The International POPs Elimination Project

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

Awareness-Raising on Socio-economic Effects of POPs in Nigeria

Nigerian Environmental Study/ Action Team (NEST)

Nigeria - Anglophone Africa
May 2006

No. 1 Oluokun Street
Old Bodija, Ibadan
UIPO Box 22025
Ibadan, Nigeria
Tel: +234-2-8105167, +234-80332 83083
E-mail: info@nest-interactive.org
Website: www.nest-interactive.org

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

IPEN gratefully acknowledges the financial support of the Global Environment Facility, Swiss Agency for Development and Cooperation, Swiss Agency for the Environment Forests and Landscape, the Canada POPs Fund, the Dutch Ministry of Housing, Spatial Planning and the Environment (VROM), Mitchell Kapor Foundation, Sigrid Rausing Trust, New York Community Trust and others.

This report is available in the following languages: English

Awareness-Raising on Socio-economic Effects of POPs in Nigeria

TABLE OF CONTENTS

LIST OF ABBREVIATION

AAN	Agrochemical Association of Nigeria
AGENDA	AGENDA for Environment and Responsible Development
ASP	Africa Stockpiles Programme
CSO	Civil Society Organization
GEF	Global Environment Facility
IPEN	International POPs Elimination Network
IPEP	International POPs Elimination Project
NCMCC	National Chemicals Management and Control Committee
NEST	Nigerian Environmental Study/Action Team
NGO	Non-Governmental Organization
PAN	Pesticide Action Network
POPs	Persistent Organic Pollutants
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
WWF	World Wildlife Fund for Nature

ACKNOWLEDGEMENTS

The Nigerian Environmental Study/Action Team (NEST) is deeply grateful to the IPEP Anglophone Africa Hub, AGENDA in Tanzania, especially Mr. Silvani Mng'anya the Hub Coordinator and entire IPEP Management and sponsors. NEST is also grateful to WWF - Nairobi. Thanks also to the Federal Ministry of Environment, Abuja, Nigeria for being handy to provide useful information.

Damian Ihedioha, PhD
Programme Director
NEST

1. BACKGROUND

The problems associated with toxic chemicals including persistent organic pollutants (POPs) in Nigeria tally with the problems experienced in other countries, especially the developing countries and are mainly health and environmental problems. The POPs chemicals contain both chemicals still in use and obsolete chemicals or contaminated sites and soils.

These chemicals and contaminated sites constantly cause mass suffering and widespread irreversible human and environmental health hazards. Unfortunately, the effects continue at an increasing rate. Generally there is no country free from the negative legacy of POPs chemicals and wastes given their wide use and characteristics.

The problems associated with these chemicals need special attention and measures at different levels. In Nigeria, for example, there is no established Poison Center, where such incidences are reported and recorded. The best estimate would be from hospitals were such information could be obtained. To date, there has been no structured study/survey to ascertain the prevalence of that in hospitals in Nigeria. However, in communities across the country, stories abound of farmers and pesticides dispensers who died after using/spraying one chemical or the other. Information on the death of children who mistake the stock for water and drink them also abound. There is however no targeted study undertaken to document these occurrences which are very important for the health of the people and environment.

2. HEALTH AND ENVIRONMENTAL IMPLICATIONS OF TOXIC CHEMICALS

The hazards caused by toxic chemicals are devastatingly dangerous in the developing countries because:

- People and governments are unaware of the inherent dangers of pesticides and other chemicals;
- The necessary financial resources are either scarce or do not exist;
- Facilities either for containing the wastes or for its destruction are not available
- Appropriate legal measures do not exist or, if they do, are either impossible or difficult to implement;
- Environmental activists are either absent or too weak to stage public demonstration, and
- Expertise or skilled manpower is not available.

However, some of the adverse health and environmental impacts, include

- Direct exposure of workers and farmers, local residents, to unsecured pesticides stocks
- Indirect exposure through contaminated food and water, thus endangering public health
- Poisoning of farm lands and other workers
- Pollution of ground and surface water sources, which impacts on fauna and flora
- Impacts on land use resulting in limiting the potential of development of the area surrounding any chemical site
- Destruction of beneficial insects
- Risks and costs of destruction and incineration.

3. INTERNATIONAL CHEMICAL CONVENTIONS AND THEIR STATUS IN NIGERIA

In recent years there have been international and regional efforts to formulate international agreements to deal with the management and control of toxic chemicals including POPs. Some of the Conventions and their status in Nigeria are:

(i) The Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal adopted in 1989 in response to concerns about toxic waste from industrialized countries being dumped in developing countries. Nigeria ratified the Convention in 1991.

(ii) The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade adopted in 1998. Nigeria ratified the Convention in June, 2001.

(iii) The Stockholm Convention on Persistent Organic Pollutants adopted in 2001, in response to urgent need for global action to protect human and environmental health. Nigeria signed the Stockholm Convention in May 2003, and ratified it in May 2004.

(iv) The Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement of Hazardous Wastes within Africa adopted in 1991, currently in the process of ratification.

3.1 Nigeria Situation

The issue of chemical stockpiles became evident in Nigeria, when the National Chemicals Management and Control Committee (NCMCC), funded by Agrochemical Association of Nigeria (AAN) tried to catalogue stockpiles in Nigeria, from 1997 – 2001. The committee conducted surveys of stockpiles in

Nigeria, and came up with the result that 22 tons of obsolete chemicals abound in Nigeria.

During the first continental conference for Africa on Environmentally Sound Management of Unwanted Stocks of Hazardous Wastes for Preventing Air Pollution, Rabat, Morocco, 8 – 12 January 2001, Nigeria presented its report on stockpiles that amounted to 22 tons. The conference was surprised that with the size, population and activities in Nigeria, the stock reported was so small. It was then confirmed that the study was not in depth, hence that figure. Since then, no serious attempt has been made to profile the amount of stockpiles in Nigeria. This indicates the need to streamline which Ministry or Agency of government is charged with that chemicals and chemical wastes management. If this is not done first, the inventory of stockpiles and chemical wastes in Nigeria by any agency may not be a reflection of the national total.

3.2 The Role of Civil Society in Chemicals Management

NGOs in Nigeria have not established strongly on issues of chemicals, pesticides and POPs. Aside the fact that individual NGOs do an occasional project tangentially related to pesticides management, there is no united front. This lapse may be the missing link in implementing a successful programme in Nigeria.

4. CAPACITY BUILDING WORKSHOP

4.1 Introduction and Background

The workshop programme (Annex 1) started with self introduction of participants (Annex 5), after which the Chairman of Nigerian Environmental Study/Action Team (NEST), Prof. David Okali welcomed them to the meeting. In his opening remarks, he said that the issues of persistent organic pollutants (POPs) and chemicals management have become serious issues in Nigeria, and indeed the world over. The workshop was thus scheduled to find organized approach to dealing with chemicals and stockpiles. He said that these chemicals were acquired because of their usefulness, but have outlived their usefulness. He hoped that the outcome and outputs of the meeting will spell-out innovative ways of disseminating information on these chemicals, their effects and tackling the problem in general.

