Gender Dimensions

of Hazardous Chemicals and Waste policies under the Basel, Rotterdam and Stockholm Conventions

Case Studies Indonesia and Nigeria, 2017

wecf I Women Engage for a Common Future
www.wecf.org

BALIFOKUS

IMPRINT

This publication has been produced as part of a project implemented by WECF International, BaliFokus Foundation and Women's Environmental Programme for the BRS Secretariat, 2017.

This publication has been written and prepared for publication by:
Women Engage for a Common Future, WECF International
Korte Elisabethstraat 6, Utrecht, The Netherlands www.wecf.org wecf@wecf.eu

and

BaliFokus Foundation
Mandalawangi No.5, Jalan Tusad Tegalwangi, Sesetan, Denpasar 80223, Indonesia www.balifokus.asia balifokus@balifokus.asia

Input to the publication for the Nigerian case study is based on the stakeholder conference organised by the **Women Environmental Program - WEP International** in Abuja, Nigeria.
Input to the publication for the Indonesian case study is based on the stakeholder conference organised by the **BaliFokus Foundation** in Jakarta, Indonesia.

Lead author, Nigerian chapters: **Sascha Gabizon, WECF**
Lead author, Indonesian chapters: **Yuyun Ismawati, BaliFokus**
Contributing authors: **Priscilla Achakpa & John Baaki (WEP), Sarah Petras (WECF), Meriel Watts (PAN-AP)**
Editors: **Susan Wingfield, Leah Khayat, Tatiana Terekhova (BRS secretariat)**

Design/Layout: **Sarah Petras & Mariel Kieval**
Photo credits: **Laure Poinsot, John Baaki, Sascha Gabizon, Sonia Buftheim/Yuyun Ismawati for BaliFokus**

Available online
at WECF : http://www.wecf.eu/english/publications/2017/GenderandWaste_casestudy.php
at BRS: http://www.brsmeas.org/Gender

This document is produced with the financial assistance of the Governments of Germany and Sweden. The views expressed herein can in no way be taken to reflect their official opinion.

TABLE OF CONTENTS

1.About the Gender Dimensions project

The BRS Gender Action Plan (BRS-GAP) was finalized in December 2013 and aims to ensure that principles of gender equality are firmly embedded in activities undertaken by the Secretariat of the Basel, Rotterdam and Stockholm Conventions (BRS). Together, the BRS Conventions have the objective of protecting human health and the environment from the negative effects of hazardous waste, hazardous chemicals and persistent organic pollutants (POPs). In 2012, a single Secretariat was created to organise meetings of the conferences of the Parties to the conventions, to disseminate information, to assist Parties and work with other international bodies. The BRS Secretariat supports "countries...[and] regional centres to address the sound management of hazardous chemicals and wastes."1 As part of its mandate to address the gender dimensions of the BRS Conventions, the Secretariat has requested Women Engage for a Common Future (WECF) and its partners to carry out scoping studies in two pilot countries, Indonesia and Nigeria.

The main objective of the project is to develop an understanding by the Parties and stakeholders of BRS on the issue of gender equality, including identifying vulnerable groups, and the different impacts of hazardous chemicals and wastes on men and women, boys and girls; and to promote the consideration of gender issues in hazardous chemicals and waste management at the national and regional levels.

The scoping study aimed to understand three gender dimensions:

- How is women and men's health differently impacted by POPs, hazardous chemicals & waste?
- How do women and men's occupations and roles at home and at work influence their exposure to POPs, hazardous chemicals & waste?
- What best practices with women and men's leadership exist to substitute and eliminate the negative impacts of POPs, hazardous chemicals & waste?

Left: Panelists at the multi-stakeholder meeting on 23 February, 2017, including from the Gita Pertiwi Foundation working with women farmers to reduce pesticide exposure and the breastfeeding mothers association who found that 74% of their members did not know that mothers can transfer harmful chemicals to their children during pregnancy and breastfeeding.
Photo credit: BaliFokus

Right: Visit of Minister of Environment Ms Amina Mohammed, by the team from WEP and WECF, Abuja, Nigeria, January 2017.
Photo credit: WEP

The scoping study in Nigeria and Indonesia focused on the gender dimensions of hazardous chemicals, wastes and persistent organic pollutants.

Nigeria

The Nigeria scoping study took place from 9-16 January, 2017 and included visits of ministries, agencies and waste companies in both Abuja and Lagos, as well as a half-day multi-stakeholder meeting with 33 participants from different ministries, agencies, science, press and civil society organisations including women's NGOs.

The scoping study was followed by a documentary film mission from 5 to13 February, 2017, in which in-depth interviews were held with key experts on hazardous chemicals and electronic waste in Lagos, Abuja and in the rural areas at 4 hours' drive from the capital.

The scoping study was preceded by a desk research of available publications covering the BRS conventions and the situation in Nigeria and Indonesia, extending also to the mercury treaty. In total, more than 20 documents were consulted including the National Implementation Plan prepared by the Government of Nigeria under the Stockholm Convention, published in November 2016.

Meeting with Nigeria's Minister of Environment, Ms. Amina Mohammed. Photo credit: WEP

Meeting with Nigeria's Director of the Environment Agency. Photo credit: WEP

Indonesia

The BaliFokus Foundation Indonesia, jointly with Women Engage for a Common Future (WECF International) carried out a scoping study from 19 to 24 February 2017 to investigate the gender dimensions of implementing the BRS conventions in Indonesia. Before the visit to Indonesia, a desk study was carried out covering 20 research and policy documents on gender, chemicals and waste in Indonesia, including its National Implementation Plan under the Stockholm Convention.

On 23 February, a multi-stakeholder forum on Gender and the BRS Conventions was co-hosted with the Ministry of Environment and Forestry in Jakarta, with 38 experts from the ministries of environment and health, science institutes, WHO, UNIDO, trade union representatives, health professionals and environmental and women NGOs such as the breastfeeding mothers' association and women farmers' association. Other stakeholders included the industry association, the teachers' association, the trade unions, the Pesticide Action Network, the ban-lindane-lice-oil campaign, an endocrine disrupting chemicals (EDC) action group, a medical expert on NDCs and journalists of Kompas and the Jakarta Post.

Top: Organisers of BaliFokus and WECF and participants of the Early Childhood Educators Union at the Multi-stakeholder Forum in Jakarta.
Photo credit: WECF

The official representatives included the Ministry of Environment and Forestry, Ministry of Health, the National Food and Drug Agency, a POPs expert from the National Science Institute (LIPI), and the WHO Indonesia representative.

The expert from the LIPI Institute presented findings on old and new POPs, where they are found in Indonesia and who are likely to be exposed. Studies conducted by LIPI found the level of POPs flame retardants PDBEs in dust was 100 times higher in the commercial part of Jakarta than on the outskirts, and dioxins around the waste dumpsite as well as DDT contaminated soil in residential areas. Information about the new POPs and the fact that they can be found in multiple consumer products were an eye-opener for the participants.

The Food and Drugs Administration representative explained that there are many cosmetic products with forbidden ingredients including mercury. These cosmetics are unlabelled. The Food authority created a hotline and website for consumers to report these cases. The Ministry of Environment and Forestry reported on informal and illegal imports of pesticides from India and China as well as on imports of e-waste and plastic waste.

During break-out groups best practices and proposals for how to address POPs and the wider topics under the BRS convention from a gender perspective, were discussed, looking at women and men's roles, leadership and exposure path by occupation and social groups.

Participants of the Multi-stakeholder Forum, Jakarta.
Photo credit: Balifokus

2. Summary

Nigeria

With an estimated 186 million inhabitants, Nigeria is one of the largest and most populated countries in Africa. It has the largest port in West Africa, and borders with four countries (Niger, Chad, Cameroon, and Benin).

The situation of POPs in Nigeria is particularly serious and a major threat to public health. Large stockpiles of POPs have not yet been destroyed and are finding their way into the environment and back into informal markets. The population is not well aware of unintentional POPs, and open burning of waste including agricultural waste, municipal waste and electronic waste is ubiquitous.

Lagos is the largest port of entry of electronic waste into West Africa and counts large e-waste 'recycling' and refurbishing businesses, which include unregulated burning of electronic cables and plastic casings of cables, TVs, computers, fridges and mobile phones.

There a illegal oil sellers who mix edible cooking oil with toxic PCB oil. These adulterated food-oils are used by street vendors are they are low priced. DDT continues to be used in parts of Northern Nigeria as a malaria treatment, and other obsolete POPs pesticides are reportedly still being sold in the informal market.

Nearly a thousand children were poisoned by lead in ASGM practices in Zamfara State in 2010.

The poisoning occurred in residential areas due to heavy metal releases from processed ores. Mercury levels in human biomarkers were also elevated. The Niger Delta is the industrial powerhouse of Nigeria due to its abundant oil and gas resources, seaports, fertiliser plants, and many other manufacturing industries. In the region, there have been issues of oil pipe vandalism and oil spillage, inappropriate discharge of waste waters, gas flaring, acid rain, toxic leakage from underground petroleum storage tanks, dumping of dangerous chemical wastes, etc.

The health conditions in the oil and gas region have been declining due to heavy pollution and affecting the reproductive health of the population.

Women on the way to a meeting in Abuja, Nigeria. Photo credit: WECF

Indonesia

Indonesia is recognised as one of the most populated countries in Southeast Asia and has a fast growing population, which has increased by some 50 million in the last 10 years (similar to all of France) to now reach about 270 million inhabitants. Growing plantations, industrial agriculture, mining and other intensive resource use are amongst the reasons which have led many women and men to leave rural areas and move to the cities. Around the cities, they join large informal settlements where the waste sector absorbs many newcomers in a polluted environment with unhealthy and poor working conditions.

Gender equality data shows that some 50% of women do not participate in the official workforce, but are very likely engaged in informal economic activities (UNFPA, 2017). A recent UNFPA study shows that approximately 40% of women have suffered from some form of gender-based violence, which limits their chances to participate equally in social and economic activities (UNFPA, 2017).

POPs in Indonesia are mainly released in the agricultural sector, from pesticides such as endosulfan, paraquat and traces of DDT. Lindane is still widely used as head lice treatment registered as Gamaxene. As a result of the civil society awareness raising campaigns, many cases of pesticides and lindane poisoning among women and young girls were registered.

Other POPs chemicals which are considered as widely used in Indonesia are unintentionally produced POPs from open burning and the use of pesticides in agricultural land including in tobacco and palm oil plantations. Even the reproductive health of the wives of farmers who frequently do the spraying, and were not involved directly, was also affected.

Abundant ASGM where mercury is used are also found in Indonesia. Mercury is used in poorer communities to extract gold. However, its import, production, distribution and use are completely unregulated. Recent study showed the total mercury in the hair of women of childbearing age from Indonesia's ASGM hotspots was the highest among 1,044 women from 25 countries.

A survey amongst the members of the Breastfeeding Mothers organisation in 2017, showed that almost 75% of breastfeeding mothers in urban areas were not aware that chemicals can affect the quality of their breastmilk. The lack of awareness in local population as well as the lack of regulation on the reduction and elimination of hazardous substances increases the risk of exposure for the local population.

The scoping study found that, due to the greater number of women in informal jobs and often working from home, there is a lack of information on exposure to POPs, hazardous chemicals and waste. Empirical evidence shows women more often than men dispose of household waste by burning it in open fires in homes and yards, thus releasing and being exposed to furans and dioxins (unintentional POPs). In informal waste 'recycling,' men were seen melting plastics in the factory without any protective gear nor filters.' Meanwhile, women were sorting the plastic waste in the room next door, breathing the fumes from the smelter.

