National Implementation Plan (NIP) Update for the Stockholm Convention on Persistent Organic Pollutants (POPs) for The Gambia

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Preface

The use of chemical products to enhance and improve life is a widespread practice worldwide: they protect agricultural crops against disease and infestation, they remove weeds where they are not needed, they combat vermin in and around homes and above all, they enable or enhance industrial processes.

However, as beneficial as these products may be, their unguided use pose potential hazards to the user, the consumer and the environment.

For the past 40 years, awareness has been growing about the threats posed to human health and the global environment by the ever-increasing release in the natural environment of synthesized chemicals. Mounting evidence of damage to human health and the environment has focused the attention of the international community on a category of substances referred to as Persistent Organic Pollutants (POPs).

POPs are chemicals that persist in the environment accumulate in high concentrations in fatty tissues and are biomagnified through the food chain. Hence, they constitute a serious environmental hazard that comes to expression as important long-term risks to individual species, to ecosystems and to human health.

Health effects of POPs chemicals on humans may include cancer, allergies and disorders in the reproductive and immune systems as well as in the developmental process, and constitute a particular risk to women and children who may be exposed to high levels through breast-milk and food.

Some of these substances are pesticides, while others are industrial chemicals or unwanted by-products of industrial processes or combustion.

The decision also includes PCBs (mainly used in electrical equipment) triggering most of the mentioned toxic effects and globally present in human milk above tolerable daily intake of WHO.

With the evidence that POPs are transported to regions where they have never been used or produced, the international community decided in 1997 to work towards a convention that will serve as an international legally binding instrument to reduce and /or eliminate releases of twelve POPs identified by a UNEP Governing Council Decision.

The initial list of POPs contains nine pesticides including aldrin, chlordane, DDT, dieldrin, endrin, toxaphene, heptachlor, hexachlorobenzene, and mirex. Industrial chemical polychlorinated biphenyls (PCBs) and unintentional by-products polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/PCDFs).

The Stockholm Convention includes a mechanism, criteria and a procedure to identify and assess and list further POPs as candidates for international action. From 2009 to 2017 sixteen new POPs were listed and additional two POPs were listed in 2019.

Aware of the health concerns resulting from local exposure to Persistent Organic Pollutants, and in particular impact upon women and, through them, upon future generations and considering the vulnerability of a population with a low level of awareness, The Gambia has recognised the need and has over the years taken courageous steps towards the development of an institutional framework for the sound management of chemicals to support a rapidly growing industrial and agricultural sector.

The Gambia signed the SC on POPs in June 2001 and ratified in April 2006, and has also signed and ratified a number of other International and Sub-regional accords and agreements for the sound Management of Chemicals including the Rotterdam Convention on Prior Informed Consent (PIC), the Basel Convention on the Transboundary movement of hazardous wastes and their disposal, the Bamako Convention, the Montreal Protocol on substances that deplete the ozone layer, and the Common Regulations for the Registration of Pesticides in the Sahel, and the Minamata Convention on Mercury.

The Stockholm Convention aims at the reduction or complete elimination of POPs, which pose a major threat to human health and the environment. Under the Convention, all signatories are required to develop National Implementation Plans (NIP) to demonstrate how the obligations of the convention will be implemented. A salient part of the NIP is for parties to create a POPs inventory and to make an assessment of contaminated equipment and sites.

The Gambia received through UNEP as GEF implementing agency GEF capacity building support for enabling activities to strengthen her ability to implement a systematic and participatory process for the preparation and production of the NIP through multi-stakeholder participation.

The overall objective of the NIP update project is to strengthen National Capacity in developing a national framework for the effective and sound management of chemicals in general and POPs in particular develop a national framework for the protection of human health and the environment from the negative effects of POPs. The Gambia is committed to the full Implementation of the Stockholm Convention on Persistent Organic Pollutants and there are indications of consistent multi-sectoral and high-level participation by stakeholders.

Executive Summary

The Stockholm Convention (SC) on Persistent Organic Pollutants (POPs) was adopted on 22 May 2001 in Stockholm, Sweden. The Convention entered into force on 17 May 2004 for the protection of human health and the environment from these hazardous substances. The SC imposes a worldwide ban or control on the production and trade of POPs pesticides, POPs used in industrial processes and consumer goods and requires the reduction and minimization of the unintentional production and release of unintentional POPs from industrial and combustion processes.

The Gambia has signed the Stockholm Convention on 23. May 2001and ratified the Convention on 28. April 2006. The Convention entered into force for The Gambia on 27 July 2006.

Article 7 of the SC requires each Party to develop, and endeavour to put into practice, a plan setting out how it will implement its obligations under the Convention. Therefore, The Gambia has developed its National Implementation Plan (NIP) to meet the country's obligations to the Stockholm Convention. The NIP is transmitted to the Conference of the Parties through the Secretariat of the Stockholm Convention.

The NIP describes how The Gambia will fulfil its obligations under the SC to eliminate or reduce POPs releases and carry out environmentally sound management of stockpiles of POPs containing wastes and contaminated sites that pose high risks to human health and the environment. The action plans described in the NIP should be mainstreamed into the related goals and strategies of these national plans.

The current NIP has addressed the POPs listed up to 2013 (COP6). The action plan also included initial activities to address the POPs listed in 2015 (COP 7) and 2017 (COP8).

The goals of the NIP are:

I. To describe the actions that The Gambia has undertaken regarding the inventory, management and reduction of the presence of POPs;
II. To propose actions that The Gambia will undertake in order to manage and eliminate POPs, as well as for preventing these chemicals from entering the environment;
III. To inform the Conference of the Parties and The Gambia's stakeholders about the national initiatives and projects designed to meet the requirements of the SC.

The NIP comprises of three chapters:

Chapter 1 provides an overview of the aims and goals of the NIP, as well as the process for the development of the NIP;

Chapter 2 outlines The Gambia's demographic, political and economic status and it gives basic information on The Gambia's status regarding the management of POPs;

Chapter 3 presents an overview of recommended activities, strategies, action plans, and presents priorities, capacity-building needs, time frame for implementation strategy and estimated resource requirements.

During the NIP formulation the situation of the POPs has been assessed and inventories have been developed. The following are the main assessments made;

POPs pesticides: POPs pesticides are not used in The Gambia anymore. POPs pesticides are banned except of PCP and sulfluramide. Some pesticides are illegally smuggled into the country and some counterfeit pesticides might be sold in the country and it cannot be excluded that some POP pesticides might enter the country via these two routes. Endosulfan has been used until recently. For two areas (GHE and the old cotton project store in Basse) Endosulfan was uncovered with five hundred litres (500 L) of Endosulfan stock at GHE and three hundred and sixty-five litres (365 L) Endosulfan stockpiled in the old cotton store in Basse.

During the 1999 obsolete pesticides clean-up and export, the pesticide stores were cleaned-up. During the exercise, all the pesticide stocks were identified, packaged and transported to a central location, prior to shipment abroad for final disposal. These sites were revisited during the inventory exercise and no re-stocking of obsolete pesticides was found.

No data on PCP treated wood and leather waste could be identified during the inventory.

DDT: The Gambia government re-introduced DDT for malaria vector control in 2010 to address the issue of resistance to the existing insecticides at the time used. The DDT formulation and used quantity for the period 2010 to 2014 was 72,582 kg containing 544 kg DDT. The use of DDT for malaria control has been stopped since 2014. Instead Bendiocarb is used as an alternative to DDT for the control of malaria in The Gambia with associated health risk. There is the need to venture into environmental control measures in order to reduce reliance on chemicals that are prone to resistance with transience of time. Integrated Vector Management approaches taking into account both environmental and chemical measures would save the environment as well as reduce reliance on synthetic chemicals.

The Gambia has developed within the National Malaria Control Program (NMCP) a partnership framework for malaria control. Within this frame The Gambia's endeavour to participate in the International Initiatives, especially with the Global Alliance for Alternative to DDT in the near future.

The DDT stock balance at 12/2014 was 1125 kg. NMCP intends to keep the balance for control studies during routine vector control activities but there is no plan for the re-introduction of DDT for malaria control.

Polychlorinated biphenyls (PCBs) and polychlorinated naphthalenes (PCNs): PCB-containing equipment and materials, such as transformers, capacitors, hydraulic oils, and possibly, PCB-containing materials for open applications (eq. paints, cables etc.) have been imported in the past.

Most PCB-containing or contaminated equipment can be found in the electricity generation sector, which is owned by government enterprises.

During the inventory, it was found that 63 transformers containing PCBs were decommissioned. These transformers are considered waste and can be found in various NAWEC sub-stations and not as one stockpile stored at a central location.

There is no data available on the amount and type of the transformers in their various storage facilities. These transformers could be found to be leaking in various locations and in different magnitudes. The sites were the PCB transformers are likely stored have been marked as potentially PCB contaminated.

The updated inventory revealed in 2015 a total number of 19 PCBs containing transformers. Compared to the 2006 inventory 53 PCB containing transformers were missing. It is reported that some PCB-containing equipment were unofficially scrapped and sold to metal scrap

dealers. The quantity and type of equipment sold as scrap is unknown. Most likely the missing PCB transformers were also partly scrapped.

Furthermore, in The Gambia, there is no Sound Environmentally Management (ESM) particularly of PCBs and waste oils. Local motor bicycle mechanics and Blacksmiths re-use PCB oils in their operations. These result in a high exposure risk for workers and for people working with re-used PCB oils.

There was no data on capacitors containing PCBs. There are no large and old capacitors in the NAWEC system. Recently four new capacitors were introduced, but since these are all manufactured after the year 2000, they should not contain PCBs. Most of the inspected small capacitors were produced after 1990 and therefore assumed to be PCBs free. It is therefore concluded that even if small capacitors that are made before 1990 (and possibly PCBs containing) do exist in The Gambia this must be minimal.

PCBs in open applications like paints and sealants were not assessed in this inventory. Currently a UNITAR/UNDP project for managing PCBs has started which will finalize the PCB inventory and initiate the management of PCB stocks.

Polybrominated diphenyl ethers (POP-PBDEs): The Global E-waste Monitor 2017 estimated a total of 2,200 tonnes of e-waste was generated in Gambia in 2016. This amount is containing approximately 440 tonnes of polymeric fraction partly contaminated by POP-PBDEs. A Tier I estimate for cathode ray tube casings were conducted considering penetration rates from another African country. Based on this it was estimated that 1129 tonnes of CRT plastic casings are in use/stock in Gambia containing 1 to 2.9 t of c-OctaBDE with 0.54 to 1.5 t of POP-PBDEs listed 2009. A preliminary EEE inventory conducted for CRTs indicated that only 680 t of CRT plastic is currently in use/stock with 0.28 to 0.81 t of POP-PBDEs listed2009. Gambia has no WEEE inventory at the national level, therefore no estimate for PBDEs in WEEE could be made.

For the transport sector, the total estimated amount of PUR foam in imported vehicles (2007 to 2011) was 328 tonnes with an estimated 0.46 tonnes of c-PentaBDE.

Overall this can be considered a lower estimate since decaBDE listed as POP in 2017 has not been considered in this inventory but is the PBDE with the highest former production and use quantity.