The second session was the background to the workshop by Dr. Damian Ihedioha, the Programme Director of NEST through his paper *"**Background Towards Awareness-Raising on Socio-economic Effects of POPs in Nigeria''*** (Annex 2). He gave indication of how NEST came to work with AGENDA for Environment and Responsible Development (AGENDA) in Dar es Salaam, Tanzania, and linked to the International POPs Elimination Network

(IPEN). He gave a brief description of how IPEN developed the Global project, International POPs Elimination Project (IPEP) and secured funding from the Global Environmental Facility (GEF) and implemented in collaboration with United Nations Industrial Development Organization (UNIDO), United Nations Environment Programme (UNEP) and other partners. He said that the aim of the project among others is to prepare NGOs and other civil society organizations (CSO) for effective participation in the implementation of the Stockholm Convention on POPs. It was hoped he said, that the outcome of the workshop would be basis for further work in this area.

4.2 Africa Stockpiles Programme

After the background, Ms. Angela Mwandia the Programme Coordinator for World Wide Fund for Nature (WWF), Nairobi, Kenya made a presentation on the African Stockpiles Programme (ASP), the objectives and what it was meant to achieve in key countries where ASP is operational in phase one. She responded to questions from participants who sought to know the gaps they felt in the ASP, notably of which was, the will of government to engage relevant stakeholders. It was however opined that the way out of effects caused by chemicals was effective and integrated management of chemicals.

4.3 Socio-economic Effects of POPs on the Environment and Health

The next session was a paper by Dr. Godson Ana of the Department of Environmental Health, University College Hospital, Ibadan, entitled: **Socio-economic Effects of POPs on the Environment and Health** (Annex 3). Dr. Ana went through memory lane, including concluded research that exemplified the effects of chemicals, POPs and such other substances on human health and the environment. He traced the travail most people are passing through to the effects of these substances in the atmosphere. He categorized the chemicals according to their characteristics, properties, route of exposure, nature, environmental and health implications of these chemicals. He ended his paper with a call to:

- Take an inventory of all the sources of POPs in the country.
- Generate a database on the current environmental levels of POPs.
- Carry out a human exposure assessment based on exposure to POPs.
- Enforce discontinuation of indiscriminate use of pesticides and other economic viable POPs.
- Encourage use of biological and environmentally friendly replacements.
- Plan a long term decontamination of high risk POPs deposits and contaminated sites.
- Educate the public regularly on hazards associated with POPs.

4.4 Training Needs

Dr. Taiwo Olajide gave a paper entitled: **Training Needs and Communication Channels for Safe use of Agrochemicals in Nigeria**. He enumerated the dangers of pesticides to man and environment, need for chemical safety, target groups for training, training needs and module and communication channels for agrochemicals handling. He concluded that conscious training and awareness-raising on effects of chemicals would be a way of enhancing good health and safe environment for all in the long and short term and as the panacea to minimizing the effects of POPs and other chemicals. However, methods of organic farming practiced as alternative to pesticides and introduction of integrated pest management (IPM) may offer a valuable way forward for safer crops.

4.5 Discussions and the Way Forward

Presentations were followed by reactions from participants, who were awed by the life threatening effects of POPs and enunciated in the presentations made by the resource persons. The workshop unanimously agreed that unless something is done, humanity and the environment face real serious danger.

On how to maximize the opportunity of the workshop, and to give attention to the keys issues raised, workshop participants categorized the issues into; improvement in the knowledge base of people about chemicals and their nature, challenges and the way forward.

4.5.1 How to improve knowledge base of people

- Field and extension workers are better placed to educate farmers and other users on the effects of chemicals used in their respective sectors of work. Therefore they have to be facilitated to take the responsibility.
- A need to sort out all chemicals which are really bad to avoid them while encourage the use of safe and alternative chemicals or safe non-chemical practices
- Develop a database on the best environmental practices of what is happening in the field and promote them.
- Conduct basic research and support whatever best and safe alternatives already undertaken.
- A need for action to take inventory of all stockpiles in the whole of Nigeria.
- Review of any existing legislation on chemicals and POPs.
- Identify the type and amount of the chemicals currently in use and their emissions and make appropriate statement. This could be done through a pollutant release and transfer registry (PRTR).

- Emphasize indigenous ways of protecting crops other than use of chemicals and their associated risks as a way out to combat pests. For instance, goat excreta are used to stop goats from eating vegetables.
- Catching awareness to the young generation as children at home also fall victim of chemical misuse and application as a way forward.

4.5.2 Chemicals and Characteristics of Concern

The workshop asked what chemicals and characteristics the country should talk about and some required steps.

- There is a need of comprehensive list of chemicals involved in POPs group and categorize them in the way they are applied.
- Information on the sources of POPs chemicals, where are they procured, distributed and marketed, information on storage conditions and end users.
- Characteristics of POPs chemicals and their nature, including information on dangers and persistence nature.
- Safety, use and management aspects and impacts on non-target organisms.
- Information on environment and health aspects, health risks, use of substitutes, integrated pest management.
- Knowledge of toxic chemicals and existing administrative framework to address them including policy and legislation.
- Socio-economic effects/aspects, including indigenous knowledge base, socio-cultural barriers for effect tests on humans.
- Search and promote safe chemicals that can not harm humanity.

4.5.3 Challenges

The workshop identified major challenges to streamline the use and application of chemicals as including:

- Challenge on inventory and administrative framework including institutional arrangement, policy and legislation and need for synergy.
- Implementation of international agreements and enforcement of legal framework.
- Enlightenment and public education on sound chemicals management.
- Research to support advocacy.

4.6 Way Forward and Recommendation

The workshop came out with the following as a way forward:

- The report of the meeting should be sent to the media houses and published on the IPEP and IPEN websites, Pesticides Action Network (PAN), other NGOs and networks, key Ministries, and other stakeholders.
- Conduct targeted public awareness according to sector.
- Advocacy work on the effects of chemicals supported by empirical research should focus and reach all those responsible for respective action.
- NEST to look for support through other organizations and networks at regional and global level, international organizations and development partners to form a network of organizations to address the effects of chemicals in Nigeria.
- Targeted awareness campaigns should be designed for different occupational groups that manufacture, trade, use and deal with chemicals.
- The cost of no action will be grave.

ANNEXES

ANNEX 1: Programme

CAPACITY BUILDING WORKSHOP ON PERSISTENT ORGANIC POLLUTANTS (POPs) AT NEST HOUSE, 24 NOVEMBER, 2005

TIME	EVENT	RESPONSIBLE
9:30 – 10:00	Introduction of Participants	All
10:00 – 10:15	Opening Remarks	Prof. David Okali
10:15 – 10:45	Introduction of the project	Dr. Damian Ihedioha
10:45 – 11:15	Presentation	Angela (WWF), Kenya
11:15 – 11:45	Presentation	Prof. Adedipe, University of Ibadan
11:45 – 12:15	Presentation	Dr. Ana, University of Ibadan
12:15 – 12:30	Comments	NEST Boards of Directors
12:30 – 12:45	LUNCH	
12:45 – 1:00	Comments	NGOs and Institutes Reps
1:00 – 1:30	Comments	Farmers
1:30 – 2:00	General Discussions	
2:00	Closing	

ANNEX 2: Background Paper

Background Towards Awareness-Raising on Socio-economic Effects of POPs in Nigeria – Damian Ihedioha

The quest by Nigerians to survive, drive them into several things, irrespective of its social and economic implications. Nigeria is also one country, where use of chemicals for agriculture, health and other economic activities is high. The effects of these chemicals range from impacts on the environment and to humans, especially to children and women, whose lot most of the time is to apply these chemicals for specific purposes. The toll this has on the human development index in Nigeria, require in-depth awareness creation among segments of society, encompassing occupational, gender and other stakeholder groups.