The scoping study however also found evidence of commitment from women and men (and boys and girls) to find solutions to reduce pollution and health risks from hazardous substances and waste. This includes a social-media campaign to ban lindane in anti-lice treatment for children, which immediately gathered 10,000 signatures and the attention of the media. Another highlight is the campaign of a young school pupil to create a network of 'e-waste collection bins' around Jakarta, where people can bring their old phones and cables for safe about consumer products which have been found to contain banned products, such as mercury in skin bleaching creams.

The consumer protection agency has a hotline for the population to report trespassers. NGOs such as Gita Pertiwi and BaliFokus Foundation work to raise awareness and provide information for target groups such as women farmers on how to reduce the use of hazardous pesticides, substitute mercury in artisanal small-scale gold mining and especially to avoid using mercury in their homes. The government also announced major measures to reduce plastic litter entering the ocean during the week the scoping study took place.

The gender dimensions that have emerged from the scoping study in Indonesia and Nigeria show that, in majority (young) men are exposed to POPs and other toxic chemicals in the sector of (electronic) waste handling, but that women and children are also working in the informal waste sector. Women are also exposed as farmers using pesticides and when washing clothes of husbands containing toxic chemicals to which they were exposed at work.

Exposure to hazardous chemicals and the resulting illnesses, medical costs and loss of income, are often an additional burden on women, who might in addition be at greater risk of domestic violence at home or from other men on whom they depend for income or care. This will most likely further affect the physical and mental health of the women impacted by such a combination of health impacts and sexual and other violence (Bhattacharya et al., 2017).

These socio-economic factors of gender inequality need to be understood when developing a strategy to implement the Basel, Rotterdam and Stockholm Conventions in a gender-responsive manner. Often, women and children with the lowest socio-economic status, may be exposed disproportionately to POPs compared to the rest of the population.

The boy's playground is between piles of segregated wastes in a village on the outskirts of Jakarta's landfill.
Photo credit: BaliFokus & WECF

This case study on gender dimensions of the BRS Conventions in Nigeria and Indonesia is conducted based on desk research, interviews, multi-stakeholder forums and site visits.

3. Gender dimensions of hazardous chemicals and waste

Left: Woman waste scavenger on her way home to cook lunch for her family. Photo credit: WECF

3.1 Unintentional persistent organic pollutants | Nigeria

Like in other countries, women and men in Nigeria are both exposed to unintentionally produced POPs, but exposure routes and health effects differ by gender (Harrad, 2001; Mergler, 2012; Pollard, 2012; Llop, et al. 2013).

Nigeria lacks a system for waste separation, including types of waste that emit POPs when burning. There are no state-of-the-art waste incinerators. Everywhere along roads and near houses, waste is dumped and regularly set on fire. Because of the enormous scope of unintended waste burning in Nigeria, it is estimated that by the scoping-study team, that the entire population, all women, men and children, are exposed regularly and continuously to unintentionally produced POPs, particularly to dioxins. POPs emitted by burning waste in the open enter into the air and the neighbouring environment, and from there, into the food chain. Chickens, cows, goats and people living near the burning waste dumps are at risk of being contaminated with POPs such as dioxins.

The most impacted population group is likely to be the slum dwellers and waste pickers who not only work but also often live in and around the waste dumpsites. At the waste dumpsites, there is continuous uncontrolled burning of waste, setting free POPs such as dioxins.

Women and children are estimated to be most exposed because they remain close to their homes (shacks), and thus are exposed to the smoke of burning waste throughout the day.

Pregnant women may be impacted by dioxins found in clay, which in some regions is traditionally eaten by women during pregnancy as a source of minerals. Unfortunately, these pieces of clay, which can be bought on local markets, have often been found to contain contaminants including dioxins and other POPs (Reeuwijk et al., 2012).

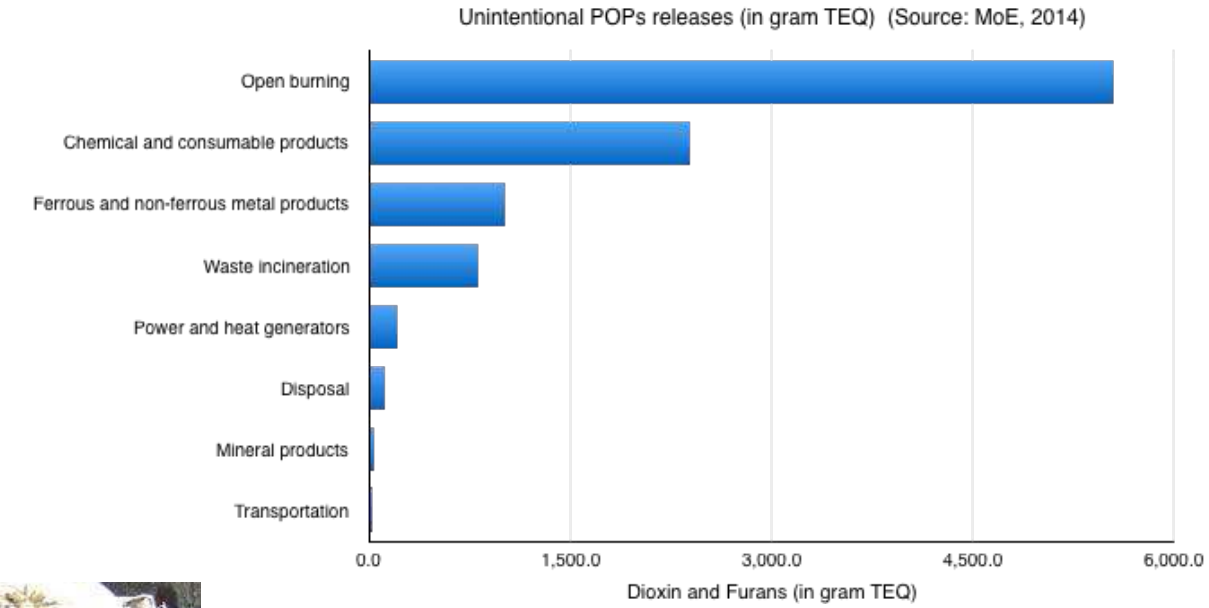
The study for the Basel Convention, "Informal e-waste management in Lagos, Nigeria, socio-economic impact and feasibility of international recycling cooperation," informs that about 30% of the most laborious jobs of e-waste scavenging are done by women, with a large share done by children (Manhart et al., 2011). Almost 99% of the 'better' jobs of refurbishing computers, TVs and mobile telephones are carried out by men.

Waste scavengers are often poor people who have arrived from other parts of the country and have little or no other means to survive. Any strategy to eliminate POPs emissions must integrate a solution for these groups.

3.2 *Unintentional persistent organic pollutants* | *Indonesia*

Indonesia, has very high levels of emissions of unintentional POPs from various sources. The total release of dioxins and furans in Indonesia reached 9,881 grams toxic equivalency (TEQ) in 2013 (MoEF2014). Sectors contributing to dioxins and furans releases, from the highest to the lowest, were open burning process, chemical and consumable products, wastes incineration, ferrous and non-ferrous metal products, power and heat generators, disposal, mineral products and transportation (MoEF, 2014).

The release of unintentional PCBs was estimated at 4.32 kg TEQ with major release coming from heavy oil combustion in particular due to the relative high emission factor for heavy oil. The release of unintentional HCB was estimated at 1.91 tonnes yearly, and the major release came from the production of chlorinated aromatic chemical, particularly pigments (1.76 tonnes).



Women from a village in central Java work with metal scraps. Some of the scraps are contaminated with various chemicals. Photo credit: Koran Sindo

The World Bank estimated that the total economic costs of the fires in 2015 in Indonesia exceeded US $16 billion. Air quality during high burning periods in villages near the fires regularly exceed the maximum level of 1,000 on the international Pollutant Standard Index (PSI), more than 3 times the amount considered hazardous. More than 5 million children and vulnerable populations are impacted by open burning (World Bank, 2015).

3.3 Polychlorinated biphenyls | Indonesia

Organochlorines (OCs) such as PCBs, DDT, HCHs, CHLs and HCB were found in fish samples collected from five locations during 1998 and 2003 from Indonesian waters. PCBs and DDT were the predominant contaminants with high concentrations (Sudaryanto et.al., 2007).

Scientists also found PCB levels in breastmilk from densely-populated areas and highly industrialised areas, while organochlorine pesticides such as DDT and HCHs were particularly more prominent in suburban and rural areas (Sudaryanto et al., 2006).

Time wise, concentrations of PCBs and DDT in fish samples from Jakarta Bay were significantly lower in samples collected in 2003 compared to fish sampled in 1998. These results indicate a decreasing trend of these compounds in the Indonesian environment.

Ilyas et al. (2011) reported the aquatic environment of Surabaya City has been contaminated by organohalogen compounds with higher levels of PCBs than that of brominated flame retardants. have higher concentrations of PCBs and brominated flame retardants than those of coastal sediments. Land-based activities in areas such harbours, urban centres, commercial and industrial establishments were identified as major sources of PCB and brominated flame retardants contamination in aquatic environments, commercial and industrial establishments were identified as major sources of PCB and BFR contamination in aquatic environments.

Some of the PCB levels in polluted riverine sediments of the present study exceeded the sediment quality guidelines standards, indicating their possible potential adverse effects on aquatic biota. Unfortunately, like in other developing countries, there is no regular monitoring of chemicals in fish and no fish advisory in Indonesia.

Breastfeeding is more than just feeding. A healthy and toxic-free social reproduction period needs to be ensured and secured so babies can enjoy their mothers' milk until two years old.
Photo credit: Farahdibha Tenrilemba/AIMI (Indonesian Breastfeeding Mothers Association)

3.4 PCB oil use & waste | Nigeria

It is estimated that 3,400 tons of PCB waste, including PCB oils, are found around Nigeria, in need of destroying. Two recent studies by Professor Okoh, Abuja University, for the World Bank, give an overview of the critical situation of PCB in Nigeria. Nigeria never produced PCB, but imported it from 58 countries. The interviews with experts during the scoping study identified that illegal imports ('dumping') of PCB waste and oil from industrialised countries in Nigeria may still be occurring from other countries. Moreover, the Power Holding Company Nigeria (PHCN) that should be responsible for PCB waste destruction ceased to exist, leading to lack of control of the waste and spreading of PCBs around Nigeria.