Hexabromocyclododecane (HBCD): One polystyrene foam plant is present in the country. This company imports expanded polystyrene (EPS) beads, heat it, convert it into foam and mould it into shapes mainly for insulation in construction of buildings. No HBCD or any other flame retardant was discovered in the production. HBCD was used in plastic in EEE but at lower quantity than PBDEs. HBCD was also used in textiles and floor mats in vehicles. These are likely present in The Gambia but the amount could not be estimated. Also the use of HBCD in specific textiles like curtains in public buildings or uniforms for fire fighters or military has not been addressed in this inventory.

Perfluorooctane sulfonic acid (PFOS): The main stocks of PFOS and related substances are likely firefighting foams. At firefighting stations and dealer of firefighting materials, no PFOS was found in use or on sale however fluoroprotein foam (FFFP) might contain PFOS or other PFASs but this was not mentioned on the label of the foams. Also synthetic carpets imported to The Gambia in particular before 2002 might contain PFOS. Other current uses were not discovered in The Gambia (sulfluramide pesticide, aviation hydraulic fluid or chromium plating or other industrial uses).

PFOS treated textiles and paper mainly produced before 2002 have short service life and have largely entered end of life and are in dumpsites with associated releases. Together with former use of firefighting foams the dumpsites can be considered potential PFOS/PFAS contaminated sites.

Unintentionally-produced POPs (UPOPs): The inventory of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs) was compiled for inventory year 2016. The total emission from inventoried sources were 28.4 g TEQ/a. The highest share of PCDD/PCDF released stem from open waste burning with an estimated release of 23 g/a (77% of total). The second most relevant source was PCDD/F in wastes (3.2 g TEQ; 11.5%) and health care waste hospital waste incineration (3 g TEQ; 10.4%). Some sources could not be quantified (e.g. forest fires) and some sources are underestimated due to incomplete data (e.g. hospital waste incineration; informal metal smelting) and therefore the inventory is a lower estimate.

The baseline inventory from 2000 was updated with the emission factors from the 2013 toolkit. By this update the former estimate of 176.4 g TEQ was reduced to 41.4 g TEQ due to reduced emission factors for open burning. A comparison of the recalculated baseline inventory with the updated inventory from 2016 (28.4 g TEQ) demonstrated an overall decrease of 13 g TEQ (31%). This was mainly caused by a reduction of open waste burning. There was an increase in release from medical waste incineration (3 g TEQ compared to 1.5 g TEQ) observed due to the increase in incineration of hospital waste. PCDD/Fs are representative of other unintentional UPOPs in sources present in The Gambia and a reduction of PCDD/F result in a similar reduction of other UPOPs.

An initial assessment of POPs-contaminated sites was conducted. For all POPs categories, contaminated sites likely exist for most POPs categories in The Gambia.

POP pesticides contaminated sites are the former storage sites and ware houses were POPs pesticides were stored for decades. While stocks have been removed, the soils and buildings were not cleaned. These (former) stores and sites are likely contaminated with related exposure risk for humans close by.

14 sites have been identified by the task team as being likely contaminated **by PCBs** and all these sites are situated within the Greater Banjul Area (G.B.A). These are locations of transformers with PCB oil, some of which have been leaking for some time and are believed to have contaminated the sites.

POP-BFR (PBDEs, HBCD) containing wastes (plastic/polymers from electronics, vehicle interior or insulation foams) end up in dumpsites or are thrown into the environment in trenches and along roadside. So the major dump sites could be considered as potential POP-BFR impacted sites.

PFOS released of the last 50 years to soil and ground- and surface water have likely accumulated in these environmental matrices or have been further transported in the environment.

PFOS contaminated sites in The Gambia have likely been generated at sites were PFOS containing fire-fighting foams were used for training and in fires dumpsites where PFOS containing synthetic carpets, textiles and paper were disposed.

Potentially PCDD/PCDF or other UPOPs contaminated sites in The Gambia include:

a) Application sites of (formerly) PCDD/PCDF containing pesticides and other chemicals

b) Timber manufacture and treatment sites

c) PCDF contamination in PCB polluted sites

d) Surrounding of waste incinerators and ash disposal areas

e) Dumps of wastes/residues from source groups

However, there is limited assessment and analytical capacity in the country to ascertain this premise.

Laboratory capacity was assessed in the country and this revealed that there is inadequate capacity both in terms of trained personnel and equipment

POPs management and destruction capacity were also evaluated. There exists no capacity in this regard.

An assessment scheme exists in the country for monitoring POPs pesticides. However, there is currently no particular assessment of industrial chemicals used in The Gambia.

Chapter 3 include the Policy Statement (3.1), and strategies for NIP implementation (3.2):

- Strengthening the coordination between institutions and stakeholders and development of capacity and knowledge in the relevant committees
- Adequate legal, institutional, administrative and technical infrastructure
- Synergies among related Multilateral Environmental Agreements (MEAs)
- Addressing POPs substitution and Clean Material Cycles within implementation of sustainable consumption and production (SDG12)

Section 3.3 of this NIP outlines the action plans, including respective objectives, activities and strategies for POPs management in The Gambia with suggested time frames for implementation and responsible implementing authorities and participating implementers and stakeholders. Individual action plans have been developed which can support the overall management of POPs and hazardous chemicals impacted waste fractions, support the development of BAT/BEP and improving research in environmental monitoring, in recycling and industrial releases as well as contributing to:

- Institutional and regulatory strengthening measures including development of legislation
- Measures to reduce or eliminate releases from intentional production and use POPs pesticides and highly hazardous pesticides (SAICM synergy) - import and export, use, stockpiles/waste and disposal as well as implementation of IPM and organic farming
- PCBs – inventory, storage, management, import and export, use, and disposal
- POP-BFRs (PBDEs, HBCD and HBB) - regulation and life cycle management
- PFOS and related substances – life cycle management and synergies use, stockpiles, and wastes. To promote the synergy of the Stockholm Convention and SAICM, the action plan is extended where appropriate to other PFAS which are an issue of concern in SAICM.
- Register for specific exemptions and the need for exemptions (Article 4)
- Measures to reduce releases from unintentional production (PCDD/Fs and other UPOPs) including integrated pollution prevention and control.
- Identification and management of stockpiles, waste and articles in use, including release reduction and appropriate measures for handling and disposal (Article 6)

- Identification of contaminated sites of Annex A, B, and C Chemicals and, where feasible, remediation in an environmentally sound manner
- Facilitating or undertaking information exchange and stakeholder participation
- Public/stakeholder awareness, information awareness and education (Article 10)
- Effectiveness evaluation (Article 16)
- Reporting (Article 15)
- Research, development and monitoring/analytical capacity (Article 11)
- Technical and financial assistance (Article 12 and 13)

In Chapter 3.4 priority activities and capacity building are compiled. The main priority action areas include:

- Strengthening coordination between institutions and stakeholders and development of capacity and knowledge in the relevant working committees of the National Environmental Conservation and Climate Change Central Committee
- Development of legislation and related implementation
- Education, information and awareness raising
- Management of POPs stockpiles (PCBs/PCNs, pesticides; POP-PBDEs, HBCD and PFOS)
- Improvement of waste management and introduction of waste hierarchy for reduction of unintentionally formed POPs from open burning
- BAT/BEP for dioxin/UPOPs reduction and integrated pollutant prevention and control
- Monitoring of POPs, effectiveness evaluation and initiate research and collaborations
- Substitution of POPs in use and selection of green and sustainable alternatives
- Contaminated sites assessment and management

In Section 3.5 strategies for financing of the NIP are shortly compiled. Financial resources needed for implementation of priority activities are roughly estimated.

The ability of the country to fulfil its obligations under the POPs Convention depends on adequate financial and technical assistance. The Gambia needs technical and financial assistance from international donors and will seek this assistance when implementing its NIP. By mainstreaming of the NIP into Gambia's National Development Plan for possible co-funding from the national budget.

For the priority areas, tentative budget requirements have been estimated. For a range of activities information needed for estimating the cost will be generated during the implementation of the NIP to make a reasonable estimate. Considering the larger share of co-funding needed for GEF projects, appropriate and robust co-funding sources and approaches are needed. Therefore, approaches and strategies for funding and co-funding are compiled in Section 3.4.

Action plans on technical and financial assistance (Articles 12 and 13) have been developed (in Section 3.3) to enable the country to obtain the needed financial and technical support required for the successful implementation of activities and actions to be carried out to achieve the overall objectives of the POPs Convention.

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List of Abbreviations and Acronyms

ABS	Acrylonitrile-butadiene-styrene
AFFF	Aqueous film forming foams
BAT	Best available techniques
BC	Basel Convention
BEP	Best environmental practices
BFRs	Brominated flame retardants
BHC	Benzene hexachloride (hexachlorocyclohexane)
COP	Conference of the Parties
CRT	Cathode Ray Tube
DAS	Department of Agricultural Services
DDE	Dichlorodiphenyldichloroethylene
DDT	1,1,1-trichloro-2,2-bis (4-chlorophenyl)ethane
DLS	Department of Livestock Services
EDB	Ethylene Dibromide
EDCs	Endocrine disrupting chemicals
EEE	Electrical and electronic equipment
EIA	Environmental Impact Assessment
ELV	End of life vehicle
EPR	Extended Producer Responsibility
ESM	Environmentally sound management
EU	European Union
E-waste	Electronic waste
FAO	Food and Agriculture Organization
FSQA	Food Safety and Quality Authority
GBoS	Gambia Bureau of Statistics
GCCI	Gambia Chamber of Commerce and Industry
GDP	Gross domestic product
GEF	Global Environment Facility
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
G&SC	Green and Sustainable Chemistry
GWP	Global warming potential
HBB	Hexabromobiphenyl
HBCD	Hexabromocyclododecane
HCB	Hexachlorobenzene
HCH	Hexachlorocyclohexane
HCBD	Hexachlorobutadiene
HFCs	Hydrofluorocarbon
HHPs	Highly Hazardous Pesticides
HIPS	High Impact Polystyrene
ILO	International Labor Organization
IOMC	Inter-Organization Programme for the Sound Management of Chemicals
IPM	Integrated Pest Management
IPPC	Integrated Pollution Prevention and Control
IVC	Integrated Vector Control
L	Liters
LCD	Liquid-Crystal Display

LDCs	Least Developed Countries
MEAs	Multilateral Environmental Agreements
MOA	Ministry of Agriculture
MOBSE	The Gambia Ministry of Basic and Secondary Education
MOHERST	The Ministry of Higher Education, Research, Science and Technology
NAP	National Action Plan
NARI	National Agricultural Research Institute
NAWEC	National Water and Electricity Company
NCC	National Coordinating Committee
NEA	National Environment Agency
NEMA	National Environment Management Act
NEMC	National Environment Management Council
NGOs	Non-Governmental Organizations
NIP	National Implementation Plan
OCP	Organochlorine pesticides
ODS	Ozone Depleting Substances
OECD	Organisation for Economic Co-operation and Development
PAHs	Polyaromatic hydrocarbons
PBDEs	Polybrominated diphenyl ethers
PBTs	Persistent, bioaccumulative and toxicchemicals
PCBs	Polychlorinated biphenyls
PCDDs	Polychlorinated dibenzo-p-dioxins
PCDFs	Polychlorinated dibenzofurans
PCP	Pentachlorophenol
PCU	Project Coordinating Unit
PeCBz	Pentachlorobenzene
PFASs	Per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonic acid
PFOSF	Perfluorooctane sulfonyl fluoride
POPs	Persistent Organic Pollutants
ppm	parts per million
PSMS	Pesticide stockpile management system
PUR	Polyurethane
PVC	Polyvinyl Chloride
SAICM	Strategic Approach to International Chemicals Management
SC	Stockholm Convention
SCP	Sustainable Consumption and Production
SEA	Socio-Economic Assessment
SPC	Sahelian Pesticides Committee
t	Tonnes
TEQ	Toxic equivalent
UNEP	United Nation Environment Programme
UNFCCC	United Nation Framework Convention on Climate Change
UNIDO	United Nation Industrial Development Organization
UPOPs	Unintentionally produced POPs
WEEE	Electric and electronic equipment waste
WHO	World Health Organization

1. Introduction

Chapter 1 outlines the purpose and structure of the National Implementation Plan (NIP), including a summary of the Stockholm Convention (SC) on Persistent Organic Pollutants (POPs), its aims and its obligations. It also describes the mechanism used to develop the NIP and the stakeholder consultation process. A summary of the POP issues provide the context and background of the chemicals, their uses, and the problems they cause.