It was in the light of these that IPEN and its participating organizations in partnership with the United Nations' Industrial Development Organization (UNIDO) are trying to sensitize a cross section of society to be conscious of these implications. The campaign in the region is coordinated through Agenda for Environment and Responsible Development (AGENDA), Dar es Salaam, Tanzania. This activity in the main is a step towards developing an action programme that would be implemented nationally. That is to say, our discussion, other than bringing to limelight the implication of chemicals, should come up with an action programme that would be the basis of more programmes in this area.

However, chemicals are essential requirements for modern society that needed to be managed properly for sustainable level of agriculture and industrial development. It also requires a high level of environmental and human health protection. At the international level, considerable attention has been given to sound management of chemicals. The major types of chemicals used in Nigeria are imported. Some formulations are however undertaken locally, often without adequate consideration for human health and the environment during handling, storage and disposal.

In Nigeria however, there is yet no known mechanism to help educate Nigerians on the effects of these chemicals on humans and the environment at various stages of use. Although national legislative instruments and policies may be in place, implementation and enforcement are grossly inadequate; hence, we have to find innovative ways to stimulate government to action.

Building awareness – educational, outreach, communication tools and capacity – for a more effective dissemination of information on chemicals in the popular media, require active collaboration with journalist, experts in the field, educators and researchers. Campaigns on chemicals however, should have a scientific foundation, in addition to having clear platform, boundaries and objectives.

The seeming lack of awareness and reporting on POPs derive in part to nature and manner of the awareness and reportage of the issues. Giving a human face

to impacts and vulnerabilities of humans to chemicals would be better appreciated by stakeholders and policy makers; otherwise the entire gamut would look very esoteric and far removed from reality.

However, public and mass awareness can give people the environmental and ethical basis, attitudes and values, as well as the skills and behaviour needed for sustainable development. Hence, such education needs to explain not only the physical and biological environment, but the socio-economic, environment, and the human developments impacts of the science.

In order to beat the current inadequate knowledge of chemicals, efforts should be geared towards:

- promoting and facilitating at the national and as appropriate, sub-regional and regional levels, and in accordance with national laws and regulations;
- the development and implementation of educational and public awareness programmes on chemicals and its effects;
- public access to information and chemicals and its effects;
- public participation in addressing issues of chemicals and developing adequate response mechanism;
- training of scientific, technical and managerial personnel;
- development and exchange of educational materials on chemicals and its effects;
- development and implementation of education and training programmes, including the strengthening of national institutions.

In all these, there is a need for a plan of action that anticipates barriers and resources in relation to achieving the objectives of working with media and stakeholders to promote chemical concerns and issues. These concerns and issues should be predicated on results from research, studies, analysis and campaigns.

From the foregoing, the main objectives of this working discussion include:

- to (raise) create of Nigerians on proven effects of POPs;
- to use the awareness creation and results as basis for further action; and
- to engage government with a view to knowing what is being done.

I hope that ensuing discussion would enrich our knowledge base on issues of chemicals, at least among participants to this meeting.

Damian Ihedioha, PhD
Programme Coordinator

ANNEX 3: Socio-economic Effects of POPs

A PAPER PRESENTED AT THE NIGERIAN ENVIRONMENTAL STUDY/ACTION TEAM (NEST) WORKING DISCUSSION ON PERSISTENT ORGANIC POLLUTANTS (POPs)

ON

SOCIO-ECONOMIC EFFECTS OF PERSISTENT ORGANIC POLLUTANTS (POPs) ON THE ENVIRONMENT AND HEALTH

BY

GODSON R. E.E. ANA
(Ph.D, FLEAD, MAPHA, MRSPH, MNES)

DIVISION OF ENVIRONMENTAL HEALTH,
FACULTY OF PUBLIC HEALTH, COLLEGE OF MEDICINE
UNIVERSITY OF IBADAN
IBADAN, NIGERIA

NOVEMBER 24, 2005

1. INTRODUCTION

Persistent organic pollutants (POPs) constitute an important group of chemicals of environmental and health concern. These persistent organic pollutants include the first generation of organochlorine pesticides e.g. chlordane, DDT, heptachlor, mirex, toxaphene, aldrin, dieldrin, endrin and hexachlorobenzene; PCBs, dioxins and furans, originally known as the **"dirty twelve (dozen)". Other chemicals with POPs characteristics include** recalcitrant chemical species such as polycyclic aromatic hydrocarbons (PAHs) such as pyrenes and anthracenes.

This group of substances, the organochlorines in general, and Lindane in particular, are characterized by their broad spectrum insecticidal activity, long persistence in the environment, and their tendency to bio-accumulate along the food chain. Most of them including the polycyclic aromatic hydrocarbons (PAH) and dioxins are very ubiquitous and found in all the environmental media: air, water, soil, sediments and the food chain.

The widespread and persistent nature of these chemicals has been linked to various environmental effects some of which include pollution of the air, water, sediments, soil as well as the terrestrial and aquatic food chain. The health effects implicated with exposure to these chemicals include anaemia, liver

damages, kidney disorders, nervous disorders, learning disabilities and various forms of reproductive abnormalities.

Following the enormous environmental and the health impacts associated with these set of compounds are the socio-economic effects which could be looked at in their positive and negative perspectives. It is obvious that the negative other than the positive socio-economic implications of human exposure to POPs would indeed attract grave consequences; the reason therefore of current remedial efforts.

Since the 2001 Convention in Stockholm, the United Nations has been making consistent efforts at eliminating or reducing some of these most damaging chemicals, persistent organic pollutants (POPs) through the formulation of an international, legally binding treaty. Nine of the POPs chemicals included in the Treaty are pesticides that have been extensively used in both developed and developing countries. Although many countries have banned these chemicals, they remain stockpiled, are produced or used illegally, or, because of lengthy half-lives, they continue to exist in soil, or other environmental media.

Today history is being made again as we all converge at this meeting to further sensitize the society especially the Nigerian public on the sources of, hazards associated with exposure to POPs, and veritable ways of managing this threat to life and sustainable development.

2. GENERAL CHARACTERISTICS

2.1 Sources

Polychlorinated biphenyls (PCBs) are produced on a large scale for use as dielectric and hydraulic fluids, among other applications. They are industrial compounds that are synthesized via the ferric ion or iron-catalyzed chlorinated biphenyl (Safe and Hutzinger, 1987).

Polycyclic Aromatic Hydrocarbons are known to originate from both natural and anthropogenic sources. The release of PAHs into the environment could be from point/or diffused sources. The main natural sources of PAHs in the environment of certain geographical areas are forest fires and volcanoes (Benner *et al.,* 1989; Baek *et al.,* 1991).

PAHs in coal and petroleum products; the commercial processing of coal initially produces coal tars, which are further processed to yield pitch, asphalt, bitumen, impregnating oils (creosotes for the preservation of wood), and residue oils such as anthracene oil (IARC, 1985).