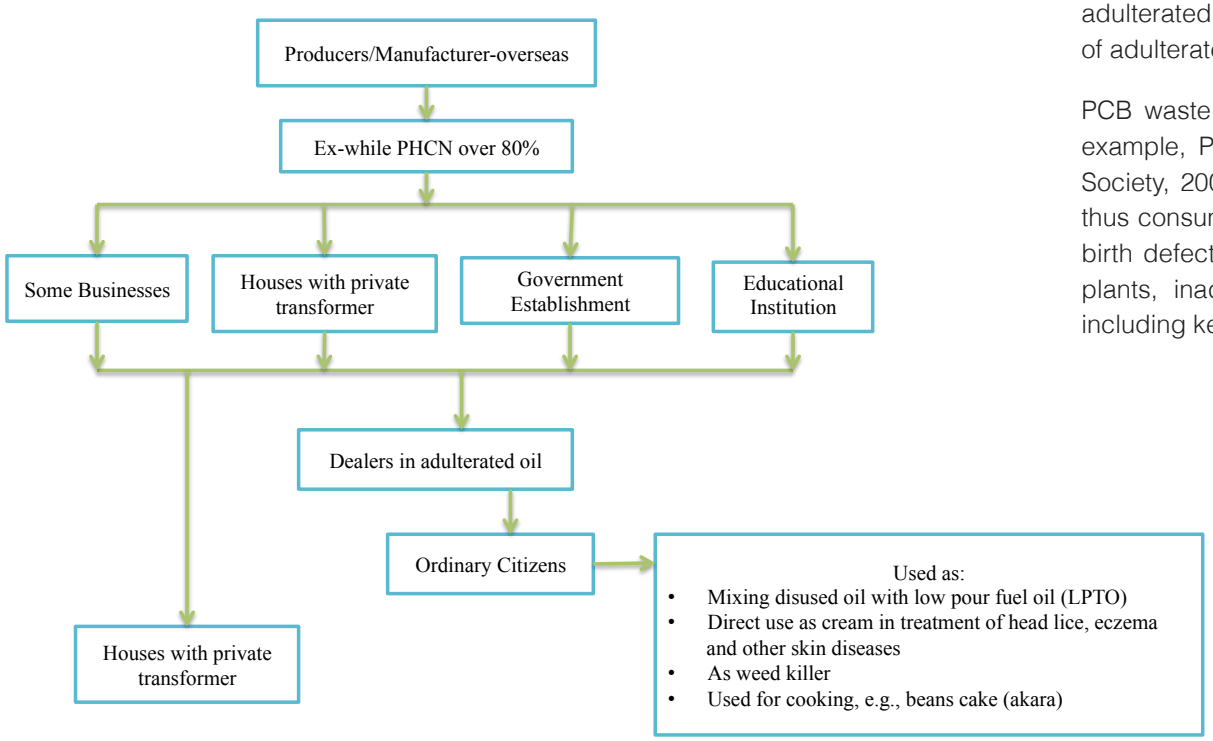


Fig. 1. Main sources of PCB waste in Nigeria. Source: Dr. Okoh, Abuja University in International Journal on Chemicals Studies (pg. 16)

The *International Journal of Chemicals Studies* warns about the dumping of old transformers from other countries in Nigeria, and the unsafe 'recycling' of PCB oils bythe urban poor, including women and children (Okoh, 2016).

There are an estimated 400-500 tons of PCB oil on the 'market' of adulterated oil, which is being sold and used by unaware Nigerians for several uses:

- deep-fry cooking (street vendors selling bean cakes)
- lice and skin treatment
- weed killer
- fuel

In all four of these applications, it is estimated that it is in majority women using the adulterated PCB oils, and both men and women involved in the handling and selling of adulterated oil.

PCB waste has also found its way into Nigeria's environment and waterways. For example, PCB was found in fish from the Lagos Lagoon (Nigerian Environmental Society, 2006). Women, men and children consume fish from the lagoon everyday, thus consuming PCBs. The Niger Delta region of Nigeria experiences higher rates of birth defects due to the PCB pollution from oil and gas spillage, seaports, fertilizer plants, inadequate disposal of waste waters, acid rain, and burning of biofuel including kerosene, bush, biomass, and coal (Obire & Amusan, 2003; UNEP, 2011).

3.5 PCB oil use & waste | Indonesia

Recent inventory results of PCBs in Indonesia estimate the amount of oil contaminated with PCBs in concentrations exceeding 50 ppm is 22,878 tonnes. The State Electricity Company (PLN) estimates that 14,967 tonnes of oil are contaminated with PCBs, whereas within industries outside of PLN, the estimated amount is 7,911 tonnes (AlÁfghani and Paramita, 2016).

In 2010, the Minister of Environment issued Decree No. 140/2010 regarding the Permit to Utilise Hazardous Waste by a cement company, PT Holcim Indonesia TBK, Cibinong Plant Unit as alternative fuel. Unintended POPs emissions from similar plants in other countries could help to estimate the potential risks.

Stockholm Convention provisions state for such cases that:

- Article 6 (d) ii POPs should be destroyed or irreversibly transformed into non-POPs that do not posses the characteristic of POPs.
- Article 6 (d) iii prohibits the disposal of POPs through recovery, recycling, reclamation, direct use or as alternative uses of POPs.

Unintended POPs emissions measurements from similar plants in other countries could help to estimate the potential risks.

The scoping study concluded that the Holcim Indonesia cement would need to be reviewed, especially regarding the reutilisation of PCBs waste as an alternative fuel and using thermal methods to dispose hazardous POPs wastes.

PCB oil destruction project in Senegal.
Photo credit: Image from the film, 'What has gender got to do with chemicals?' Camera: Laure Poinsot

In the National Implementation Plan (NIP) for Nigeria under the Stockholm Convention, it is estimated that POPs pesticides and DDT are still being used in Nigeria (Nigeria Federal Ministry of Environment, 2016). Widespread contamination of soils is reported in Nigeria despite relatively short half-lives of POPs chemicals in soil (Osibanjo, 2002), indicating continued use (Nigeria Federal Ministry of Environment, 2016). The level of POPs contamination in soils tends to be the greatest in private farms, industrial sites, and municipal refuse dumps. There is an overall lack of information and labeling of pesticides as well as a lack of awareness among farmers and households of the risks of POPs-containing pest control substances.

The National NIP reports high usage levels of lindane, which can no longer be used under the Stockholm Convention (Nigeria Federal Ministry of Environment, 2016). DDT and Gammalin-20, which are also banned, continue to be used illegally in some parts of Nigeria (Tijani & Sofoluwe, 2012; Ita, 1993).

The NIP has set as priority for its gender mainstreaming actions, the awareness-raising of female farmers about the risks of POPs pesticides. Nigeria participated in the POPs in Human Milk monitoring global survey but many POPs could not be measured. Among the POPs tested, those found in human milk included: dieldrin, chlordane, DDT, toxaphene, PCBs, HPCBs, HCH and PFOS. In particular, very high levels of PCDD/PCDE, HCB, lindane and endosulfan were found in human milk in Nigeria.In other countries, the level of DDT in human milk decreased steadily once it was no longer used. The human milk study is an indication that DDT continues to be used in Nigeria and that women and children remain highly exposed.

POPs-containing pesticides are not only a source of concern when used by farmers, but also when not safely managed and polluting the environment. Very high levels of the pesticides lindane, aldrin and DDT are found in soil samples. This is a public health concern when the soils are used for agriculture, and for people and animals living near contaminated sites. The same POPs were also detected in water sources near Ibadan and Lagos, which is a concern for food safety. Indeed, some tests of foodstuffs show residue levels of several POPs in meat, pulses and fish higher than Food and Agriculture Organisation (FAO) standards. In recent years, the European Union refused numerous imports of foodstuffs based on the presence of banned chemicals

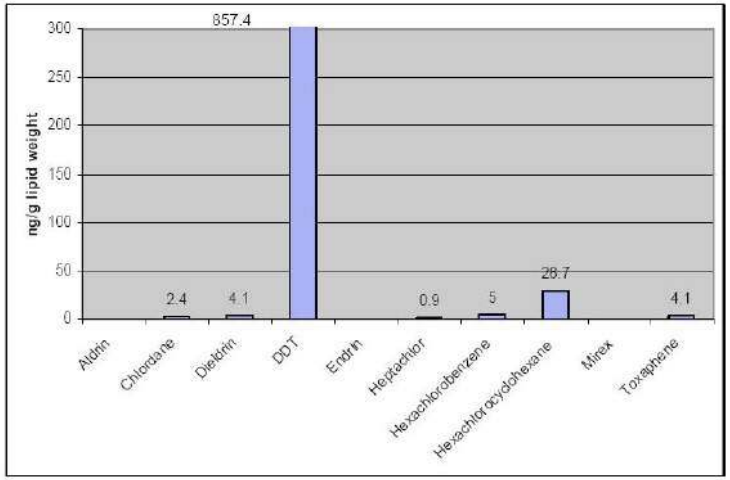


Fig. 2. Level of selected POPs in human milk in Nigeria. Source: POPs Africa GMP Project

SN	POP-Chemical	Quantity ($pg.m^{-3}$)	Remark
1	Endosulfan	179,25	Recorded in 2010
2	Cis-chlordane	2,81	Recorded in 2012
3	Oxy-chlordane	6,24	Recorded in 2012
4	Dieldrin	2,08	Recorded in 2011
5	Endrin	36,65	Recorded in 2010, Significantly reduced in 2011 and 2012
6	Heptachlor	1,32	Recorded in 2012
7	PBDE	10,97	Recorded in 2011

Fig. 3. Summary of POPs monitoring data obtained under UNEP/GMP. Source: Nigeria Federal Ministry of Environment, 2016.

3.7 POPs-containing pesticides | Indonesia

Between 2000 and 2017, more than 3,200 brand names of pesticides registered at the Indonesian Committee for Pesticides under the Ministry of Agriculture. Statistics in Indonesian agriculture showed that, in 2016,37.5% of 35.3 million farmers (or approx. 13.3 million) were women. About 58% of women farmers are involved in rice planting and vegetable crops, including palm oil plantations, where they do almost everything and almost the same thing as men. Women exposed to pesticides and organs chlorine in agriculture sector of Indonesia reportedly have reproductive health problems (Murphy et al., 2000a; Murphy et al., 2000b).

Wives of farmers using pesticides and the involvement of family members in agricultural activity, especially children under 16, made them vulnerable to pesticides exposures, directly and indirectly. Mahmudah et al. (2012) showed a correlation between the involvement of wives in agriculture activities and risks of suffering from pesticides poisoning.

Children working in tobacco farms across Java and Nusa Tenggara to help their parents also risk their lives because of nicotine poisoning and exposure to pesticides (Human Rights Watch, 2016).

Although Indonesia is a party to the Stockholm Convention, some highly hazardous pesticides, such as paraquat and lindane are still found in some areas of the country (Ministry of Environment of Indonesia, 2014).

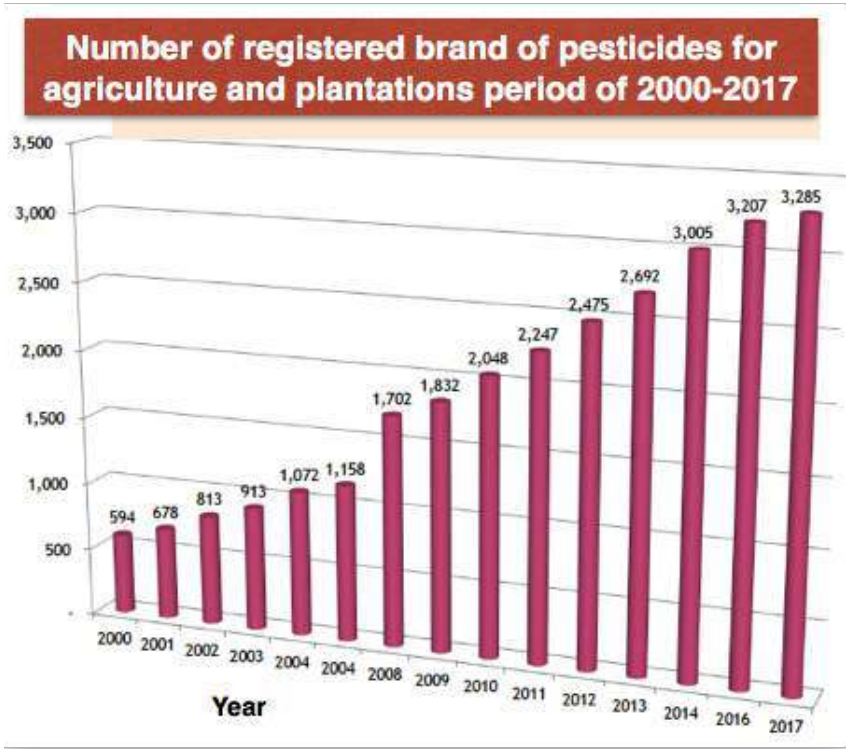


Fig. 4. Source: Pesticides Registration Committee, Ministry of Agriculture of Indonesia

Left: Agriculture waste or straw residue burning is a common practice in Indonesia. Farmers are not aware of the potential exposures of pesticides evaporation during burning.
Photo credit: Istimewa

Photo credit: Rossana Dewi

A young girl ties tobacco leaves onto sticks to prepare them for curing in East Lombok, West Nusa Tenggara, Indonesia. The girl is exposed to pesticides used to grow the tobacco.
Photo credit: Marcus Bleasdale for Human Rights Watch

A young woman works at an open dumpsite in Lagos, risking exposure to harmful chemical emissions in the landfill.

