Project Document

Government of Ghana

United Nations Development Programme

PCB Management in Ghana, from Capacity Building to Elimination

Brief description

This project is aimed at strengthening the capacities and capabilities of government officials and stakeholders outside of government to address PCB identification, and manage existing sources of PCBs as well as their elimination/destruction, as identified as a priority in the National Implementation Plan for Persistent Organic Pollutants for the Republic of Ghana.

The project develops and implements a strategy, and the required steps, from the current unsustainable management of PCB-containing equipment to sound management and disposal practices. The strategy commences by strengthening the legal framework and the management capacity both within government institutions and among PCB holders. The project will also eliminate, as a first step, the PCB-containing equipment, mainly transformers, and in a second step start phasing out PCB-contaminated equipment. The project is the first major step to meet the obligations of Ghana under the Stockholm Convention.

Ghana is the first country in the sub-region that has developed a Full Size Project (FSP) of this nature to eliminate PCBs as required under the Stockholm Convention. The experiences obtained during the implementation of the project will be shared with the other countries in the sub-region that are currently developing concrete phase-out activities. The project is part of the general strategy of Ghana to significantly improve power production and distribution and to strengthen the management of the sector.

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Acronyms

ECG	Electricity Company of Ghana
FSP	Full Size Project
GAEC	Ghana Atomic Energy Commission
IOMC	Inter-Organization Programme for the Sound Management of Chemicals
GEFAD	Ghana Energy Development and Access Project
NEX	National Execution Modality in UNDP projects
NIP	National Implementation Plan
PCBs	Polychlorinated biphenyls
PCB-containing	Pure PCB oil or equipment intentionally filled with PCBs
PCB contaminated	Mineral oil contaminated above 50 ppm or equipment containing such oil
PDF-B	Programme Development Funding, type B
SBC	Secretariat of the Basel Convention
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNITAR	United Nations Institute for Training and Research
VRA	Volta River Authority

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SECTION I: Elaboration of the Narrative

PART I: Situation Analysis

Context and global significance

The Stockholm Convention on Persistent Organic Pollutants requires Parties to discontinue production and use of intentionally-produced POPs and minimize releases of unintentional, by-product POPs. PCBs are the only intentionally-produced POP which have been predominantly used in industrial applications. Experiences in different countries and regions on managing PCBs has highlighted the need for capacity building and technical assistance for developing countries to ensure that PCB- containing or PCB-contaminated wastes do not unnecessarily cause releases and environmental or human exposure. The Stockholm Convention requires parties to set up safe management and ensure that adequate steps are taken for phasing out any material containing PCBs above a concentration of 50mg/kg by 2025.

Ghana has, as national reporting for Stockholm Convention, developed a National Implementation Plan (NIP) on POPs, including information on the PCBs and status of PCB management in the country.

While PCBs have never been manufactured in Ghana, they have been legally imported in significant quantities in transformers and capacitors. The NIP investigations revealed that there are possibly significant quantities of PCB-containing transformers and capacitors in Ghana. Further investigations confirmed that some 2-3% of the transformer park contains pure PCBs and a further 13% of transformers are PCB-contaminated to a level higher than the threshold set in the Stockholm Convention.

The Ghana NIP acknowledges the challenges posed by PCBs and rates PCB management as one of the top priorities, agreed among NIP stakeholders, within and outside of government. The pertinent PCB actions as laid down in the NIP are included in Annex I.

The PCB situation in Ghana, as unfolded during the preparatory stage of this project, is typical for the region and current stage of economic development. However, the example and determination of the Ghanaian society to respond to the arising problem of PCB management gives a heightened global significance to the project. Ghana is the first country in sub-Saharan Africa to develop a single country Full Size Project (FSP) that aims at addressing PCB-containing equipment throughout their life-cycle, in line with the requirements of the Stockholm Convention. It can be expected that the example set by Ghana will be followed by other countries, particularly in Africa. The determination and demonstration of "can-do" attitude will increase the global significance of the project many-fold.

The global/regional significance will also be amplified by the PCB management experience gathered during the project and will be very relevant for the other countries in the region that are currently preparing their activities to eliminate PCB-containing equipment. Addressing PCBs in Ghana by introducing proper handling and management as well as safe disposal of the PCB-containing waste streams would reduce the releases of these POPs regionally and ultimately globally.