For the past 40 years, awareness has been growing about the threats posed to human health and the global environment by the ever-increasing release in the natural environment of synthesized chemicals. Mounting evidence of damage to human health and the environment has focused the attention of the international community on a category of substances referred to as Persistent Organic Pollutants (POPs). Some of these substances are pesticides, while others are industrial chemicals or unwanted by-products of industrial processes or combustion. POPs are characterized by persistence – the ability to resist degradation in various media (air, water, sediments, and organisms) for months and even decades; bio-accumulation - the ability to accumulate in living tissues at levels higher than those in the surrounding environment; and potential for long range transport – the potential to travel great distances from the source of release through various media (air, water, and migratory species).

Specific effects of POPs can include cancer, allergies and hypersensitivity, damage to the central and peripheral nervous systems, reproductive disorders, and disruption of the immune system. Most POPs are also considered to be endocrine disrupting chemicals (EDCs), which, by altering the hormonal system, can damage the reproductive and immune systems of exposed individuals as well as their offspring.

The realization of these threats led a number of countries to introduce policies and legal and regulatory instruments to manage an increasing number of these substances. However, because of POPs persistence and propensity to undergo trans-boundary movement, countries began to seek multinational co-operative actions.

Momentum to this process gave the 1992 Global Rio Conference on the Environment, where the principle of Sustainable Economic Development was introduced.

Concerning POPs the Chapter 19 of Agenda 21 is of special importance. A goal to be met by the year 2000 was set to achieve worldwide environmentally sound management of toxic chemicals, including prevention of illegal international traffic in toxic and dangerous products. Pursuant to this the Stockholm Conference established in 1994 the Inter-governmental Forum on Chemicals Safety (IFCS), through which countries regularly discuss their activities and priorities for the sound management of chemicals. Further, FAO, OECD, ILO, UNIDO, UNEP and WHO established in 1995 the Inter-Organization Programme for the Sound Management of Chemicals (IOMC), a co-operative agreement to co-ordinate linking and integrating their respective programmes in the area of chemical management and safety.

What was achieved so far thanks to these joint international efforts?:

- The Basel Convention on Transboundary Movements of Hazardous Waste was adopted in 1989 and entered into force 1992. 186 states, including The Gambia are parties to this convention.

- The Rotterdam Convention on Prior Informed Consent was adopted in 1998 and entered into force 24. 2. 2004. It has 73 signatories and 157 parties, including The Gambia.
- The Stockholm Convention on Persistent Organic Pollutants has been adopted in 2001. It entered into force 17. 5. 2004. It has 152 signatories and 182 Parties. The Gambia signed the SC on 23. 05. 2001 and ratified on 28. 04. 2006.
- UNITAR/IOMC Programme on National Profiles for Sound Management of Chemicals was developed in the late 90-ties. To date 60 countries, developed their National Profiles, 22 are in the process to do so and 30 requested funding to elaborate their NP.
- On regional level the Protocol on POPs to the UN ECE Convention on Long-range Trans-boundary Air Pollution has been adopted 1998, and has 36 signatories and 17 parties and entered into force in October 2003
- The Bamako Convention on the ban of the Import into Africa and the Control of Transboundary Movement of Hazardous Wastes within Africa was adopted in Bamako, Mali, on 30 January 1991. The Bamako Convention came into force on 10 March 1999.
- Sahel: Conscious of disastrous consequences that massive application of pesticides could have on an already disturbed fragile ecosystem as a result of drought, the nine (9) member countries of CILSS established the common regulations for pesticides in 1992 with the following main objectives:
  - a. To put together the expertise of the Sahelian countries
  - b. To avoid free circulation of banned products from one country to another.
  - c. To reduce the cost of pesticide registration on individual countries.
- The Minamata Convention on Mercury was adopted in Kumamoto, Japan on 10thOctober, 2013. The Gambia ratified the Convention on 20th October, 2016. There are currently 128 signatories and 102 Parties to the Minamata Convention including The Gambia.

GEF through its implementing and executing agencies is facilitating the worldwide implementation of the Stockholm Convention. Parties to the Stockholm Convention are required to develop National Implementation Plans (NIPs) describing how they will meet the obligations set by the Convention. The Gambia received through UNEP as GEF implementing agency capacity building support for enabling activities to strengthen its ability to implement a systematic and participatory process for the review and update of the initial NIP.

1.1. Stockholm Convention

The Stockholm Convention on Persistent Organic Pollutants was adopted on 22 May 2001 and entered into force on 17 May 2004.It imposes a worldwide ban on the production and trade in pesticides (Aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex, and toxaphene), two industrial chemicals (Hexachlorobenzene(HCB) and polychlorinated biphenyls (PCBs)) and two by-products of incineration processes, polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), from 2004 onwards.

In 2009, the COP by decisions SC-4/10 to SC-4/18, adopted amendments to Annexes A (elimination), B (restriction), and C (unintentional production) to list nine additional chemicals as POPs. These chemicals are the following pesticides: chlordecone, alpha hexachlorocyclo-hexane (HCH), beta HCH, lindane, pentachlorobenzene (PeCB); industrial chemicals:

hexabromobiphenyl (HBB), hexabromodiphenyl ether (hexaBDE) and heptabromodiphenyl ether (heptaBDE), PeCB, perfluorooctane sulfonic acid (PFOS), its salts and perfluoro-octanesulfonyl fluoride and related substances, tetrabromodiphenyl ether (tetraBDE and pentabromodiphenyl ether (pentaBDE); and unintentional byproducts: alpha-HCH, beta-HCH and pentachlorobenzene.

In 2011, the COP through its decision SC-5/3, adopted an amendment to Annex A (elimination) listing technical endosulfan and its related isomers.

In 2013, the COP in its decision SC-6/13, adopted an amendment to Annex A (elimination) by including hexabromocyclododecane (HBCD).

In 2015, through its decisions SC-7/12, SC-7/13 and SC-7/14, the COP adopted amendments to Annex A (elimination) and C (unintended production) listing hexachlorobutadiene (HCBD) and pentachlorophenol (PCP) and its salts and esters in Annex A, and polychlorinated naphthalenes (PCNs) in Annex A and C.

In 2017, through its decisions SC-8/10, SC-8/11 and SC-8/12, the COP adopted amendments to Annex A (elimination) and C (unintentional production) by adding decabromodiphenyl ether (commercial mixture, c-DecaBDE) and short-chain chlorinated paraffins (SCCPs) in Annex A. HCBD was additionally listed in Annex C. The POPs listed in 2017 are not assessed in this updated NIP. However, activities are proposed in the action plan to address these POPs in future.

Table 1 presents an overview of the POPs listed in Annex A, B and C of the SC as of 2017.

In the case of some POPs listed in Annexes A and B, the COP has adopted acceptable purposes and/or specific exemptions as presented in Table 2 below.

These substances are designated as POPs and are toxic, persistent and can be transported over great distances through the air or water. POPs can cause adverse effects on the environment and health because they accumulate in organisms. This can result in cancer, sterility and disruption of the immune system. Parties to the SC are obligated to develop, within two years of the ratification, a NIP describing the national situation with respect to the substances listed in the Convention and the strategies developed to implement their obligations under the SC. The SC also requires all parties to develop an Action Plan. In this National Action Plan (NAP) the parties must specify what strategies they would develop to meet the obligations of the SC.

The Gambia signed the SC in May 2001and ratified it on 28 April 2006. The Convention entered then into force on 27 July 2006.

Table 1. List of POPs in Annex A, B and C of the SC

Annex A (Elimination)	Annex B (Restriction)	Annex C (Unintentional Production)
Parties must take measures to eliminate the production and use of the chemicals listed under Annex A. Specific exemptions for use or production are listed in the Annex and apply only to Parties that register for them.	Parties must take measures to restrict the production and use of the chemicals listed under Annex B in light of any applicable acceptable purposes and/or specific exemptions listed in the Annex.	Parties must take measures to reduce the unintentional releases of chemicals listed under Annex C with the goal of continuing minimization and, where feasible, ultimate elimination.
Aldrin Chlordane Chlordecone Decabromodiphenyl ether (commercial mixture, c-decaBDE), Dieldrin Endrin Heptachlor Hexabromobiphenyl (HBB) Hexabromodiphenyl ether and heptabromodiphenyl ether Hexabromocyclododecane (HBCD) Hexachlorobenzene (HCB) Hexachlorobutadiene (HCBD) Alpha hexachlorocyclohexane Beta hexachlorocyclohexane Lindane Mirex Pentachlorobenzene (PeCB) Pentachlorophenol and its salts and esters (PCP, its salts and esters) Polychlorinated biphenyls (PCBs) Polychlorinated naphthalenes (PCNs) Short-chain chlorinated paraffins (SCCPs) Tetrabromodiphenyl ether and pentabromodiphenyl ether Toxaphene Technical Endosulfan and its related isomers	DDT Perfluorooctane sulfonic acid, its salts and perfluorooctanesulfonyl fluoride (PFOS, its salts and PFOS-F)	Polychlorinated dibenzo-p-dioxins (PCDDs) Polychlorinated dibenzofurans (PCDFs) Hexachlorobenzene (HCB) Pentachlorobenzene (PeCB) Polychlorinated biphenyls (PCBs) Polychlorinated naphthalenes (PCNs) Hexachlorobutadiene (HCBD)

Table 2. Acceptable purposes and/or specific exemptions for POPs listed in the SC