The increase in gold prices worldwide has been followed by an increase in informal Artisanal and Small-scale Gold Mining (ASGM) in Nigeria. Lead is present in both ore and gold, and awareness about the health dangers of it and mercury is scarce amongst miners in general, especially amongst women. Due to their lower socio-economic status, women in these ASGM communities are often illiterate. Women often use mercury during the amalgamation process, which can lead to serious birth defects in their children (Plumlee et al., 2013).

The amalgamation process involves mixing mercury, using bare hands, with the gold ore. Prior to this process, the ore has to be crushed into smaller pieces to liberate gold minerals. the ore and mixing mercury for the amalgamation process is regarded as the easiest part of the process, and women can do it at home while they are taking care of their children. Unfortunately, when they crush the ore, lead is also liberated.

In two artisanal mining communities in Zamfara State, Nigeria, 25 percent of children under five years old died of lead poisoning in 2010. They were exposed to lead from contaminated soil due to gold ore processing activities in households, as well as drinking water from containers in which lead had been previously stored (Lo et al., 2012). Of those children, 972 had venous blood lead levels (VBLL) over 45 µg/dL and required chelation therapy. VBLLs ≥80 µg/dL in children aged 1-3 were also associated with neurological signs, symptoms and/or seizures (Greig, 2014). Moreover, lead concentrations in soil of >100,000 ppm were found in and around habitations in the villages (the limit for residential areas applied in the USA and France is 400 ppm). Despite an awareness raising campaign in these communities, the same problem keeps occurring, probably also because of newcomers to the gold mining sites.

When inhaled or ingested, lead can cause damage to the brain, kidneys, bone marrow and other organs in young children.

Since most the processing takes place in residential areas as home industry, women and children suffer the most from exposure to lead dust and mercury. Meanwhile, most men risk their lives at mining sites, mainly from landslides and other occupational hazards.

A small gold & mercury amalgam ready to be burned. Photo credit: Doctors Without Borders/Médecins Sans Frontières

Mercury used in ASGM is mainly exported by other countries to Nigeria, through the sea freight, airplanes, and vehicles across the border. Between 2012-2014, Nigeria imported mercury from India, South Africa and Switzerland total approx. 30 metric tonnes with trade values approx. USD 310,734.00 (United Nations, n.d.). Since 2015, there is no mercury traffic coming in or out to and from Nigeria. However, no data does not mean that there is no pollution.

In February 2017, Nigeria launched the Minamata Initial Assessment project coordinated by the Ministry of Environment, supported by the GEF with UNIDO and UNITAR as the implementation agencies. In Nigeria, mercury pollution occurs through many sources, including artisanal and small-scale gold mining (ASGM), cement production, use and disposal of mercury containing products; coal combustion and improper waste management.

A gold kiosk owner in Poboya, Southeast Sulawesi, Indonesia, sells mercury and buys gold from miners every day with her 4 year old girl, unaware of the danger of mercury. Like other gold kiosks, she also provides an amalgam burning unit in front of her kiosk that releases mercury vapour into the surroundings. Photo credit: BaliFokus.

Shinobu Sakamoto, 61, Minamata Disease survivor, at the first COP of the Minamata Convention on mercury September 2017 in Geneva, reminded delegates to protect women and children from mercury pollution. Photo credit: Yasushi Saito for IPEN

3.9 *Artisanal and small-scale gold mining* | *Indonesia*

About 800 hotspots of ASGM that use mercury and cyanide can be found in 29 out of 34 provinces of Indonesia. About 1 million miners and the lives of more than 5 million people depend on this sector (BaliFokus, 2013). This informal sector produces about 60-100 tons of gold per year, almost as substantial as the gold produced by large-scale gold mining companies (Ismawati, 2011).

Recent studies show that ASGM miners use about 3,500 ton of mercury annually, and most of it comes from local mercury primary mining sites and home productions near Jakarta. After importing mercury illegally for nearly 20 years, Indonesia has become one of the world's largest mercury exporter, together with Mexico since 2015. (Ismawati et al,. 2017).

Unfortunately, this progress comes with big economic losses: USD 900,000 up to 1.6 million USD a year, in the form of loss of opportunities and economic potential (Trasande et al., 2016).

A study conducted by IPEN and BRI in 25 countries on 1044 women of child-bearing age revealed that the highest mercury levels were found in women from Indonesia's ASGM hotspots (Bell et al., 2017).

Another study by Grandjean et.al (2008) shows that every 1 ppm increase in mercury in a mother's hair is associated with a 1.8 point drop in her child's IQ. several poor communities where ASGM practices are found, mercury is one of the key factors that contribute to worsening health conditions of vulnerable populations. Field surveys and interviews with local health workers revealed an increased number of miscarriage, stillbirths and birth defects in the ASGM hotspot regions.

It is important for governments to include fish advisories and food alerts in mercury-contaminated areas into the National Implementation Plan under the Minamata Convention to reduce mercury exposure and protect vulnerable populations.

A girl with incomplete fingers and club-foot in one ASGM hotspot and mercury polluted area of Indonesia.
Photo credit: Yuyun Ismawati/BaliFokus2015

3.10 Oil and gas industry | Nigeria

The Niger Delta is the industrial powerhouse of Nigeria due to its abundant oil and gas resources, seaports, fertiliser plants, and many other manufacturing industries. In the region, there have been issues of oil pipe vandalism and oil spillage, illegal discharge of waste waters, gas flaring, acid rain, and toxic leakage from underground petroleum storage tanks (Abbey, 2017).

The impact of chemicals pollution to human health is very clear, both to women and men. Various studies show that the pattern of congenital abnormalities varies from one oil region to the other. An epidemiology study of Niger Delta shows various abnormalities including diseases related to the central nervous system (27.0% of the cases), followed by multiple abnormalities of which 13.84% consisted of abnormalities of the gastrointestinal system (11.95%), cardiovascular system (10.69%), and the anterior abdominal wall (8.18%) (Ekanem, et.al. 2009; Ekanem, et.al. 2011).

Abbey et.al. (2017) reported that in northeastern Nigeria, out of the total number of birth defects, the predominant abnormalities were those of the gastrointestinal system (34.5%), unclassified abnormalities (33%), and the central nervous system (13.6%). In South Western Nigeria, abnormalities of the cardiovascular and gastrointestinal systems predominated, followed by the abnormalities of the musculoskeletal, cardiopulmonary, and genitourinary systems.

In the southeast of Nigeria, abnormalities of the gastrointestinal system predominated (36.7% of the total cases) followed by those of the skeletal and then the cardiovascular systems.

An 18-year old mother with her two-year-old son in a Delta slums settlement without clean water and electricity.
Photo credit: Ed Kashi/National Geographic

A woman carries tapioca seeds, earlier set out to dry near a gas flare fire, on April 20, 2007, near Warri, Nigeria.
Photo credit: Lionel Healing/AFP/Getty Images

Melting plastic in a recycling facility in Indonesia, polluting the factory air with no worker protections.
Photo credit: WECF & BaliFokus

3.11 Plastic and e-waste 'recycling' | *Indonesia*

Jakarta's port receives containers including e-waste and mixed plastic waste. During the scoping study, WECF and BaliFokus visited the largest waste dump site of Jakarta. During the scoping study, WECF and BaliFokus visited the largest waste dump site of Jakarta. Around the waste dump, informal waste 'recyclers' are working under unacceptable conditions, doing open-air melting of styrofoam, plastic bags, and PVC plastic cables from e-waste. The workers – women, men and sometimes children – are exposed directly to the fumes coming from the melting of these plastics, very likely containing POPs such as dioxins. On and around the waste dump, open burning of waste is continuously taking place, also emitting POPs such as dioxins. These POPs emissions certainly contaminate the surrounding rice-fields, chicken, goats and other animals used for meat and milk production. There exists a hierarchy in the waste sector, with families arriving from rural areas starting at the bottom of the line, as waste scavengers, and living in huts in and among the waste dumps, for which they need to take out loans and indebt themselves. The top level are the owners of the so-called recycling enterprises, who should follow regulation on occupational health protection, but this was not the case for the sites visited during the scoping study. The waste scavengers association tries to improve the living conditions, health care and social support for the women, men and children whose livelihoods depend on the waste sector (Suyoto, 2015).

4. Health impacts and gender dimensions

4.1 Health impacts and gender dimensions | Nigeria

There is only very little research available about the health impacts of POPs in Nigeria and the exposure of the population to POPs, either via food, environment, at home or in the workplace. Apart from POPs in human milk studies, there has been no other human bio-monitoring evidence. The human milk studies state that unintentionally produced POPs such as dioxin are highly prevalent in Nigerian women's breastmilk. Also, there is limited data available on the possible links between exposure to POPs and observed health conditions such as infertility, birth defects or cancer. The cancer registry is not well developed and for example, little data exist on breast cancer and possible hotspots or clusters around areas polluted by chemicals. There is also a lack of data on POPs in food and consumer products. It has been reported that fish in the Lagos Lagoon contains PCBs, that the milk from cows grazing on waste dumps contained POPs as well as eggs. The raw data of these food tests has not been identified, but the information was reported in serious studies and newspapers.

In addition to lack of official health surveys, another challenge is the general belief that ill health is not caused by pollution, but by someone in the neighborhood who has gone to a marabou (medicine man) to 'throw a bad eye on you' or by a 'higher being' as a punishment for bad behaviour. These misconceptions are fed by information received from religious organisations and through media. This does not help raising awareness about POPs- related diseases with the general population, or the willingness of the population to inform themselves about health problems. In particular, male infertility is highly taboo, as gender roles want men to be fertile and virile. Finally, as one of the interviewees noted, 'in a country where many people can only eat one meal a day, only that what kills immediately is taken seriously, that what kills slowly is not.'

What is certain is that large parts of the Nigerian population are exposed to numerous POPs and unintentionally produced POPs, likely in high levels, but human biomonitoring data is lacking. However, it should be possible to provide estimations of the associated health impacts based on extrapolations and the documented health effects from exposure to POPs and other harmful chemicals in other regions of the world.