PAHs are produced during processing and use of coal and petroleum products. Coal coking, coal conversion by gasification and liquefaction, petroleum refining, and the production and uses of carbon blacks creosote, coal tar and bitumen from fossil fuels may produce significant quantities of PAHs (Anderson *et al*, 1986). PAHs may also be produced due to incomplete combustion. PAHs are

found not only to preexist in fossil fuels but more are formed during pyrolysis by a radical mechanism (Zander, 1980). The combustive processes that may result in significant release of PAHs can be classified into domestic and industrial activities. The domestic activities include vehicle traffic, tobacco smoking, broiling and smoking of foods as well as refuse burning. While the industrial activities include aluminum production with use of Soderberg electrodes, iron and steel production, foundries, tyre production, power plants, incinerators, and stubble burning (Anderson *et al*, 1986).

The levels of PAHs released into the environment from various human activities especially from industrial sources in the Niger Delta Area of Nigeria shows that the most polluted medium is the air followed by the soil and water media. Comparing the study locations there is an indication that Eleme (the most industrialized) as compared to Ahoada East (one of the least industrialized) recorded PAH levels 7- million fold higher in the air. Levels of PAHs in Eleme were 3-fold higher in surface water and 7 -fold higher in soil than the levels found in Ahoada East. (Ana, 2003) (See Fig 1.0).

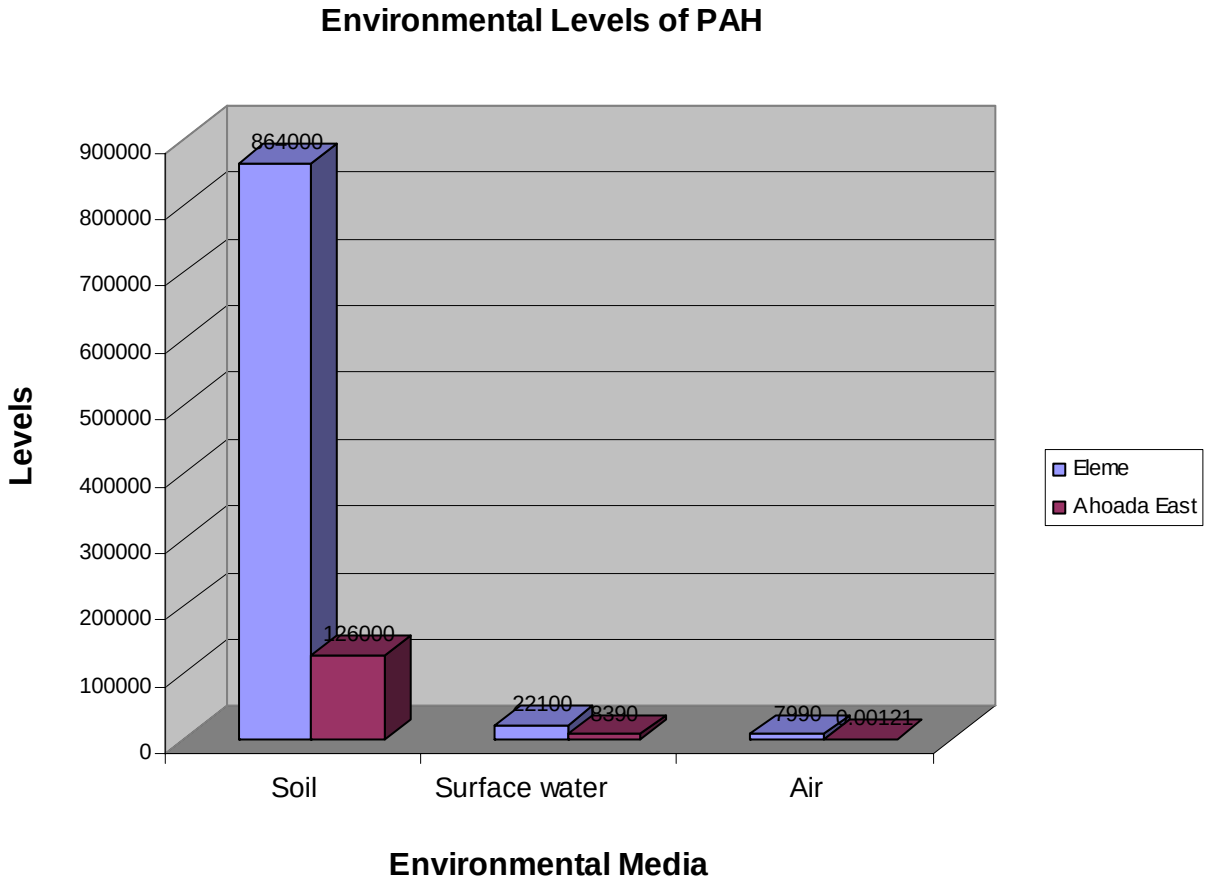

Fig 1.0 Environmental levels of PAH in the Niger Delta Area

With the exception of dioxin-like PCBs, dioxin-like compounds (DLCs) are unintended byproducts of combustion. The primary environmental source of dioxins and furans is combustion (Rappe, 1994) Combustion sources can be of anthropogenic (e.g. waste incineration: municipal solid waste, sewage sludge, medical waste, and hazardous waste), burning of various fuels (e.g. coal, wood, and petroleum products), or other high temperature sources (e.g. cement kilns) or "natural origin" (e.g. forest fires burning deposited organochlorines of anthropogenic origin). Industrial (e.g. paper, pesticide, and chemical manufacturing) processes are major sources of DLCs production. These DLCs are formed in various quantities and released into the environment.

Dioxin and dioxin-like compounds (referred to collectively as DLCs are ubiquitous in the environment (ATSDR, 1998; Travis and Hattemer-Frey, 1989). People may be exposed to background levels (i.e. low concentrations) of DLCs by breathing, air, by consuming food or beverages, or by their skin coming into contact with DLC-contaminated materials (ATSDR, 1998).

Pesticides, which include insecticides, fungicides, herbicides, rodenticides and fumigants, are undoubtedly the largest group of potentially toxic chemicals that are introduced into the environment from agricultural fields and other forms of general vector management.

DDT: insecticide used on agricultural crops, especially cotton, and insects that carry diseases like malaria and typhus. **Aldrin** and **dieldrin** insecticides used for crops like corn and cotton, also used for termite control.

Endrin: insecticide used mainly on field crops such as cotton and grains. Also used as a rodenticide to control mice and voles, also used to combat birds.

Chlordane: broad spectrum contact insecticide used on agricultural crops including vegetables small grains, maize, other oilseeds, potatoes, sugarcane, sugar beets, fruits, nuts, citrus, cotton and jute. Used on home lawns and gardens, also used on control of termites.

Heptachlor: stomach and contact insecticide used primarily against soil insects and-termites. Also used against cotton insects, grasshoppers, some crop pests and to combat malaria.

Hexachlorobenzene: fungicide used for seed treatment of wheat, onions, sorghum. Also found as impurity in several pesticide formulations, also is found as an industrial by-product.

Mirex: stomach insecticide used to combat fire ants and leaf cutters, harvester termites, mealy bug and yellow jacket wasps. Also used as a fire retardant in plastics, rubber, and electrical goods.