Chemical	Annex	Specific exemptions / Acceptable purposes	Related (decision)
Decabromodiphenyl ether (commercial mixture, c-decaBDE)	A	Production: As allowed for the parties listed in the Register Use: Vehicles, aircraft, textile, plastic housings, polyurethane foam for insulation, in accordance with Part IX of Annex A	SC-8/10
Hexabromocyclododecane	A	Production: As allowed by the parties listed in the Register of specific exemptions. Use: Expanded polystyrene and extruded polystyrene in buildings in accordance with the provisions of part VII of Annex A	SC-6/13
Hexabromodiphenyl ether and heptabromodiphenyl ether (c-OctaBDE)	A	Production: None; Use: Articles in accordance with the provisions of Part IV of Annex A	SC-4/14
Lindane	A	Production: None Use: Human health pharmaceutical for control of head lice/scabies as second line treatment	SC-4/15
Pentachlorophenol and its salts and esters	A	Production: As allowed for the parties listed in the Register in accordance with the provisions of part VIII of Annex A Use: Pentachlorophenol for utility poles and cross-arms in accordance with the provisions of part VIII of Annex A	SC-7/13
Perfluorooctane sulfonic acid, its salts and perfluorooctanesulfonyl fluoride	B	Production: For the use below Use: Acceptable purposes and specific exemptions in accordance with Part III of Annex B	SC-4/17
Polychlorinated naphthalenes	A and C	Production and use of polyfluorinated naphthalenes	SC-7/14
Technical endosulfan and its related isomers	A	Production: As allowed for the parties listed in the Register of specific exemptions Use: Crop-pest complexes as listed in accordance with the provisions of part VI of Annex A	SC-5/3
Tetrabromodiphenyl ether and pentabromodiphenyl ether (c-PentaBDE)	A	Production: None Use: Articles in accordance with the provisions of Part V of Annex A	SC-4/18
DDT (1,1,1-trichloro-2,2-bis (4-chlorophenyl) ethane)		Production: Use of vector control in accordance with Part II of this Annex Use: Use of vector control against diseases in accordance with Part II of this Annex	

Source: Stockholm Convention website

1.2. Goals and Provision of the Stockholm Convention

Among others, the provisions of the Stockholm Convention (SC) require each party to:

- Prohibit and/or eliminate the production and use, as well as the import and export, of the intentionally produced POPs that are listed in Annex A to the Convention (Article 3)
- Annex A allows for the registration of specific exemptions for the production or use of listed POPs, in accordance with that Annex and Article 4, bearing in mind that special rules apply to PCBs. The import and export of chemicals listed in Annex A can take place under specific restrictive conditions, as set out in paragraph 2 of Article 3.
- Restrict the production and use, as well as the import and export, of the intentionally produced POPs that are listed in Annex B to the Convention (Article 3)
- Annex B allows for the registration of acceptable purposes for the production and use of the listed POPs, in accordance with that Annex, and for the registration of specific exemptions for the production and use of the listed POPs, in accordance with that Annex and Article 4. The import and export of chemicals listed in Annex B can take place under specific restrictive conditions, as set out in paragraph 2 of Article 3.
- Reduce or eliminate releases from unintentionally produced POPs that are listed in Annex C to the Convention (Article 5)
- The Convention promotes the use of best available techniques and best environmental practices (BAT/BEP) for preventing releases of POPs into the environment.
- Ensure that stockpiles and wastes consisting of, containing or contaminated with POPs are managed safely and in an environmentally sound manner (Article 6)
- The Convention requires that such stockpiles and wastes be identified and managed to reduce or eliminate POPs releases from these sources. The Convention also requires that wastes containing POPs are not transported across international boundaries without taking into account relevant international rules, standards and guidelines.
- To target additional POPs (Article 8)
- The Convention provides for detailed procedures for the listing of new POPs in Annexes A, B and/or C. A Committee composed of experts in chemical assessment or management - the Persistent Organic Pollutants Review Committee, is established to examine proposals for the listing of chemicals, in accordance with the process set out in Article 8 and the information requirements specified in Annexes D, E and F of the Convention.
- Other provisions of the Convention relate to the development of implementation plans (Article 7), information exchange (Article 9), public information, awareness and education (Article 10), research, development and monitoring (Article 11), technical assistance (Article 12), financial resources and mechanisms (Article 13), reporting (Article 15), effectiveness evaluation (Article 16) and non-compliance (Article 17).

The Gambia is addressing the relevant provisions of the Stockholm Convention by the development and implementation of the SC National Implementation Plan.

1.3. National Implementation Plan

Article 7 of the SC requires that each Party must develop, and endeavour to put into practice, a plan setting out how it will implement its obligations under the SC. The SC imposes the

obligation on the parties to develop, within two years of the ratification of the Convention, a NIP describing the national situation in respect of the substances covered by the SC and the strategies that have been developed to implement their obligations under the SC and to transmit the NIP to the Conference of the Parties (COP).

The goals of the current NIP of The Gambia are:

- To describe the actions that The Gambia has undertaken regarding the reduction of the presence of POPs;
- To propose actions that The Gambia will undertake in order to manage and eliminate POPs from entering the environment considering the Convention;
- To inform the Conference of the Parties and The Gambia's community about national initiatives and projects designed to meet the requirements of the SC.

The NIP describes how The Gambia will fulfil its obligations under the SC to eliminate or reduce POPs releases to the environment and carry out environmentally-sound management of stockpiles of POPs-contaminated wastes and POPs-contaminated sites that pose high risks for human health and the environment, with a regional perspective.

The outcomes from the implementation of the NIP will include:

- The protection of public health from the effects of POPs;
- Meeting the obligations under the SC;
- A structured POPs management;
- Capacity building to maintain and monitor the quality of the environment; and
- The coordination with related national plans.

The NIP will be updated as necessary to reflect decisions made by the Government and by the COP - such as amendments to the SC or its annexes, including the addition of chemicals to annexes A, B or C, or adoption of guidance or guidelines.

1.4. NIP Development Methodology

1.4.1. Relevant Activities Preceding this Project

The Gambia, although faced with numerous constraints has already made some remarkable steps in the field of chemicals management, notably there is:

a) A multi-sectoral Hazardous Chemicals and Pesticides Control and Management Board need to be revitalized;
b) Pesticides Regulations operational with enforcement mechanisms in place;
c) Hazardous Chemicals Regulations in place;
d) Pesticide Formulation Laboratory established; further equipment and training needed
e) An Inspectorate established;

f) A viable registration scheme in place (prior to the adherence to the common CILSS registration system;
g) Environmental Management and Discharge Permit Regulation in place
h) A National Profile to assess the country's capacity to manage chemicals prepared;
i) A National Action Plan for Integrated Chemicals Management prepared;
j) Sensitisation and Education programs ongoing;
k) Database set up at Inspectorate (on imports, licenses, cases of violations);
l) A National Action Plan for Implementation of the Rotterdam Convention elaborated.

1.4.2. Implementation arrangements

The NIP review and update is a GEF funded project being executed by UNEP and implemented by NEA on behalf of The Gambian Government.

1.4.3. The Objectives of the NIP update

The overall objective of the NIP update was to develop a national framework for the protection of human health and the environment from the negative effects of POPs, through:

i. Review and update of plans for implementation of the Stockholm Convention in The Gambia;
ii. Assist The Gambia to meet reporting and other national obligations under the Convention;
iii. Strengthen National Capacity for the effective and sound management of chemicals in general and POPs in particular.

1.4.4. NIP update Implementation Method

To facilitate successful project implementation, the participation of all stakeholders in the management of POPs was found essential.

Recognizing the importance of stakeholder participation, the inception workshop was held on the 27th of December 2014 at the Baobab Holiday Resort, to map out strategies of implementation and to identify roles and responsibilities for different stakeholders.

The review and update of the NIP entails 5 phases:

Phase 1 - Determination of coordination mechanisms and organization of process;

Phase 2 - Training and establishment of a POPs Inventory and assessment of infrastructure;

Phase 3 - Priority setting and development of objectives;

Phase 4 - Formulation of National Implementation Plan

Phase 5 - Development of the National Implementation Plan and Endorsement by Stakeholders.

Activities by phases

Phase I

- Establishment of the National Coordination Committee (NCC) and a Technical Coordination Body called the Project Coordination Unit (PCU). The NCC is comprised of institutions (both public and private) that are involved in POPs management in the Gambia. These are:
    - National Environment Agency (NEA) - Chair
    - Permanent Secretary, Environment, Climate Change, Natural Resources & Forestry
    - Department of Agriculture – Plant Protection Services
    - Department of Livestock Services (DLS)
    - National Agricultural Research Institute (NARI)
    - Department of Public Health Services
    - Gambia Bureau of Statistics (GBoS)
    - University of The Gambia (Chemistry Unit)
    - National Water and Electricity Company (NAWEC)
    - Gambia Chamber of Commerce and Industry (GCCI)
    - Stay Green Gambia (Environmental NGO)
    - Food Safety and Quality Authority (FSQA)
- A National Consultant was identified and hired to assist in the implementation of the first and other phases of the NIP Review and Update;
- Consultations were held with heads of key institution to determine the level of involvement and awareness to these institutions with regards to POPs issues.

Phase II

An international consultant Dr. Roland Weber was identified and hired to assist in the implementtation of phase 2 to 5 of the project.

Seven multidisciplinary task teams, each headed by a team leader, were established around the following areas of interest:

1. POPs Pesticides;
2. DDT;
3. PCBs;
4. New listed industrial brominated POPs chemicals (PBDEs, HBCD, HBB);
5. New listed industrial fluorinated POPs chemicals (PFOS, PFOSF and related chemicals);
6. Unintentionally Produced POPs (UPOPs);
7. Information Dissemination, Education and Awareness Raising

National consultants were hired for the above work in each of these areas: POP pesticides; PCBs; unintentionally produced POPs; new industrial POPs and establishment of a POP information system.

Inventory development and assessment:

- Draft inventory for the individual POPs were developed by the national consultants;
- The inventory reports were reviewed and comments by the international consultant;
- The national consultants updated the inventory reports according to the comments and suggestions considering the national situation;

- The updated inventory reports were again assessed by the international consultant and further commented.
- Based on the comments, the national consultants finalized inventory reports.

Phase III

- Action plans and objectives of the initial NIP were reviewed and valid objectives and activities considered for the updated NIP;
- Draft action plan activities were developed and suggested within the inventory development by the individual consultants;
- The draft action plan suggestions were reviewed by the international consultant and further action plan options were added and suggested also taking into considering the first NIP
- The comprehensive data base established for PCBs and PCBs containing equipment in the first NIP were updated;
- The study which covered both agriculture and vector control POPs revealed that POP pesticides are not currently used in the country. The study has not however ruled out possible entry through our porous borders to weekly ("Loomo") markets;
- The preliminary inventories were assessed and commented by the international consultant and revert back to the national consultants

All task team reports were validated at a multi stakeholder workshop and by the NCC.

Report in each case study has been reviewed and present to NCC and international consultant for validation.

A task team was established under the Information Dissemination and Awareness Creation issue: Level of Awareness; Knowledge of health implications of Chemical especially POPs; Existence of appropriate information systems.

A socio-economic study and gender consideration study was developed by the information dissemination task team with the emphasize on pesticide use:

- Questionnaires were developed for the different targets groups; the farmers including vegetable gardens, rice growers, private applicators, the Alkalos and VDC chairpersons.
- The questionnaires were administered through Focused-Group Discussions (FGDs) at village level and one-to-one interviews with local vendors at the Lumos (open weekly markets) and local mobile vendors.
- Assessment report was compiled and reviewed by the international consultant and NCC
- The final report was used for awareness raising activities.