Top: Women in impoverished communities have limited options of market supplies to feed their families and have no mechanism (or no way) to know whether the food they prepare for their families has been contaminated with harmful chemicals. Photo credit: WECF

Left: Photo credits: Images from the film, 'What has gender got to do with chemicals?' Camera: Laure Poinsot

4.2 Health impacts and gender dimensions | Indonesia

The health impacts of hazardous chemicals on women and men in Indonesia are not well-known and are under-reported. Not only are there very few statistically relevant studies available from, for example, cancer registries, but also there is very little sex-disaggregated data available. Thus, policy actions need to be based on empirical data reported by health professionals, worker unions and civil society organisations.

The empirical data from field studies show that Indonesia has hotspots of poor health conditions for both women and men working in:

- chrysotile asbestos factories and sites where chrysotile asbestos was used in construction and during demolition;

- palm oil plantations and other industrialized agricultural plantations, potentially due to highly hazardous pesticides use including banned ones by the Government of Indonesia and open burning;

- open dumping and waste recycling sites due to poor processing standard, lack of occupational, health and safety measures, and contaminated food chain;

- artisanal and small-scale gold mining, due to mercury and cyanide use in gold extraction process, poor practices in residential areas;

- metallurgic, electric & electronic, chemical, pharmaceutical and automotive industries and lack of occupational health measures.

More studies and support for reporting and sex-disaggregated data on chemicals and waste are needed to understand where to take action to halt the exposure and related health impacts on women and men.

Top: A boy's foot who suffered from cerebral palsy. He lives in a used lead acid battery (ULAB) village near Jakarta.
Photo credit: Rahmad Azhar Hutomo/Arkamaya/GFJA

Bottom: Suspected of mercury poisoning, many children are born with birth defects and delayed growth in several ASGM hotspots of Indonesia.
Photo credit: BaliFokus

Expected health impacts of exposure to hazardous substances

Who	Exposure Type	Related Substances	Health Impacts
Women	Female farmers; home applications of DDT; through ingestion of meat, milk, eggs, fresh produce	DDT, dieldrin, chlordane, etc.	Breast cancer, infertility, delayed pregnancy
Women, children, developing embryos and fetuses, pregnant women, workers	Women consuming PCB-contaminated oils, through fish, food; workplace exposures; take-home exposures from workplaces; prenatal exposures from umbilical blood; postnatal exposures from breast milk	PCBs	Immune suppression, low birth weight, impaired thyroid and reproductive function, cardiovascular and liver disease, diabetes, neurodevelopment disorders, birth defects including skin disorders (Carpenter, 2006)
Women	Waste burning smoke; indirect exposure via environmental pollution in soils and sediments; ingestion of contaminated food, primarily dairy products, meat, fish and shellfish (WHO, 2016)	Dioxins	Acute, high-level exposure: skin lesions (e.g. chloracne and patchy darkening of the skin), altered liver function; Chronic exposure: impairment of the immune system, developing nervous system, endocrine system and reproductive functions (WHO, 2016)
Women, children, developing embryos and fetuses, pregnant women, workers	Direct ingestion and inhalation of contaminated household dust and food; workplace exposures; take-home exposures from workplaces; prenatal exposures from umbilical cord blood; postnatal exposures from breast milk (Gore et al., 2014)	Polybrominated diphenyl ethers (PBDEs)	Neurodevelopmental disorders, including cognitive deficits, hyperactivity, attention problems; thyroid hormone disruption and related neurobiological effects (Gore et al., 2014)
Women, children, developing embryos and fetuses, pregnant women, workers	Indoor, residential and agricultural pesticide exposures; prenatal exposures from umbilical cord blood	Organophosphate pesticides	In children: neurodevelopmental disorders, including impaired mental development and developmental problems, attention deficit hyperactivity disorder (ADHD), autism spectrum disorders (ASD) and developmental delay (DD) (Rauh et al., 2006; Eskenazi et al., 2007; Marks et al., 2010; Shelton et al., 2014)
Male workers	Workplace exposures; contaminated foods	Heavy metals, pesticides and other agricultural agents, industrial chemicals, estrogens and estrogen derivatives	Male factor infertility, including reduced sperm count and motility, spermatogenesis impairment, testicular dysfunction and atrophy, and impaired fertility index (Abarikwu, 2013)
Men, women and children working on farms	Workplace exposures; take-home exposures from workplaces	Agricultural pesticides	Acute health effects including nausea, headaches, vomiting, eye irritation and skin problems (Oluwole & Cheke, 2009)

Figure 5. WECF

Siti Kristina, 47, one of the first asbestos victims from Indonesia, worked for 23 years at a factory that used asbestos as their raw materials. She was diagnosed with asbestosis in 2010.
Photo credit: BRS Secretariat

Women and children waste picking between the broken asbestos dumped near an asbestos factory.
Photo credit: Ina-BAN

Many products sold to consumers contain highly hazardous chemicals listed in the BRS Conventions. For example, children's toys containing POPs were found in Nigeria, and children's shampoo containing Lindane is still widely used in Indonesia. Photo credits: various sources

5. Harmful chemicals and substances in products

The harmful chemicals regulated by the Stockholm Convention accumulate in the environment and in the food chain and remain dangerous for several decades. They can enter into food, and thus the population can be unknowingly exposed to them. They can also be 'recycled,' and thus a new product may still contain POPs without the consumer knowing about it.

A recent test of toys bought in more than 16 countries, including Nigeria, showed that high levels of hazardous chemicals such as flame retardants and phthalate plastic-softeners were found in toys made out of recycled e-waste plastics. (WECFa, 2017).

Mercury, which is regulated by the Minamata Convention, may also be found in fish and other foods and bioaccumulate up the food chain. When women are exposed during pregnancy or breastfeeding, these chemicals accumulate in the baby. Developing embryos, fetuses and breastfed infants are more vulnerable to exposure to developmental toxicants like mercury, and resulting health impacts may be more severe for an equivalent level of exposure than for an adult.

Lead is another known neurotoxin. Unfortunately, there is a large market for recycled lead, for example in cooking pots, thus exposing children as the most vulnerable group.

Products likely to contain or emit harmful chemicals:

Product	Examples	Photo Example	Related Substances	Exposure Type
Polyvinyl chloride (PVC)	PVC bottles, flooring, rainwear, toys		Dioxin (UPOP) when burned	Air pollution from waste burning
Meat	Smoked meat from cows eating waste or near burning sites		UPOPs from burning old tires in abattoirs	Eating meat
Milk	From cows near waste dumps		UPOPs (e.g. dioxins)	Drinking milk
Fish	From inland lagoons		PCBs, mercury	Eating fish
Eggs	From chicken on waste dumps		Dioxins from UPOPs	Eating eggs
Pulses, grains	Residues of POPs pesticides		DDT, chlordane, dieldrin	Eating pulses, grains
Cooking pots, pans	Non-stick Teflon, recycled lead		PFOS, lead	Cooking
Tooth fillings	Amalgam		Mercury	When put in or taken out, or worker exposures in dentistry
Gold mining	Amalgamation process		Mercury, lead	Working with mercury or lead without protection
Skin cream	Skin bleaching creams (some)		Mercury	Absorption from skin

Figure 6. Hazardous chemicals and related exposures in consumer & industrial products and waste. Source: WECF

Product	Example	Photo Example	Related Substances	Exposure Type
Electronics	Refurbished electronics; industrial products used in electrical equipment (coolants, insulating materials and lubricants)(Manhart et al., 2011)		PCBs; lead, cadmium, mercury and other heavy metals; phthalates; PBDEs; toner chemicals; dioxins and furans from burning (Manhart et al., 2011)	Workplace exposures for refurbishers, collectors and recyclers; indirect exposure via environmental pollution
Recycled e-waste plastic	Imported products made from recycled plastics (e.g., toys)		May contain recycled POPs such as OctaDBE, DecaDBE and HBCD	Through skin and inhalation from abrasion, wear and tear of the product
Refrigerants and foaming agents	Old refrigerators, freezers and air conditioners (Manhart et al., 2011)		CFCs, HFCs, hydrocarbons, mercury switches, PCB-containing capacitors, PVC, ammonia, hexavalent chromium (Manhart et al., 2011)	Workplace exposures for refurbishers, collectors and recyclers; indirect exposure via environmental pollution
Industrial equipment	Transformers, capacitors, hydraulic fluids, plasticizers, surface coatings, adhesives, pesticides, carbonless copy, dyes, waxes		PCBs	Workplace exposures for refurbishers, collectors and recyclers; indirect exposure via environmental pollution
Waste products	Industrial waste, municipal and solid waste, electrical and electronic equipment waste (e-waste)		PCB-contaminated oils and equipment	Workplace exposures for refurbishers, collectors and recyclers; indirect exposure via environmental pollution
Pesticides	Herbicides, fungicides, insecticides, rodenticides, imported POPs pesticides (Nigeria Federal Ministry of Environment, 2009)		Aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, toxaphene, endosulfan (Nigeria Federal Ministry of Environment, 2009)	Agricultural exposure of workers, farmers and local residents via pesticide applications and unsecured pesticide stockpiles; indirect exposure via environmental pollution

6. Good practices and recommendations

6.1 Good practices and recommendations | Nigeria

Nigeria has already identified gender dimensions of the implementation of the Stockholm Convention as a specific focus area in its updated 2016 implementation plan. The activities focus on women farmers and POPs-containing pesticides.

Activities	Action Plans	Priority Ranking	Outcomes/ Output	Performance Indicator	Responsible Institutions	Resource and needs	Cost Estimate (USD)	Funding Sources	Timeline
(1) Sensitisation and awareness raising among women to increase knowledge on POPs-exposure, its health and environmental effects	Advocacy for women farmers on minimising exposure to agricultural pesticides	4	Improved women farmers' support for minimising exposure to agricultural pesticides	Sensitised women farmers. Report of workshop / town-hall meeting.	FMENV, FMI, FME, FMA & RD, Federal Ministry of Women Affairs (FMWA) and NGO	Financial Support	300.000	Nigerian Govt., GEF, Bilateral & Multilateral Donors, and Multinationals	2016-2018
	Sensitisation of rural women on traditional practices that could lead to POPs exposure e.g. using of tyre scraps for cooking and land clearance; and open burning; fossil fuel and firewood.	4	Reduced POPs exposure among rural women	Rural women sensitised on risk of POPs exposure through traditional practices	FMEnv, FMI, FMA & RD, FMWA and NGO.	Financial Support	500.000	Nigerian Govt., Bilateral and Multilateral donors	2016-2019

Figure 7. Mainstreaming Gender Perspective. Source: Nigeria Federal Ministry of Environment, 2016, Activity 3.3.11.