Toxaphene: A mixture of more than 670 chemicals and an insecticide, primarily used for control insect pests on cotton and other crops. It has been used to control insect pests on livestock and to kill unwanted fish in lakes.

2.2. Chemical properties

POPs are branched-chain or ringed organic compounds, are often highly chlorinated, and are resistant to biological, chemical, and photolytic breakdown. Consequently, they remain in the environment for many years. They are fat (lipid) soluble, accumulate along food chains, and are often toxic to living organisms.

For instance the chemical properties of the commercial PCB mixtures are dependent on their degree of chlorination; the lower chlorinated mixtures are mobile, colorless oils, whereas the higher chlorinated ones (Aroclors 1262 and 1268) are an immobile, viscous liquid and an amorphous solid, respectively. Mechanisms of toxicity of individual PCB congeners can depend on the planarity a molecule (Safe, 1994), as well as the molecular weight and biotransformation rate (Rose *et al*. 2002)

The estimated worldwide production of PCBs is approximately 1.5 million metric tons (De Voogt, P and Brinlman, U.A.T. 1989). The widespread industrial utilization of PCB products is due to their variable physical properties (i.e. liquid to solid), chemical stability, dielectric properties, inflammability, and miscibility with organic solvents.

PCBs have been used as heat transfer fluids, hydraulic lubricants, dielectric fluids for transformers and capacitors, plasticizers, wax extenders, adhesives, organic diluents, de-dusting agents, pesticide extenders, cutting oils, carbonless reproducing paper and flame retardants.

Due to the relative stability of the more highly chlorinated PCBs and their lipophilicity, PCBs are widely distributed and transported throughout the environment, and their residues have been identified in air, water, aquatic and marine sediments, fish, and wildlife and human adipose tissue, serum, and milk (De Voogt, P and Brinlman, U.A.T. 1989)

The physical and chemical properties of PAHs are largely determined by the conjugated π-electron systems which vary fairly regularly with the number of rings and molecular mass, giving rise to a more or less wide range of values for each parameter within the whole class. At room temperature, all PAHs are solids. The general characteristics common to the class are high melting and boiling points, low vapour pressure and very low solubility in water. PAHs are soluble in many organic solvents (IARC, 1983; Lide, 1991) and are highly lipophilic.

2.3. Route of exposure

Exposure to chemical hazards may occur via all types of exposure: inhalation, oral ingestion, absorption through the skin, absorption through the eyes, and

placental transfer from pregnant woman to the fetus, inoculation and direct penetration to target organs and from mother to child through breastfeeding (Yassi *et al.* 2001)

In the non occupational environment, ingestion of substances containing chemicals is the most common route of exposure. In the workplace, because of the nature of exposure, duration of the workday, and character of the compounds; inhalation is the most significant route of entry, followed by skin absorption and ingestion (Yassi *et al.* 2001).

4. ENVIRONMENTAL AND HEALTH EFFECTS

The effects associated with exposure to POPs are enormous. They could be classified into environmental and health effects. While the environmental effects are associated with the pollution of the air, water and soil ecosystems, the later being the most dominant is associated with disturbances and disorders ranging from the disorders of the nervous or immune system, to increases in the risk of certain cancers.

They persist in the environment, and may bioaccumulate and magnify in the food web. Because of the tendency of these chemicals to accumulate in fatty tissue, many (such as DDT and dioxin) are found in significant quantities in human breast milk. Many are mobilized during pregnancy when fat reserves are depleted, and subsequently find their way across the placenta to the newly developing fetus. There may be special windows of vulnerability in the development of fetuses when these chemicals can have long-term, irreversible effects on the reproductive and neurological systems.

Health Effects of PCBs and Dioxins

Exposure of humans to relatively high levels of PCBs has occurred primarily in individuals working in plants that extensively use PCBs and PCB-containing equipment. Occupational exposure to PCBs can result in a broad spectrum of symptoms which include elevated serum lipid levels, increased levels of some serum enzymes, and related dermal lesions, possible hepatic damage, and respiratory problems (Warshaw *et al*, 1979). PCBs have also been associated with cancer of the liver and biliary tract. (ATSDR 2000). For this reason and from animal studies, both US EPA and the International Agency for Research on Cancer have determined that PCBs are probable human carcinogens.

The biological activities of PCBs have been reported to include both estrogenic and anti estrogenic effects in various in vitro and in vivo models (Cooke *et al*, 2001; Hansen, 1998). Several AhR agonists including dioxin-like PCBs have been frequently reported to have anti-estrogenic activity (Buchanan *et al*, 2002; Oenga *et al*, 2004; Safe and Wormke, 2003). A recent study by Ana *et al*, 2005 revealed the increased synergistic effects exhibited by two POP mixtures: PAHs such as Benzo(a)pyrene and Halogenated Aromatic Hydrocarbons (HAHs) such as Dioxin (see Fig. 2.0).

Health Effects of PAHs

PAHs have been associated with reproductive effects, embryo-toxicity, teratogenicity and carcinogenicity. Benzo(a)pyrene is embryotoxic to mice, and the effect is partly dependent on the genetically determined induction of the cytochrome P450 monoxygenase receptor Ah; of the mother and fetus by PAHs. Shum *et al* (1979) and Hoshino *et al* (1981) have at different points reported on the teratogenic effects of PAHs on mice with different genotypes. In a related study by Mattison *et al* (1980), a single intraperitoneal injection of benzo(a)pyrene reduced fertility and destroyed primordial oocytes of DBA/2N mice in a dose-dependent manner.

Studies on various environmentally relevant matrices such as coal combustion effluents, vehicle exhaust, used motor lubricating oil, and side stream tobacco smoke showed that PAHs are the agents predominantly responsible for their carcinogenic potential (Grimmer *et al*, 1991b).

Certain types of organic compounds have estrogen-like activity. Such action by exogenous chemicals is believed to occur because of the spatial (geometric) resemblance between the toxicant and the natural (endogenous) estrogen hormone. Links to breast cancer and male infertility have been hypothesized for these estrogen-like substances (Davies *et al*, 1995; Sharpe and Skakkeback,1993). Other effects of these kinds of chemicals include disruption of the endocrine system (endocrine disruptors) (Colborn *et al*, 1996).

The particles emitted from combustion sources contain most of the POPs such as PAHs that induces tumours in animals, mutations in cells and these have been implicated in epidemiological studies as human carcinogens (IARC, 1984). Again studies conducted by Ana *et al*, 2003 revealed various cancer outcomes associated with exposure to environmental risk factors most especially industrial emissions in Nigeria's Niger Delta Area in comparison to a less industrialized setting like Ibadan (see Table 1.0 and Table 2.0). The distribution is an indication of a higher cancer reporting rate in the health facility at Ibadan compared to Port Harcourt. However, this is not necessarily lower disease prevalence in the later.

