elimination and "management" of existing POPs and their by-products.

The aims are to:

- Empower South Africa civil society and other role players to support progressive POPs elimination policies and processes in South Africa;
- Generate data and provide information that will enable the building of civil society capacity, to engage on processes at local level to avoid the further proliferation of POPs generators, mainly waste incinerators and cement kilns, as well as promoting safe alternatives to DDT;
- Provide government with a blueprint as to what is actually possible, and motivations for

supporting the civil society position on POPs.

- Make POPs information available to South Africans in a non-technical and empowering way.
- Help build the Africa-wide information base on POPs through the IPEP.

Project process

Literature review

Internet search

Questionnaires – Civil Society; National, Provincial and Local government; Academia.

2 CONTEXT

"I think the economic logic behind dumping a load of toxic waste in the lowest wage country is impeccable and we should face up to the fact that … countries such as Africa are vastly under-polluted." - Quote from a leaked internal memo of ***Lawrence Summers*** in 1991 when he was then Chief Economist for the World Bank.

One could argue that the economic development path chosen by the South African government was bound to lead to the problems of the North becoming problems of the South. However, it has become clear, that while indeed business and industry in South Africa are pushing for unsustainable practices to continue (such as incineration), the South African government is taking positions that potentially bode well for the future health of our people, particularly on the issue of POPs.

2.1 Introduction to POPs and the Stockholm Convention [3]

The term "Persistent Organic Pollutants" or "POPs" is used to describe a class of toxic chemical substances that are harmful to human health and the environment. POPs are long-lasting toxic substances that are produced and released into the environment by human activity. Some POPs are produced for use as pesticides, as industrial chemicals, and result as byproducts of certain chemical and/or combustion processes. Once POPs enter the environment, they last for several decades. Today, POPs are widely found in the environment in all regions of the world. They contaminate food, they find their way into the human body, and they contribute to disease and to health defects.

On May 23, 2001, a global, legally binding instrument called the Stockholm Convention on POPs was adopted. The Convention preamble expresses awareness of *"health concerns, especially in developing countries, resulting from local exposure to POPs, in particular impacts on women and, through them, upon future generations."* One hundred and twenty

[3] The *UNDP-GEF POPs Resource Kit*

governments participated in the Intergovernmental Negotiating Committee that reached final agreement on the Stockholm Convention's terms and provisions. The Convention's objective is to protect human health and the environment from POPs. Convention Parties are required to take actions to reduce or eliminate POPs releases, and often take actions aimed at their ultimate elimination. Resources have been made available through the Global Environment Facility (GEF) to assist countries in developing their program of Enabling Activities under the Convention. This allows countries to start developing their plans, preparing their initial inventories, and building capacity in order to get ready to meet future Convention obligations, as it is anticipated that additional POPs will be added onto the initial list.

2.1.1 POPs Effects on Human Health and the Environment

Little was known about the harm to health and the environmental caused by POPs until the 1960's. Now, however, scientists have developed a large body of evidence associating POPs with a range of ailments and negative impacts to the environment. Scientists researching population declines in wildlife made the first important discoveries about the harm POPs cause. These scientists observed a range of negative health impacts in birds, fish and mammals associated with POPs in the environment. Predator species often suffer the greatest harm as they ingest larger volumes of POPs due to their position on the food chain where their diet is largely meat and fish. POPs bio-accumulate in the fat tissue of living organisms hence the higher in the food chain the larger POPs intake.

Many scientists noted that POPs also are widely present in human food. This raised the question: if POPs injure wildlife, do POPs also cause injury in humans? When scientists and medical researches looked into this question, they determined that the answer is: *"Yes!"*

Scientists analyzed human tissue samples and human blood samples. They found that POPs and other man-made toxic chemicals are present in the bodies of people, everywhere. Some groups of people are especially contaminated. These include farmers and workers who are exposed to POPs in their occupations. Subsistence hunters and fishermen in some regions have high levels of POPs in their bloodstream due to high exposure levels. Human exposure to POPs, however, is not limited to specific occupations or to certain regions. POPs can be found in the blood and in the tissues of the general human population in all parts of the world. As a result, POPs are now a legitimate and important cause for concern, everywhere.

Research on the ways POPs impact human health is continuing. More data is still needed documenting levels of POPs contamination in many countries. In addition, more health studies are needed to further explore and document the specific ways POPs harm human health under conditions in developing countries and under conditions in countries with tropical climates. Still, we already know a great deal about impacts of POPs on human

health. Certainly, we know enough to justify urgent action now, to reduce and to eliminate the human exposure to these toxic chemical pollutants.

Please note:
Good evidence associates human exposure to specific POPs or classes of POPs with health effects, including the following:

• Cancers and tumors at multiple sites;
• Neurobehavioral impairment including learning disorders, reduced performance on standard tests and changes in temperament;
• Immune system changes;
• Reproductive deficits and sex-linked disorders;
• Shortened period of lactation in nursing mothers; and
• Diseases such as endometriosis (a painful, chronic gynecological disorder in which uterine tissues grow outside the uterus), increased incidence of diabetes, and others.

The evidence suggests that women, infants, and children are especially vulnerable to certain effects of POPs. Mothers transfer POPs from their own body, through the placenta, into the fetus at vulnerable stages of development. This can harm the developing infant. The harm caused, however, is often not easily recognized. Learning and behavior disorders in children and adolescents have been linked to pre-natal POPs exposure. Exposure to POPs before birth also contributes to immune system disorders, to reproductive and sex-linked disorders, and to some other diseases and deficits that may only begin later in life.

Wildlife species exposed to POPs in the environment may exhibit any of a number of different kinds of diseases or ailments. These include:
• Reproductive failure and population declines;
• Abnormally functioning thyroids and other hormone system dysfunctions;
• Feminization of males and masculinization of females;
• Compromised immune systems;
• Behavioral abnormalities;
• Tumors and cancers; and
• Gross birth defects.

2.2 Background - South African Government

The signing and ratifying of the Stockholm Convention by South Africa is particularly welcomed, as this gives a clear focus on where the country would need to move towards in the future.

The government has embarked on a series of steps to attend to the problems of POPs (as well as the African Stockpile Programme – linked, as many of the chemicals stockpiled in Africa are POPs, and were either sold to African countries, who sometimes did not know of their toxicity. These steps to date include:

Measures to reduce or eliminate releases from unintentional production

- Participating in drafting of guidelines on best available techniques and best environmental practices (BAT/BEP), and
- Identification and quantification of releases (problems of incineration / kilns / med waste – start – incinerators

Measures to reduce/eliminate releases from wastes

- drafting technical guidelines for the environmentally sound management of persistent organic pollutants[4]

Furthermore, the South African Government has committed to complying with the Stockholm Convention through their programme for enabling activities, and the creation of a National Implementation Plan (NIP) (supposed to be finalized by mid-2005[5]) - however, we are still awaiting this Plan.

2.3 Potential and existing Harm in SA

The US government Environmental Protection Agency is conducting a public review of dioxin toxicity. Its research shows

- dioxin does cause cancer in humans;
- for responses to dioxin there may be no safe level;
- effects on reproductive and the immune system can be expected at or just above the levels in body fat of the general population

2.3.1. The HIV / AIDS challenge – relevance of POPs in South Africa

South Africa has a high rate of HIV/AIDS infection, and counts are rising. It has one of the highest rates in the world. While very good work is being done in this regard, including focus on abstinence, condom use, nutrition, and the roll out of anti-retro viral drugs by the government, it is clear that generally, the connection between immune damaging chemicals and HIV/AIDS has not been made, and is certainly not part of any strategy in the country to date.

2.3.2 Immune System Toxins[6]

In 1987, about 45% of Americans were living with one or more chronic conditions (a term that includes chronic diseases and impairments). In 1935, the proportion was 22%, so

[4] DEAT document – Department of Environmental Affairs and Tourism, Preparatory meeting, First Conference of Parties of the Stockholm Convention, 15 April 2005, 08h: 00-17h: 00, Manhattan Hotel Pretoria. CHAIRPERSON: Dr Joseph Matjila
[5] DEAT document - National Implementation Plan – 14Feb05
[6] Rachel - #536 - Immune System Toxins, March 06, 1997

chronic conditions have approximately doubled during the last 60 years. The majority of people with chronic conditions are not disabled, nor are they elderly. In fact, one out of every four children in the U.S. (25%) now lives with a chronic condition.[7]

Chronic conditions can often be "managed" (helping people to live with the condition), but they usually cannot be cured. The cost of chronic conditions in 1990 was estimated to be $659 billion -nearly three quarters of all U.S. health care costs (to get this huge number into perspective, it may help to know that the entire U.S. military budget is $250 billion per year).

Perhaps it is time we looked seriously at prevention as an approach to chronic conditions.

Unfortunately, during the past 50 years, corporations have been permitted to release more and more industrial chemicals and consumer products that damage the immune systems of birds, amphibians, reptiles, fish, and mammals, including humans. The immune system itself has only been fully recognized since the 1950s, and it wasn't until the 1970s that all the major components and activities of the immune system were identified. Many of these are not well understood even today.[8]

Partly as a result of this ignorance, public health authorities have still not established consistent criteria for measuring damage to the immune system,[9] which of course allows corporate polluters a lot of "wiggle room" when they are asked to stop releasing or to clean up past releases of immunotoxic chemicals such as PCBs, cadmium (see Rachel's Environmental Health Weekly - REHW #179), and mercury (REHW #462). (PCBs are a class of industrial chemicals outlawed in the U.S. in 1976 because of their dangerous properties. Unfortunately, large quantities of them persist in the environment to this day, affecting wildlife and humans.[10])

A new study of immunotoxic chemicals affecting mammals appeared in 2005 in ENVIRONMENTAL SCIENCE AND TECHNOLOGY, a publication of the American Chemical Society.[11] Since 1987, large numbers of dolphins, seals, and sea turtles have been killed by disease in the Atlantic Ocean, the Gulf of Mexico, the North Sea, and the Mediterranean. (See REHW #399.)

In this new study, researchers examined carcasses of bottlenose dolphins found dead on Atlantic and Gulf coast beaches in Florida, 1989-1994. They found elevated levels of tin, a toxic metal that has been used for the past 40 years to paint the bottoms of boats and ships

[7] Catherine Hoffman and others, "Persons With Chronic Conditions," JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION Vol. 276, No. 18 (November 13, 1996), pgs. 1473-1479. The data describe the non-institutionalized population.
[8] William R. Clark, AT WAR WITHIN; THE DOUBLE-EDGED SWORD OF IMMUNITY (New York: Oxford University Press, 1995). Clark lists autoimmune diseases on pg. 123.
[9] Anna Fan, Robert Howd, and Brian Davis, "Risk Assessment of Environmental Chemicals," ANNUAL REVIEW OF PHARMACOLOGY AND TOXICOLOGY Vol. 35 (1995), pgs. 341-368.
[10] See, for example, Andrew C. Revkin, "New Studies Show PCB's [sic] Persist in Hudson, and Are Entering Air," NEW YORK TIMES February 22, 1997, pg. A1.
[11] K. Kannan and others, "Elevated Accumulation of Tributyltin and Its Breakdown Products in Bottlenose Dolphins (TURSIOPS TRUNCATUS) Found Stranded along the U.S. Atlantic and Gulf Coasts," ENVIRONMENTAL SCIENCE & TECHNOLOGY [ES&T] Vol. 31, No. 1 (1997), pgs. 296-301.

to prevent the growth of barnacles and slime (the specific tin compounds are tributyl tin, dibutyl tin, and monobutyl tin, together called organotin compounds. Tributyl tin is added to paint to prevent growth of organisms on ships' bottoms; it slowly degrades into the other two compounds). The tin found in bottlenose dolphins was compared to the tin found in spotted dolphins, and pygmy sperm whales, which spend their lives far offshore. The bottlenose dolphins had higher levels of tin, presumably because they spend their lives close to shore, where anti-fouling paint from boats and ships has contaminated bottom sediments and local food chains.

The researchers conclude that the tin compounds which are well established immunotoxins combined with PCBs and the pesticide DDT, which are also found at high levels in dolphins and which are also well-established immunotoxins together may have deprived the dolphins of their main defense against disease, their immune systems. They then succumbed to bacteria and viruses that they had previously been able to live with.

Other common agents and environmental contaminants known to harm the immune system include:

- Ultraviolet light from the sun (the kind of light that is increasing in the northern latitudes of the Earth because chlorofluorocarbons (CFCs) have damaged the planet's protective ozone shield 10 to 30 miles in the sky). (See REHW #246, #441.) Ultraviolet sunlight striking the inhabited portions of the planet has increased 5% to 10% in recent years. In sum, we are now all taking a bath in a moderately immunotoxic agent.[12]

- Dioxin and PCBs. As mentioned above, PCBs are a class of industrial chemicals now outlawed in the U.S., but still present in many parts of the environment at toxic levels. Dioxins are a class of chemicals created as unwanted byproducts of incineration, metal smelting, and the manufacture of many pesticides. Dioxins and PCBs are carcinogenic and powerfully immunotoxic in many animals, including humans. (The International Agency for Research on Cancer [IARC] part of the World Health Organization announced February 14, 1997, that the most potent dioxin, 2,3,7,8-TCDD, is a now considered a Class 1 carcinogen, meaning a "known human carcinogen.")[13]

In monkeys (marmosets), changes in white blood cells associated with the immune system can be measured at dioxin levels of 10 ng/kg (nanograms of dioxin per kilogram of body weight) - 25% below the dioxin level already found in average Americans. Mice with body burdens of 10 ng/kg - 25% below the amount already found in you and me display an

[12] And see A.J. McMichael and others, editors, CLIMATE CHANGE AND HUMAN HEALTH (Geneva, Switzerland: World Health Organization, 1996), Chapter 8, especially pages 167-170.
[13] According to the press statement, the new IARC finding on dioxin will be published in Volume 69 of IARC MONOGRAPHS ON THE EVALUATION OF CARCINOGENIC RISKS TO HUMANS. The IARC can be contacted at: IARC, 150 Cours Albert Thomas, 69372 Lyon, France.

increased susceptibility to infections by viruses, presumably because their immune system has been damaged. (See REHW #463 and #414.)

Many pesticides damage the immune system. In 1996, a study of pesticides and the immune system, published by the World Resources Institute (WRI), examined a growing body of literature from around the world, showing that many common pesticides degrade the immune systems of laboratory animals, wildlife, and humans.[14]

WRI examined studies of all major classes of pesticides organochlorines such as DDT, organophosphates such as malathion, and carbamates such as aldicarb. All three classes were immunotoxic.

Please note:

Living near a toxic dump damages the immune system in some people, though these effects have been rarely studied (REHW #272).

Exposure to fibers of asbestos and fiber glass damages the immune system (REHW #444). These effects may be more common than, and perhaps more important than, cancer caused by exposure to such fibers, but have been largely ignored in favor of cancer studies.

Organochlorine chemicals, including those known as "endocrine disrupters," damage the immune system. The endocrine (hormone) system strongly influences the immune system, so chemicals that mimic hormones may disrupt immune functions.[15] In addition, common chlorine-containing chemicals such as perchloroethylene (dry cleaning fluid), trichloroethylene (a common industrial solvent), and chloroform (created in drinking water when it is chlorinated to kill germs) can damage the immune system. (REHW #279, #365, #399)

Since 1970, the U.S. has spent 98% of its health dollars trying to cure diseases, and only 2% trying to prevent them.[16] During this same period, many diseases connected to the immune system such as asthma (REHW #218, #374) and diabetes has increased dramatically, and deaths from infectious diseases (not including AIDS) have increased 22%. (REHW #528) These seem to be strong indications that immune disorders are increasing.