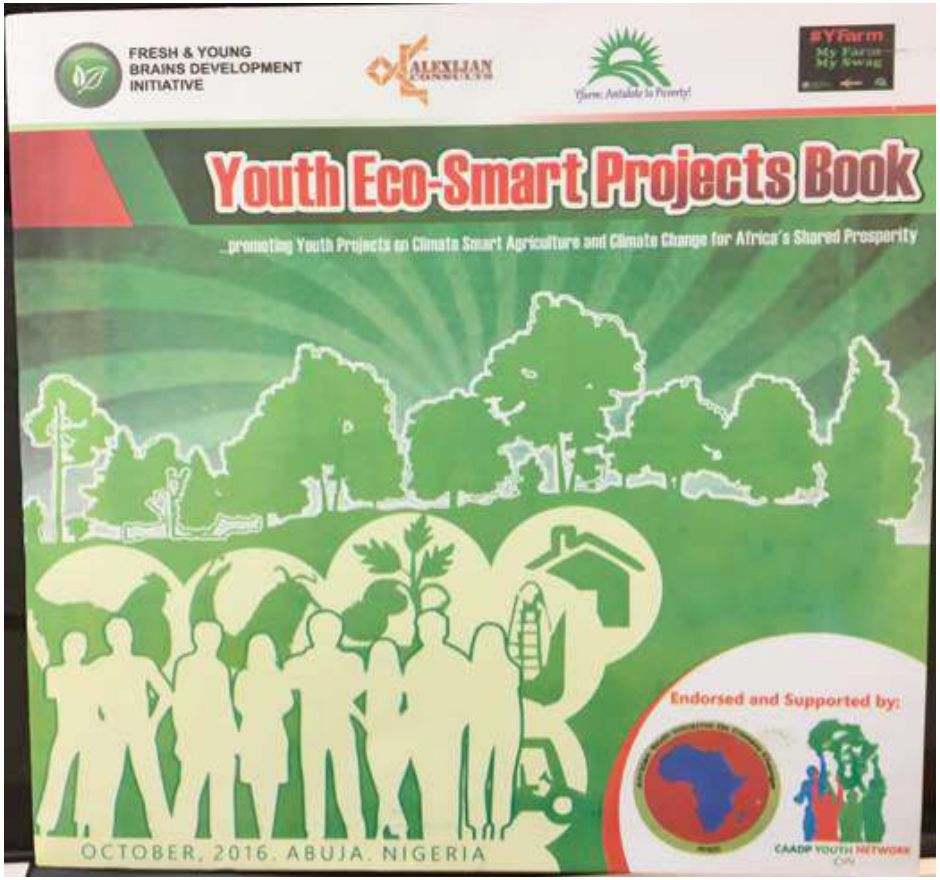
6.1.1 *Reducing pesticide exposure* | *Nigeria*

Several projects that contribute to reducing pesticides were identified during the scoping study and desk research, such as the young women and men organic farming training program by one of the Nigerian organic farming organisations. A publication "Youth Eco-Smart Projects Book" collects a number of such interesting practices that help to promote better food, less pollution and more employment opportunities for young women and men (YFarm Project, 2016).

Research on non-chemical pest control methods and products has also been undertaken in Nigeria. UNIDO has been testing pesticides based on the neem tree in trial plots with interesting results. Neem-based pesticides are a viable alternative to chemical pesticides; they are used increasingly around the world and do not have negative health impacts on humans.

Farmers and households can buy neem-based pesticides from large pesticide producers. See project film, 'What has gender got to do with chemicals?' (WECFb, 2017).

Possible pilot project ideas to further develop non-chemical pesticides include promoting safer alternatives to chemical pest control with female farmers in Nigeria, as well as sharing and documenting the knowledge of indigenous women in alternative pest control methods as part of the implementation of the gender actions of the Nigerian NIP of the Stockholm Convention.



Publication example from Nigeria and other African countries

Youth organic farming project example

6.1.2 Reducing exposure to hazards from e-waste | Nigeria

The improvement in enforcement of border controls and international cooperation in the framework of the BRS Conventions contributes towards reducing e-waste and its risks on human health and the environment. Nigerian Environmental Standard, Regulation and Enforcement Agency (NESREA) in cooperation with concerned Parties to the Basel Convention, no longer exports electronic waste, although it remains permitted under the provisions of the Convention, and has been identifying illegal shipments of e-waste to Nigeria. Almost 10 illegal shipments of large amounts of end-of-life of electric and electronic equipment and e-waste were returned to Europe according to the Nigerian authorities. Considering the growing amount of electronic waste and the dynamic illegal e-waste sector, it can be expected that not all illegal imports have been stopped. The principle of extended producer responsibility applied in chemical policies calls on producers to take back electronics for safe recycling, refurbishment and destruction (where needed).

Example of responsible recycling of e-waste:

Based on the extended producer responsible principle, several producers of electronics have started to take back products to recycle them safely. In Lagos, the company 'Greencyclers,' in partnership with Hewlett Packard, demonstrates how e-waste recycling and refurbishment can be done, ensuring the protection of workers' health and at the same time promoting gender equality. A remaining challenge is that the most hazardous substances, including PCB oils, cannot be destroyed in Nigeria and must be shipped to a hazardous waste incinerator in the UK, which requires additional costs. See project film, 'What has gender got to do with chemicals?' (WECFb, 2017).

E-waste arrives often 'disguised' as consumer electronics at the electronics markets in Lagos. Photo credits: Images from the film, 'What has gender got to do with chemicals?' Camera: Laure Poinsot

6.1.3 Reducing pollution and health risks from plastic waste

Plastic used to be seen as a harmless product. Unfortunately, plastic has become one of the greatest global pollutants and sources of health hazards. Not only does plastic waste pollute and clog waterways and sewers, it also does not disappear, but rather breaks down into smaller and smaller 'micro-plastics' which can enter the food chain. Tests on fish and commercial sea salt have shown they are being increasingly polluted with micro-plastics. In 30 years, there will be more plastic than fish in the oceans, putting at risk the food security of 3 billion people that depend on the oceans for their nutrition. In Nigeria and Indonesia, like many other countries, plastic waste is now found everywhere in the environment.

The European Union lists chemicals contained in plastics as harmful to human health, such as hormone-disrupting and carcinogenic bisphenol-A and phthalates). These harmful chemicals leach out of plastic during use and as waste. When plastic is burned, it can emit dioxins as one of the POPs types

Packaging is the greatest source of plastic waste. More and more countries have started to ban one-time-use plastic bags and bottles. Nigeria and Indonesia have not yet implemented a country-wide system for deposits and collection of plastic packaging. The local authorities of Lagos have announced an increase in taxes to address plastic and other municipal waste, but so far this change has not yet been implemented. The authorities are working with bottling companies to set up a take-back system for plastic bottles nationwide. Ministry of Environment and Forestry of Indonesia have started the trial of charging consumers for single-use plastic bags.

Example of responsible recycling plastic waste:

In Lagos, the female entrepreneur Bilikiss Abiola has created a social company called 'Wecyclers,' which consists of a network of community-based recycling schemes in different Lagos neighborhoods. The systems works quite well, as it provides incentives to households - mostly women - to collect their waste and sort it by plastic, cans, paper and glass. An employee of Wecyclers visits households on a trolley bicycle, collects and weighs the bags of waste, and gives the household a stamp for each bag collected. When enough stamps have been collected, the household can choose from a set of gifts (household goods).

With this incentive, Wecyclers created a very successful way of keeping waste out of streets and stopping backyard open burning of waste. The collected waste is cleaned, sorted by type of waste, and the recyclable waste is sold to recycling companies. Wecyclers also has a partnership with bottling companies and collects specific types of bottles at locations such as cinemas, sorts and cleans them and returns them to the company for re-use. See project film, 'What has gender got to do with chemicals?' (WECFb, 2017).

Another community-led initiative in Indonesia called Bank Sampah, or Garbage Bank, started to appear in many cities and has led many urban poor communities to sort their waste and send it to the nearby Garbage Bank to be further recycled.

Women working at the community plastic collection initiative 'Wecyclers' sort plastic waste in Lagos, Nigeria. Photo credit: WECF

Indonesian stakeholders identified gender-related actions in chemicals and waste sectors relevant to the implementation of the Basel, Rotterdam and Stockholm Conventions as specific focus areas in the near future.

Policy and regulatory framework	Research	Civil society
Develop regulation on household electronic wastes, its collection and processing mechanism	Increase research funding for POPs and harmful chemicals	Conduct awareness campaign of chemicals and its gender aspects including pregnant women and breastfeeding mothers
Strengthen monitoring of management of harmful chemicals and wastes	Develop database/inventory/mapping of chemicals in consumer products through primary/secondary/desk research	Conduct training and awareness campaign on pesticides for health workers, women groups including men
Increase law enforcement of chemicals and wastes management regulations	More studies on gender, chemicals and livelihoods	Introduce and promote smart consumers to read labels in products before they buy and use it
Increase the inter-sectoral coordination on chemicals and waste including its gender dimensions	More research on handling/disposal of chemicals and its gender dimension	Media campaign on gender dimension of chemicals
Increase and activate gender budget allocation (at the Planning Directorate of MoEF), women's health-oriented project (Min. of Health), activate the Gender Task Force at MoEF and at the Min.of Health especially at the Directorate of Family Health	Continue the study on PCB inventory, grant for laboratory instruments and assess it impact to human health and the environment	Empower the consumers' pressure groups through social media campaign and through their networks
To include gender and chemicals in the Annual Gender Award organised by the Ministry of Women Empowerment and Children's Protection (Kementerian Pemberdayaan Perempuan dan Perlindungan Anak)	Develop a roadmap and gender perspective of PBDE including inventory and related technical issues	Lobby government and parliament members to advocate to highlight gender dimensions of chemicals and wastes

Fig. 8. Source: BaliFokus

6.2.1 Agroecology practices | Indonesia

The Indonesian economy depends heavily on the production of agricultural commodities and therefore, over the years, there has been a dramatic increase in the number of pesticides registered nationwide . Farmers are the main targets of poor marketing promoting the sale of pesticides. Unethical marketing and promotions sometimes create financial incentives for farmers to buy pesticides, insecticides or fungicides for agricultural purposes, even though they would prefer switching to non-chemical pest control.

Gita Pertiwi promotes agroecology practices and teaches women farmers about harmful chemicals to avoid and to read labels before they purchase and use it.

Agroecology practices introduce safer alternatives of pest control and agricultural practices that consider connections between plants, animals, humans and the environment within agricultural systems.

Community monitoring is also introduced as a mechanism of self-protection. Female farmers are encouraged to report harmful pesticides found in their areas to the authority

Gita Pertiwi trained women farmers to recognise harmful chemicals and read labels in agricultural products.
Photo credit: Gita Pertiwi

As both mothers and farmers, women in rural areas often take their little children to their workplace, be it agricultural lands or mining sites. Knowing the products they are using is important not only for themselves, but also for their families.
Photo credit: PAN Asia-Pacific

6.2.2 *Electronic wastes dropzone* | *Indonesia*

Household electronic wastes are not strictly regulated in Indonesia. A young boy, Rafa Jafar, or RJ, did his school project when he was twelve and came up with the idea to distribute e-waste drop boxes in several places in Jakarta.

His mother helped him contact a couple of electronic waste processing companies near Jakarta to collaborate with RJ. The companies agreed to accept RJ's waste drop boxes, dismantle them and then report back to RJ on how many elements were recovered.

RJ's initiative was replicated by several institutions, including the Environmental Agency of Jakarta.

RJ's activism also inspired many young people to explore similar initiatives in other areas. He is now continuing his campaign with battery collection boxes in several shops labelled as 'Batt-Man box,' which won the grand prize in a student science competition in Seoul, South Korea. Occasionally, on Sundays, RJ also puts his waste dropbox at a car-free day event in the centre of Jakarta.

At the Indonesian stakeholders meeting organised as part of the project, participants agreed that clearer regulations regarding household electronic waste collection and its disposal should be developed to tackle the growing number of electronics equipment products in Indonesia.

RJ, 15, with his waste dropbox. Photo credit: Sanitasi.or.id

RJ's team designed a battery collection box labelled as 'The Batt Man' box. Photo credit: RJ ewaste

7. Conclusions and next steps

Nigeria

There is already a lot of information available on POPs in Nigeria. The NIP for the Stockholm Convention (2016) developed by the Federal Ministry of Environment has an extensive analysis and plan of action to address this major challenge.