TABLE 1.0 Cancer Records from the University of Port Harcourt Teaching Hospital

CANCER CASES (1992-2001)	***SEX***	FREQUENCY (f) 10 YEARS	**%**	**MEAN ± SD**
LUNG	M	18	1.99	1.80 ± 1.81
	F	15	1.66	1.50 ± 1.65
SKIN	M	90	9.96	9.00 ± 4.74
	F	82	9.07	8.2 ± 6.23
EYE	M	9	0.99	0.90 ± 1.10
	F	6	0.66	0.60 ± 0.69
BLADDER	M	5	0.55	0.50 ± 0.85
	F	3	0.33	0.30 ± 0.67
PROSTRATE	M	257	28.4	25.7 ± 18.3
	F	0	0	0
BREAST	M	0	0	0
	F	418	46.2	41.8 ± 16.6
TOTAL	**M**	**380**	**42**	
	F	**524**	**58**	

Source: Ana et al 2004

TABLE 2.0: Cancer Records from University College Hospital Ibadan

CANCER CASES (1992-2001)	***SEX***	FREQUENCY (f) **10 YEARS**	**%**	MEAN ± SD
LUNGS	M	88	2.49	8.80 ±3.43
	F	25	0.71	2.5 ± 1.72
SKIN	M	223	6.33	22.3 ± 7.70
	F	142	4.03	14.2 ± 8.22
EYE	M	148	4.20	14.8 ± 5.18
	F	110	3.12	11.0 ± 3.39
BLADDER	M	123	3.49	12.3 ± 5.10
	F	36	1.02	3.60 ± 3.50
PROSTRATE	M	631	17.9	63.1 ± 25.8
	F	0	0	0
BREAST	M	0	0	0
	F	1997	56.7	199.7 ± 44.4
TOTAL	**M**	**1211**	**34.4**	
	F	**2310**	**65.6**	

Source: Ana et al 2004

Health Effects of Pesticides

The World Health Organization estimated that approximately 500,000 pesticide poisonings occur worldwide each year (WHO, 1981); the number of fatalities resulting from such poisonings may be greater than 10,000 per year (Loevinsohn, 1987).

Most pesticides have been associated with particular impacts on women which affect their ability to bear healthy children, capable of developing into healthy adults. The following pathologies have to be taken into account relating to fetal contamination and women's ability to bear healthy children.

Miscarriage: Animal studies indicate that exposure to certain synthetic chemicals, such as PCBs, increase the risk of miscarriage. Similar studies implicate chemical exposure with ex-uteri pregnancy.

Intellectual development: Studies done by Sarah and Joseph Jacobson on the intellectual impairment of children exposed intrauterine to pesticides and PCBs indicate that these children suffer from lower full-scale and verbal IQ scores, with strongest effects being reported on memory and attention. What is of concern is that these effects are seen in children exposed to pesticide and PCB concentration only slightly higher than those found in the general population.

Sperm count: Shocking findings have been announced in the last few years in regard to infertility of men. A literature review revealed that there has been a serious decline in both volume of semen and the number of sperm between 1949 and 1990. In the research (Carlsen *et al*, 1992) "Evidence for the decreasing quality of semen during the past 50 years", British Medical Journal, Vol. 305, 1992, pp. 609-612) which reviewed 61 papers from 61 countries showed that semen volume declined from 3,40 to 2,75 ml and the number of sperm from 113,000,000 to 66,000,000 per ml. Accumulating evidence suggest that 'estrogens' could be responsible for disturbing maturation of males that may seriously affect male fertility.

Immune System Dysfunction and Immunodeficiency Syndrome: Recent studies indicate that children in the high Arctic do not produce the necessary antibodies when they receive vaccination for smallpox, measles, polio and other diseases. Babies in the Arctic take in seven times more pesticides and PCBs than other infants which can been suggested to be linked to the fact that people eat wild meat and fish and that therefore breast milk is highly contaminated.

Temperament Change: Darvill and others have studied children born to mothers who ate contaminated fish from Lake Ontario. These fish were contaminated with a wide range of POPs like dieldrin, chlordane and mirex. The children appear to be over-reactive to stimulation, and demonstrate a greater number of abnormal reflexes, and do not smile or seem to experience joy as much as do children whose mothers did not eat contaminated fish.

Table 3.0: TCDD TISSUE Levels in ng/kg(ppt) Lipid and Adverse Health Effects in Humans

Repeated Exposure	Adipose	Blood lipids	Adverse effects observed	Reference
General population	N.Da-30	N.Da-30	None	Patterson *et al* (1986a, 1986b)
Exposure to TCDD in soil	2.8-59		None	Stated in text
Exposure to TCDD in riding arenas	5.0-577		None	Stated in text
Exposure to TCDD at work place	3.5-750		None	Stated in text
Children in Seveso (short-term exposure)		1770-56,660	Chloracne	CDC Preliminary Report (1988b) Needham (1989)
Production workers		930-12,000	Chloracne	Schecter and Ryan (1988)

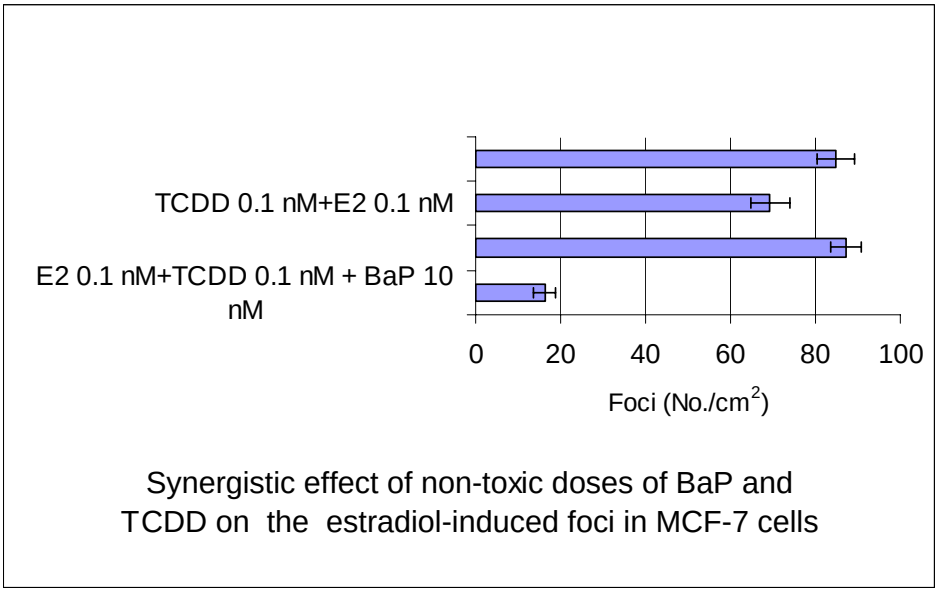

Fig 2.0: Synergistic Effects by two POPs: PAHs and HAHs

5. SOCIO-ECONOMIC IMPACTS

The socio-economic effects of POPs on the environment and health may be viewed in terms of the positive effects and negative effects. While it is true that most of the POPs are chemical products of great economic value especially

among the pesticide and PCB congeners it is also true that the rest of these compounds are unintentional by-products such as dioxins, DLCs and PAHs.

5.1 Positive Socio-economic Impacts

The positive socio-economic effects of POPs on the environment and health could be considered in terms of the cost implication for the various efforts aimed at eliminating these dreadful chemicals. These efforts range from the total ban of most of the chemicals including DDT, re-invention and introduction of non-chemical or biological, more environmentally friendly substitutes to expensive clean–up regimes amongst others.