[14] Robert Repetto and Sanjay S. Baliga, PESTICIDES AND THE IMMUNE SYSTEM: THE PUBLIC HEALTH RISKS (Washington, D.C.: World Resources Institute, 1996). Available for $14.95 from WRI Publications, P.O. Box 4852, Hampden Station, Baltimore, MD 21211. Telephone: 1-800-822-0504, or (410) 516-6963. Fax: (410) 516-6998. E-mail: chrisd@wri.org.

[15] William R. Clark, AT WAR WITHIN; THE DOUBLE-EDGED SWORD OF IMMUNITY (New York: Oxford University Press, 1995), Chapter 8. See also: Phyllis B. Blair and others, "Disease Patterns and Antibody Responses to Viral Antigens in Women Exposed IN UTERO to Diethylstilbestrol," in Theo Colborn and Coralie Clement, editors, CHEMICALLY-INDUCED ALTERATIONS IN SEXUAL AND FUNCTIONAL DEVELOPMENT: THE WILDLIFE/HUMAN CONNECTION [Advances in Modern Environmental Toxicology Vol. XXI] (Princeton, N.J.: Princeton Scientific Publishing Co., 1992), pgs. 283-288. And, in the same volume, see Phyllis B. Blair, "Immunologic Studies of Women Exposed IN UTERO to Diethylstilbestrol," pgs. 289-294.

[16] Speech by Gilbert Omenn, Dean, School of Public Health and Community Medicine, University of Washington, given at the meeting of Grantmakers in Health, Fort Lauderdale, Florida, February 27, 1997.

Perhaps all these immunotoxins are having a cumulative effect - Peter Montague (National Writers Union, UAW Local 1981/AFL-CIO).

2.3.3 Dioxin a 'known' human carcinogen

Dioxin Study is a Political Hot Potato for EPA - It has gone from being a 'possible' to a 'known' human carcinogen[17]

ONE OF EVERY thousand high-risk Americans could develop cancer from the toxic chemical dioxin, according to a landmark study the Environmental Protection Agency is preparing to make official. Even more worrisome, the study warns, are dioxin's effects on the thyroids and immune systems of children.

Bush Senior and his EPA chief, William Reilly, ordered the study at the specific behest of the chemical industry, which complained that environmentalists' calls for limits on dioxin were based on hype, not sound science. But now that the study is near completion, it is unwelcome in corporate boardrooms.

"Industry pushed for this study as a way to stall tougher regulations," says Rick Hind of Greenpeace, one of 411 groups that recently wrote Bush, urging the study's release. "Dioxin has gone from being a `possible' to a `known' human carcinogen and the risks of cancer have increased tenfold."

2.3.3.1 Dioxin too deadly to be used for chemical warfare purposes

In 1959 Dr. Fredrich Hoffman, a chemical warfare specialist and chief of the United States Army Chemical corps' Agency Research Branch at the Edgwood Arsenal, was sent to Europe to scout for potential chemical warfare agents. During his trip Dr. Hoffman noted that, he had received 'startling information' about the toxicity of dioxin, including the fact that it had been linked to severe and sometimes fatal liver damage. Dr. Hoffman reportedly told the army that; ***"dioxin was too deadly to be used for chemical warfare purposes."***[18]

2.3.3.2 More Health Effects

"these data indicate that human children might be susceptible to immunotoxic pollutants and that, due to present levels of PCBs and dioxins in the food chain, health effects may occur. These effects are important from a public health perspective because large population groups are exposed. Perinatal exposure to PCBs, dioxins, and related compounds should therefore be lowered by reducing the intake through the food chain at all ages, rather than by discouraging breast-feeding. Long-term follow-up studies of perinatally

[17] Published on Monday, March 12, 2001 in the San Francisco Chronicle- by Mark Hertsgaard (Mark Hertsgaard is the author of "Earth Odyssey: Around the World in Search of Our Environmental Future" (Broadway Books) and a columnist for the Blue Ridge Press syndicate. He lives in San Francisco.)

[18] Observations on Dioxin and dioxin-like PCBs in the UK Environment; Consultation document ; By Communities Against Toxics; ralph@tcpublications.freeserve.co.uk; www.communities-against-toxics.org.uk

exposed cohorts should be conducted into later childhood, through puberty, and into adulthood to investigate the implications of our findings.[19] Infect 123:263–270 (1999).

The document referred to contains new information on the health effects of dioxin exposure. This new information, which combines animal exposure data and epidemiological data, shows that dioxins are more potent carcinogens than previously believed. What follows are excerpts from a summary "Information Sheet" that the U.S. EPA released on June 12, 2000.[20]

"For cancer, USEPA estimates that the risks for the general population based on dioxin exposure could be as high as the range of a 1 in 100 to 1 in 1000 increased chance of experiencing cancer related to dioxin exposure."

"This range for cancer indicates an about 10 fold higher chance than estimated in USEPA's earlier (1994) draft of this reassessment.

2.4 Dioxin Effects in Human Populations

"USEPA estimates that the amount of dioxin found in the tissues of the general human population (which is known as the 'body burden') closely approaches (within a factor of 10) the levels at which adverse effects might be expected to occur, based on studies of animals and highly exposed human populations.

2.5 Children and Other Groups of Concern

"Fetuses, infants, and children may be more sensitive to dioxin exposure because of their rapid growth and development. Data on risks to children are limited, however, it is not known if the children in the general population are experiencing adverse effects from dioxin. Although breast milk appears to be a significant source of dioxin exposure for nursing infants, the overwhelming body of evidence supports the health benefits of breastfeeding despite the potential presence of dioxin. Other populations have experienced elevated exposures to dioxin as a result of food contamination incidents around the world, through the workplace or from industrial accidents, or from consumption of unusually high amounts of fish, meat, or dairy products containing elevated levels of dioxins. In some cases, such as U.S. Air Force personnel exposed to the herbicide Agent Orange contaminated with dioxin during the Vietnam War, dioxin exposure has been associated with adverse health effects."

It is clear from the above that South Africans are, as a rule, exposed to at least the same levels of dioxins, especially since there is a culture of burning waste in the open in many

[19] Immunologic Effects of Background Exposure to Polychlorinated Biphenyls and Dioxins in Dutch Preschool Children
Nynke Weisglas-Kuperus,1 Svati Patandin,1 Guy A.M. Berbers,2 Theo C.J. Sas,1 Paul G.H. Mulder,3 Pieter J.J. Sauer,1 and Herbert Hooijkaas4

rural areas. This also takes place in urban areas, as a result of under servicing of municipal waste collection, resulting in community waste skips overflowing, with people setting fire to these, to create more space for waste.

3 KEY SOURCES OF CONCERN TO SOUTH AFRICANS

The questionnaires that were sent to civil society, academia and the various spheres of government, including provincial and national departments responsible for POPs, show that the few organizations involved in POPs have internal capacity, but almost always have average to low awareness, with a few rating their knowledge as good.

Questionnaire Responses

Large areas of civil society are unaware of the Stockholm Convention and POPs. As expected, currently active and capacitated sectors are aware. The strong and repeated request for more research; more information production and dissemination; more capacity building; and further research on alternatives came from all sectors.

The key requests are:

- well researched information - printed and emails;
- capacity building workshops;
- better research and information on safe alternatives and responses to POPs.

4 DDT

Malaria is a killer disease in South Africa, with higher levels than elsewhere in Africa. The numbers are still unacceptable, given that these deaths are from a mainly preventable disease. South Africa has been the only country that has pushed for the continuing use of DDT for vector control within her borders, yet countries such as Kenya are looking for safer alternatives, which is a far seeing approach to this problematic issue.

"Initially, DDT seemed to be harmless to anything other than insects. It was also long-lasting: most other insecticides lost their potency in a few days, but in the early years of its use, the effects of a single dose of DDT could last for up to six months. In 1948, Müller won a Nobel Prize for his work and DDT was hailed as a chemical miracle.

A decade later, DDT had inspired another kind of war a general assault on malaria. The “Global Malaria Eradication Program,” launched in 1955, became one of the first major undertakings of the newly created World Health Organization. Some 65 nations enlisted in the cause. Funding for DDT factories was donated to poor countries and production of the

[20] http://www.epa.gov/ncea/pdfs/dioxin/factsheets/dioxin_short.pdf

insecticide climbed. The malaria eradication strategy was not to kill every single mosquito, but to suppress their populations and shorten the life-spans of any survivors, so that the parasite would not have time to develop within them. If the mosquitoes could be kept down long enough, the parasites would eventually disappear from the human population. In any particular area, the process was expected to take three years-time enough for all infected people either to recover or die. After that, a resurgence of mosquitoes would be merely an annoyance, rather than a threat. And initially, the strategy seemed to be working. It proved especially effective on islands relatively small areas insulated from re-infestation. Taiwan, Jamaica, and Sardinia were soon declared malaria-free and have remained so to this day. By 1961, arguably the year, at which the program had peak momentum, malaria had been eliminated or dramatically reduced in 37 countries.

One year later, Rachel Carson published *Silent Spring.* The problem with DDT is that it bioaccumulates. It is fat soluble, so when an animal ingests it by browsing contaminated vegetation, for example the chemical tends to concentrate in its fat, instead of being excreted. When another animal eats that animal, it is likely to absorb the prey's burden of DDT. This process leads to an increasing concentration of DDT in the higher links of the food chain. And since DDT has a high chronic toxicity that is, long-term exposure is likely to cause various physiological abnormalities this bioaccumulation has profound implications for both ecological and human health.

However, with the miseries of malaria in full view, the managers of the eradication campaign didn't worry much about the toxicity of DDT, but they were greatly concerned about another aspect of the pesticide's effects: resistance. Continual exposure to an insecticide tends to "breed" insect populations that are at least partially immune to the poison. Resistance to DDT had been reported as early as 1946. The campaign managers knew that in mosquitoes, regular exposure to DDT tended to produce widespread resistance in four to seven years, since it took three years to clear malaria from a human population, that didn't leave a lot of leeway for the eradication effort. As it turned out, the logistics simply couldn't be made to work in large, heavily infested areas with high human populations, poor housing and roads, and generally minimal infrastructure. In 1969, the campaign was abandoned. Today, DDT resistance is widespread in *Anopheles*, as is resistance to many more recent pesticides.

Undoubtedly, the campaign saved millions of lives, and it did clear malaria from some areas. But its broadest legacy has been of much more dubious value. It engendered the idea of DDT as a first resort against mosquitoes and it established the unstable dynamic of DDT resistance in *Anopheles* populations. In mosquitoes, the genetic mechanism that confers resistance to DDT does not usually come at any great competitive "cost" that is when no DDT is being sprayed; the resistant mosquitoes may do just about as well as nonresistant mosquitoes. So once a population acquires resistance, the trait is not likely to disappear even if DDT isn't used for years. If DDT is reapplied to such a population,

widespread resistance will reappear very rapidly. The rule of thumb among entomologists is that you may get seven years of resistance-free use the first time around, but you only get about seven months the second time. Even that limited respite, however, is enough to make the chemical an attractive option as an emergency measure or to keep it in the arsenals of bureaucracies committed to its use.

In December 2000, the POPs Treaty negotiators convened in Johannesburg, South Africa, even though, by an unfortunate coincidence, South Africa had suffered a potentially embarrassing setback earlier that year in its own POPs policies. In 1996, South Africa had switched its mosquito control programs from DDT to a less persistent group of pesticides known as pyrethroids. The move seemed solid and supportable at the time, since years of DDT use had greatly reduced *Anopheles* populations and largely eliminated one of the most troublesome local vectors, the appropriately named *A. funestus* ("funestus" means deadly). South Africa seemed to have beaten the DDT habit: the chemical had been used to achieve a worthwhile objective; it had then been discarded. And the plan worked until a year before the POPs summit, when malaria infections rose to 61,000 cases, a level not seen in decades. *A. funestus* reappeared as well, in KwaZulu-Natal, and in a form resistant to pyrethroids. In early 2000, DDT was reintroduced, in an indoor spraying program. (This is now a standard way of using DDT for mosquito control; the pesticide is usually applied only to walls, where mosquitoes alight to rest.) By the middle of the year, the number of infections had dropped by half.

Initially, the spraying program was criticized, but what reasonable alternative was there? This is said to be the African predicament, and yet the South African situation is hardly representative of sub-Saharan Africa as a whole."[21]

Further details about the negotiations:

At 7:28 a.m. on Sunday, 10 December 2000, the delegates in Johannesburg, South Africa, approved a treaty allowing for the continued use of DDT in disease vector control as the United Nations Environment Program concluded the fifth and FINAL round of negotiations on a treaty to ban persistent organic pollutants. The future public health uses of DDT are safeguarded by a "DDT exemption" written into the treaty. That exemption:

(1) Restricts DDT use and production to disease vector control only (not agriculture);
(2) Requires countries using DDT to follow WHO recommendations and guidelines for disease vector control;
(3) Requires countries to notify the Secretariat and WHO if they use DDT;
(4) Requires rich countries to pay the "agreed incremental costs" of more expensive alternatives to DDT (this is located elsewhere in the treaty); and
(5) Encourages rich countries to support research and development of alternatives to DDT;

[21] Malaria, Mosquitoes, and DDT; The toxic war against a global disease; by Anne Platt McGinn ; Senior Researcher, Worldwatch Institute

and having said this, what the treaty does NOT require is equally important:

(1) it does NOT require a country to notify WHO before it sprays DDT, so in an epidemic a country may spray first and report to WHO later in what is considered "emergency" use, although normally, a country would apply for an exemption first.
(2) it does NOT require a country to obtain WHO's approval at any time;
(3) it does NOT require poor countries to bear the added cost of alternatives to DDT;
(4) it does NOT set a specific deadline, only general ones, by which countries must stop using or producing DDT; and
(5) it does NOT restrict DDT use to malaria control, but allows for controlling any vector-borne disease.

The outcome of the treaty is arguably better than the status quo going into the negotiations over since 2003. For the first time, there is now an insecticide which is restricted to vector control only, meaning that the selection of resistant mosquitoes will be slower than before.

Also, there is a clear procedure that endemic countries may follow to use DDT, and having done so, they have the RIGHT under international law to use DDT, without pressure from the developed countries or international institutions who have in the past threatened them against doing so. [22]

5 INCINERATORS

5.1 What is incineration[23]

Incineration is the process of burning materials in a furnace at high temperature. This process decomposes solid materials into gas and incombustible solids. This process reduces the volume of the waste.

5.2 Types of incineration equipment

Incinerators take many forms and have many different attachments that attempt to reduce the pollution of the surrounding environment. These are:-

1. Single chamber incinerators: These are simple, generally gas fired furnaces that are relatively inexpensive devices. *These could be compared to burning material in a gas oven, for example.*
2. Double chamber incinerators: These are generally gas fired furnaces. The material is incinerated in the first chamber. The fumes and vaporized materials are then incinerated again at high temperature in the second chamber. The aim of double incineration is to reduce the Products of Incomplete Combustion (PIC's). These PIC's take the form of CO, NOx, dioxin, etc.