The 2016 NIP identifies a number of gender mainstreaming actions (action 3.2.2) with a focus on female farmers. However, in principle, all actions of the NIP have a gender dimension, and these could be further elaborated. The limitation of the NIP is that its full implementation requires significant resources, including from the private sector, through the above-mentioned extended producer responsibility programmes, as well as other international support.

The experts interviewed - from the Federal authorities, universities, business and civil society - as part of the scoping study and filming carried out by WEP and WECF in January and February 2017, identified some key concerns which related specifically to the gender dimensions of chemical and waste challenges in Nigeria:

1). Men working with PCB oils and pesticides in environments polluted by e-waste need to be provided better protective equipment by employers and the State (in case of informal activities). It is also of fundamental importance to organise nation-wide campaigns to raise awareness of potential health risks, including infertility, and explain how to take measures to protect oneself from exposure to these hazardous chemicals. A key ally for such an awareness-raising campaign could be the union of truck drivers. The truck drivers have already been key in raising awareness about HIV / AIDS.

Meeting with the Deputy Head of the Environment Agency. Photo credit: WEP

2). Women are more likely to be exposed to hazardous chemicals in informal settings, such as the household. Their higher illiteracy rates and the fact that they are usually not the primary targets of awareness raising campaigns mean that they often have less access to information, fewer resources and weaker decision-making power. This must be addressed by overall gender equality policies in Nigeria to promote women's empowerment, education and equal rights to resources and decision-making as well as equal opportunities.

Left: Young men exposed to hazardous pesticides and POPs at work have a higher risk of infertility than those not working with harmful chemicals. Phase-out of hazardous chemicals and promoting safer alternatives need to be supported by all stakeholders. Photo credit: Youth Farm Project, Nigeria

Women may be indirectly exposed to pollutants their husbands bring home from work (in work clothes and gear). Through their activities, women may also be risking their own health unknowingly, e.g., by eating contaminated clay during pregnancy (a common practice in Nigeria and other African countries), using PCB-contaminated cooking oil, burning plastic waste in their neighborhoods, using lead and mercury in small-scale mining activities, or using pest control chemicals without protection. To reduce risks to women, a more comprehensive approach is needed, including the engagement of women's civil society organisations. Women will often have limited access to medical care and are rarely included in pensions or Medicare by employers, so that chemical health damage has an even greater negative impact.

3). Informal workers, the internally displaced, children and other vulnerable groups need special attention in policies and actions addressing chemicals and waste. For the most deprived groups of society, often the only way to survive is to be engaged in informal activities such as waste scavenging. Some reports estimate that a significant amount of workers in these informal sectors are women, children and internally displaced groups of the population While aiming to end open waste burning and promote the safe collection and management of e-waste, plastic waste, PCB waste and other hazardous substances, policies need to help bring these vulnerable groups out of the informal sector and into safer jobs.

Some of the good practices visited during the scoping study and presented in the previous pages, show that a number of initiatives are already taking place with often modest budgets. These include information and awareness-raising efforts about risks and safety measures to take to reduce exposure to harmful substances regulated by the BRS conventions.

As a follow-up to the scoping studies, possible pilot actions will be identified on gender, chemicals and waste. These pilot actions could include a stronger institutionalization of gender policies in government, as well as projects on the ground on gender and women's priorities in both Nigeria and Indonesia.

Top: Women farmers near Abuja.

Middle & bottom: Ms Billikiss Abiola, the founder of Wecyclers community plastic collection business in Lagos, Nigeria.

Photo credits: Images from the film, 'What has gender got to do with chemicals?' Camera: Laure Poinsot

Indonesia

In Indonesia, the NIP for the Stockholm Convention also provides a lot of information and indicates several areas of concern, for example high levels of unintentionally produced POPs from open burning and contaminated soils which are not cleaned before housing construction takes place. The information has not been sound enough to take sufficiently strong regulatory measures. The two other chemicals and waste conventions, the Basel and Rotterdam Conventions, are not as well-known and would benefit from stronger implementation measures. This also goes for the new Minamata Convention on mercury.

The main challenges for Indonesia include the fast growth of the use of new POPs and flame retardants, of e-waste and plastic waste, and the lack of facilities to contain and destroy POPs. A waste incinerator is being built, but plans to use the fly-ash - which contains a concentration of harmful chemicals - in road building. This finds little support from environmental experts who fear a widespread dissemination contamination as it cannot be guaranteed that the fly-ash chemicals will remain contained inside the asphalt. Other solutions should be investigated.Furthermore, the 'recycling' of hazardous waste – e.g. hospital waste, plastics, e-waste – is mostly left to the informal sector, which lacks safety measures and controls. The Ministry of Environment has gender expertise, and even a budget allocation for gender-specific activities, but thus far little priority has been given to chemicals and waste activities. The Stockholm Convention NIP identifies 'women' as a target group for awareness raising, but could use more specific actions to address women's concerns and priorities and to promote their involvement in decision-making on matters of chemicals and waste .

The Indonesian experts who contributed to the scoping study in February 2017, – from national authorities, universities and civil society, – identified some key areas of need for gender action, some which have found interest from the government to be further pursued:

1) Men are mostly working in the industrial sectors (metal, automotive, electronics) where they lack sufficient occupational health protection. For example, clusters of disease and the mortality of men working in the asbestos industry are documented, but the factories continue to be allowed to operate, despite the strong recommendation by the World Health Organization to phase out all asbestos production and use and to apply the PIC procedure established under the Rotterdam Convention. Occupational health protection from substances listed under the BRS conventions must be strengthened immediately.

2) Women in Indonesia are more represented in the informal sector than in the formal sector. Due to gender-based discrimination, women have less information, protection and income to mitigate any negative health effects from exposure to harmful chemicals, ensuring medical insurance, child and health care in particular for informal female workers would be one of the needed measures.

3) Women in the informal sector work with highly hazardous substances, such as mercury in home-amalgamation as part of their ASGM activities, dioxins and furans emitted from open waste burning and 'recycling' of plastics, as well as highly hazardous pesticides such as endosulfan. When these women fall ill, or their children do, they can access some basic social security services but this often is not enough to keep them out of poverty. The informal waste scavenger organisation runs its own medical services as, otherwise, thousands of informal waste workers would not have access to any medical care.

4) Women are consumers and through gender roles, which often make them responsible for the care of other family members, they can be agents of change through responsible consumer choices. There are many examples of good practice, such as women campaigning for a ban of lindane in child lice treatments, female farmers receiving training about highly hazardous pesticides, teachers' organisations campaigning for waste reduction with pupils and organizing awareness campaigns against skin bleaching creams that contain mercury. Government agencies are already cooperating with these women on their initiatives, which could become a part of Indonesia's NIP for the Stockholm Convention.

Pregnant women workers call to end precarious work condition in their workplaces and allowing them to have a healthy pregnancy while maintaining their jobs. Photo credit: Aktual/Komunitas Solidaritas Perempuan Kendari

List of interviewees

Nigeria

Mr Oluyomi O Banjo, UNIDO Regional Office for Nigeria

Prof. Robert Barouki, Epidemiologist & POPs expert, National Institute of Health and Medical Research, France

Mr Idi Maleh, Deputy Director, Department of Environmental Pollution Control, Federal Ministry of Environment, Nigeria

Dr Lawrence Anukam, Director of NESREA, Nigerian Environmental Standards & Regulation Enforcement Agency, Nigeria

Ms Saibu Ganiat Arike, Electronics Technician, Ikeja Computer Market

Mr Adesanza Taiwo, Media Consultant on E-waste

Dr Michael P Okoh, Phd, University of Abuja, Suleja, Dept. of Biochemistry, College of Health Sciences

Mr Williams Ngwakwe, President of FADAMA, Association of Farmers, Nigeria

Mr George Richards, Managing Director & Co-Founder, Green Cycle Resource Waster Management Ltd

Ms. Billikiss Abiola, Founder and Director, WeCycle, Nigeria

CSP James Vandefan, Former Commander SARS, Nigerian Police

The president of the Abuja Region Scavengers Association

Indonesia

Ibu Ir. Sinta S. Soemiarno, MSc, Director for Performance Evaluation of Hazardous Waste and Non Hazardous Waste Management at Ministry of Environment

Mr Sharad Adhikary, Environmental Health Advisor at World Health Organization Indonesia

Rio Deswandi, PCB National Project manager, UNIDO

Yenny Widjaja, Gender and Livelihood Technical Associates at UNDP Indonesia,

Dr Agus Haryanto, Head of Chemistry Research Centre (Pusat Penelitian Kimia), LIPI (Indonesian Science Institute)

Dra. Ratna Irawati, Apt, M.Kes, Director of Standardisation Therapeutic Products and Traditional Cosmetics, Indonesian Drugs and Food Administration (BPOM)

Budi Susilorini, Country Director of Blacksmith Institute/Pure Earth Indonesia

Rossana Dewi, Advisor, Gita Pertiwi Foundation, agroecology activist

Farahdhiba Tenrilemba, Secretary General Association of Indonesian Breastfeeding Mothers (Asosiasi Ibu Menyusui Indonesia/AIMI)

Rafa Jafar, Ewaste RJ movement

Bunda Anna, HIMPAUDI (Association of Early Childhood Facility Managers)

Kristi Wulan, Krea Asia, anti-Lindane activist

Bagong Suyoto, Coordinator of Recycler and Scavengers Association Bantar Gebang and Sumur Batu landfills

Wiranta Yudha, Director of LION (Local Initiative for OSH Network), Indonesia, representative of Ina-BAN (Indonesia Ban Asbestos Network)

Brigitta Isworo, Senior Humaniora Journalist, Kompas

Molly, contributor, Jakarta Post

References

Abarikwu SO. 2013. Causes and Risk Factors for Male-Factor Infertility in Nigeria: A Review. African Journal of Reproductive Health 17(4):150-166.

Abbey, M., et al. 2017. Prevalence and pattern of birth defects in a tertiary health facility in the Niger Delta area of Nigeria. Int J Womens Health 9:115-121. DOI:10.2147/IJWH.S108905 PMCID: PMC5339003

AlÁfghani, M. A. and Paramita, D. 2016. Polychlorinated Biphenyls (PCBs) Phasing-Out Regulation in Indonesia. Final Report. UNIDO. Available: https://crpg.info/docs/pcb/UNIDO%20PCB%20Final%20Report.pdf

BaliFokus. 2013. Mercury Hotspots in Indonesia: Selected ASGM Hotspots Poboya and Sekotong. Available: https://docs.wixstatic.com/ugd/13eb5b_b7c61267630c47d0bd1db3111f46481c.pdf

Bell, L., et al. 2017. MERCURY in women of child-bearing age in 25 countries. IPEN. Available: http://ipen.org/sites/default/files/documents/updateNov14_mercury-women-report-v1_6.pdf

Bhattacharya. T., et al. 2017. Social Reproduction Theory. Remapping Class, Recentering Oppression. Pluto Press. eBook ISBN: 9781786801586

Carpenter, D. O. 2006. Polychlorinated biphenyls (PCBs): Routes of exposure and effects on human health. Rev Environ Health 21(1):1-23.

Ekanem, T. B., et al. 2011. Incidence of congenital malformation in 2 major hospitals in Rivers state of Nigeria from 1990 to 2003. Eastern Mediterranean Health Journal 17(9).