Some of these efforts have been undertaken in the United States, which has taken domestic action to reduce emissions of POPs. None of the nine pesticide POPs in the Convention are registered for sale and distribution in the United States today. However, Lindane, which has been nominated for inclusion in the Stockholm Convention, is in wide use currently. In 1978, the US Congress prohibited the manufacture of new PCBs and severely restricted the use of remaining stocks. Despite this, there are numerous PCB dumps and old leaking transformers that need cleanup.

Since 1987, US EPA has been taking actions to effectively reduce environmental releases of dioxins and furans to land, air, and water from sources in the United States. An inventory of U.S. sources suggests that, in 1987, all known source activity contributed 13,998 grams of dioxins and furans to the environment, using a methodology developed by the World Health Organization called toxic equivalents, or WHO-TEQ. Regulatory actions have resulted in a 77% decline in total dioxin and furans releases between 1987 and 1995. These regulatory actions fully implemented and enforced as at 2004, according to EPA resulted in a further decrease of 92% in environmental releases from 1987 levels. The largest reductions appeared to result from shutting down dirty incinerators.

However, despite these activities on POPs, US residents have some of the highest levels of brominated flame retardants in their bodies in the world. These chemicals resemble PCBs and one has already been nominated for inclusion in the Stockholm Convention.

5.2. Negative Socio-economic Impacts

The negative socio-economic effects of POPs in the environment are the avoidable and painful costs that have to be paid for the damages to the environment and most importantly to the health of the present and future generations. There is no gainsaying that POPs are genotoxic, cause still-births, neonatal deformations, infertility and cancers. Whereas some of these health outcomes are debilitating, most are terminal, irreversible and fatal attracting colossal cost to manage where such management facilities exist.

Paradoxically, while the developed economies have gone ahead to institute programs aimed at curbing the hazards associated with exposure to POPs, the

developing economies including Nigeria are yet to come to terms with the true status of POPs be it in terms of the available sources, environmental levels, health effects and the most vulnerable target population. The situation at hand thus makes it rather implausible to be able to estimate any meaningful socio-economic impact.

6. CONCLUSIONS

The current paper has elucidated that indeed POPs exist in our environments and they are: largely from anthropogenic sources, widespread, recalcitrant, lipophilic and found in human fatty layers. These compounds have been implicated in various environmental and health effects with the latter including neurobehavioural disorders, reproductive disorders, immune disorders, genetic disorders and cancers.

Apart from pesticides and PCBs that have direct economic benefits other POPs are certainly of little or no economic value. Despite these benefits, the use of pesticides remains controversial, and public opinion research conducted over the past decade has consistently ranked pesticides near the top of consumers' concerns. The recent link between breast cancer and DDT, which has not been used for more than 20 years is a testimony to the DDT tissue burdens which may now be contributing to the disease.

As concerns mount on the socio-economic impact of these life–threatening compounds, the developed economies are well positioned to manage the current health needs of their society and secure the future generation. This is true given the current efforts made by the United Nations which is of-course pioneered by the advanced countries. The developing economies including Nigeria are maintaining a precarious trail despite the fact that POPs are trans-boundary substances and most of the peculiar health outcomes associated with it are becoming regular features in our health care system.

This forum therefore provides another veritable medium to remind all the stakeholders especially here in Nigeria on the need to aggressively pursue the following:

- Take an inventory of all the sources of POPs in the country
- Generate a database on the current environmental levels of POPs
- Carry out a human exposure assessment based on exposure to POPs
- Enforce discontinuation of indiscriminate use of pesticides and other economic viable POPs
- Encourage use of biological and environmentally friendly replacements
- Plan a long term decontamination of high risk POPs deposits
- Educate the public regularly on hazards associated with POPs

7. REFERNCES

Anderson, J.W; Neff, J.M. & Boehm, P.D. (1986). Sources, fates and effects of Aromatic hydrocarbons in the Alaskan manure environment with recommendations for monitoring strategies. Sequim, Washington, Battelle Pacific Northwest Laboratories, 230 pp (Report No. EPA/600/3-86.

ATSDR (1998). Toxicological Profile for Chlorinated Dibenzo-p-dioxins. Atlanta, GA.

ATSDR (2000) Toxicological Profile for Polychlorinated Biphenyls (PCBs), Atlanta, GA

Buchanan DL, Oshako S, Tohyama C, Cooke PS, Iguchi T (2002) Dioxin inhibition of estrogen-induced mouse uterine epithelial mitogenesis involves changes in cyclin and transforming growth factor-beta expression. Toxicol Sci 66:62-68

Cooke, PS., Sato, T., Buchanan DL (2001) Disruption of steroid hormone signaling by PCBs. In PCBs. Recent advances in Environmental Toxicology and Health Effects (Robertson LW, Hansen LG, eds). Lexinton, KY: University Press Kentucky, 257-263

Colborn T, Dumanoski D, Peterson Myers J.(1996) Our Stolen Future, New York: Penguin

Davies DL, Bradlow HL, Wolff M, woodruff T, Hoel DG, Anton-Culver H.(1995) Medical hypothesis: Xenostrogens as preventable cause of breast cancer. Environ Health Perspect 101:372-377

De Voogt, P and Brinlman, U.A.T.(1989) Production, properties and usage of polychlorinated biphenyls. In Halogenated Biphenyls, Terphenyls, Naphthalenes, Dibenzodioxins and Related Products, 2nd ed, Elsevier-North Holland, Amsterdam, pp 3-45

Grimmer G, Brune H, Dettbarn G, Jacob J, Misfeld J, Mohr U, Maujack K – W, Timm J, & Wenzel – Hartung R (1991b) relevance of polycyclic aromatic hydrocarbons as environmental carcinogens. *Fresenius J Anal Chem*. 339-792-795.

G.R.E.E Ana, M. K. C. Sridhar and L.A Mac-Nutt (Unpublished). A Comparative Cancer Prevalence in two Nigerian Cities**.** American Journal of Public Health.

G.R.E.E. Ana, L.M. Bravo and J. Gierthy (2005) Environmental Toxicants and Human Exposure: A Case of PAH and HAH Mixtures. Journal of Environmental Health and Toxicology

Hansen, LG (1998). Stepping backward to improve assessment of PC congener toxicities. Environ Health Perspect 106 (suppl1): 1-189

Hoshino K, Hayashi Y, Takehira Y & Kameyama Y (1981). Influences of genetic factors on the teratogenicity of environmetal pollutants. Texatogenic susceptibility to benzo (a) pyrene ad Ah locus in mice. Congenital Anomaties, 21:97-103.

IARC (1984) IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans, Vol 34. Polynuclear Aromatic Compounds. Part 3, industrial Exposures in Aluminum Production, Coal Gassification, Coke Production, and Iron and Steel Founding. International Agency for Research on Cancer, Lyon, France.

IARC (1985). IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans, Vol.35. Polynuclear Aromatic Compounds. Part 4, Bitumens, Coal-tars and Derived Products, Shale-oils and soot. International Agency for Research on Cancer, Lyon, France.

Loevinsohn, M.E (1987): Insecticide use and increased mortality in rural Philippines. Lancet, 8546:1359-1362

Mattison DR, White NB, & Nightingale MS (1980). The effect of benzo (a) pyrene on fertility, primordial oocyte number, and ovarian response to pregnant mare's serum gonadotropin. *Rediation Pharmacol*, 1:143-151.