[22] Malaria Foundation International - Dr. Amir Attaran
[23] DRAFT INCINERATION DOCUMENT REV 4 – September 2001 – Earthlife Africa M. Lakhani / L. Heron

3. Plasma Arc Furnaces: These are furnaces where electrical energy is used to heat plasma gasses to super hot temperatures which are used to melt and decompose solids into molten solids and gas. The claim is that the waste is not burnt, but instead separated into its constituent elements by a process of 'molecular dissociation', and in so doing produces products that can be used and sold. The proponents of this technology claim that it is superior to gas fired (or similar) furnaces in that it operates more reliably and at higher temperatures. The argument is therefore that there are fewer PIC's and that the technology is therefore more environmentally friendly. This technology is not yet thoroughly proven. There is not a single plasma arc furnace in use in commercial use for the disposal of medical or municipal waste and the long term economic viability has not been proven. This technology is used primarily for disposal and treatment of hazardous industrial wastes. These furnaces use a lot of electricity (800-1000kWh/ton), which makes them expensive to operate and indirectly result in large amounts of CO_2 emissions. Many of the problems with incineration still exists e.g. releases of heavy metals.
4. Cement kilns are not designed to burn waste, however as they burn at high temperatures they are often used to incinerate hazardous wastes. These kilns are not designed to burn waste and should therefore not be used for this purpose. Emissions from cement kilns are far higher than those from incinerators specifically designed to incinerate waste. Even these incinerators however have unacceptable levels of harmful emissions.
5. Fabric filters are ideally fitted to the flue of the incinerators to capture the particulate matter that would otherwise escape into the environment. Most chimneys in SA are not fitted with these.
6. Electrostatic condensers capture particulate matter (fly ash). Most chimneys in SA are not fitted with these. In saving this kind of cost some incinerators become "financially viable" i.e. the cost is borne by the environment, and the people (you and I). These devices are however starting to fall out of favour as they operate within the dioxin forming temperature range and therefore catalyze the formation of dioxins.
7. The hot flue gasses are sometimes used to heat water in boilers to generate steam. This is used as a heating medium or to generate electricity. These systems are often called 'waste to energy' systems. The concept of getting energy out of waste is used as a sales driver for incineration technology, but is flawed, as the recovered energy could never be a significant portion of the energy consumed in manufacturing the waste in the first place.

5.3 What are the issues with incineration

5.3.1. Dioxins and Furans

Dioxins and furans are never produced on purpose, and have no known use. They are always formed as a by-product of another process.

Dioxin is formed when waste is burned that contains chlorine and carbon, including PVC

plastics and other chlorine-containing items. It forms at temperatures between 200 – 500 degrees Celsius. They are only again destroyed at temperatures exceeding 900 – 1000 degrees Celsius. Medical waste incinerators produce the largest amount of dioxins.

Many proponents of incinerator technology will claim that their incinerator does not produce dioxin as it operates at above the required temperature. Not a single incinerator in the world works to specification at all times, so even a 90% efficient incinerator would generate large amounts of unacceptable dioxins, etc. However what is not mentioned is that the dioxin will form again as soon as the temperature passes through the required temperature range. So even if the dioxin formed in the incinerator is destroyed it will form again in the flue gasses, and on the pollution control devices.

Many types of dioxin will only form onto a particle. These particles are available in the flue gasses in the form of the fly ash. This fly ash is in itself a hazard as particulate matter is easily breathed in and the small size of these particles allows them to become embedded in the lungs, where they can lead to cancer. Very expensive technologies are therefore employed to prevent the fly ash from being released. The equipment required to perform this task will be damaged at very high temperatures. They therefore function at the lower temperatures, in which the dioxins are most likely to form. The particulate matter then trapped by the pollution control equipment assists with the formation of dioxins. ***The result can be said that the more effective the pollution control equipment is the more dioxin is formed***. On the other hand very few, if any incinerators in South Africa are fitted with pollution control devices.

Dioxin and furans are extremely durable. Dioxin does not dissolve readily in water; it has a high melting and boiling point, and only slowly evaporates, for example, from the surface or plants. Dioxin binds tightly with other organic compounds and thus, can readily accumulate in soils and sediments. In humans and animals, dioxins are stored in fat tissue, slowly metabolized, and eventually eliminated from the body. Studies of dioxin levels in humans suggest that an amount of dioxin stored in fat tissue decreases by one-half every seven years (Gough 1993). Dioxin easily accumulates in the food chain, becoming more concentrated as it moves up the chain.

Dioxin is found in very high concentrations in breast milk. Babies are the most susceptible to the toxic effects of dioxin but receive the highest dose. Dioxin is toxic at very low concentrations, where it is an endocrine disruptor, and can lead to cancer. It is one of the initial 12 POPs that have been banned under the POPs treaty. South Africa as a party to the treaty is therefore obliged to minimise emissions of these chemicals with the goal of elimination. Incineration does not support the intent of this treaty.

5.3.2. Mercury

Mercury is an extremely toxic metal. It is toxic in its pure metallic form, but mercury can bind with other materials to form compounds which in some cases are far more toxic than the pure metal. Mercury will combine with organic compounds forming methyl mercury. These organometallic molecules are easily absorbed into the bodies and cells of plants, animals, and humans. Mercury reacts with the human body to create a wide range of health problems. These include; birth defects like twisted limbs as methyl mercury easily crosses the placenta, immune system damage, blindness, gingivitis, kidney damage, changed mental states and nervous system damage like; irritability, depression loss of hearing, loss of balance and numbness as it does cross from the blood into the brain, damage to the lungs and chronic fatigue, digestion problems, skin problems, and death!

Mercury occurs in many every day products like batteries, fluorescent light bulbs, and paints. In the medical industry mercury is used in thermometers, blood pressure devices, dilation and feeding tubes, mercurochrome, and dental amalgams.

According to the USEPA, there is up to 50 times more mercury in hospital and/or medical/ infectious waste than in general municipal waste. Items found in waste streams from medical facilities that may contain mercury include glass thermometers and sphygmomanometers, medical batteries, tubing weights, and amalgams[24].

Mercury cannot be destroyed. Incineration vaporises the mercury which is then released through the stack. It settles back into the surrounding environment where it will remain indefinitely. Mercury and the organic form of mercury are concentrated in animals and the human body as they move up the food chain.

Mercury should not be used when alternative technologies exist. The full list of mercury containing products and their alternatives is outside of scope of this document, but here are some examples:-

Thermometers containing mercury	Electronic thermometers can be used
Batteries	Nickel-Cadmium, and other re-chargeable batteries
Dental amalgams	Non-mercury containing amalgams

There are many ways to eliminate and minimize the hazards that mercury poses

1. Use alternative technologies whenever possible.
2. Return devices that use mercury to the supplier. They should be able to safely recycle the mercury into new products.

[24] "FACT SHEET: Mercury in Medical Waste - Keeping Mercury Out of Medical Waste," EPA Region 5, Air and Radiation Division, http://www.epa.gov/reg5oair/glakes/fact1.htm.
"FACT SHEET: Mercury in Medical Waste - Use of Alternative Products," EPA Region 5, Air and Radiation Division, http://www.epa.gov/reg5oair/glakes/fact2.htm.

3. Where incineration is currently practiced, divert all mercury away from the waste stream destined for incineration. This is only until alternatives to incineration are in place.

5.3.3. Other Heavy Metals

Apart from mercury many other heavy metals are liberated and dispersed into the environment during incineration. These include lead, cadmium, arsenic, selenium, and nickel.

5.3.3.1 Lead

Lead poisoning can lead to nervous disorders. It is far more toxic to children as it is far more easily absorbed into growing bodies and will retard the development of the brain leading to slower learning and reduced intelligence.

A major source of lead is vehicle emissions. This however does not excuse the incinerators from emitting lead as pollution as its effects are cumulative. The lead pollution from the incinerator is in addition to that produced by say leaded fuel (using unleaded fuel will help a great deal to reduce the amount of lead in the environment).

Lead can cause damage to vision, hearing damage, kidney disease, sleeping disorders, birth problems, and others.[25]

5.3.3.2 Cadmium

Cadmium can cause kidney failure, hypertension, and genetic damage.

5.3.3.3 Arsenic

Arsenic can contribute to fertility problems, genetic damage, and many other problems.

5.3.4. Carbon dioxide emissions

Incinerators produce a vast amount of CO_2. This is produced from the reaction of some of the carbon in the wastes with oxygen and from the fuel used to heat the incinerator. Carbon dioxide causes global warming as it prevents some heat from escaping the atmosphere. Global warming has very serious consequences for the entire global eco-system and will change the lives of everyone. The scale of the risk is far greater than can be justified by even the most enthusiastic support for incineration. In addition to this, agreements made under the Kyoto protocol could result in very financial heavy penalties for CO_2 emissions.

5.3.5. Ash disposal

Two types of ash are formed in the incinerator. Bottom ash is the ash that remains in the bottom of the incinerator. Fly ash is the very fine particles that are caught in the pollution control devices or are vented to atmosphere in the flue gasses. Very few, if any incinerators in SA have scrubbers or filters at all, or are inadequate. “Cost” is the argument put forward

[25] National safety council Fact sheet – Lead poisoning

for this; however, people's health and the environment pay this "cost" instead.

The bottom ash and the fly ash are toxic. However the fly ash is far more toxic as it contains most of the heavy metals and dioxins. The safe disposal of this ash is very expensive and almost impossible. This ash should be stored in a hazardous waste site, but these sites eventually leak and the leachate from the ash will contaminate ground water. Long term storage is therefore not a solution to the problem of toxic ash.

5.4 The arguments for and against incineration

The following is a summary of some of the claims made by the proponents of incineration and why these positions are inadequate.

FOR	AGAINST
- Incineration reduces the volume of the waste. Less material must therefore be land filled and the amount of land used is dramatically reduced	• All that incineration really does is transmit the waste from one medium to another (from solid to gas / air), and concentrates the toxicity of the waste. Further, the resources in the waste are lost to the economy, leading to more exploitation of scarce resources and its consequent environmental and human harm. • More volume of material can be removed from the waste stream by a good recycling program than the reduction in volume achieved by incineration, where the waste is reduced to between 30-40% of the original size. Recycling could divert up to 80% of the waste stream away from the landfill and back into the economy. • The waste that cannot easily be recycled can be disposed of in a regular landfill. The ash from an incinerator should be stored in a hazardous waste landfill. These sites are far more expensive to operate and eventually leak and leach very toxic materials into the ground water. • Shredding can result in a large reduction in the volume of the waste.
- Incineration destroys all the pathogens in medical waste leaving it sterile.	• Medical waste can be made sterile in many other more environmentally friendly ways. For example, autoclaving waste kills all the pathogens and does not generate POPs. • The proponents of incineration try to imply the meaning "safe" when they say "sterile". This is false as the ash left, although biologically sterile is highly toxic and anything but "safe".

- Energy in the 'waste' can be used to generate electricity and produce heat in 'waste to energy' incinerators. This means that usable energy can be generated and money can be produced from the waste, instead of 'wasting' this energy in a landfill.	• Incinerators will often not burn at the temperatures required, if not assisted by another heat source. (This however depends on the types of wastes being incinerated, and this does not apply to wastes high in plastic and paper content.) Energy is therefore added to the incinerator. This added energy needs to be accounted for. • The energy derived from the burning of the waste in an incinerator is only a portion of the energy contained within the materials. However, if one does a full energy accounting, the energy required for the primary manufacture of the same material it is much more than the energy that can be obtained from burning it. Re-using and recycling the materials saves the energy and cost associated with obtaining the raw materials (mining, oil drilling, forestry, etc), purifying the materials, processing these into a usable form, and then making the final product. • This also encourages the production of more waste, to keep such installations running, and discourages any and all steps towards creating a better environment for all, as well as continuing to drain the planet of resources. • The heat exchangers and other equipment required for these systems increase the residence time of the flue gasses in the dioxin-forming temperature range. This leads to far more dioxin being formed than would be the case otherwise.

5.5 The Situation in South Africa

As is the situation in most parts of the world, the incinerators are situated in the lower income communities. This is so for the following reasons:-

1. The decision makers seldom live in these neighbour-hoods.
2. These communities have less capacity to resist the establishment of the incinerators.
3. The proponents wish to reduce the cost of the investment, and therefore choose less expensive sites.

This situation is grossly unfair. The communities do not derive the benefit, suffer the bulk of the negative effects, (particularly children and the elderly) and have the least capacity to obtain adequate medical attention.

There has recently been a surge in the number of proposals for incinerator construction. The proponents all claim that the existing incinerators are under capacity pressures, and that their incinerator will create the extra capacity required.

As stated above, the problem has nothing to do with too little incineration capacity. Instead the problem is that there is too little focus on reducing waste at source, recycling, reuse, and lastly finding more benign ways of treating and disposing of waste. In addition to stopping the new incinerators from being constructed, the existing incinerators need to be phased out.

5.6 Root cause of the problem

The root cause is the continued production, use and over-consumption of unsustainable materials, with limited programmes for avoidance, reduction, re-use and recycling of wastes. The government hierarchy tends to focus on “end of pipe” solutions, and after 10 years, cannot show a meaningful intervention towards Extended Producer Responsibility; Polluter Pays; or other Zero Waste programmes.

5.7 The picture elsewhere

Many people in South Africa claim that "in other parts of the world, incineration is a popular and uncontroversial method of garbage disposal" and often offer the US, Germany, Japan, France and Sweden as examples, but they are way off the mark.[26]

Since 1985, the public has rejected over 300 trash incinerator proposals in the US and no new facility of any size has been built there in over 8 years. In Germany, where they probably run incinerators better than anywhere else in the world, they have only built a few incinerators since the 1980's. In the early 1990's there were over 500 citizens groups opposed to incineration and in Bavaria, over 1 million citizens went to their town halls in 1991 to get a new waste law (Das Bessere Mullkoncept) on the ballot which would have essentially banned incinerators completely.

While, incinerators are very popular in Japan with government officials (they have three times more than the rest of the world combined) the people are less enthusiastic especially when they learned that Japan is the number one dioxin emitter in the world. There is a very aggressive movement against incineration in France led by the group CNIID, partly because they have found high levels of dioxin in cows' milk downwind of several facilities, as well increased cancer rates and birth defects. Recently town officials in Albertsville have been imprisoned for their role in allowing an incinerator there to grossly pollute the surrounding farmland with dioxin.

As far as Sweden is concerned while they are proud of their technology, they too find it difficult to site new plants and in 1986 a Swedish environmental official said that they came within an inch of banning incineration completely because of public opposition to the technology.

There is no question that the incineration industry has improved its operations, but they have done this on the fly with local residents as the guinea pigs. Considering what has been discovered over the last 20 years about air emissions it is hardly likely that the issue will neatly close with dioxin as the last chapter. For example, dioxins and furans are chlorinated byproducts. More recently concerns have been raised about the byproducts of burning brominated and fluorinated materials (e.g. poly brominated diphenyl ethers (PBDE) and

[26] Dr. Paul Connett, Professor of Chemistry, St. Lawrence University, Canton, NY 13617.

perfluorinated octanoic acid (PFOA). There have hardly efforts begun to measure these, let alone understand their full toxicological ramifications.

Moreover, citing strong governmental regulations will not satisfy a suspicious public who adhere to the old maxim, "once bitten, twice shy." They know that to protect the public you need three things:

1) Strong regulations;
2) Adequate monitoring; and
3) Aggressive enforcement

None of the three above are present in South Africa. Current plans to allow burning of waste in cement kilns confirm the direction. As far as monitoring is concerned this is essentially nonexistent.