Phase IV

Activities under this phase included:

- Based on the final inventory reports the respective NIP chapters were updated with the updated inventory information
- For new listed POPs new chapters were developed for the individual POPs based on inventory reports;
- Based on the developed action plans, the action plan chapter were updated
- Identification, prioritization and development of objectives concerning POPs issues;

- o A socio-economic analysis of POP management and control;
- o A socio-economic analysis of the impacts of alternatives.

Action plan options were assessed by the NCC and action plans were refined.

Individual implementers and stakeholders were identified for the individual action plans and time frame suggestion were assigned for the individual activities.

Phase V

A complete updated NIP draft was developed and was reviewed by the NCC and other stakeholders.

At the same time the NCC and stakeholders validated all priority problems, objectives and management options as well as the structure and content of the NIP, in particular the action plans and strategies, and produced the first validated draft of the NIP document.

This draft was again reviewed and supplemented by the project team as necessary and appropriate, commented and validated by the NCC. The final draft was presented countrywide and finally endorsed by The Minister of Environment, Climate Change and Natural Resources

1.4.5. NIP structure

The NIP comprises of the following three chapters:

- Chapter 1 gives an introduction about the SC and its goals and provisions. It describes the development and the structure of the NIP. Overall, chapter 1 provides an overview of the aims and goals of the NIP, as well as the process for the development of the NIP;
- Chapter 2 outlines The Gambia's demographic, political and economic status. It elaborates on the environmental situation and the current status of the institutional, policy and regulatory framework. This chapter also presents the results of the assessment of POPs, focusing on the import and export, production, current and future use, registration, release, storage, disposal, and the potential impact. The POPs mentioned in this chapter are: POPs pesticides, PCBs, DDT, new POPs and unintentional POPs. The existing monitoring programmes, and the information exchange and awareness are also described in this chapter. Overall, it gives basic information on Gambia's status regarding the management of POPs;
- Chapter 3 presents an overview of recommended activities, strategies, and action plans. In addition, there is a budget related to the activities of the action plan;

1.5. Further considerations

1.5.1. Socio-Economic Assessment

A growing body of data on the links between pollution and health demonstrates the negative impacts, including contaminants from indoor exposure (e.g. heating/cooking, chemicals used indoor and chemicals in consumer products), outdoor air pollution, pesticide use and contaminated sites with highest impact on health in developing countries with an estimated 12

to 14 million death per year[1,2,3,] Open waste burning[4,5] and open biomass burning[6] contribute to the overall air pollution including particulate matter (PM10; PM 2.5). Dioxins/UPOPs, PAHs, and heavy metals together with plastics have a relevant contribution to open burning in urban area as fuel sources.5 Endocrine disrupting chemicals (EDCs) including POPs and their effects are main contributors to health-associated costs in industrial countries[7,8,9].A recent assessment suggests that environmental chemical exposures contribute a cost that may exceed 10% of the global domestic product.[10] The World Health Organization estimates the burden of disease from selected chemicals at 1.6 million lives in 2016.[11]Therefore, a more critical assessment of the burden of pollution from chemicals, industrial and other releases is needed.

Also the 2010 Luanda Commitment identified chemical management as one of the top health and environment priorities to be addressed to accelerate the implementation of the 2008 Libreville Declaration on Health and Environment in Africa. In this regard, the WHO and UNEP Joint Task Team (JTT) for the implementation of the Libreville Declaration developed in 2012 a framework to reduce chemicals risks to human health and the environment in Africa endorsed by the African Ministerial Conference on the Environment in October 2013.[12]

References to socio-economic assessment can be found throughout the text of the SC[13]. These references indicate the importance of a socio-economic assessment when implementing the obligations under the Convention and when developing the updated NIP.

Annex F gives information on socio-economic considerations of SC and provides an indicative list of items to be taken into consideration by Parties when undertaking an evaluation regarding possible control measures for chemicals being considered for inclusion into the Convention. The preamble to Annex F states that: “An evaluation should be undertaken regarding possible

[1]Prüss-Ustün A, Wolf A, Corvalán C, Bos R, Neira M (2016) Preventing disease through healthy environments: a global assessment of the burden of disease from environmental risks. WHO report. ISBN 978 92 4 156519 6

[2] The Lancet Commission on pollution and health. http://www.thelancet.com/commissions/pollution-and-health

[3] Other studies see these diseases as the major reason for death (Institute for Health Metrix& Evaluation; http://www.healthdata.org/gbd/publications)

[4]Wiedinmyer C, Yokelson RJ, Gullett BK (2014) Global emissions of trace gases, particulate matter, and hazardous air pollutants from open burning of domestic waste. Environ Sci Technol. 48(16), 9523-9530.

[5] Kumar S, Aggarwal SG, Gupta PK, Kawamura K (2015) Investigation of the tracers for plastic-enriched waste burning aerosols. Atmospheric Environment 108, 49-58.

[6]Yadav IC, Linthoingambi Devi N, Li J, Syed JH, Zhang G, Watanabe H. (2017) Biomass burning in Indo-China peninsula and its impacts on regional air quality and global climate change-a review Environ Pollut. 227, 414-427.

[7]UNEP & WHO (2013) State of the Science of Endocrine Disrupting Chemicals – 2012.

[8] Attina TM, Hauser R, et al. (2016) Exposure to endocrine-disrupting chemicals in the USA: a population-based disease burden and cost analysis. Lancet Diabetes Endocrinol. 4(12):996-1003.

[9]Trasande L, Zoeller T et al. (2015) Estimating Burden and Disease Costs of Exposure to Endocrine-Disrupting Chemicals in the European Union. J ClinEndocrinolMetab. 100(4), 1245–1255.

[10]Grandjean P., Bellanger M (2017) Calculation of the disease burden associated with environmental chemical exposures: application of toxicological information in health economic estimation. Environmental Health (2017) 16:123

[11] Global Chemicals Outlook II From Legacies to innovative solutions. Synthesis Report (2019).

[12]WHO (2015) Report by the World Health Organization on the engagement of the health sector in the Strategic Approach to International Chemicals Management. SAICM/ICCM.4/INF/3.

[13]UNEP (2007) Draft guidance on socio-economic assessment for national implementation plan development and implementation under the Stockholm Convention. UNEP/POPS/COP.3/INF/8.

control measures for chemicals under consideration for inclusion in this Convention, encompassing the full range of options, including management and elimination. For this purpose, relevant information should be provided relating to socio-economic considerations associated with possible control measures to enable a decision to be taken by the COP".

The COP in its decision SC-1/12 requested that the SC Secretariat, in collaboration with other relevant organizations and subject to resource availability, to develop among others, additional guidance on social and economic assessment, and in so doing, consider the particular circumstances of developing countries and countries with economies in transition. In response to that request, the Secretariat developed the draft guidance on socio-economic assessment for NIP development and implementation under the Convention. According to the guidance, the Socio-economic Assessment (SEA) is a systematic appraisal of the potential social impacts of economic or other activities such as the management of POPs in all sectors of society (including local communities and groups, civil society, private sector and Government). It is a means of analysing and managing the intended and unintended social impacts, both positive and negative, of planned interventions (policies, programs, plans and projects) and any social change processes invoked by those interventions. Social impacts are the changes to individuals and communities that come about due to actions that alter the day-to-day way in which people live, work, play, relate to one another, organize to meet their needs and generally cope as members of society.

In the context of managing POPs, social and economic impacts might include:

- contamination of air, water and soil and threat to food safety and drinking water safety;
- degradation of ecosystem services[14];
- vulnerability arising from exposure to POPs;
- deterioration or improvement in health[8];
- loss or improvement in livelihoods;
- changes in cost of living;
- cost of contaminated site management and remediation;
- changes in employment, income and workplace protection;
- changes in levels of equity of wealth distribution;
- opportunities for enterprise development (including Small and Medium Enterprises);
- changes in demand for public services, such as health and education

1.5.2. Gender policy in NIP development and implementation

Gambian women are not only child bearers and care takers. They are the majority in the agricultural sector, being the leaders in vegetables and rice production. Most women are household heads. Despite their tedious daily household chores, they are active actors in all

[14] Millennium-Ecosystem Assessment (2005) Ecosystems and Human Well-being: General Synthesis. http://www.maweb.org/documents/document.356.aspx.pdf

household economic, social, cultural and religious functions. The average percentages of women in vegetable and rice production are 97% and 84% respectively.

The statistics unfolded that women are the major users of chemicals. The rural-urban drift, the literacy rate and contemporary life style of the youths contributed immensely to the middle aged and elderly women being the majority in the agricultural sector thus, the vegetable and rice producers. Vegetables are grown in small plots by smallholder farmers on individual basis and through communal gardens mainly managed by women (ANR Policy, 2009-2015) and, nearly 88 percent of all women farmers in The Gambia are estimated to be engaged in individual or communal horticultural activities with related exposure to pesticides (ANR Policy, 2009-2015).

The Socio-Economic Assessment has assisted and will assist in taking actions that are appropriate and effective. Socio-Economic Assessment provides a basis for minimising the negative impact on the population and improving equitable outcomes for the most vulnerable groups. However, the Socio-economic Assessment lacks information on external costs. The unknown external costs can give rise to biased decisions and thus there is need to take precautionary approaches. The human resource capacity on Socio-economic Assessment in The Gambia is rather limited and needs to be improved throughout the NIP implementation.

Socio-economic Assessment helped in the development of the NIP and during its implementation. The results will assist in developing NIP communication strategies and rule out the worst excesses of inequitable impact.

For the Gambia the following socio-economic considerations and cost benefit analysis are highlighted as relevant:

a) Food and water safety (including POPs exposure of population)
b) Exposure of vulnerable and highly exposed groups
c) Management of chemicals and waste
d) Cost of destruction and end-of-life management and treatment of POPs and other hazardous waste
e) Cost of contaminated soil and site remediation

The socio-economic considerations mentioned above are highlighted as most relevant. Improper chemical and waste management play a relevant role.

2. Country baseline

Section 2 provides basic background information relevant to the NIP. It describes the current situation and state of knowledge in the country about POPs and the status of institutional and other capacity to address the problem.

2.1. Country profile

2.1.1 Geography and population

Located on the West African coast, The Gambia stretches about 480-kilometre inland from West to east on either side of the River Gambia. The country varies in width from approximately 50km near the mouth of the River to about 24 kilometres upstream. The Gambia is bound to the North, South and East by the Republic of Senegal and to the West by the Atlantic Ocean. The river Gambia runs the entire length of the country, thereby dividing its land area of 11,295 square kilometres almost equally into two halves- the South Bank and North Bank.

Figure 1. Map of The Gambia

The Gambia attained internal self-government from British rule in 1963 and full independence on the 18th February 1965. The country became a sovereign Republic within the Commonwealth in 1970. Maintenance of multi-party democracy and the adherence to the rule of law constitute an integral part of the country's political framework, which basically comprises of executive, the Legislature, the Judiciary and the Press. The President, who is elected every five years by universal suffrage, heads the government. Elections are also held every five years for members of the country's National Assembly.