Ekanem, T. B., et al. 2009. Prevalence of congenital malformations in Cross River and Akwa Ibom states of Nigeria from 1980-2003. DOI: 10.1111/j.1741-4520.2008.00204

Eskenazi B, Marks AR, Bradman A, Harley K, Barr DB, Johnson C, et al. 2007. Organophosphate pesticide exposure and neurodevelopment in young Mexican-American children. Environ Health Perspect 115(5):792-798.

Gore AC, Crews D, Doan LL, La Merrill M, Patisaul H, Zota A. 2014, December. Introduction to Endocrine Disrupting Chemicals (EDCs): A Guide for Public Interest Organizations and Policy-Makers. Endocrine Society and IPEN.

Greig, J. et al. 2014. Association of Blood Lead Level with Neurological Features in 972 Children Affected by an Acute Severe Lead Poisoning Outbreak in Zamfara State, Northern Nigeria. PLOS ONE 9(4): e93716. https://doi.org/10.1371/journal.pone.0093716

Harrad, S. E. (2001). Persistent Organic Pollutants Environmental Behaviour and Pathways of Human Exposure. Kluwer Academic Publishers.

Human Rights Watch. 2016. The Harvest is in My Blood. Hazardous Child Labor in Tobacco Farming in Indonesia. ISBN: 978-1-6231-33504. Available: https://www.hrw.org/sites/default/files/report_pdf/indonesia0516web_0.pdf

Ilyas, M., et al. 2011. Characterization of polychlorinated biphenyls and brominated flame retardants in sediments from riverine and coastal waters of Surabaya, Indonesia. Marine Pollution Bulletin 62 (2011) 89-98.

Ismawati, Y. 2011. Opening the Pandora's Box of Poboya: The Social and Environmental Production of Suffering in Central Sulawesi, Indonesia. Environmental Change Institute, School of Geography and the Environment, University of Oxford. Available: https://www.academia.edu/9961553/Opening_the_Pandora_s_Box_of_Poboya_The_Social_and_Environmental_Production_of_Suffering_in_Central_Sulawesi_Indonesia

Ismawati, Y, et al. 2017. Mercury trade and supply in Indonesia. BaliFokus. Available: https://docs.wixstatic.com/ugd/13eb5b_bf0b2658eccf40cc9dbbb3a6514e9d64.pdf

Ita, E.O. 1993. Inland Fishery Resources of Nigeria. CIFA Occasional Paper No 20. Rome, FAO. Available: http://www.fao.org/docrep/005/T1230E/T1230E00.htm

Llop, S., Lopez-Espinosa, M. J., Rebagliato, M., Ballester, F. 2013. Gender differences in the neurotoxicity of metals in children, Toxicology 311(1-2): 3-12.

Lo, Y., Dooyema, C. A., Neri, A., Durant, J., Jefferies, T., Medina-Marino, A., et al. 2012. Childhood Lead Poisoning Associated with Gold Ore Processing: A Village-Level Investigation — Zamfara State, Nigeria, October-November 2010. Environ Health Prospect 120(10): 1450-1455. DOI: 10.1289/ehp.1104793

Mahmudah, Muamilatul, Wahyuningsih, Nur Endah, Setyani, Onny. 2012. Kejadian Keracunan Pestisida Pada Istri Petani Bawang Merah di Desa Kedunguter Kecamatan Brebes Kabupaten Brebes. MEDIA KESEHATAN MASYARAKAT INDONESIA Vol 11, No 1 (2012): MKMI.

Manhart, A., Osibanjo, O., Aderinto, A., Prakash, S. 2011. Informal e-waste management in Lagos, Nigeria: Socio-economic impacts and feasibility of international recycling co-operations. Freiburg, Germany: Öko-Institute.V.

Marks, A. R., Harley, K., Bradman, A., Kogut, K., Barr, D. B., Johnson, C., et al. 2010. Organophosphate pesticide exposure and attention in young Mexican-American children: The CHAMACOS Study. Environ Health Perspect 118(12):1768-1774.

Mergler, D. (2012). "Neurotoxic exposures and effects: gender and sex matter! Hanninen Lecture 2011." Neurotoxicology 33(4): 644-651.

Ministry of Environment and Forestry (MoEF). 2014. Review and Update of National Implementation Plan for Stockholm Convention on Persistent Organic Pollutants in Indonesia. Jakarta, 149 pp.

Ministry of Environment of Indonesia. 2014. Review and Update of National Implementation Plan for Stockholm Convention on Persistent Organic Pollutants in Indonesia.

Murphy, H. H., Sanusi, A., Dilts, D. R. Yuliantiningsih, S., Djajadisastra, M., Hirschhorn, N. 2000a. Health Effects of Pesticide Use Among Indonesian Women Farmers. Part I: Exposure and Acute Health Effects. Journal of Agromedicine, 6:4, 27-43, DOI: 10.1300/J096v06n04_05

Murphy, H. H., Sanusi, A., Dilts, D. R. Yuliantiningsih, S., Djajadisastra, M., Hirschhorn, N. 2000b. Health Effects of Pesticide Use Among Indonesian Women Farmers. Part II: Reproductive Health Outcomes. Journal of Agromedicine, 6:4, 27-43, DOI: 10.1300/J096v06n04_05

Nigeria Federal Ministry of Environment. 2009. National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (POPS) Final Report. Abuja, Nigeria.

Nigeria Federal Ministry of Environment. 2016. Updated National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants. Mabushi, Abuja.

Nigerian Environmental Society. Identification and Control of POPs Contaminated Sites in Lagos, South western, Nigeria. April 2006, Lagos, Nigeria.

Obire, O., Amusan, F. O. 2003. The environmental impact of oilfield formation water on a freshwater stream in Nigeria. J Appl Sci Environ Manag 7(1): 61-66.

Okoh, M. P. 2016. Exploration, Mining and Energy Generation in Nigeria: Exposure to Organo-Chlorinated Compound and Other Chemicals - Environmental and Public Health Implications. Modern Environmental Science and Engineering 2, no. 02: 100-10. doi:10.15341/mese(2333-2581)/02.02.2016/006.

Oluwole, O., Cheke, R. A. 2009. Health and environmental impacts of pesticide use practices: A case study of farmers in Ekiti State, Nigeria. International Journal of Agricultural Sustainability 7(3), 153-163.

Osibanjo, O. 2002. Organochlorines in Nigeria and Africa. The Handbook of Environmental Chemistry Vol.3, Persistent Organic Pollutants. Springer-Verlag Berlin Heidelberg, pp 321-354.

Plumlee, G. S., et al. 2013. Linking Geological and Health Sciences to Assess Childhood Lead Poisoning from Artisanal Gold Mining in Nigeria. Environmental Health Perspectives 121(6).

Pollard, K. M. 2012. Gender differences in autoimmunity associated with exposure to environmental factors. J Autoimmun 38(2-3): J177-186.

Rauh, V. A., Garfinkel, R., Perera, F. P., Andrews, H. F., Hoepner, L,, Barr, D. B., et al. 2006. Impact of prenatal chlorpyrifos exposure on neurodevelopment in the first 3 years of life among inner-city children. Pediatrics 118(6):e1845-e1859.

Reeuwijk, N. M., Talidda, A., Malisch, R., Kotz, A., Tritscher, A., Fiedler, H., et al. 2013. Dioxins (polychlorinated dibenzo-p-dioxins and polychlorinated dibenzo-furans) in traditional clay products used during pregnancy. Chemosphere 90 (5): 1678-685. doi:10.1016/j.

Shelton, J. F., Geraghty, E. M., Tancredi, D. J., Delwiche, L. D., Schmidt, R. J., Ritz, B., et al. 2014. Neurodevelopmental disorders and prenatal residential proximity to agricultural pesticides: The CHARGE Study. Environ Health Perspect 122(10):1103-1109.

Sudaryanto, A., Takahashi, S., Tanabe, S. 2007. Persistent Toxic Substances in the Environment of Indonesia in Developments in Environmental Science, Volume 7. Ch. 13. A. Li, S. Tanabe, G. Jiang, J.P. Giesy and P.K.S. Lam (eds). Elsevier Ltd. ISSN: 1474-8177/DOI:10.1016/S1474-8177(07)07013-1

Sudaryanto, A., Kunisue, T., Kajiwara, N., Iwata, H., Adibroto, T.A., Hartono, P.,Tanabe, S., 2006. Specific accumulation of organochlorines in human breastmilk from Indonesia: levels, distribution, accumulation kinetics and infant health risk. Environ. Pollut. 139, 107-117.

Suyoto, B. 2015. Malapetaka Sampah, Kasus TPA Bantar Gebang, Kasus TPA/IPLT Sumur Batu, Kasus TPST Bojong.

Tijani, A. A., and N. A. Sofoluwe. 2012. Factors determining the extent of pesticide use in Nigerian farms. Journal of Agricultural Economics and Development 1 (1): 1-9.

Trasande et al. 2016. Economic implications of mercury exposure in the context of the global mercury treaty: Hair mercury levels and estimated lost economic productivity in selected developing countries. J Environ Manage 183:229-235. doi: 10.1016/j.jenvman.2016.08.058.

United Nations. n.d. Comtrade database. Available: https://comtrade.un.org/data/

United Nations Environment Programme (UNEP). 2011. UNEP Environmental Assessment of Ogoniland. Nairobi: United Nations Environment Programme.

United Nations Population Fund (UNFPA). 2017. Worlds Apart. Reproductive health and rights in an age of inequality. State of the world population.

Women Engage for a Common Future (WECF). 2017a. 'Plastic speelgoed, door recycling, vervuild met giftige stoffen uit electronisch afval.'

WECF. 2017b. "What Has Gender Got to Do with Chemicals?" (film).

World Bank. 2016. The Cost of Fire: An Economic Analysis Of Indonesia's 20515 Fire Crisis. Jakarta, 12 pp. Available: http://pubdocs.worldbank.org/en/643781465442350600/Indonesia-forest-fire-notes.pdf

World Health Organisation (WHO). 2016. Dioxins and their effects on human health.

YFarm Project. 2016. Youth Eco-Smart Projects Book. Nigeria.

This publication has been produced as part of a project implemented by WECF International, BaliFokus Foundation and Women's Environmental Programme for the BRS Secretariat, 2017.

Available online at: http://www.wecf.eu/english/publications/2017/GenderandWaste_casestudy.php

This publication has been produced as part of a project implemented
by WECF International, BaliFokus Foundation and Women's Environmental Programme
for the BRS Secretariat, 2017.

Available online at:
http://www.wecf.eu/english/publications/2017/GenderandWaste_casestudy.php

Cover page top photo credit: Balifokus, WECF and Aktual/Komunitas Solidaritas Perempuan Kendari

WECF Netherlands
Korte Elisabethstraat 6
NL – 3511 JG Utrecht
Phone + 31 - 30 - 2 31 03 00
Fax + 31 - 30 - 2 34 08 78

WECF Germany
St.-Jakobs-Platz 10
D – 80331 Munich
Phone + 49 - 89 - 23 23 93 80
Fax + 49 - 89 - 23 22 39 38 11

WECF France
Cité de la Solidarité
Internationale
13 Avenue Emile Zola
F – 74100 Annemasse
Phone + 33 - 450-49 97 38
Fax + 33 - 4 50-49 97 38

wecf I Women Engage for a Common Future
www.wecf.org