Overseas, modern incinerators are usually measured only once a year (and in South Africa, hardly ever), with the operator given about a month's notice beforehand. On the chosen day, three six hour samples of flue gas are collected. The results are then averaged. Thus just 18 hours of "ideal" data is used to extrapolate to estimate 8000 hours of operation. This makes no sense from either a statistical or physical point of view. In fact, in 1998 two Belgian scientists reported to the Dioxin Symposium in Stockholm that they had compared the traditional six hour test with a two week sampling method and found that latter projected 30-50 times higher stack gas concentration for dioxins. This was probably due to the two week sampling collecting dioxins during upset conditions and during start-up and shutdown periods, when dioxin emissions are known to increase.

What is most revealing about this matter is that despite the two week sampling methodology now being available commercially (the AMESA system) so that twenty six two week samples could be collected throughout the whole year, practically no incinerator operator has opted to use this method to convince people that they <u>really</u> can meet the standard over an extended period of time. If they don't trust their own technology why should the public?

People often try to minimise the impacts, by describing dioxins and furans as substances "that can "bio-accumulate" in human tissue over time" hardly does justice to the scientific concerns on these problematic chemicals. They do indeed accumulate in human and animals fat. For a man they steadily accumulate over a lifetime, but a woman has the ability to get rid of them. It is called having a baby. Over the nine months of pregnancy the dioxins, which have concentrated in her body fat over twenty years or so, move cross the placental membrane into the fetus. Later, they are passed during breast feeding. Thus the highest doses of dioxins inevitably go to the most fragile and vulnerable human beings.

Right now industrialized countries have far too much dioxin in their food (incredibly in one day a grazing cow puts as much dioxin into its body as it would take a human being 14 years of breathing of the same air) in their bodies and in their babies. So much so that the Institute of Medicine in 2002 (NY Times, July 1, 2003) advised parents to encourage young girls to eat less animal fat and to switch to skimmed rather than whole milk. The argument being that the dioxins should be avoided long before pregnancy is reached. "

5.8 Dioxin Harm Proved - 2005

Victim of DuPont dioxin pollution awarded $14 million by Mississippi jury. Dioxin from DuPont plant found to have caused cancer in 1996 with possibly more cases coming up. DuPont's Delaware, Tennessee, Mexican, plants have similar emissions. DuPont is responsible for 3/4 of all reported U.S. dioxin emissions with minimal media attention to date.

New York, Times August 26, 2005: ‘‘Today a jury in Laurel, Mississippi awarded Mr. Glen Strong $14 million dollars in damages, deciding that his cancer had been caused by dioxin emissions from DuPont's DeLisle, Mississippi titanium dioxide plant. In addition, the jury awarded Strong's wife 1.5 million for loss of consortium. Additional punitive damages are likely to be awarded next week.’’

Mike Fenasci, one of the principal lawyers in the case, told Green Delaware that "DuPont has caused the death of many people through the dioxins it created at the DeLisle plant."

Strong, an oyster fisherman, has a relatively rare blood cancer, multiple myeloma. He alleged that his cancer was caused by dioxins from the DuPont plant, which he was exposed to through the air and by eating oysters contaminated by DuPont.

DuPont called no defense witnesses. Earlier, Circuit Judge Billy Joe Landrum had excluded a number of DuPont witnesses, ruling that they had failed to cooperate by "deliberately" avoiding being deposed by Strong's lawyers. These sanctions were upheld by the Supreme Court of Mississippi.

Court-ordered testing by Strong's lawyers, aided by former DuPont employee Glen Evers of Hokessin, Delaware, revealed the presence of the most toxic form of dioxin, "2,3,7,8, TCDD" in various parts of the plant, including vent stacks. Other testing found dioxin, and other contaminants, in oysters in the fishing grounds used by Strong, and in house dust in the area.

Approximately 2000 other DeLisle-area residents are also suing DuPont. Since class-actions are not allowed in Mississippi, DuPont faces 2000 more trials.

Documents obtained by Strong's lawyers revealed that DuPont knew that its plants were generating dioxins years before this information was disclosed, if at all, to regulators and the public.

Detailed trial coverage is in the Biloxi-Gulfport Sun Herald (http://www.sunherald.com) and the Sea Coast Echo (http://208.62.60.4/40/).

5.9 Implications for SA

Monitoring:[27]

One of the many problems with incinerators is that they produce dioxin in bursts. When a modern incinerator is starting up, shutting down, or going through a frequent "upset condition", it will produce far greater quantities of dioxin than during "normal" operations. However, there is no technology currently capable of continuously monitoring dioxin emissions and giving real-time results. Instead, regulators will often test an incinerator at a pre-scheduled time (not a surprise inspection), take a sample for 6-8 hours, and then assume that this result is typical for the incinerators operations. Of course, they never measure dioxin emissions under the conditions that produce large quantities, only when the incinerator is operating "well" (this has been documented by the US National Research Council). As a result, the estimates of dioxin emissions from an incinerator based on stack tests are extreme underestimates of the true emissions. See the paper at < http://www.essentialaction.org/waste/underestimate.htm > for evidence.

Now, several German scientists have announced a method for "quasi-continuous" dioxin sampling. This means that they take a continuous sample for about two weeks, then analyze it; meanwhile taking another two week sample. So the results are not delivered in real time, but any high emissions periods should be captured. So this technology should reveal much higher dioxin emissions.

First of all, the paper indicates that this sampling technique is useful to the operating engineers because it enables them to operate the machine better. Second, communities have a right to know about all the dioxin emissions from an incinerator, not just the low ones.

The American Public Health Association (APHA):

1. Recognizes that chlorine-containing organic compounds are found to pose public health risks involving the workplace, consumer products and the general environment;
2. Recognizes that the elimination of chlorine and/or chlorinated organic compounds from certain manufacturing processes, products and uses may be the most cost-effective and health protective way to reduce health and environmental exposures to chlorinated organic compounds;
3. Recognizes that industry has the capacity and creativity to undertake a technological transformation of chemical manufacturing processes, products, and uses to reduce or eliminate these risks;
4. Concludes that there should be a rebuttable presumption [a presumption that may be rebutted by other evidence] that chlorine-containing organic chemicals pose a significant risk, therefore, before introducing new chemicals into commerce, using existing chemicals in new applications or continuing to use these chemicals in manufacturing processes or products beyond some future date, industry should either:

[27] Neil Tangri – Essential Action

a. Demonstrate that the risk is not significant for a particular compound, use or manufacturing process, or
b. Demonstrate that there are no substitutions, product reformulations or changes in manufacturing processes that will result in a lower risk,
c. Further, industry should ensure that substitutes for existing products or changes in manufacturing processes will result in a lower risk,
5. Supports legislation that will assist workers who are displaced by resulting technological changes in the chlorine industry; and
6. Finally, asks for measurable and progressive reduction toward the elimination of the use of chlorine-based bleaches in the pulp and paper industry and ozone-depleting chlorinated organic chemicals.

The APHA's "chlorine resolution" of 1993 urges removal of the “handle from the chlorine pump”. All the mechanisms by which chlorine is harming ecosystems, wildlife, and humans are not known. From what is known, it seems clear that, if waiting for conclusive scientific proof, the destruction, which is already vast, may well become irreversible.

Thus the APHA has defined two principles for a truly modern approach to chemical contamination:

(a) regard chemicals as harmful until proven safe;

(b) don't try to control chemicals one-by-one using risk assessment; instead, avoid irreversible harm by taking precautionary action to ban or phase out whole classes of chemicals as soon as there is evidence of harm, not waiting for conclusive scientific proof.[28]

5.10 Possible future

In the Johannesburg Plan of Action, the South African Government has committed to:

- Expanding and accelerating international assessment of chemical risks;
- Harmonisation of classification and labelling of chemicals;
- Information exchange in toxic chemicals and chemical risks;
- Establishment of risk reduction programmes;
- Strengthening of national capabilities and capacities for the management of chemicals; and
- Prevention of illegal international traffic in toxic and dangerous products.

What remains is the actual development and implementation of these plans of action.

6. CEMENT KILNS

"...there's no scientific basis for concluding that burning waste tyres in cement kilns is safe." (Dr. Seymour I. Schwartz, Professor of Environmental Science and Policy, University of California, Davis and author of the report "Domestic Markets for California's Used and Waste Tyres.")

[28] RACHEL'S HAZARDOUS WASTE NEWS #363; November 11, 1993 ; TAKING THE HANDLE OFF THE CHLORINE PUMP

6.1 Possibility of burning tyres and POPs

Negotiations are currently underway between the cement industry and the South African government regarding the possible use of scrapped tyres as fuel for cement kilns. This may take the form of an Environmental Management Co-operation Agreement (EMCA). Unfortunately, such agreements are not, as a rule, aimed at Best Practice or necessarily implementation of lowest polluting approaches, but often used to lower costs for industry, while not automatically leading to a reduction in pollutants. It must be remembered that cement kilns are inferior to incinerators mentioned above, so must therefore be considered even more dangerous.

Further, concerns (shared by the international civil society community) around the possible utilisation of cement kilns for the "disposal" of POPs and other hazardous materials may follow permission to burn tyres, seen as the thin edge of the wedge. This challenge is real, as evidenced at COP1.

6.1.1. ***What is in tyres***

- Natural rubber and synthetic rubber containing styrene and butadiene
- Up to 17 different heavy metals (including lead, zinc, arsenic, and chromium)
- Benzene-based extender oils and other petrochemicals
- Carbon black
- Chlorine

6.1.2. ***What happens when tyres are burned***

- The hazardous constituents are released into the air and create new, frequently more toxic, compounds.
- Chlorinated materials produce dioxin. Dioxins are some of the most toxic chemicals known; damaging health effects include cancer, birth defects, and impaired child development.
- Incomplete combustion of benzene leads to the creation of highly toxic dioxins, furans, PCBs (polychlorinated biphenyls), and higher levels of PAHs (poly-aromatic hydrocarbons) - all known to cause cancer or reproductive problems.
- Metals are not destroyed at any temperature - 100% are emitted from the stack or concentrated in the cement product or in the waste material of the process. Lead is poisonous to the nervous system and known to cause learning disabilities; zinc can cause birth defects; chromium and arsenic can cause cancer.

6.1.3. ***What's wrong with burning tyres in cement kilns***

- Cement kilns are designed to make cement, not to be waste incinerators. Cement kilns are not equipped with secondary combustion chambers to assure complete

destruction of wastes.

- Cement kilns do not have to meet the same stringent standards of performance and the emission limits required of commercial incineration facilities.
- Combustion recovers only a portion of the energy contained in a tyre; true recycling is much more energy efficient. Tyres are being truly recycled into rubberized asphalt roadbeds and other rubber products, such as new tyres. Scrap tyre shreds are being used successfully as drainage layers under roadways, fill for embankments and retaining walls, frost barriers, and more.

*6.1.4. **Socio-economic impacts of burning tyres***

- Studies are finding that indirect exposure to toxins through the food chain presents serious health risks to humans, even more serious than inhaling pollutants, which is already very unhealthy, and therefore increased healthcare costs for communities and government.
- At least 75 different products can be made from scrap tyres that the communities around the country can make to earn a living, and enter the economy.
- Contaminated agricultural products, fish and game could threaten an area's economic vitality.
- Property values for kilometres around cement factories could drop.
- Cement companies may even import scrap tyres; our local communities and agricultural lands would receive the resulting pollution.
- Toxic chemicals released by burning tyres at cement factories will become part of the food chain, entering water, soil, plants, livestock, dairy products, and wildlife – the chemicals lower the quality of the products and affect human beings resulting in lower production capacity (economic growth).

*6.1.5. **What's the point***

- Burning tyres in cement kilns is not "recycling" or a sound disposal solution. Toxic by-products are created and dispersed to enter the food chain and human bodies.
- Cement factories in other countries that are permitted to burn tyres and other wastes have been unable to consistently stay within emission limits.
- Cement companies should not burn wastes to save on fuel costs at the expense of the surrounding communities.
- To our knowledge, not a single operation in South Africa that burns waste today is run correctly.
- South Africa must, as a party to the Stockholm Convention, reduce the production of dioxins and furans, which however, increased by tyre burning.

6.2 Burning wastes in Cement kilns[29]

Cement kilns are not designed to incinerate hazardous or any other wastes. However due

[29] DRAFT INCINERATION DOCUMENT REV 4 – September 2001 – Earthlife Africa M. Lakhani / L. Heron

to the high temperatures at which these kilns operate, they are thought to be ready made for the disposal of wastes.

These kilns should not be used for the following reasons:-

1. All the problems that apply to other types of incineration apply to these kilns. These include dioxins formation, heavy metals, particulate matter release etc.
2. Heavy metals are in a leachable form once they have been incinerated. The high pH of the cement makes these metals even more prone to leaching and therefore more likely to pollute ground water.
3. Cement kilns are not fitted with the same pollution control devices that some other incinerators have, leading to more widespread environmental pollution. (Most incinerators in South Africa are NOT fitted with air pollution control devices. This helps to make them "cost effective".)
4. The cement will be contaminated by the wastes being incinerated. This makes the cement more dangerous to handle and puts the health of construction workers at risk. The hazards of living in a home made of these materials are unknown, and therefore, under the "precautionary principle", should be avoided completely.
5. Cement kilns do NOT incinerate the waste as incinerators specifically designed for this purpose.

According to the US EPA cement kilns burning hazardous wastes produce 60% of the total cement kiln dioxin emissions, are the second largest source of mercury, and also produce many other harmful emissions.

Cement kilns also produce large quantities of Cement Kiln Dust (CKD) which is laden with heavy metals like lead, arsenic, cadmium, and chromium. These dusts are either emitted from the stack or take the form of dust in the kiln. This dust is most often disposed of in places other than hazardous waste landfills. This has great potential for ground water contamination[30]

6.2.1 Hazardous wastes incineration[31]

Hazardous wastes can often contain higher concentrations of heavy metals than other wastes. Nineteen metals have been identified in the air emissions of hazardous wastes incinerators.

No incinerator is 100% efficient. Apart from the dioxins and heavy metals, numerous products of incomplete combustion (PIC's) are also released. As hazardous wastes can be made up of a great variety of materials, the releases into the environment vary all the time

[30] National citizens alliance – Facts and myths about protecting human health and the environment – The real story about burning hazardous wastes in cement kilns.
[31] DRAFT INCINERATION DOCUMENT REV 4 – September 2001 – Earthlife Africa M. Lakhani / L. Heron

and can contain thousands of chemicals, many of them hazardous. These will settle around the incinerator, be contained in the ash which will leach into the ground water. This has high toxicity and many “new” and uncharacterized compounds that are formed during this process.

It is highly likely that scrap tyres are already being imported into South Africa, which will be confirmed officially soon.

6.3 Monitoring and enforcement

Given the lack of monitoring and enforcement in South Africa at present, it is likely that not a single incinerator or kiln works consistently to specification, which in themselves, are inadequate. The case in the USA refers to the following:

Tuesday July 24, 2005 7:39 PM ET - Court Orders US to Rewrite Standards
By JOHN HEILPRIN, Associated Press Writer

WASHINGTON (AP) - A federal appeals court ordered the government Tuesday to rewrite standards for hazardous waste-burning incinerators and cement kilns, ruling that the nation lacks proper limits on airborne emissions of dioxins, mercury and metals.

Since the standards ``fail to reflect the emissions achieved in practice by the best-performing sources as required by the Clean Air Act,'' the justices ordered them scrapped and sent back to the EPA for another look.