Finally and importantly, the project will safely dispose a minimum of 160 tons of PCB-containing transformers with approximately 40 tons of pure PCBs and approximately 5 tons of PCB-containing capacitors. The project will further set-up a system of safe collection of low-contaminated PCB oils with subsequent disposal through exports. This scheme will establish washing of transformer formerly containing low PCB-contaminated oils and recovery of metal in Ghana. It is estimated that 35 PCB-contaminated transformers are phased-out yearly, which would total the safe disposal of 450 tons of contaminated material including 150 tons of PCB-contaminated oils and associated non-cleanable waste. All these actions will destroy considerable quantities of PCBs and eradicate these from global circulation.

Threats, root causes, and barriers analysis

For several decades, Ghana, like virtually all countries, has imported transformers and electrical equipment with PCBs as dielectric fluid. Very little attention was given to the chemical composition of the dielectric fluids during the time of imports. The electro-technical performance and the costs were the guiding criteria, and in any case the awareness of possible environmental and health consequences of PCB exposure was not high.

Unmanaged PCB-containing equipment and materials will give rise to releases of PCBs during all stages of their life-cycle. During operation, maintenance workers will be exposed; and improper re-use will expose oil-recyclers and end-users, which in the local context can be ordinary consumers. Released PCB oils will bio-accumulate in biota and bio-magnify in higher tiers of the food webs. This will lead to harmful effects in wildlife and disrupt the balance in ecosystems. Also, humans, at top of many food chains, will be affected by the higher exposure to PCBs through this route.

It is difficult, due to absence of systematic monitoring and research data from Ghana, to ascertain the influence of PCB releases and exposure to wildlife and human health. While no data points to a widespread contamination of food or water sources, elevated local PCB-contamination does occur in places where PCB-containing equipment has been manipulated or where installed equipment has been leaking. With an aging transformer park, the probability of increased failure rates in the pure PCB-containing transformers is augmented every year. Breakdown of a PCB-filled transformer could lead to widespread contamination or even worse acute effects in the case of fire. The age of many transformers is well above normally expected service life (see annex I), which seriously increases the risk of leakage.

The lack of awareness is still the main barrier to safe PCB management in Ghana. Practically all other identified barriers and unpreparedness to manage PCBs safely can be derived from the lack of awareness. Only in recent years PCB management has been given some attention. To better identify the required steps and find the most appropriate ways to tackle the challenges in PCB management in Ghana, this awareness barrier has been divided into three barriers, namely, (i) legal and administrative; (ii) technical and infrastructure; as well as (iii) financial barriers.

Legal and administrative barriers

There are no legal provisions covering PCBs in the Ghanaian regulatory framework. Consequently, little attention has been given to identify PCBs or taking precautions in the different stages of the management of the substances. Without legal obligations, all action taken by PCB holders are voluntary. Indeed, the only administrative action taken in Ghana pertaining to PCBs is an internal Directive of the state owned electricity distribution company, Electricity Company of Ghana (ECG), that banned importation of PCB containing equipment in 1972. However, due to a lack of enforcement mechanisms, this action has had little or no effect in practice. Although regulatory and enforcement action can in principle be taken based on the Environmental Protection Agency Act (EPA Act), this has not been done so far.

Due to the lack of regulatory coverage of PCBs, no sub-legislation or guidelines on PCB imports/ exports, storage, handling, transportation, or disposal exist. As government resources are already stretched by mandatory legal obligations, no administrative structures have been developed to manage various aspects of PCBs and PCB-containing equipment.

There exists consequently an overarching regulatory and administrative barrier for having clear management roles and responsibilities among different ministries and within central and local administrations. The underlying administrative barrier results in an absence of systematic structures for PCB reporting and control as well as clear technical guidelines on various risky stages in PCB management. In addition, the level of knowledge about PCBs and appropriate measures for managing them are not adequate among concerned government institutions and employees to develop clear guidance for PCB holders.

Technical and infrastructure barriers

The technical and infrastructure barriers can be identified throughout at practically all stages of the PCB management cycle, stretching from PCB identification to final disposal of PCB-containing and PCB-contaminated material. It should further be acknowledged that the technical and infrastructure barriers exist both in the government (control) as well as in the PCB holding companies.