English is the official language of the country on which all government matters are transacted. In addition to this, a number of local languages are spoken including, Mandinka, Fula, Wollof, Jola, and Sarahule.

The population of The Gambia is currently estimated at 1.8 million (2013 census). With its land area, this makes The Gambia one of the most densely populated countries in Africa with 173.9 persons per square kilometre. Out of this population, the urban population accounts for 57.8 % whilst 42.2 % accounts for the rural population. This distinction between urban and rural is predominantly based on the rapid rural urban drift with majority of the population now living in the urban areas. Thus, the rural economy is predominantly agricultural with urban settlements characterised by intense commercial activities as well as formal and informal sector employment.

In terms of gender distribution, there are 943,426 females to 913,755 males as (2013 census). The population is characterised by a youthful population with 42.7% below the age of 15 years. Life expectancy is 63.4 years. Currently, the literacy rate, which is at 55.1%, is higher among males (65.9%) than female (45.0%). There is an improvement, however, as the current Gross Enrolment Ratio (GER) at the basic education level incorporating Madrassa, is at 83%, of which girls enrolment is faster than that of boys.

2.1.2 Political profile

The Gambia is divided into seven Administrative Regions including the city of Banjul and Kanifing Municipality. Five of the Regions are further divided into Districts, which are headed by Chiefs, with a total 39 Districts in the country.

Under the new Local Government reforms and decentralisation, the country is divided into 8 Local Government Areas, two municipal Authorities (Banjul and Kanifing) and six Local Government Authorities (Brikama, MansaKonko, Kerewan, Kuntaur, Janjanbureh and Basse).

An analysis of the population by Local Government Areas (LGAs) shows that, Banjul, Kanifing and Brikama account for 1.7, 20.3 and 37.1 percent of the total national population, respectively. This implies an over concentration of 59.1% of the population in these three LGAs while the 40.9% live in the other 5 LGAs.

2.1.3 Profiles of economic sector

In common terms the Gambia is classified as a Least Developed Country (LDC) and is ranked 173 out of 188 in the United Nations Development Program Human Development Index, 2016. Like other countries in this category, it is characterised by a significant large agricultural and natural resources sector, a relatively small industrial sector and a large services sector dominated by government.

The agricultural sector is characterised by crop production and livestock production and fisheries contributes 21% of GDP, while industry and manufacturing sectors account for 9% and 4.8% GDP respectively (GBoS 2016). The services sector, which is dominated by the hotel industry and a vibrant informal sub-sector, contributes about 66% of GDP and is the main foreign exchange earner. The mineral resources in the Gambia include heavy mineral deposits such as ilmenite, quartz sand, kaolinite clay stones, plastic clay, laterite and cockleshells. The potential of the country regarding zircon is being investigated.

The structure of the sectors is shown in Tables 3 and 4. The Gambia's industrial (manufacturing and fish processing) is dominated by small facilities, 82%. Micro facilities form 14% while medium facilities form 7%.

Table 3. Overview of the Industrial and Agricultural Sectors

Sector	Contribution to Gross Domestic Product (%)	Number of employees / farming population	Major products	Remarks
Industrial / Processing / Manufacturing Sector	23	2862 (1995)	Fish, fruits, beverages, wood, iron and still, cement etc.	
Mining and Extraction	0.09	2500	Sand Clay Gravel	
Agricultural Sector	22 – 23	759,016	Groundnut Rice Coarse grains Millet Maize Sorghum	Unlike 1994 / 95 cotton has not featured as a major crop in 2002/2003. This may also account for the reduction of the sectors contribution to GDP which stood at 23.8% in 1994 / 95

Table 4. Structure of the sectors

Sector	Micro Farms/Facilities	Small Farms /Facilities	Medium Farms /Facilities	Big Farms /Facilities
Manufacturing/ Industrial Sector	4	23	2	NA
Agricultural Sector	NA	274,685	766,676	31,549
Total	NA	NA	NA	NA

The formal manufacturing sector of The Gambia is dominated by the food industry, which include beverage facilities, and fish processing plants, abattoir, sweets and milk processing plants. There are four small/micro-mining facilities for sand and gravel mining to serve the building industry. Carnegie Corporation Company used one big facility in the mining sector, to test mining Zircon. Samples were collected and taken to Australia for further testing. If results are positive, the company could engage in large-scale mining of Zircon. However, Carnagie Corporation Company was closed down by government due to disputes regarding their operations in the country.

Three facilities are involved in the production of timber, also serving the building industry. The government owns two of these facilities. They each employ an average of five people and produce between 0.5 and 0.9 cubic meters of timber per day. Two facilities foam manufacturing and plastic production plants are in the chemical and plastic plant product category. The foam plant produces mattresses with Freon 11 which is a ODS as blowing agent, and the plastic plant produces plastic containers using polyethylene pellets. The plastic plant ceased operations in

2015 following the Plastic Ban Order 2015. Two facilities manufacture simple farm implements and garden tools. There is one facility that produces ceramic tiles.

Employment is highest in the food industry followed by: mining and extraction, electric generation, chemical/plastic products etc. Except for the mining and extraction sub-sector whose output value was given as GMD10, 561,690 for 2002-2003, information on the output value of on the other industrial sub -sectors is not forthcoming.

The Gambia's production of chemicals is very minimal if not negligible. On the other hand, it imports a large quantity of chemicals ranging from agricultural, industrial to consumer chemicals

2.1.4 Environmental overview and concerns

2.1.4.1 Environmental background

The Gambia occupies an area of about 11,300 square kilometres of which almost 10% is covered by the Gambia River and another 20% by swampy land and flood plains. It is bordered by Senegal on three sides (north, south and east) except on the west coast bordering the Atlantic Ocean. The river stretches about 480 km eastwards and a narrow strip of land extends 15-30 km North and South of its banks.

The Gambia as a country does not have proper infrastructure in dealing with solid waste and other waste in general since colonial era. However, in every region, Local Government Authority is charged with the responsibilities of managing the waste in their various regions on behalf of central government.

Environmental pollution is a common phenomenon in the urban areas mainly due to lack of regular waste collection. Waste is dumped indiscriminately and haphazardly with no management. This results in serious environmental pollution. People also resort to open burning of waste due to inadequate collection service thus resulting in air pollution. There are no sanitary landfills and waste is dumped uncontrollably at official Dumpsites such as Bakoteh dump site in Kanifing Municipality and Mile II Dumpsite in Banjul.

During the previous two decades, a combination of adverse weather conditions (particularly drought) and unsustainable human practices including poor agricultural practices, a high rate of population growth and a significant rate of rural- urban population drift lead to severe deterioration of the environment.

2.1.4.2 Main environmental concerns

Estimation of emissions due to fuel combustion during the National Inventory of Green House Gases in 1993, consist of a total of 181,064 tonnes (t) of CO_2, 2,911 t CH_4, 40 t N_2O, 2,224 t NOx, 54,536 t CO and 6,987 t of NMVOC (non-methane volatile organic compounds). The inventory indicates that the bulk of the CO_2 emissions came from road transport, representing 60% while industries emitted 30% of CO_2. The residential sub-sector emitted 99% CH_4. The energy and manufacturing, construction industries emitted 94% and 6% of N_2O respectively. The residential and road transport sub-sectors contribute to 93% of NOx emitted while industries emit about 7%. A Memorandum of Understanding was signed between the Department of Water Resources (Focal Point for UNFCCC) and key institutions to make data available as and when required for up-date.

The priority concerns related to chemical import and use are varied. In the Greater Banjul and Kombo areas, the concern stems from problems such as pollution (air and water) clinical and industrial wastes, e-waste to consumer chemicals such as used batteries. End of-life vehicle are now scrapped and sold to scrap iron dealers mainly Indians who export them. Outside these areas, the problem is mainly pesticides and other agrochemicals. The low level of awareness coupled with the unavailability of data in most cases; contribute to the difficulty to address such concerns.

2.2. Institutional, policy and regulatory framework

2.2.1 Introduction

This section describes the present overall institutional, policy, and regulatory framework within which the NIP will be implemented. It also covers more detailed baseline information about the POPs issue such as the status of action and implementation activities under related Conventions or regional and sub-regional agreements.

2.2.2 Institutional framework

Following institutions are playing a key role in chemical management in The Gambia:

a) National Environment Management Council (NEMC)

The Council is chaired by the Head of State and is comprised of all Ministers whose Ministries have a stake in the management of the Environment, such as the Ministry for Environment, Climate Change Natural Resources and Forestry; Agriculture; Health; Lands and Regional Administration; Finance and Economic Affairs; Trade, Industry and Employment; and others that the President may co-opt. The Executive Director of the NEA is the Secretary of the Council. The Council is the policy-making organ of the National Environment Agency.

b) The Ministry of Environment, Climate Change, Natural Resources and Forestry

The NEA, which is hitherto, an agency of the Department of State for Fisheries, Natural Resources the Environment, is now operating under the Ministry of Environment, Climate Change, Natural Resources and Forestry

c) The National Environment Agency (NEA)

The NEA is operating under the Ministry of Environment, Climate Change, Natural Resources and Forestry. The Hazardous Chemicals and Pesticide Control and Management Act (1994), mandates it to control the use of chemicals and pesticides in The Gambia. This Act established the Hazardous Chemicals and Pesticide Management Board and the office of the Registrar of Hazardous chemicals and Pesticides.

The Board has representatives from the following Institutions:

I NEA (Chairperson and Secretariat of Board)

II Department of Agricultural Services (DAS)

III Department of Livestock Services (DLS)

IV National Agricultural Research Institute (NARI)

V Department of Public Health Services

VI Attorney General's Chambers

VII Gambia Chamber of Commerce and Industries

VIII Customs and Excise Department

The functions of the Board are to:

- Monitor and control the importation, manufacture/production, sale, use, distribution, storage and disposal of chemicals, including pesticides;
- Prepare guidelines on the environmentally sound management of chemicals and pesticides;
- Conduct public educational campaigns;
- Publish list of prohibited and accepted chemicals and pesticides;
- Establish technical committees when necessary.

Under the auspices of the Board, a National Coordinating Committee (NCC) and a Project Coordinating Unit (PCU) were maintained for the purpose of the review and update of the national implementation plan under the Stockholm Convention. The NCC is a policy making body, whereas the PCU is the technical arm of the Project.

An Inspectorate is set up at the NEA to monitor compliance with regard to certain environmental laws.

Part IX of National Environment Management Act 1994 (NEMA) gives duties and powers to environmental inspectors. Further, VII of the HCPCMA 1994 also gives powers to inspectors with regard to monitoring and inspection of chemicals.

These two Acts empower the inspectors to enter any premises, seize any object or stop any activity which is suspected to be deleterious to the environment, or in non-compliance with the laws.

In 1996, a consignment of mosquito coils containing 10% of DDT was intercepted by the inspectors. The consignment was returned to the country of origin, and neighbouring countries alerted.

Due to the inadequate number of environmental inspectors, under the auspices of the Board, a network of enforcement personnel is established in all the divisions of the country to control the entry of banned and illegal pesticides, and to conduct sensitization campaigns.