Environmental groups hailed the ruling by the U.S. Court of Appeals for the District of Columbia as a victory toward protecting people and the environment from air toxins. They said incinerators and cement kilns that burn hazardous waste – the ruling lists dioxins, mercury, particulate matter, chlorine, carbon monoxide, hydrocarbons and metals such as lead, cadmium, chromium, arsenic and beryllium - are among the most dangerous sources of air pollution.

``EPA refused to establish the strict controls for these polluters that the Clean Air Act requires,'' said James Pew, an attorney for the Earth Justice environmental law firm that filed suit on behalf of the Sierra Club to challenge the EPA over 1999 regulations.

6.4 The proponents of incineration

Due to the now well known problems with incineration there has been very strong resistance to incineration in the developed northern countries. The proponents of this technology are now targeting developing counties, particularly in the Global South. These companies wish to benefit from the generally poor environmental standards and enforcement capacity.

6.4.1 The inadequacy of risk analysis

Risk analysis studies done for incinerators assume that the materials that are released by the incinerator are known, and that their effect on the human body and the environment are known. With these assumptions it is possible to determine what the effects of these emissions will be.

However this assumption is flawed. The chemicals emitted from the stack are not known. Thousands of chemicals are released from the stacks of incinerators. The mix of these chemicals depends on the materials being incinerated, and the conditions within the incinerator. There is currently no known way to accurately detect and quantify these chemicals. [32] Of those chemicals that can be detected, many of them cannot be monitored continuously.

In many cases, the effects of these chemicals are also not known. Even where the effects are known, there is no agreement as to how to determine if the effects have taken place e.g.:-

- There is no agreement as to the baseline studies that will be used in the risk assessment;
- There is no agreement in the methodology used or proposed;
- No quantitative or qualitative data on the health impacts, real and potential, is provided, before, during and after the use of this proposed facility's life;
- No agreement on how to study cumulative impacts, both from multiple emissions of different toxins, and existing and future hazards in the local and regional environment;
- There is no agreement on which tests to use to determine whether someone's immune system has been damaged;
- There is no agreement on which tests should be used to assess damage to the nervous system;
- There is no agreement and there may never be on ways to test for genetic damage. [33]

In addition there is very little understanding of the effects on the human body of exposure to multiple toxins at the same time. Even well known toxins may have a different impact when combined with others.

Without being able to accurately define what materials are being emitted, and what their effects on human and environmental health are, it is impossible to quantify the risk posed by incineration. Under these conditions the Precautionary Principle must apply. Doing risk

[32] 'Development of hazardous waste incinerator target analyte list of products of incomplete combustion. Final report.' – 1998 - Office of solid waste, United States Environmental protection agency.
[33] A. Fan, R. Howd, and B. Davis, "Risk Assessment of Environmental Chemicals," ANNUAL REVIEW OF PHARMACOLOGY AND TOXICOLOGY Vol. 35 (1995), pgs. 341-368.

analysis based on very few known chemicals and heavy metals is unacceptable.

In addition to the uncertainties already mentioned above, some methodologies try to use 'surrogate indicators' to measure other substances that are impossible to measure accurately. A surrogate indicator performance indicator is an easily measured parameter or compound whose measurements can account for the levels of a more difficult to measure chemical (target chemical). This methodology is flawed for the following reasons:

1. If we are not certain what the mix of chemicals are, how can one conclusively say that the level of one 'convenient' chemical is an indication of many others?
2. Many of the chemicals' (e.g. dioxins and furans) form outside of the incinerator or in cooler parts of the incinerator, like the stack. This is not the case with carbon monoxide (which is used as the surrogate indicator for dioxin). If the performance and characteristics of the surrogate and target chemicals are not the same, then one cannot be used as a substitute for the measure of the other.[34]

In spite of all that has been said above about risk assessment, the single biggest problem with this science is its disregard for people's lives, health, well being, and happiness. In most cases the ACCEPTABLE level of risk is measured as the number of people who will die from cancer per million (typically 1 person per million or 1x10¯6.) This is saying that if the profit is going to be good, it is OK to kill a person in every million. Can we accept this kind of thinking? Instead:-

1. If genetic damage can occur, then this is a non-threshold event. Only zero emissions are acceptable;
2. Cancer is a non-threshold event. Only zero emissions are safe;
3. The same applies to reproductive system damage, developmental system damage, and any other damage that can have a life long negative effect.

This means that if any chemical that is released from an incinerator can be linked to any one of these serious lifelong health impacts, no matter how small the impact is claimed to be, then the incinerator should not be permitted to operate!

6.5 The economics of incineration[35]

6.5.1 The cost of incineration technology

Incinerators are very expensive. A 2000 tons/day incinerator was recently built in Amsterdam at a cost of US$600 million (approx. R4,4 billion Rand). Of this amount half of the money was spent on pollution control equipment. Incinerators are high tech, and this makes them a very expensive investment.

Incinerators and the pollution control devices are very expensive to run and to maintain.

[34] Development of hazardous waste incinerator target analyte list of products of incomplete combustion. Final report.' – 1998 - Office of solid waste, United States Environmental protection agency
[35] DRAFT INCINERATION DOCUMENT REV 4 – September 2001 – Earthlife Africa M. Lakhani / L. Heron

They require a high level of skill to ensure that they run at the required specifications and that they are maintained to the right standard (it has however been shown that no incinerator will operate within specification 100% of the time). South Africa has a shortage of skilled people. This means that the incinerators will most probably be operated by under skilled operators and technicians, or skilled people will be directed away from more meaningful and beneficial jobs. On the contrary a good recycling program will employ unskilled and semi-skilled people. Recycling will also generate more jobs than the incinerator will, even ignoring the saving of resources, etc.

The Kyoto Protocol could result in very heavy fines for carbon dioxide emissions. This could dramatically affect the operating costs of incinerators. These fines could be in the region of US$20 / kg of CO_2.

The reality is that in South Africa, standards are limited, with the Air Quality Bill only recently coming into effect, and can still be overridden by EMCA's.

7. AGRO-INDUSTRY

While the agro-industrial use and impacts of POPs was raised by various sectors, the research capacity of the authors is limited by current constraints within this project. A future project will require to be undertaken to address these issues.

8. WAY FORWARD

The Perfect Solution in all cases is to begin by stopping the production of toxic materials. This implies:

- An immediate ban on incineration;
- An immediate ban on the manufacture or import of any POP; and
- An immediate halting of sales and use of existing POPs.

Implementation of the Polokwane Declaration on Zero Waste to be phased in within 5 years, by 2010, instead of the current delayed phasing in by 2022.

The next steps would be:

- Planned phasing out of chlorine use in industry, such as paper manufacturing, and replaced with alternatives, such as oxygen bleaching.
- Planned phase out of other sources of POPs, including manufacture, use and disposal of PVC.

9. RECOMMENDED APPROACHES

The Stockholm Convention states:

General prevention measures relating to both best available techniques and best environmental practices

Priority should be given to the consideration of approaches to prevent the formation and release of the chemicals listed in Part I of Annex A on Elimination. Useful measures could include:

(a) The use of low-waste technology;
(b) The use of less hazardous substances;
(c) The promotion of the recovery and recycling of waste and of substances generated and used in a process;
(d) Replacement of feed materials which are persistent organic pollutants or where there is a direct link between the materials and releases of persistent organic pollutants from the source;
(e) Good housekeeping and preventive maintenance programmes;
(f) Improvements in waste management with the aim of the cessation of open and other uncontrolled burning of wastes, including the burning of landfill sites. When considering proposals to construct new waste disposal facilities, consideration should be given to alternatives such as activities to minimize the generation of municipal and medical waste, including resource recovery, reuse, recycling, waste separation and promoting products that generate less waste. Under this approach, public health concerns should be carefully considered;
(g) Minimization of these chemicals as contaminants in products; and
(h) Avoiding elemental chlorine or chemicals generating elemental chlorine for bleaching.

9.1 Best available techniques

The concept of best available techniques is not aimed at the prescription of any specific technique or technology, but at taking into account the technical characteristics of the installation concerned, its geographical location and the local environmental conditions. Appropriate control techniques to reduce releases of the chemicals listed in Part I of Annex A on Elimination are in general the same. In determining best available techniques, special consideration should be given, generally or in specific cases, to the following factors, bearing in mind the likely costs and benefits of a measure and consideration of precaution and prevention:

General considerations:

(i) The nature, effects and mass of the releases concerned: techniques may vary depending on source size;

(ii) The commissioning dates for new or existing installations;

(iii) The time needed to introduce the best available technique;

(iv) The consumption and nature of raw materials used in the process and its energy efficiency;

(v) The need to prevent or reduce to a minimum the overall impact of the releases to the environment and the risks to it;

(vi) The need to prevent accidents and to minimize their consequences for the environment;

(vii) The need to ensure occupational health and safety at workplaces;

(viii) Comparable processes, facilities or methods of operation which have been tried with success on an industrial scale;

(ix) Technological advances and changes in scientific knowledge and understanding.

9.2 Principles that should guide POPs and other related issues

Precautionary Principle

- Definition and general duty to take precautionary action;
- Aggressive goals for reductions in hazardous substances, processes, products and practices (back-casting);
- Shifting the burden of proof to those undertaking hazardous activities (reverse onus);
- Criteria and structure for decision-making about harm under uncertainty;
- Prevention-based tools for implementing precautionary action;
    - Bans and phase-outs.
    - Clean production/pollution prevention.
    - Alternatives assessment.
    - Health based occupational exposure limits
- Use of the "Polluter Pays" principle;
- Evaluating alternative activities, technologies, chemicals;
- On-going monitoring, investigation, and information dissemination;

- Methods for participative/democratic decision-making;
- Strong enforcement.

9.3 Policy and regulatory tools needed

- Internalising of costs
- Life Cycle Thinking / Analysis
- Extended Producer Responsibility
- "Right to Know"
- PIC - prior informed consent (committed to "Implementation of the Prior Informed Consent (PIC) Convention. The PIC Convention tries to promote the exchange of information on certain hazardous chemicals and their transport and trade" – government website, July 2005).

9.4 Tools for assessment and implementation:

Criteria for scaling and framing policy problems in sustainability[36]

9.4.1 Problem framing attributes

1. Spatial scale of cause of effect: local-national-regional-international-global
2. Magnitude of possible impacts (on both humans and natural systems)
3. Temporal scale of potential impacts, timing (near, medium, long term, longevity (short, medium, long)
4. Reversibility (easily quickly reversed or expensive/ irreversible)
5. Measurability of factors and processes (well known, ignorance)
6. Degree of complexity and connectivity

9.4.2 Response-framing attributes

1. Nature of cause(s) (simple, systemic)
2. Tractability (availability of means, acceptability of means)
3. Public concern.

9.4.3. Attributes related to strength of association between assessment and measurement endpoints [37]

1. Biological linkage between measurement endpoint and assessment endpoint
2. Correlation of stressor to response
3. Utility of measure for judging environmental harm
4. Extent to which data quality objectives are met
5. Site specificity

[36] (Dovers, 1995)
[37] MassachusettsWeight of Evidence Workgroup (MWEW, 1995)

6. Sensitivity of the measurement endpoint for detecting changes
7. Spatial representativeness
8. Temporal representativeness
9. Quantitativeness
10. Use of a standard method.

9.4.4. Principles of Effective Environmental Management[38]

1. Consider a variety of plausible hypotheses
2. Consider a variety of possible strategies
3. Favour actions that are robust to uncertainties
4. Hedge
5. Favour actions that are informative
6. Probe and experiment
7. Monitor results
8. Update assessments and modify policy accordingly
9. Favour actions that are reversible
10. Solicit all available information from all stakeholders

9.4.5. Hill Criteria for distinguishing between association and causation in epidemiologic studies[39]

1. Strength of evidence
2. Consistency of evidence
3. Specificity of effect
4. Temporality of effect
5. Dose response of effect
6. Plausibility of effect
7. Coherence with existing knowledge
8. Experimental evidence
9. Analogy (structure activity)

9.4.6. Criteria for managing uncertainty and regulation in public policy[40]

1. Who/what gets the benefit of scientific doubt?
2. Who takes the burden of proof?
3. What level of proof is appropriate?
4. Which are the toxicologically dominant and strategically dominant causes?
5. Is it of public health significance but not of statistical significance?
6. What are the multiple benefits of risk reduction?
7. What is the optimal balance between time spent establishing causation and time spent

[38] (Ludwig, et. al, 1993)
[39] (Hill, 1965)
[40] (Gee, 1997)

reducing risk?

8. What is the likely size and distributions of false negatives and false positives?
9. What is the optimum mix of policy instruments, targets, and timetables that will maximize overall cost-effective public policy?
10. What mechanisms are needed for establishing need in public policy on new products/ services so as so optimize the balance between innovation and risk?

9.5 Proposed criteria to guide precautionary decision-making[41]

9.5.1 Association/ Uncertainty criteria

- Strength of evidence (experimental and observational)
- Amount and consistency of evidence across a wide range of circumstances
- Temporality of effect
- Coherence with existing knowledge
- Plausibility of effect
- Have all evidence and all plausible hypotheses been considered
- Power of study(ies) to detect an effect
- Have false negatives (type II errors) been minimized?
- Is the evidence statistically significant or of public health significance?
- Is there some presumption of causal relatedness based on previous experience which would lower the evidentiary standard? (i.e. is there evidence from any other similar case that would lead one to believe that the similar impact could be considered in the present case).
- What is the adverse effect being studied and is it the correct one?

9.5.2 Decision-stakes criteria

- Spatial scale of cause of effect: local-national-regional-international-global
- Magnitude of possible impacts (on both humans and natural systems)
- Temporal scale of potential impacts, timing (near, medium, long term), longevity (short, medium, long)
- Reversibility (easily quickly reversed or expensive/irreversible)
- Measurability of factors and processes (well known, ignorance)
- Degree of complexity and connectivity

Is the action robust to uncertainties (error friendly)

- Do alternatives or measures exist to reduce or eliminate potential harm (ease of prevention)?
- What is the trade off between further study and potential impacts?

[41] Raffensperger, C. and J. Tickner eds. Protecting Public Health and the Environment: Implementing the Precautionary Principle. Washington, DC: Island Press

9.6 Alternatives to DDT

There are safe and effective alternatives to DDT, including, but not limited to, alternatives and safer chemicals; bacterial toxins; bed nets impregnated with safe alternatives; electronic and natural repellents; etc. A key failing in the way governments have looked at alternatives, is that they have not looked at the issue holistically, they ignore the improved health of people by NOT being exposed to DDT, for example, over the life of the DDT (which by its very nature, is long). So, it seems that overall, the alternatives are really cheaper than spraying DDT.

Malaria control: Alternatives to DDT have been documented as safe and effective and have been used in Africa and Asia. Several countries in the Asia/Pacific region have successfully moved away from DDT. For example, the World Health Organization's (WHO) Roll Back Malaria campaign reports that in Vietnam between 1990 and 1997, deaths from malaria dropped 98 percent from 4,500 to 100. This was accomplished using drugs and chemically-treated bed nets. At the third POPs negotiating session, delegates from the Philippines and Thailand noted their countries' great success with alternative approaches[42].