Oenga GN, Spink DC, Carpenter DO (2004).TCDD and PCBs inhibit breast cancer cell proliferation. Toxicol In Vitro 18: 811-819

Rappe C, Anderson R, Karlaganis G, Bonjour R (1994) PCDDs and PCDFs in samples of sewage sludge from various areas in Switzerland. Organohalogen Compound 20:79-84

Sharpe RM and Skakkeback NE. (1993) Are Oestrogens involved in the falling sperm counts and disorders of the male reproductive system. Lancet 341:1392-1395

Shum S, Jensen NM, & Nebert DW (1979). The murine Ah locus: In utero toxicity and teratogenesis with genetic differences in benzo(a)pyrene metabolism. *Teratology*. 20:365-376.

Safe, S, and Hutzinger, O (1987) Polychlorinated Biphenyls (PCBs). Mammalian and Environmental Toxicology. Environmental Toxin Series, Vol 1.Springer-Verlag,Heidelberg

Safe SH, Wormke M (2003) Inhibitory aryl hydrocarbon receptor-estrogen receptor alpha cross-talk and mechanisms of action. Chem Res Toxicol 16: 807-816

Travis CC, Hattemer-Frey HA (1989) Human exposure to dioxin from municipal solid waste incineration. Waste Manag 9:151-156

Warshaw, R., Fischbein,A., Thornton, J., Miller, A., and Selikoff, I.J (1979) Decrease in vital capacity in PCB-exposed workers in a capacitor manufacturing facility. Ann.N.Y Accd.Sci.320:227-283

WHO, 1981: Pesticide deaths. What's the toil? Ecoforum,6:10-18.

Zander M (1980). (Origins, chemical and physical properties of PAH) in: (Air pollution through polycyclic aromatic hydrocarbons: registration and evaluation). Dusseldorf, VDI-Verl eng, pp 11-21 (VDI Repot No. 358 in Germany).

ANNEX 4: List of Participants

S/No	Name	Address
1	Prof. Enoch Okpara	Imo State University, Owerri, Nigeria
2	Dr. Gloria Ujor	Federal Ministry of Environment, and Board Member of NEST
3	Sgt John Udom	Public Education Unit, Nigerian Armed Forces, Ibadan
4	Dr. Olajide Taiwo	National Horticultural Research Institute, Ibadan
5	Ms. Angela Mwandia	World Wife Foundation for Nature, Nairobi
6	Jimoh Okeh	Farmer, Ibadan
7	Prof. David Okali	Chairman, Nigerian Environmental Study/Action Team (NEST), Ibadan
8	Dr. Godson Ana	Institute of Environmental Health, University College Hospital, Ibadan
9	Justin Ajani	Farmers Development Union, Ibadan
10	Joseph Ojedeji	Farmer
11	Dr. G. A. Oluwatosin	Institute for Agricultural Research and Technology, Ibadan
12	Ms. Margaret Ana	Chemist, University of Ibadan
13	Ms. Comfort Hassan	Gender Specialist, NEST, Ibadan
14	Henry Osadolor	Center for Community Development, Ibadan
15	Dr. Damian Ihedioha	Programme Director, NEST
16	Chinedu Uwaegbulem	Guardian, Lagos
17	Ms. Abiola Olanipekun (Absent with Apology)	Federal Ministry of Environment, Abuja
18	Abiodun Omole	Farmer

ANNEX 5: Newspaper Clipping

Environmental Groups Picked to Assess Nigerian POPs Situation –
The Guardian 19 December, 2005, pages 41 and 53

By Chinedu Uwaegbulam, Snr. Housing & Environment Correspondent

The NGOs have been engaged to study the social and economic consequences of the use of banned chemical substances on the Nigerian environment, investigate the matter and offer measures to shift the country to safer alternatives.

Amidst traces of hazardous chemicals in some major cities, three prominent Nigerian environmental groups have been selected to assess the level of Persistent Organic Pollutants (POPs) in the country.

The groups - Friends of the Environment (FOTE), Nigerian Environmental Study Team (NEST) and Nigerian Environmental Society (NES) under the guidance of the Federal Ministry of Environment were selected by United Nations Industrial Development Organisation (UNIDO). They are expected to produce a comprehensive document on the Nigerian POPs situation.

POPs threaten the global environment due to their toxicity, persistence, mobility and tendency to bioaccumulate in higher organisms. Most of the banned POPs substances have been used and some are still in use today. Most of them are being used in agriculture as pesticides, in industries as chemicals and as by-products of various industrial processes. Experts have recently reported traces of PCBs and other hazardous chemicals in dumpsites across major cities in Nigeria with concomitant health effects among Nigerians.

The project is meant to strengthen national capacity and facilitate better planning for elimination of POPs in Nigeria. It will also focus on the vulnerable segments of the population like handlers, illiterates, women and children on the hazards of POPs and attempt to increase the level of awareness among the population.

Nigeria signed the Stockholm Convention on the May 2001 and ratified it on the May 2004. However, enlightenment and information sharing on POPs and other hazardous chemicals, associated health and environmental implications among Nigerian stakeholders is very poor.

The management of this type of chemicals in Nigeria is cross-sectoral in nature. There exist legal instruments that address chemical management. This legislation has in-built administrative and management schemes such as permitting, classification, restriction, reporting and feedback mechanisms to monitor implementation. There is also in existence, a list of banned and severely restricted chemicals. Sadly, there have been some hiccups in their implementation.

Already, NEST one of the groups had a capacity building workshop few weeks ago. Dr. Godson Ana, of the Environmental Health Division, College of Medicine University of Ibadan who spoke at the NEST working discussion on POPs said: "The widespread and persistent nature of these chemicals has been linked to various environmental effects some of which include pollution of the air, water, sediments, soil as well as the terrestrial and aquatic food chain. The health effects implicated with exposure to these chemicals include anaemia, liver damages, kidney disorders, nervous disorders, learning disabilities and various forms of reproductive abnormalities."

He called on stakeholders in Nigeria to pursue the followings:
* take an inventory of all the sources of POPs in the country,
* generate a database on the current environmental levels of POPs,
* carry out a human exposure assessment based on exposure to POPs,
* enforce discontinuation of indiscriminate use of pesticides and other economic viable POPs,
* encourage use of biological and environmentally friendly replacements,
* plan a long term decontamination of high risk POPs deposits, and
* educate the public regularly on hazards associated with POPs.

FOTE on its part intends to conduct national stakeholders' workshop in the next few weeks on POPs to reflect the POPs situation in Nigeria. Participants will be drawn from the six geopolitical zones of Nigeria based on their roles, contributions and knowledge of the Nigerian POPs situation, their environmental and health implications and likely remediation measures.

The non-governmental organisation intends to conduct an assessment of the Lagos lagoon as a suspected POPs site receiving enormous wastewater from an estimated 2000 significant industrial user, small industrial users, commercial establishments and domestic sources. It will also involve extensive literature review, consultation with key stakeholders, associated risks of POPs and existing efforts for containment and remediation measures.

Dr. Joanna Maduka, FOTE's Chairperson disclosed that the project was based on Article 10 of the Stockholm Convention, which calls for "development and exchange of educational and public awareness materials at the national and international levels," and "development and implementation (especially for women, children and the least educated) of educational and public awareness programmes" on persistent organic pollutants.