The National Environment Agency (NEA) has put into place a discharge Permitting Regulations (2001) under the NEMA 1994), for all companies, operators and processes that have a potential of polluting the environment, the release and production of chemicals included.

The Permit contains the following elements:

- The conditions stating the requirements that the permit holder, his employees and site should meet;
- Record keeping and reporting;
- Notifications to the NEA in case of any unusual release;
- The treatment of wastes, releases or effluents;
- An agreed improvement program;
- Monitoring and sampling of releases;

d) The Ministry of Agriculture (MOA)

This is the major importer of agro-chemical used in agriculture for pest control, in livestock production & health and also fertilizers for the improvement of crop yields. It works in close collaboration with the NEA in controlling pesticides. It is primarily responsible for the use and application of pesticides. It conducts training for farmers on the use of agricultural products and input, including pesticides. They can be very instrumental in the control of POPs, through education, sensitization and enforcement of the laws.

MOA is also responsible for the distribution of pesticides emanating from government grants, through well-established distribution points. It is also responsible for the government stocks of pesticides and played an active role in the clean-up and transport of obsolete pesticides to Britain for high temperature incineration, in 1999.

The Ministry should come up with concrete strategies to avoid accumulation of illegal and unwanted pesticides.

e) The Department of Public Health Services

It is the mandate of this Department to control diseases including their vectors. The Department therefore is actively engaged in programs to control malaria. It uses among other things insecticides. It will therefore be highly involved in the decision and eventual use of DDT as a control of the vector of malaria. With partners such as UNICEF and the Medical Research Council, the Department imports pesticides for vector control.

DDT was also used for agricultural purposes until the early 60s. It was used as a contact insecticide, in different formulations. In 1975, the use of DDT was replaced by insecticides such as Pynerzone EC24, Abate 500E and granules, Malathion and Vapona.

f) The Ministry of Trade, Industry and Employment

This is the Ministry responsible for industrial development and promotion. It monitors the effective/proper usage of investment incentives (such as duty waiver concessions, expatriate quotas, etc.) to companies and organizations. Companies/enterprises that utilize chemicals as raw materials in their production processes are requested to provide detail information (on toxicity levels, residual effects etc.) about such materials.

g) National Nutrition Agency (Na NA)

This is an Agency responsible for nutrition and nutritive values. It is aiming to set standards to food and nutrition in the country. It also has plans to establish in collaboration with MOA residue analyses laboratories. POPs residues in breast milk and in food will eventually have to be determined by this Agency.

h) The Customs and Excise Department (Ministry of Finance and Economic Affairs)

The role of this institution is to control the entry of POPs at the entry points. With the right and adequate training they can be instrumental enforcement scheme. They also form part of the enforcement personnel set up to monitor the import and use of pesticides.

i) The National Agricultural Research Institute (NARI)

This institute is under the Ministry of Agriculture and has the mandate to conduct research on agricultural products and inputs. NARI also conducts research in alternatives to POP pesticides.

j) The Attorney General's Chambers (Ministry of Justice)

This institution is responsible for drafting new laws and regulations and plays an active role in the process of ratification of conventions.

k) The Gambia Chamber of Commerce and Industries (GCCI)

GCCI represents the private sector in the management of chemicals including pesticides. A large number of pesticides are imported and distributed by the private sector. Most of them represent the pesticide manufacturers outside The Gambia. Their role in the control of POPs through sensitization and participation in stewardship programs cannot therefore be over emphasized.

l) The Sahelian Pesticide Committee (SPC)

The SPC was established following the signature of the Common Regulations for Pesticide Registration for the Sahel countries. The SPC is comprised of experts from each member state and other experts in the disciplines of pesticide management. The SPC meets twice a year in Bamako, and review dossier from pesticide manufacturers. The review process is done in accordance with internationally accepted methods. Laboratories have been identified for field trials and analyses. The SPC determines and advises governments of member states on pesticides that should enter the sub region. The accepted pesticides are granted registration status and numbers. Since the inception of the SPC, no POP pesticide has been registered.

The structure is not a regional economic integration organization to which member states have transferred competence in respect of matters governed by the Stockholm Convention, and cannot therefore accede to the Convention on behalf of member states. However, the SPC can advise and guide governments through its mandate as a registration body on the control of pesticides and can use its discretion to reject POP pesticides.

The SPC is now being expanded to accommodate the humid zone countries of West Africa to form the West Africa Pesticides Registration Committee (WAPRC)

2.2.3 Legal framework, roles and responsibilities

2.2.3.1 Overview of national legal instruments which address the management of chemicals

a) The Gambia Environment Action Plan 1992 (GEAP)

The Gambia Environment Action Plan (GEAP) adopted in 1992 forms the main policy framework for environmental planning and decision-making. It came to reinforce government's program on sustainable development, such as the Poverty Reduction Strategy (PRSP). It emphasises the need for national development without compromising the environment. The main objective of the GEAP is the conservation and rational use of natural resources, the strengthening of institutional and regulatory framework, and the raising of awareness in environmental issues. The big challenge in the Gambia is to alleviate poverty, because poverty is a vicious cycle culminating in ill health and vice-versa.

b) The National Environment Management Act (1994)

The Act provides both regulatory and legislative framework for environmental management in The Gambia. It is not specific to hazardous chemical or pesticides but covers all environmentally related issues, and therefore indirectly deals with POPs.

The NEMA established the National Environment Management Council (NEMC) and the National Environment Agency (NEA).

NEMA empowers the NEA to instruct the seizure or closure of an activity which negatively affects the environment and to carry out inspections, studies, monitoring to ensure compliance with established environmental legislation and conventions.

It establishes also the Technical Advisory Committee (TAC), the Technical Working Groups (TWG), and Local Environment Committees (LEC). Pollution Control is established under part VIII of the Act. This part prohibits the discharge of materials, substances and oil into the environment, and also provides for the formulation of the Environmental Management Discharge Permit Regulations.

c) Environmental Management Discharge Permit Regulations (2001)

The National Environmental Agency under the powers of the NEMA 1994 has a duty to prevent pollution of the environment and specifically control discharge of dangerous materials or polluting substances.

The NEA is currently implementing the Environmental Management Discharge Permit Regulations (2001) under the NEMA 1994. The purpose of the permitting system is to control discharges from industries and other establishments, including households operating or carrying out processes potentially harmful to the environment. The first stage is to register all industries and establishments operating in the Gambia currently producing wastes or emissions discharges to water, land or air. This is to ensure that discharges of hazardous substances in the environment are minimised and controlled.

d) The Hazardous Chemicals and Pesticides Control and Management Act (1994)

In 1994 the Hazardous Chemicals and Pesticides Control and Management Act was enacted to regulate the indiscriminate sale and misuse of chemicals, particularly pesticides. The Act calls for the mandatory registration of all hazardous chemicals and provides a wide and comprehensive framework for the control and management of the manufacture, distribution and use of hazardous chemical and pesticides. The NEA is administering the Hazardous Chemicals and Pesticides Control and Management Act of 1994. The Act covers pesticides and all other hazardous chemicals from consumer, industrial, to agricultural chemicals.

The Act provides for:

- The establishment of a multi-sectoral Board with final authority to register and control all hazardous chemicals in the country (from importation to disposal);
- The position of a Registrar to implement the decisions of the Board;
- Technical committees to advise the Board when required;
- System of registration of pesticides and chemicals- provisional clearance, restriction and banning of pesticides;
- Labelling, advertising and packaging of pesticides;
- Licensing of dealers and the payment of fees for Licenses and Certificates;
- Enforcement- designation of inspectors and analyst;
- Penalties for infringement- Fines for offences against the Act;
- For powers to make regulations.

The Hazardous Chemicals and Pesticides Control and Management Act is the only one that addresses the various stages of the lifecycle of the chemical (from importation to disposal).

The Act is very general and does not specifically deal with POP pesticides. It should be noted that some of the POP pesticides are already banned in The Gambia. These include Aldrin chlordane, DDT, dieldrin, heptachlor and HCB.

Section 3 of the Act provides for the monitoring and control of the import, manufacture, distribution, storage, use, sale and disposal of pesticides

Section 10 of the Act provides for the mandatory registration of all pesticides, even though the function of registration by the Board has been relinquished to a central sub regional body since the adherence of The Gambia to the Common Regulations for Pesticide Registration in the CILSS Member States, in 1997.

Section 13 of the HCPCMA provides for exemptions in import, use and manufacture of restricted and banned pesticides for scientific and educational purposes.

Section 37 and 38 of the HCPCMA provide for penalties and sanctions in cases of violation of the Act with regard to import, sale, use, manufacture, export of a banned or restricted pesticide.

The Hazardous chemicals and Pesticides Control and Management Act is the only national legal structure at the moment that amply and sufficiently addresses the control and management of chemicals other than pharmaceuticals. It does not conflict with the Medicines Act, which addresses Pharmaceuticals, or with the Water Resources Act, nor the Plant Protection Act. The Act uses language and concepts consistent with international laws (such as the FAO Code of Conduct and the PIC Procedure) and provides for international notification procedures. The Hazardous Chemicals and Pesticides Control and Management Act is currently under review with the aim to amend and expand it to take on board emerging issues

It has three sets of Regulations:

e) The Pesticide Registration Regulations 1994

Part A and B of these Regulations lay down the procedures for registration and licensing of pesticides respectively, and Part C deals with procedures for inspection, analyses, disposal in water and land and the application of the Prior Informed Consent Procedure.

f) The Pesticide Licensing regulations 1994 and the Hazardous Chemicals Regulations 2001

Although these Regulations deal with chemicals other than pesticides, under Schedule 3 containing Group I chemicals, all chemicals subject to the Stockholm (POP) Convention are included. Part II, Section 11 of these Regulations prohibits the importation, manufacture, distribution or sale of chemicals of Group I without prior authorization from the Board.

The following existing legal documents are also addressing various stages of life-cycle management of chemicals:

a) Local Government Act 2002

This Act establishes under Schedule 1, Part 1 seven Local Government Areas (Central River Division, Lower River Division, North Bank Division, Upper River Division, Western Division, City of Banjul and Kanifing Municipality) each with Area Council or Councils with designated

jurisdictions, which have very wide powers of regulation, supervision, inspection and management. The Act still establishes the Banjul City Council as the authority for the administration of the city of Banjul.

With regard to chemical management, Paragraphs 1 and 3 and 18 (m), of Schedule II, Part II of the Act are the most relevant. These three paragraphs respectively provide for Local Governments to:

- Control pests of all sorts, including tsetse flies, mosquitoes, and weeds;
- Prohibit, restrict and control the planting, harvesting and possession of noxious or poisonous plants;
- Prohibit, restrict, regulate or license the burning of rubbish or grassland;
- Area Councils are primarily involved in the use of chemicals. Noxious or poisonous plants may also contain some chemical elements whose control is generally vested on the Area Council. Likewise, the regulation of consumable taken care of by sub-paragraph (iii) in effect, the area councils are indirectly involved in the management of chemicals albeit in a limited capacity.