Mexico has successfully reduced the annual incidence of the disease from 2.4 million cases in the 1940s and 1950s to approximately 5,000 cases today-while simultaneously reducing annual domestic DDT production and use from 25,000 tons to a production rate of approximately 600 tons.[43]

It has become clear that malaria is irrevocably connected to rural poverty, and the author makes the powerful statement that: "Provision of basic health care centers, schools, and safe water supplies to the rural areas may contribute much more to malaria control than most of the activities which have been undertaken up to the present time."[44]

The following is a list of safe alternatives that could be evaluated for use in the South African context:

a) [45]Human-safe coconut-incubated bacterial toxin from *Bacillus thuringiensis israelensis (Bti)* can be sprayed into breeding sites as a highly specific agent against mosquito larvae. Tests demonstrate that *Bti* kills nearly all the mosquito larvae in a typical pond, halting breeding for up to 45 days. The CSIR should investigate the cheap propagation of this alternative.

b) The use of indoor spraying with residual pyrethroids (permethrin, deltamethrin,

[42] WWF – August 2000
[43] The Mexican government on 16 July 1997 unveiled a program designed to phase-out all uses of the pesticides DDT and chlordane within 10 years. - EHP
[44] *Departement d'Epidemiologie des Affections Parasitaires, Ecole Nationale de Medecine, de Pharmacie et d'Odonto-Stomatologie, Bamako, Mali*
[45] (see www.twig.org.za/edec.html).

lambda-cyhalothrin), etofenprox, bendiocarb, fenitrothion, malathion, pirimiphos-methyl, propoxur or other pesticides.

c) Pyrethroids such as deltamethrin and lambdacyhalothrin are effective at far lower doses than DDT (c.25 mg/m2 compared with 2 gm/m^2). Any synthetic pyrethoids will, however, need to be evaluated as potential EDCs.

d) Impregnated bed nets containing natural or synthetic EDC-free insecticide.

e) The World Health Organization approved a malaria treatment using artemisinin, the active ingredient of the qinghao plant, in 2001. With established anti-malarial medicines rapidly losing their effectiveness, the World Health Organization recommended in 2001 that countries afflicted with the disease switch to a combination therapy based in part on the Chinese drug. After a slow start in adopting artemisinin-based drugs, demand has skyrocketed in the last two years, with projections that 300 million doses will be needed in 2006.

f) Mexico has successfully used non-chemical alternatives such as environmental management of mosquitoes with community participation, use of *bacilli* and nematodes to control them, and the improvement of the surveillance, diagnosis and treatment system of Mexico's Health Secretariat. Chemical alternatives such as pyrethroids (mainly deltamethrin and lambda cyhalothrin) are being tested and, under the provisions of the NARAP, findings on the use of the alternatives have already been presented.

g) Solar-powered high frequency electronic mosquito repellents.

h) Topical application of oils and herbal extracts like coconut oil, cymbopogan, lantana, geranium and neem oil.

i) Physical environmental management - According to Dr Rodriguez, there are two mosquito species that transmit malaria in Mexico. In inland areas, the main mosquito vector produces cases primarily during the dry season, when local rivers empty and leave river pools, which are covered by algae that provide shelter for the mosquitoes. By removing these algae, the population of mosquito larvae decreases for almost two weeks, he notes. (A similar approach may also work in coastal areas, where malaria transmission, involving a different species, occurs in the rainy season. Although these mosquitoes do not breed on pond algae, there are some plants that provide habitat. If these plants are removed, the number of mosquitoes may decline - a theory that still needs to be tested).

Pond algae: So far, the algae removal strategy has been tried in several inland villages.

Local women and men are removing the pond algae within a one kilometre radius of their villages and with good results. The population of adult mosquitoes is decreasing in these villages, which means there is less need to spray insecticides. The MCP Director, Dr Jorge Mendez-Galván, and Dr Rodriguez' team are also promoting a new approach to insecticide spraying. The traditional method used a hand pump to spray a film of DDT on the walls of homes to kill mosquitoes before or after they dined on human blood. Instead of DDT, people are now spraying their homes with alternative insecticides such as pyrethroids, which do not persist in the environment. Moreover, the researchers have developed a mechanical pump that sprays less insecticide but in larger droplets that remain on walls for up to six months - twice as long as before. Using this pump, two people can spray about 40 houses per day, compared to eight houses with the manual pump. "This means people are being protected faster, and at the same cost as the previous technology," Dr Rodriguez says.[46]

j) Removal of non-essential standing water; exposure of the water surface to sunlight; removal of vegetation where possible; clearing channels to allow water to flow freely; use of biological control agents e.g. *Gambusia affinis* predatory fish, or *Bti*

k) Other complementary measures include the use of bed nets and house screens, planting lemon trees, fumigating homes by burning eucalyptus branches and leaves, paving irrigation channels, stocking breeding sites with larvivorous fish, screening water storage tanks and eliminating waste water, as well as the filling in of holes (including in houses - walls etc).

9.7. Recent South African Breakthrough

The CSRI has recently demonstrated that the oil of the indigenous *Lipia javanica* has mosquito repellant properties that far exceed citronella. Tests show that 90% of mosquitoes are repelled by the presence of *Lipia javanica* oil in the air as opposed to 20% repelled by equal concentrations of citronella.

9.8. Experience from other Countries - Case Studies[47]

9.8.1 India

Comparing bio-environmental management and indoor residual spraying for malaria control in India[48]

Malaria incidence in India dropped dramatically following the introduction of programmes for indoor residual spraying in the 1950s, but has resurged since the mid-1960s. Insecticide

[46] Controlling Malaria in Mexico Using Alternatives to DDT - IDRC
[47] Guidance on alternative strategies for sustainable pest and vector management - Johan Mörner,Robert Bos and Marjon Fredrix
[48] Summarised from: Phillips, Margaret, A. Mills and C. Dye 1993. Guidelines for Cost-effectiveness Analysis of Vector Control. WHO/CWS/91.4. PEEM Secretariat, WHO, Geneva, and Khaware, Ray Kishor and Priti Kumar, 1999. Bioenvironmental Malaria Control in Kheda District, Gujarat, India in WWF, 1999 Disease Vector Management for Public Health and Conservation

and drug resistance, financial constraints and decreasing community acceptance of spray programmes all contributed to this resurgence.

The challenge to find safer, more sustainable, community-based strategies led the Indian Council of Medical Research to support pilot activities on Integrated Disease Management. One of the pilot areas was the Kheda District in the State of Gujarat. The pilot activity was implemented between 1983 and 1989. The district is part of an area of low malaria endemicity: transmission intensity is low and seasonal, the population has little immunity to the parasite and there are periodic epidemic outbreaks of the disease, linked to particular weather patterns. Under these conditions, routine active case detection is not cost-effective, it is difficult to measure the impact of vector control interventions and making relevant comparisons between alternative vector control methods is a statistical challenge.

Most people in the Kheda district are subsistence farmers, growing two rice crops every year. The extensive irrigation network and associated factors provide a favourable environment for mosquito breeding. By 1980, vectors had become resistant to DDT, HCH and malathion. Increasingly, citizens were refusing house spraying. The awareness of the communities on health issues, including malaria, was generally low. The project in Kheda was designed to test an alternative, non-chemical malaria control strategy, combining enhanced health services with local ecosystem changes that discourage vector breeding. The strategy was preventive, aimed at avoiding epidemics of malaria by efficient treatment of people who could serve as reservoirs of the disease, combined with reduction of vector numbers through elimination of vector breeding sites. A stepwise implementation of the pilot activity started in 1983 with field work to monitor the impact of anti-larval and anti-parasitic measures. Project workers, including village level resident health workers, were hired by the project and received special training. An important step was to create community awareness on health-related issues as a basis for participation. Contacts were established with village councils, leading to growing local networks of staff, village leaders, teachers, and interested villagers. The project organised educational activities for villagers at the local facilities of the Malaria Research Centre and later in the communities themselves. Villagers could see for themselves mosquito larvae, adult mosquitoes and the malaria parasites through a microscope and learn about mosquito breeding around their houses and around the village. Group meetings for villagers were organised for open discussions and resolving doubts. Female health workers made house-to-house visits to involve women, whose decisions are important for water issues and uses. They taught women how to store and manage water in a way that would prevent the breeding of malaria vectors. They also encouraged interested women to expand their know-how to other women. These activities were important to motivate villagers to participate in the project. Village health workers carried out a weekly surveillance of malaria cases. They were trained to take blood samples from persons with fever that were analysed by the project within 24 hours. Village workers treated persons with confirmed or suspected malaria.

Bio-environmental management was cheaper than DDT in this study

Survey teams of entomologists, support staff, daily wage workers and volunteers from the village carried out extensive surveys of mosquito breeding sites. Most breeding sites were found within and around houses, and included irrigation canals. They also identified the two major species involved in malaria transmission and their preferred breeding sites. After the identification, breeding sites were eliminated or stocked with larvivorous fish. Weekly checks of the breeding sites took place. If mosquitoes were found in houses, their occupants were shown how to prevent further breeding. Guppies were found to be the most effective larvivorous fish. Hatcheries were set up in the project area to rear and distribute them. The promotion of ponds to grow both larvivorous and commercially marketable fish was one of the community income-generating activities the project developed in collaboration with several NGOs. The study covered six years and results at the end of that period showed that levels of malaria incidence under the conventional programme of indoor residual house spraying (IRS) and under the innovative programme of intensified case detection/ treatment and bio-environmental vector control (EMVC) were very similar – about two cases annually per 1000 persons. A cost-effectiveness analysis was carried out in 1989, comparing the two programmes. The per capita cost was Rs 5.5 in the IRS programme and Rs 4.5 in EMVC programme. The cost-effectiveness analysis took into account only the direct costs of the two programmes. Variables that could not be expressed in monetary terms, such as the environmental benefits of not using pesticides, were not included. Additional side benefits of the integrated programme, such as fish production, were not included, either. Including these benefits into the analysis would further enhance the cost-effectiveness of the integrated approach of case detection/immediate treatment and bio-environmental management for vector control.

9.8.2 Philippines

Malaria control in the Philippines

After World War II, malaria control efforts in the rural areas of the Philippines relied exclusively on mass drug treatment and DDT for indoor residual spraying. In the 1980s these activities were complemented by active case detection to focus drug treatment and efforts to reduce breeding sites and densities of mosquito larvae. Across the board, malaria incidence was kept low through these measures, although fluctuations occurred. The use of DDT was banned in 1992, for environmental reasons. More recently, the National Malaria Control Service changed its strategy. Initially several pyrethroid insecticides were selected to replace DDT for indoor residual spraying. These were more expensive and posed higher risks to members of the spray teams because of their acute toxicity. In 1993, an external review of the Malaria Control Programme recommended that only one pyrethroid was to be used for residual house spraying. Based on results of pilot activities, it was also recommended to reduce residual house spraying and to increase the use of Insecticide Treated Nets (ITN). At present, periodic stratification of malaria endemic areas serves as the key criterion in the selection of area-specific measures. At the community level, Lead

Contact Groups exist, composed of health officials, neighbour-hood co-operatives, NGOs and community members. These groups are responsible for decisions on cost-sharing for ITNs, their proper use and maintenance. The total cost of insecticides for malaria control in the Philippines has actually decreased 40 % since the banning of DDT - and malaria incidence dropped more than 40 % in the period 1993-96! Much of this significant success can be attributed to active community participation, and continued local involvement in a de-centralized structure will help sustain the positive situation.

9.8.3 Mexico

Mexico's action plan to eliminate the use of DDT in malaria control

Malaria is a long-standing public health problem in Mexico. Sixty percent of its territory from sea level to 1,800 meters above sea level presents favourable conditions for transmission. Some 45 million people live in these areas. Ninety percent of all malaria cases occur in five States: Oaxaca, Chiapas, Sinaloa, Michoacán and Guerrero. These coincide with the distribution of two vector species: *Anopheles albimanus* and *A. pseudopunctipennis*.

Behavioural aspects limit the impact of insecticide treated nets (ITNs) in Mexico: people generally tend to spend several hours of the early evening watching television, at which time they are exposed to biting anophelines.

In the 1940s and 1950s, malaria was one of the main causes of mortality, responsible for an average of 24,000 deaths annually and afflicting an estimated 2.4 million others. In recent years, the incidence of malaria had declined significantly, to less than 5,000 cases, and no deaths from malaria have been reported since 1982, indicating the success of the control program. However, the control of the disease had been highly dependent on DDT spraying (more than 2000 tons per year in the 1970s). Mexico continued the use of DDT in malaria campaigns until the 1990s, not only because of its effectiveness, but also because of its low cost and lack of acute toxicity for spray teams, compared to alternative chemical pesticides.

In 1995, Mexico adopted a more integrated approach for malaria control, to substitute the heavy dependence on house spraying. For the reduction of transmission risks in the *A. pseudopunctipennis* areas, a successful community-based programme to clear algae from ponds was established with a dramatic effect on vector breeding. Furthermore, improved sanitation, surveillance and a minimum use of pesticides to control mosquitoes and larvae are considered key elements in this new approach. The reduction of DDT use, from 1260 tons sprayed in 1991 to 477 tons in 1997 was accelerated by a North America Regional Action Plan (NARAP) developed to reduce the exposure of humans and the environment to DDT and its metabolites. This NARAP was developed by Canada, USA and Mexico as parties to the North American Agreement on Environmental Co-operation (NAAEC), and was the result of Commission for Environmental Co-operation (CEC) Resolution 95-5 on Sound Management of Chemicals. New research on the human health effects of long-term

exposure to DDT and the continuing need for an effective and comprehensive malaria control program in Mexico provided additional incentives for regional action. DDT production in Mexico was stopped in 2000 and supplies of DDT are kept for authorized government use in malaria vector control only. The objective of the NARAP is to reduce DDT use by 80 percent in five years and eventually phase it out completely for malaria control in Mexico. To achieve this goal, Mexico developed a national action plan with an initial geographical emphasis placed on areas with the highest number of cases. The general objective of Mexico's action plan is to develop and assess local alternatives to DDT for the control of malaria at a national level and to assess the health and environmental impact of DDT and alternative pesticides.

More specific objectives are:
• to strengthen the current integrated programme to control malaria in Mexico through assessment of the effectiveness of alternative control methods;
• to assess the cost-benefit/cost-effectiveness of all alternative control methods;
• to obtain general baseline information on current pesticide use, with emphasis on agricultural uses of pesticides proposed as alternatives to DDT in malaria control, and to update a Geographical Information System (GIS) with datasets on this use as a decision-making tool;
• to monitor environmental levels of DDT and other pesticides used in the malaria campaign in water, soil, food, selected animal species and humans; and
• to assess the health impact on human populations of DDT residues and alternative pesticides used in the malaria campaign.

The national and regional action plan to phase out DDT is expected to give god results.

The effectiveness of a number of alternative control measures have been assessed in the State of Oaxaca:
• field assessment of pyrethroid-impregnated mosquito nets as a complementary measure;
• field evaluation of deltamethrin and lambda-cyhalothrin as a substitutes for DDT for house-spraying; and
• establishment of a production facility for parasitic nematodes of mosquito larvae
These three projects showed promising results

However, these were small projects that have not yet been integrated into the national plan. A more holistic evaluation is under development. The studies in this phase will be used to develop and validate relevant methodology with alternative strategies and possible effects of alternative chemicals. The use of DDT has been avoided during the most critical conditions for controlling malaria outbreaks during recent hurricanes and floods in the aforementioned states. DDT has been replaced by pyrethroids in these cases. New application techniques to reduce the quantity of pesticides used will be evaluated along with greater emphasis on community participation in the surveillance and treatment of cases.