Though the responsibility of the safe management of PCBs is a shared responsibility, the main responsibility for ensuring proper functioning of equipment, regular maintenance for avoiding releases, and regarding transport, storage, and disposal, lies with the holder of the equipment.

Technical barriers at government

For the government technical barriers can be mainly identified in the analysis capacity for identifying/ verifying PCB content in various samples. The primary need is found among the identification of PCBs at points of entry in the country (customs) as well as pursuing any future enforcement action. The technical capacities to analyse PCBs in all types of matrices is lacking, making overall environmental and food quality monitoring difficult in addition to the problems for enforcing polluter pays and other obligations in cases of releases.

Technical barriers among PCB holders

The technical barriers for proper PCB management are mainly know-how related: the PCB holders are not knowledgeable in proper equipment identification and handling practices for equipment in-service. There exists no technical knowledge of how to plan and set-up proper temporary storage sites or how PCB risks can be mitigated during transport. Further, the possible disposal options for different PCB waste streams are not clear.

1. In-service equipment

Tracking and identification of PCBs

There are several barriers for efficiently identifying and tracking PCB-containing equipment in Ghana. The main barrier is due to the limited knowledge of how to identify PCB equipment and measure possible contamination. The companies do not take the possible presence of PCBs into account in their current management system. The presence of PCBs is not covered at the procurement stage, making it possible that new (re-conditioned) equipment or maintenance oils contain PCBs. The difficulties with PCB equipment identification is further aggravated by the poor administrative practices where potential PCB holders do not keep a systematic register on the presence and distribution of their equipment and related basic information such as date of manufacture, brand, properties, location, maintenance, etc.

The pure PCB equipment may be identified by type of and technical information on the equipment, as well as simple testing. However, for quantitative analysis of PCBs, the equipment holders share the same technical barriers as governmental actors. These barriers will be more impeding when the main emphasis is shifted from management of pure PCB equipment to PCB-contaminated ones.

2. Maintenance operations

Another pressing technical and infrastructure barrier for PCB holders is ensuring that appropriate practices are implemented throughout the PCB handling and maintenance cycle. Currently, all equipment is maintained in common maintenance lines and stations, which is a serious cause of cross-contamination between PCB(-containing) equipment and non-PCB-containing equipment. The technical and organizational challenges lie in ensuring that such cross-contamination no longer occurs.

Further, very little attention has been given to protecting workers during maintenance of potential PCB-containing equipment. There is very little knowledge, and even less use, of appropriate personal protection as well as possible action during leaks, spillages, etc.

3. Equipment disconnection, transportation, and storage

PCB holders have adequate technical knowledge and practices from an electro-technical point of view for carrying out transformer (and capacitor) disconnection, equipment movement, and transportation. The above operations become, however, somewhat more complicated when PCB exposure needs to be taken into consideration. PCB exposure to personnel and spill prevention as well as avoiding any unnecessary risks to the communities and environment needs to be carefully included together with the overall efficiency of the operation. Also, vehicles and drivers need to be technically updated and prepared for any eventualities. This knowledge and technical preparedness is largely lacking among PCB holding organizations in Ghana.

The knowledge of proper storage and minimization of releases during storage of PCB-containing equipment is also new territory for PCB holders. There exists infrastructure and practice (know-how) barriers both at central storages as well as provincial collection points.

Disposal of PCB waste streams

The disposal of PCBs is a barrier with both technical and financial dimensions. While no existing installation in Ghana is able to handle PCB waste, technical or at-least knowledge barriers exist for tendering export disposal of PCBs in compliance with international standards and agreements.

Further, technical barriers have been identified in setting-up transformer draining and cleaning facilities for equipment with different degrees of PCB-contamination. No consideration is currently being given to the nature of the drained dielectric fluid, nor are measures taken to treat the drained fluids as hazardous waste. Again the main barrier concerns the planning and establishment of the technical set-up and ensuring the safety of such operations rather than a lack of hands-on skills to perform the required action and the supervision of such operations in practice.