9.9 Observations with respect to the above case studies

• Economic considerations are important when deciding on vector control programmes. Data must therefore be accurate and relevant. This includes opportunity costs of community participation and external benefits (such as commercial fish production linked to the production of larvivorous fish, or the gains from timber production where trees are planted to lower water tables).
• Malaria transmission is often cyclical, following weather patterns. Vector ecology will also vary between areas. This must be considered when drawing conclusions from comparative studies on disease and vector management using conventional and innovative methods.
• Community participation will be sustainable if there is real economic benefit for a large segment of the local population. NGOs can play an important role in ensuring this. Building on existing socio-economic structures and traditions can lead to greater success. The introduction of "new" activities such as fish production in areas where fish is not part of the traditional diet may be less sustainable and will need more coaching.
• Strengthening the regulatory role of the health sector is an important pre-requisite for the successful application of results from multi-disciplinary research.
• Improved formulations and innovative applications of new pesticides may seem to be more expensive than older types, but can in fact reduce the costs of vector control programme. This is particularly true where spraying programmes become better targeted and are supported by non-chemical interventions, as shown in the case of the Philippines.
• The degree by which the decentralization of malaria control programmes supports integrated vector management (IVM) with reduced costs and improved levels of protection should be carefully assessed.
• Environmental management programmes are often more resilient and sustainable than service delivery programmes relying on regular spraying, case detection, drug treatment or vaccination. This is particularly important in times of social and political instability. An example: during the Iran-Iraq war, schistosomiasis was kept under control in Iran in irrigation schemes that included environmental modification measures, while it increased in schemes relying only on case detection and drug treatment, which were disrupted.

9.10 Some positive steps that South Africa can take to reduce reliance on DDT

1. Do away with all taxes and tariffs on bed-nets, on pesticides intended for treating bed-nets, and on anti-malarial drugs. Failure to act on this front certainly undercuts claims for the necessity of DDT; it may also undercut claims for anti-malaria foreign aid.

2. Emphasize appropriate technologies. Where, for example, the need for mud to re-plaster walls is creating lots of pothole sized cavities near houses cavities that fill with water and then with mosquito larvae it makes more sense to help people improve their housing maintenance than it does to set up a program for squirting pesticide into every pothole. To

be “appropriate,” a technology has to be both effective affordable and culturally acceptable. Improving home maintenance should pass this test; so should bed-nets, and of course there are many other possibilities. In Kenya, for example, a research institution called the International Centre for Insect Physiology and Ecology (ICIPE) has identified at least a dozen native East African plants that repel *Anopheles gambiae* in lab tests. Some of these plants could be important additions to household gardens.

3. Use existing networks whenever possible, instead of building new ones. In Tanzania, for example, an established healthcare program (UNICEF’s Integrated Management of Childhood Illness Program) now dispenses anti-malarial drugs and instruction on how to use them. The UNICEF program was already operating, so it was simple and cheap to add the malaria component. Reported instances of severe malaria and anemia in infants have declined, apparently as a result. In Zambia, the government is planning to use health and prenatal clinics as the network for a coupon system that subsidizes bed-nets for the poor. Qualifying patients would pick up coupons at the clinics and redeem them at stores for the nets.

4. Assume that sound policy will involve action on many fronts. Malaria is not just a health problem it’s a social problem, an economic problem, an environmental problem, an agricultural problem, an urban planning problem. Health officials alone cannot possibly just make it go away. When the disease flares up, there is a strong and understandable temptation to strap on the spray equipment and douse the mosquitoes. But if this approach actually worked, we wouldn’t be in this situation today.

Arguably the biggest opportunity for progress against the disease lies, not in our capacity for chemical innovation, but in our capacity for *organizational innovation* in our ability to build an awareness of the threat across a broad range of policy activities. For example, when government officials are considering loans to irrigation projects, they should be asking: has the potential for malaria been addressed? When foreign donors are designing antipoverty programs, they should be asking: do people need bed-nets? Routine inquiries of this sort could go a vast distance to reducing the disease.

Where is the DDT in all of this? There isn’t any, and that’s the point. We now have half a century of evidence that routine use of DDT simply will not prevail against the mosquitoes. Most countries have already absorbed this lesson, and banned the chemical or relegated it to emergency-only status. Now the campaign and associated efforts are showing that the frequency and intensity of those emergencies can be reduced through systematic attention to the chronic aspects of the disease. There is less and less justification for DDT and the futility of using it as a matter of routine is becoming increasingly apparent: in order to control a disease, why should we poison our soils, our waters, and ourselves? [49]

[49] Malaria, Mosquitoes, and DDT; The toxic war against a global disease; by Anne Platt McGinn ; Senior Researcher, Worldwatch Institute

The Mexican and Indian experience proves that safe alternatives to DDT can be both effective, as well as cost effective. There are no longer any excuses, unless the intent is to benefit companies selling DDT; it is high time now to change from DDT to safe alternatives in South Africa.

9.11 Alternatives to incineration

What are the alternatives to incineration?[50]

There are many proven more environmentally sound ways in which to deal with our waste problems.

1. The alternative that needs to receive the greatest amount of attention is the **avoidance of waste**. If there was no waste, there would not be a waste disposal problem. Zero waste thinking must become a strategy and a way of life. The details of the many ways in which we can reduce the amount of waste we generate falls outside of the scope of this document. However there are basic principles that can be applied. This aspect can be dealt with in two ways:-

    a. **Not generating the waste.**
        i. Ensure that things that are manufactured and purchased are well made and durable. Designing products that are environmentally benign to start with;
        ii. Choose options that minimize on packaging, as well as utilizing packaging that is made from recycled material, for example, or packaging that carries a deposit, for re-use. This option is being vigorously fought by packaging companies, as they see it as a way of minimizing their profits. Our argument is that it is unfair for human health and the environment to bear the costs of these profits;
        iii. Products should be designed that can be re-used and easily re-cycled. This would include minimizing the number of different materials used, and that they would be *designed for disassembly* (DFD).
        iv. Products must be designed to be repairable and should be repaired whenever possible. The idea of making sealed units for anything is anathema to sustainability, and minimizes the potential for local job creation in the relevant repair industry.

    b. **Recycle as much as possible.** In many cases 80% of the domestic waste stream has been re-cycled. Recycling can generate revenue which will dramatically reduce the cost of waste. Smaller volumes of waste are far easier to manage. All organic materials should be composted and used to enrich the soil. Organic matter is a fairly benign product and can be composted very easily with little or no equipment. However, when organic waste is placed in a landfill it leads to bad odours, methane and global

[50] DRAFT INCINERATION DOCUMENT REV 4 – September 2001 – Earthlife Africa M. Lakhani / L. Heron

warming, and acid which leach out many toxic materials. Regardless of the design or construction of landfill sites, it is guaranteed that all sites will leak sometime in the future, and as such, goes against South African Constitution that specifically calls for not creating problems for future generations.

Please note:

In industrial environments a cyclical approach should be pursued. Industry should adopt a cradle to cradle responsibility for their products. This is already becoming the trend in more aware countries, where products are taken back by the manufacturer at the end of their useful life, to be re-manufactured into new products. When companies are given this kind of responsibility, they naturally tend towards using material that can be easily re-used and recycled, maximising the drop in waste generated. The waste from one process should become the raw materials for another. This is the system used by nature, and is sustainable.

2. There are well known alternatives to the incineration of **medical waste**. The most important consideration with medical waste is to understand what the real problem is. Medical waste is made up of organic materials, plastics, canteen waste, office waste, sharps (blades and needles), and miscellaneous other products. Most of these materials are no more harmful than other domestic, restaurant, or office waste and should therefore not be treated in a special way just because it originates from a hospital.

   About 15% of medical waste is potentially infectious as it may carry disease causing micro-organisms. The problem with potentially infectious waste is *biological*. The objective for the treatment of this waste is to prevent bacteria and viruses that originate in the hospital or research facility from infecting the community. The scope of the AIDS epidemic has helped to change perceptions and make this problem seem far greater than it is.

   Infectious waste is not a trivial problem but fortunately can be easily disinfected using autoclaves which do not generate POPs. Incineration also kills all of the pathogens in the medical waste, but it also fundamentally changes the nature of the material that the pathogen lived on. This is completely unnecessary and is a complete overkill.

   Most of the materials that are incinerated are completely decomposed. During incineration many toxic and hazardous chemicals and particulate matter are released. These lead to real health problems for plants, animals, and humans. Many of the chemicals that are released from an incinerator are not inherent in the material that was incinerated, i.e. these chemicals are formed in the incinerator, or during the

cooling of the flue gasses. Other materials (e.g. mercury) are liberated from a fairly stable substrate like plastic or ink when incinerated and can then be changed from their inorganic state into a far more hazardous organic form. The organometallic molecule is more easily absorbed into the bodies of all living things.

Further, given lack of knowledge around infectious wastes; waste generators, transporters and incinerator operators "scare" the general public into accepting their unsustainable and hazardous processes. The fact of the matter is that waste which is autoclaved would kill all pathogens. So, it is clear that incineration of medical waste is not the solution.

The solution to the medical waste problem lies in a front-end approach. The waste stream needs to be tackled from its source. This can be done using the following suggested process.

i) The waste issue needs to be brought to the attention of all the staff in the hospital. The downstream problems that the waste causes need to be clearly explained. All administrative staff, doctors, nurses, cleaning staff, and all others should be encouraged to think about the waste problem and try to offer suggestions that can be used to overcome the problem.

ii) The waste stream needs to be studied. A breakdown of the various kinds of waste must be obtained. This study should then be analyzed to determine what materials can be removed from the waste stream, i.e. what waste can be avoided altogether. This can include all items from the avoidance of disposable plates in the canteen, to once again using re-usable health care equipment. A small table top autoclave can be used to clean and sterilize this equipment. This method has been successfully used for many years worldwide, and lowers the cost associated with health care wherever utilized.

iii) The waste stream must then be sorted at source. The most important aspect is to sort the infectious 15-20% of the stream from the other 80-85%. Sorting at source enables these materials to be re-cycled and re-used without the unpleasant task of sorting the recyclables from mixed waste. The remaining infectious waste can be sterilized and disposed of in much smaller volumes.

iv) Special consideration must be given to the handling and final disposal of sharps. These make up 1% of the waste stream, but they cause 90% and possibly up to 100% of infection among hospital staff, waste haulers, and scavengers. All sharps should be stored in a puncture proof container, sterilized and disposed of in a secure location where people cannot gain access to them. If these sharps are shredded then this problem is avoided.

v) The alternatives for the treatment of the infectious waste must be studied. This can include technologies that can be used on site and off site. There are processes that can be used to kill the pathogens and make the waste sterile without incineration. These alternatives solve the biological problem without

creating a far worse toxic chemical problem. Following are some suggested alternatives:-

a. High pressure steam treatment or autoclaving. The infectious waste is placed inside a vessel that can withstand high pressure. It is then superheated with steam. The heat damages the cells essential structures, rendering the cell unviable, and the waste sterile so that it can be safely handled (sharps however should always remain in a puncture proof container unless they are shredded or re-cycled). These devices can be constructed on the hospital grounds. This will also help to reduce the cost and further potential and real environmental costs associated with transport. Mercury cannot be put into an autoclave as it will contaminate the water residue (the use of mercury should be eliminated wherever possible, as it is also toxic when not incinerated);
b. Continuous autoclave processes are available. These units can have automatic loading facilities to improve safety, in-line shredders that can also handle the sharps, continuous steam injected auger systems that do the autoclaving work, dryers or wet material separation units;
c. Water is sprayed onto the infectious waste which is then micro-waved. Micro-waving uses radiant energy to heat molecules of water. The heat generated kills the pathogens. This system could produce less emissions and residues than other systems including autoclaving and chemical disinfection. By using shredding, a reduction in volume of up to 80% can also be achieved[51];
d. Shredding the waste and then washing it with a disinfectant will also render it sterile. The chemical used can be cycled and re-used many times.

Once the materials are sterile, they can be safely handled. The waste can be shredded, or sorted and recycled. What cannot be recycled can then be disposed of in a landfill under the correct conditions. Most often this waste can be disposed of at a municipal landfill site. The above methodology can reduce the volume going to landfill by as much as 90% to 95%.

3. There is not a single solution to the problem of **hazardous wastes**. These wastes are generated from and therefore contain a wide range of diverse constituents. The only real solution to this problem is the adoption of a front-end approach similar to the one described above.

   The stress with hazardous waste must be in the design of the products and the processes that produce them. The products should be re-designed so as not to

[51] Sanitec (Equipment supplier) - Website

require materials that are hazardous or that lead to hazardous wastes. Processes should be designed to minimize the amount of waste generated during and after production. The products and processes must be designed to be able to use the waste from the same process back in to the products, or to use the waste from another process. It makes sense to ban products and processes that are not sustainable. There are very few products in the world that have to be made from hazardous materials or processes - from cell phones to cars, to washing chemicals and paints, it is possible to make them with benign materials - this tends to happen as the cost of the damage caused by the hazardous waste is externalized into the environment and in the health impacts to people, and are therefore not a cost to the company, enhancing their profits.

For currently existing hazardous waste, there is a need to identify commercially viable means of handling it that detoxifies without generating POPs or other toxic chemicals.

Hazardous waste should not be incinerated for many reasons, of which some are that:-

a. the toxins are concentrated in the ash and are therefore more dangerous than when they are in the raw waste;
b. the toxins are often changed into a form that is more hazardous than the original waste. Mercury is an example of this;
c. toxins, and particulate matter will be released with the flue gasses; these contaminate the environment and all things that rely on that environment including human beings

4. **Radioactive wastes** are very problematic as there is no way to remove the radioactivity from the material. Incineration will not destroy the radioactivity, it will only spread it. These materials should therefore not be created or used. Every effort must be made to eliminate the need for these materials and where alternatives exist, they should be banned. This ban should be applied with immediate effect to the use of nuclear energy to generate electricity. The National Nuclear Regulator, together with the DEAT, should promulgate a policy that moves this forward.

   The nuclear waste that has already been generated, and that is still radioactive needs to be stored in a secure location that is above ground and well managed, until the radioactivity has naturally dissipated (this can take thousands of years). It must however be stressed that this is not a real solution, as the problem does not go away for a very long time, but the containment deteriorates in a much shorter time. Nuclear waste should not be incinerated as the radioactive substances are not destroyed only dispersed into the environment. This makes a bad problem much worse. Radiation leads to cancer, degenerative diseases, and many other problems

like chronic fatigue, loss of appetite, and some skin problems that are not usually associated with radiation.

5. The most common disposal method for municipal waste is to create landfills that are an eyesore, produce methane which is a very potent greenhouse gas, have a bad odour, and leach out toxic materials that contaminate groundwater. This also represents a loss of natural resources, resources that are already running short worldwide, or are being exploited in greater quantities to replace that which is land filled, resulting in more environmental degradation with the consequent loss of quality of life for all life on the planet.

   Up to 80% of the materials that are deposited on the land fills can be re-used and recycled. Municipal waste is not a high tech problem, and does not require a high tech solution. What is required is a good waste minimization and re-cycling program that is supported by the community.

   The first thing that consumers can do is to buy products that do not generate a lot of waste to begin with. Choose products with minimal or easily recycled packaging, as well as products that last a long time nothing is truly “disposable”. Change the way products are presented for sale by complaining to management of where you shop, to get them to minimize the waste you take home. For example, do you really need cling-wrap and polystyrene, both of which last over a hundred years before breaking down into more toxic materials, to take a handful of mushrooms home? Do not be fooled when told that this is for “consumer convenience” - it is almost always for the convenience of the companies involved.