Financial barriers

The management of PCBs—as this entails equipment replacement and hazardous waste disposal—is extremely costly, particularly in a developing country setting with restricted possibilities of passing on increased management costs to final consumers.

The role of government in PCB management is largely regulating and controlling, hence the cost of establishing proper PCB management for the government ministries and services is not huge. It will mainly require administrative and legal work and skills updating. In addition, resources for setting-up and running costs of enforcement infrastructure and training are needed. However, in a developing country context, hiring appropriate expertise and other essential tools for raising the skills and capacity of the administration and technical services may prove prohibitive for setting-up the structures.

For PCB holders the cost for sound PCB management and equipment replacement/phase-out are considerable. Calculations for different scenarios for PCB management by equipment holders in Ghana sets the price tag for PCB holders between US$ 3-15 million depending on the scope, approach, and timeline chosen for managing the issues. Nearly all of these expenses are in addition to the normal operational and investment budgets among the PCB holders. With a less than well-off client base, the companies, particularly the electricity distribution companies, can hardly transfer the additional costs of PCB equipment replacement and disposal to end-consumers. The financial barrier for these PCB holders is further aggravated by competing needs for investment, particularly ensuring undisturbed supply of electricity through-out the country and further expanding the electricity grid to remote parts of the country. As Ghana faces a serious energy crisis (which began several years ago), the need for investment in additional infrastructure for production and distribution is a major challenge that the government is currently trying to tackle together with the sector. Replacement of PCB-containing equipment has to financially compete with this major challenge.

ix. Identification and management of contaminated sites including remediation; and
x. Research into the extent of exposure of the population to POPs and the search for safer alternatives.

It is further foreseen that the NIP will form an integral part of the national integrated chemicals management programme and the implementation strategy would be based on the following principles:

- Public and stakeholder participation;
- Transparency in information sharing and exchange;
- Adherence to polluter-pays-principle;
- Integration with overall environmental management and sustainable development policies;
- Adherence to and use of technologies and applications of international standards;
- Commitments regarding public awareness and education; and
- Adherence to international requirements.

Main PCB holding sectors

Volta River Authority (VRA) is the sole electricity generating company in Ghana. The overall electricity generation capacity is 7,300 GWh (2006). This is made up of 4,800 GWh hydro and 2,457 GWh thermal energy respectively.

VRA sells power to seven major bulk customers. The biggest customer is the Volta Aluminium Company (VALCO) in Tema, followed by Electricity Company of Ghana (ECG). Bulk sales are also made to a number of smaller industrial and mining consumers. From a PCB point of view it is important to note that these bulk consumers are transforming and distributing the purchased energy with their own equipment and systems. Industry consumes around 70% of the supplied electricity, while the residential use stands for approximate 25%, and public and commercial use makes up for the balance.

Apart from power generation VRA also has a transmission system made up of 42 substations and approximately 4,000 kilometres of transmission lines that cover the entire country. VRA further distributes electricity directly to end-users in parts of Ashanti, Brong-Ahafo, Northern, Upper East and Upper West Regions, as well as the northern parts of the Volta Region.

ECG is responsible for the distribution of the bulk of local electricity consumption in Ghana. It operates principally in the six southern regions of Ghana, with the most dense transformer network.

Ghana, like many countries in the region has been facing problems meeting the growing electrical power demand. Consequently, the government is in the process of developing a five-year plan with the strategic goal of addressing the difficulties within the sector, particularly those on infrastructural development, institutional reforms, and regulatory lapses including inadequate pricing. It has been estimated that Ghana requires approximately US$ 4.5 billion in the short- to medium-term to meet the infrastructure requirements for reliable and efficient production and supply of energy.

These plans are already being put in practice also with assistance of the international monetary institutions like the African Development Bank, which has recently granted a US$ 45 million concessional credit for such upgrading work in Kumasi.

While such investments aim to increase power supply, a sizeable distribution loss reduction can be also be achieved by developing a more efficient transmission and distribution system. This provides an opportunity to also replace PCB transformers and ensure a safe phase-out of PCB-containing equipment.

Stakeholder analysis

The NIP highlights the priority given by all sectors to the implementation of the Stockholm Convention and in particular to the sound elimination of PCBs. Strengthening the environmental sector at all levels has been a long standing priority of the government of Ghana.