   There are a few aspects that need to be considered for a successful re-cycling program:-

   a. **Sorting at source**. This is very important. If all wastes are mixed it creates a number of unnecessary problems and reduces the amount of material that can be re-cycled, e.g. papers can be contaminated by food wastes, oils, etc making them un-useable. If the wastes are mixed, then they need to be manually sorted again. This can often be very difficult and expensive. If wastes are sorted at source, they can be taken directly to a plant where they can be recycled without any intermediate processing. A good incentive for this would be to charge more for waste, for example, by kilogram of waste generated, and the more you generate, the more you pay. This has worked successfully in more aware countries, and could easily be tied into a deposit system.
   b. **There must be community involvement**. Without the involvement of each person in the community sorting at source will not happen. The community should also be encouraged to buy products that have been made from re-cycled

materials and that can be re-cycled. Community involvement should be obtained when setting up the re-cycling program. The more ideas that are received the better the recycling program will be, and the better commitment of the community.

c. **Education and training**. The community, waste workers, and decision makers need to be educated. It is important for people to understand what the problem is, how they contribute to the problem, and what their input into the solution needs to be. Training as to how the program will work must be provided to every member of the community.

d. **Facilities need to be provided.** If the collection is to be from the curb side or from central depots the relevant facilities must be provided. The community will be reluctant to contribute if it is very difficult to do so.

9.12. The costs of the alternatives

9.12.1. Waste Minimization

This is the simplest method of all - to avoid the creation of waste in the first place. For example, all “single-use” products (better than “disposable”, and more accurate!) could carry a deposit, which would mean that at the end of it’s useful life, would go back to the manufacturer, and be re-manufactured. This is a good example of “closed loop” processes. It minimises drastically the need more removing more resources from the planet; it halts the waste problem; and becomes extremely efficient, especially if full cost accounting is carried out.

9.12.2 Recycling

A recycling program is thought to be a very expensive option as it is labour intensive. It requires more people to sort the waste, than to operate an incinerator. Much of this task can easily be done by the people who produce the waste, i.e. at source. It needs to be handled separately, and transported to different locations. Once at the recycling plant it is then processed into new products.

Recycling is however a low tech solution with little or no sophisticated equipment. The money is therefore primarily spent on labour. In other words this money is used to support, people, and families, not imported technologies or exported profits. At the same time there is a much smaller environmental cost. Full cost accounting and Life Cycle Analyses (LCA’s) often shows re-use and recycling are actually more profitable than disposal of any sort, including incineration (environmental costs are so-called ‘soft’ issues like; human and ecological health; loss of aesthetics, degradation of the environment, and loss of habitat. They are also the direct financial cost of medical bills due to pollution and a degraded environment. These things make incineration unsustainable, which means that if we continue on this path every person will feel the negative effects). Re-use and recycling is a win-win situation for the community and the environment.

Repair of products will enable reuse or continued use of these materials. Repair also creates jobs within the community that will support the community.

Incinerators are not only expensive and high tech, but they are produced by companies based in industrialized northern countries. The money spent by the community is therefore lost to the community. The people who benefit financially are also not affected by the pollution caused in local environment. Incineration is a “lose-lose” situation for the community where it is installed.

Incineration technology creates very few new jobs. Most jobs created are temporary ones during the construction of the incinerator. Relatively few people are required to operate the incinerator. There is therefore very little return for the community in relation to the large financial investment.

9.12.3. Autoclaves

These are used for the sterilization of infectious medical wastes. Autoclaves are simple containment vessels similar to a pressure cooker. Although they need to be carefully designed to withstand the pressure and the heat within the autoclave vessel and within the boiler, they are fairly low tech solutions and do not require very expensive pollution control equipment, nor do they require highly skilled people to operate them.

9.12.4 Micro-waving

Micro-waving technology that is used to treat infectious medical wastes is more expensive than the autoclave option. They are however less expensive to construct than incinerators.

9.12.5 Chemical disinfection

This is an extremely low tech solution and is very inexpensive. It is best used for low volumes of waste and in areas where electricity is not reliable. There is some risk to the waste workers as there is more handling of the waste before and after treatment, and is therefore often not the preferred option, however, there are many ways to minimize handling, making it viable in many areas.

In most cases the medical waste treated by one of the above methods can be safely disposed of at a municipal landfill site. This is dramatically less expensive than hazardous waste landfills. Shredding is either an intrinsic part of the above processes or it can be easily added. Shredding will eliminate the problem with sharps and reduce volumes for transportation and therefore another disposal problem and cost.

9.12.6 Rubber waste

Rubber waste is probably best re-used by being broken down into its component state (physically shredded), and new products made from it.

9.13. Resources on POPs

POPs kit: The kit can be downloaded from the UNDP-GEF web site: www.undp.org/gef
Recommended readings:
Reducing and Eliminating the use of Persistent Organic Pesticides; *Guidance on alternative strategies for sustainable pest and vector management;* Johan Mörner,Robert Bos and Marjon Fredrix ; United Nations Environment Programme (UNEP) – Chemicals; E-Mail: pops@unep.ch; Internet homepage: http://www.chem.unep.ch/pops

Conventions

IISD Coverage of POPs INC 1-5 - www.iisd.ca/chemical/
Rotterdam Convention on Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade - www.pic.int/
Basel Convention - www.unep.ch/basel/
Stockholm Convention – www.pops.int
Convention on Long-Range Transboundary Air Pollution - www.unece.org/env/lrtap/welcome.html

United Nations and Related Institutions

Global Environment Facility - http://www.gefweb.org
United Nations Development Programme – GEF - www.undp.org/gef
UNEP Chemicals POPs site - http://www.chem.unep.ch/pops/
UNEP Inventory of Information Sources on Chemicals - http://www.chem.unep.ch/irptc/invent/igo.html
United Nations Industrial Development Organization – UNIDO - www.unido.org
FAO Pesticides - http://www.fao.org/ag/agp/agpp/pesticid/
WHO Pesticide Evaluation Scheme (WHOPES) - http://www.who.int/ctd/whopes/index.html
Intergovernmental Forum on Chemical Safety (IFCS) - http://www.who.int/ifcs/
International Programme on Chemical Safety (IPCS) - http://www.who.int/pcs/index.htm
OECD Pesticide Programme - http://www.oecd.org/ehs/pesticid.htm

Non-Governmental Organizations

Earthlife Africa – www.earthlife-ct.org.za; www.earthlife.org.za
International HCH and Pesticides Association - http://hjem.get2net.dk/HCH-Pesticides/
Basel Action Network - http://www.ban.org/
International POPs Elimination Network (IPEN) - http://www.ipen.org/
Physicians for Social Responsibility - www.psr.org/pops.htm
Health Care Without Harm - http://www.noharm.org/
Global Alliance for Incinerator Alternatives - http://www.no-burn.org/
Pesticides Action Network - North America - http://www.panna.org/
Pesticides Action Network – UK - http://www.pan-uk.org/

PAN Pesticide Database - http://www.pesticideinfo.org/
Global Information Network on Chemicals - http://www.nihs.go.jp:80/GINC/
WWF Global Toxics Initiative - http://www.worldwildlife.org/toxics/
Physicians for Social Responsibility - www.psr.org/pops.htm

APPENDICES

Appendix 1 – IPEN document on POPs under IPEP

On the www.ipen.org website

Appendix 2 - Earthlife Africa Report Back From COP 1

DDT

South Africa turned out to be the only country in favour of the continued use of DDT. On the contrary, Kenya is employing integrated vector control methods and pyrethrum to replace DDT.

Dioxin Toolkit

At the preparatory meeting of the Department of Environmental Affairs and Tourism it was inadvertently revealed that the department had endorsed the Dioxin Toolkit. The department had a meeting with industry following which the Toolkit was endorsed. Civil society organisations were not aware of this until it was revealed at the meeting. Yet, Article 10 of the Stockholm Convention calls for processes involving the Convention to be open, transparent and participatory. Deliberations at the General Assembly on the possible adoption of the Best Available Techniques/Best Environmental Practices (BAT/BEP) guidelines and the Dioxin Toolkit by the Parties at COP 1 proved even more crucial because of their implications for cement kiln proliferation through South Africa.

The BAT/BEP Guidelines

While acknowledging the draft guidelines to be a work-in progress, IPENers found them to be lacking in citation of the sources. Another flaw was that the Basel Convention to which their development was subcontracted had gone ahead and adopted them without consulting stakeholders to the Stockholm Convention.

IPEN maintained that the guidelines could be mistaken to qualify the use of "*any cement kiln, of any design, in any region of the world*" to burn POPs waste. Moreover, such qualification could find easy justification on the basis that if the cement kiln is "*properly operated"* would release insignificant amounts of POPs. This would not be consistent with Part II (b) Annex C of the Convention. It states that dioxins, furans, HCB and PCBs are unintentionally formed and released from thermal [including cement kilns] treatment of organic and chlorine [containing materials and substances] as a result of incomplete

combustion or chemical reactions.

We juxtaposed the potential proliferation against the possible adoption of the BAT/BEP guidelines and the Dioxin Toolkit particularly in view of the role South Africa is playing through NEPAD. We urged the General Assembly to give serious consideration to the possibility that the cement kiln industry might be intent on using South Africa as an entry point. A possibility that could set a precedence for the industry, and the South African government, to roll the technology out to other countries, which could in turn see a push for trade in waste with Africa.

Lessons learnt

One thing that ought to be learnt from the conference on "Alternative Fuels in the Cement Industry," is how the waste industry can potentially undermine the goals of the Stockholm Convention. Their push for cement kiln technology through South Africa comes from a focus on potential profits, not potential harm. Earthlife Africa and groundWork prefer a policy arrived at through civil participation (as outlined in the Convention) and one that thinks ahead to the implications for sustainable development. It is therefore important for IPEN and its affiliates not to relent on governments to "Keep the Promise" until known and unknown Persistent Organic Pollutants and their man-made sources are eliminated.

Appendix 3. SA Government Position on Wastes

Directorate: Pollution Prevention and Waste Management
Subdirectorate: Hazardous and Non-Hazardous Waste

Mission: To responsibly manage and reduce the polluting and negative impacts of hazardous waste and materials on the environment, and to promote and ensure the environmentally sound and safe management of such materials in a sustainable manner through effective communication and co-ordination, both nationally and internationally.

Functions resulting from Chapter 19 of Agenda 21:

* Drafting of a national profile.
* Development and implementation of a chemicals register.
* Development of an Integrated Hazardous Materials Management Policy.
* Implementation of the Prior Informed Consent (PIC) Convention. The PIC Convention tries to promote the exchange of information on certain hazardous chemicals and their transport and trade.
* Implementation of the POPs (Persistent Organic Pollutants) Convention which attempts to limit hazardous organic pollutants.
* Implementation of the Basel Convention. The Basel Convention is a global environmental treaty that strictly regulates the transboundary movement of hazardous

waste.

* Development and implementation of a PRTR.

Functions resulting from the implementation of the National Waste Management Strategy (NWMS):

* Evaluation and approval of the provincial hazardous waste management plans.
* Monitoring of hazardous waste landfill sites and treatment facilities.
* Development and implementation of the Waste Information System as a first step towards the development of a PRTR system for SA.

Functions resulting from International Conventions and Agreements:

* Administration and approval of the import and export of hazardous waste (Basel Convention).
* Negotiations and technical information transfer on hazardous waste (Basel Convention).
* Establishment and monitoring of a Regional Training Centre for English Speaking African Countries (Basel Convention).
* Identification of chemicals to be controlled and banned (PIC Convention).
* Administration and approval of exports and imports of controlled and banned chemicals.
* Negotiations and technical information regarding Persistent Organic Pollutants (POPs).
* Implementation of the POPs Convention, aiming to phase out the current twelve POPs.

Sub-directorate: Community Programmes and Waste Management

Mission: To ensure the provision of basic waste management services to that sector of the population for whom no or inadequate waste management services are provided. To ensure an efficient and effective integrated waste management approach at the local level.
Goals:

* To ensure the provision of basic waste management services to that section of the population for whom no or an inadequate waste management service is provided.
* To ensure an efficient and effective integrated waste management approach at the local level.
* To set targets to minimise waste generation and pollution at source.
* To create measures to minimise waste and pollution.
* To ensure that local authorities have the necessary capacity to provide effective management of household waste.
* To establish efficient information systems to insure informed and transparent decision-making.

Functions:

* Facilitate the implementation of National Waste Management Strategy initiatives on general waste collection transport, treatment and disposal.
* Promote public/private partnership on waste management issues
* Monitor and audit provincial and local government activities.
* Set national standards for sound waste management.
* Provide waste management services to previously disadvantaged communities.
* Develop waste recycling and recovery systems
* Pro-active in managing and monitoring waste disposal and treatment facilities in the country.
* Address all legal requirements within the sub Directorate.
* Public awareness on waste management issues.
* Identify and coordinate recycling initiatives.
* Develop specific regulation on recycling.
* Promote Regional Disposal site concept
* Promote recycling of waste by both civil and business to be supported by specific regulation.
* Action plans on -: Collection Disposal Recycling of waste
* Establish the Green Communities pilot project for South Africa.

Glossary of Terms

Agrochemicals	Chemicals used in agricultural production systems including fertilizers, herbicides and pesticides
Arbovirus	An arthropod-borne virus; human diseases caused by arboviruses include dengue, Japanese encephalitis, yellow fever and West-Nile encephalitis
Arthropod	Class of animals that includes insects, mites and spiders
Bio-accumulation	Increase in the concentration of a pollutant in an organism compared to its direct environment or food
Bio-magnification	Increase of the concentration of a pollutant as it moves from one trophic level to another through the food chain
Biological control	Using a living organism (natural enemy) to control a pest. The biological control agent can for example be an insect, a fungal disease, a bacterium or a virus
Carbamates	Group of synthetic pesticides
Carcinogenic	Causing cancer
Ecology	The science of relationships between communities of organisms and their environment
Endocrine system	The hormonal system, regulating numerous bodily functions
Food chain	The links between food organisms and consumers (e.g.: from plankton to fish to fish-eating bird); more correctly: food web.

Formulation	The pure pesticide substance can seldom be used as it is. It is therefore formulated with solvents, dispersants and other additives.
Incidence	The number of new (disease or infection) cases over a given period, usually a year.
LD50	Measure of toxicity – the dose that will kill 50% of a population. The unit is usually mg (toxin)/kg (body weight).
Malaria	A parasitic disease caused by organisms of the genus *Plasmodium*, transmitted by mosquitoes of the genus *Anopheles.*
Mutagenic	Causing mutations
Organophosphate	Group of synthetic insecticides
Pheromone	A substance (odour) used for communication between individuals of the same species. Vital for locating mates for many insects.
POP pesticides	The POPs which are pesticides (nine of the twelve).
POPs Persistent Organic Pollutants	Chemical substances with the characteristics listed in the introduction of this document; this group includes the twelve substances identified for reduction and elimination under the UNEP Governing Council decisions 18/32; 19/13C; 20/24; and 21/4 and covered by the Stockholm Convention.
Ppb	Parts per billion.
Ppm	Parts per million.
Prevalence	The number of (disease or infection) cases divided by the total number of people at risk at one particular moment in time.
Pyrethroid	Group of synthetic insecticides that are toxic to insects also in low doses.
Resistance	The capacity of an organism to withstand the killing effect of a chemical or drug usually linked to a genetic trait that is propagated in a population because of selection pressures.
Sp.	Species (singular)
Spp.	Species (plural)
Teratogenic	Causing foetal damage
Vector organism	often an insect- transmitting an infection from one person to another or from an infected animal to a person.