The wide powers of inspection granted to the Councils in the former Act (1963-1984) (powers to provide for the inspection of all other food stuff of whatever nature, and of liquids intended for human consumption, whether exposed for sale or not, and to seize, destroy or otherwise deal with all such foodstuff or liquids as are found to be unfit for human consumption and to supervise and control all manufacturers and foodstuff of whatever kind or nature and of liquids intended for human consumption) are not provided for in the new Act.

b) The Petroleum Exploration and Production Act (1986)

This Act Contains provisions dealing with exploring for and producing petroleum generally. It does not deal specifically with the production of petro-chemicals. The only relevant provision is section 20 (a), which gives the Minister For Energy and Petroleum power to make regulation controlling the flow and prevention of the escape of petroleum, water or gasses (other than petroleum) or other noxious or deleterious matter. This Act is under review and The Petroleum Exploration and Production Act 2003 is being drafted.

c) The Fisheries Act

The only section relevant to chemicals is Section 3a which prohibits the use explosives, poison or other noxious substances for the purpose of killing, stunning, disabling or catching fish or in any way rendering fish to be more easily caught. The penalty is severe (minimum of 5 years).

d) Waste Management Bill 2003

A Waste Management Bill is currently being finalised by a legal consultant. It will provide for the disposal of POPs chemicals.

The Bill will take into account The Gambia Waste Management Strategy of 1997 and international conventions namely the Basel and Bamako Conventions on Trans-boundary Movement of Hazardous Wastes and their Disposal. The hazardous wastes identified in that Strategy, are including PIC chemicals, and industrial as well as agricultural wastes. The Gambia does not manufacture any PIC chemical.

Section 4.7 of the Strategy recommends the Hazardous Chemicals and Pesticides Unit of the National Environment Agency to continue recording all pesticides that become waste and investigate suitable disposal methods for each type. It further recommends that individual farmers and suppliers who own the pesticides, when they became waste, to shoulder the financial burden of disposal. Further, it recommends that the Department of Agriculture makes arrangements with incinerator and landfill operators, for environmentally sound disposal.

Hazardous waste is covered under Article 29 of the Bill and included under Special Waste.

Special Waste will be adequately defined to cover waste of PIC and POP chemicals. Provision is made in Article 29 giving powers to the Minister to make Regulations dealing with Special Waste. The Waste Management Bill is yet to be enacted; further reviews have been made on it to capture emerging environmental issues such as e-waste, exhaust fumes and Used Lead Acid Batteries (ULAB).

e) Medicines Act

This Act addresses drugs and pharmaceuticals

f) The Water Resources Act

This Act has an overall object of promoting good management of water resources and the abatement of harmful effects through the formulation of water policies.

g) The Public Health Act

This Act makes provision for public and environmental health. It addresses the designation of health areas, the establishment of health services institutions, safe food and beverage, infection, offences and penalties

h) Plant Importation Act

This Act makes provision for the importation of plants with a view to the prevention of the introduction and spread of pests and disease affecting vegetation.

i) Prevention of Damage by Pests Act

This Act makes provision for preventing loss of food by infestation.

j) Environmental Impact Assessment Regulations

This is another legal instrument that indirectly controls chemicals, in this case industrial pollution. It ensures that all new projects undergo environmental impact assessment. The Environmental Impact Regulations 2014 has also been developed.

2.2.3.2 Non-regulatory Measures and Relevant Initiatives

In country programs or initiatives are:

- National Implementation Program on Persistent Organic Pollutants (NEA, PPS, NARI, Ministry of Health etc.). The NIP project was implemented in the period 2003-2006 with GEF/UNEP assistance.
- National Profile (NP) on Chemicals and Management (NEA, DWR, PPS, NARI etc.). The first NP was elaborated in 1997 with UNITAR assistance, and it was updated and extended to accommodate the POPs issue in 2003.

- Plant Protection Services as the technical support to provide crop protection services (PPS, DOA, NARI, NEA etc.).
- Training in the Implementation of Integrated Pest Management Farmer Field Schools in Sustainable Small-holder Farmers Horticulture Production Systems (FAO, DOA, PPS, NARI etc.).
- Research on Plant Protection and IPM Technologies (NARI, DOA, PPS, NEA etc.).
- National Nutrition Agency's food safety programme.

The regional and subregional programs to which the Gambia is part are as follows:

- Chemical Information Exchange Network (CIEN) (NEA, PPS, NARI, Ministry of Health, etc.).
- Senegalogambia Pesticide Management Initiative
- Sahelian Pesticides Committee (SPC)
- IPM/FFS regional programs (West Africa- Senegal, Burkina, Mali) (East Africa- Kenya, Uganda, South Africa)
- LOCUSTOX (Pesticide laboratory for Sahel - Dakar).

2.2.4 Relevant international commitments & obligations

The Gambia is party to the following international commitments:

The Montreal Protocol

This instrument controls the emissions of Ozone Depleting Substances (ODS) into the atmosphere. Ozone depleting substance study was completed, indicating the types and quantities that were used, sold or stored in The Gambia for the period 1995 to 1997. Training programs were organized for mechanics and repairers on retrofitting refrigerating and air conditioning equipment. Custom inspectors were trained in setting up and enforcing a system for the identification, monitoring and control of imported ODS. Assistance was provided to the Karan foam manufacturing plant in Banjul to convert its block foaming machine to a non-CFC consumption plant. This has resulted in a reduction in the annual consumption of between 8 t of CFC at the plant.

The Basel and Bamako Conventions

These Conventions are related to trans-boundary movement of hazardous wastes and their disposal. The Stockholm Convention refers to the guidance documents elaborated under the Basel Convention with regard to environmentally sound disposal of POPs containing/contaminated wastes.

The Gambia is party to the Basel Convention since 1997 and to the Bamako Convention since 2001

The Rotterdam Convention on Prior Informed Consent (PIC)

The PIC Procedure is based on the principle of prior informed consent, that international shipment of a chemical, that is banned or severely restricted to protect human health or the environment, should not proceed without the agreement, or contrary to the decision of the Designated National Authority (DNA) in the participating importing country. The DNA is the

government authority responsible for the administration of the PIC Procedure in the country. In The Gambia, the National Environment Agency is the DNA for PIC Procedure.

The objective of the Convention is to foster a shared responsibility to protect human health and the environment between exporting and importing countries.

It enables the world to monitor and control the trade in certain hazardous chemicals. It gives importing countries the power to decide, which of these chemicals they want to receive and to exclude those, they cannot manage safely. If trade does take place, requirements for labelling and provision of information on potential health and environmental effects will promote the safe use of these chemicals.

The Convention covers pesticides and industrial chemicals that have been banned or severely restricted for health or environmental reasons by participating Parties. Severely hazardous pesticide formulations that present a hazard under the conditions of use in developing country Parties or Parties with economies in transition may also be included. Seventy four chemicals including severely hazardous pesticide formulations are currently on the PIC List.

The Convention, which was ratified by The Gambia in November 2001, principally provides for:

- Procedures for banned, severely restricted chemicals and severely hazardous pesticide formulations;
- Designated National Authorities (DNA);
- Listing of chemicals;
- Chemicals already listed;
- Removal of chemicals;
- Obligation in relation to exports and imports;
- Export notifications;
- Information exchange;
- Implementation of the Convention;
- Technical assistance;
- Non-compliance and settlement of disputes.

Obligations of Parties:

i. The Convention obliges Parties to obtain and disseminate information and decisions taken regarding those chemicals and pesticides on the list;

ii. Countries participating in the interim PIC procedure must designate one or more national authorities (DNAs) to act on their behalf in the performance of the administrative functions required by the Convention;

iii. Parties must notify all regulatory actions taken on chemicals including pesticides;

iv. Exporting Parties must notify and obtain consent from importing Parties.

The Stockholm Convention on Persistent Organic Pollutants (POPs)

Initially 12 POPs are targeted for international action. These include pesticides and industrial chemicals such as DDT and PCBs, which were or are being used in The Gambia. DDT is an insecticide both for agricultural and public health use, and PCBs are found in some transformer oils in the country.

The Convention, which was ratified by The Gambia in April 2006, provides principally for:

- Measures to reduce/ eliminate releases from intentionally and unintentionally produced POPs;
- Registration of specific exemptions;
- Measures to reduce or eliminate releases from stockpiles and wastes;
- Implementation Plans;
- Information exchange and awareness and education;
- Research and monitoring;
- Technical and financial arrangements;
- Reporting and evaluation;
- Non-compliance and settlement of disputes.

Obligation of Parties:

i. Parties should immediately stop using the following POPs pesticides: Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene, Mirex and Toxaphene;
ii. Severely restrict the use of DDT. Annex B provides for the restriction of DDT to vector control and use in accordance with specified WHO guidelines. Parties using or producing DDT have to sign up to a Register. For other Parties, the use and production have to be eliminated. However, all exemptions are for a fixed period of time, and subject to review;
iii. Restrict the use of PCBs to closed systems with the aim of their phasing out and environmentally sound disposal by 2025 (equipment) or 2028 (wastes);
iv. Measures should be taken to eliminate or reduce releases from unintentionally produced POPs;
v. Parties should develop implementation plans for the implementation of their obligations under the Convention;
vi. Parties should establish mechanisms and schemes for awareness raising and information;
vii. Parties should encourage the undertaking of research geared towards the elimination of POPs and the finding of alternatives.

Six of the pesticide POPs have already been banned and the others are not registered or used in The Gambia.

The most important POP pesticide in The Gambia is DDT. Although it is banned, there is an on-going national debate to revert to its use, as the most effective insecticide against mosquitoes, the vector of the malaria parasite, malaria being still the leading killer-disease in the country. In the past, DDT was used in The Gambia as an insecticide both for agricultural and public health use. The Ministry of Health now uses bendiocarb as an alternative to DDT in vector control.

The Common Regulations for Pesticide Registration in the CILSS member States

1992 the ministers of the countries belonging to the Permanent Interstate Committee for Drought Control in the Sahel (CILSS), comprising of such states as The Gambia, Senegal, Cape Verde, Burkina Faso, Guinea Bissau, Mali, Mauritania, Niger and Chad met in Ouagadougou, Burkina Faso, to adopt common regulations for the registration of pesticides, for the CILSS member states. The decision was prompted by the fact that large quantities of agro-

chemicals, especially pesticides, were being used by member countries to prevent food losses and ensure food security for our people, since the Sahel ecosystem is very fragile and vulnerable to these hazardous substances. A common registration system is feasible because of the similarity in our ecosystems and populations.

Consequently, a Sahelian Pesticide Committee (SPC) or CSP (French Acronym), was established. This Committee is mandated to prohibit or permit the entry of pesticides into the sub-region.

The Common CILSS regulations provide among other things for:

- Registration conditions and procedure for pesticides;
- Protection of confidential data;
- Information provision;
- Labelling and packaging;
- Field trials;
- Emergency situations;
- Post registration control by member states;
- Composition and functions of the SPC;
- Appeals.

The Gambia ratified the Common Regulations in July 1997 and its amendments in 2003.

The Gambia has entered into bilateral co-operation program with Senegal in the area of chemicals, especially pesticides management. Under the program, NEA's Pesticide Formulation Laboratory undertakes the analysis of pesticide formulation for both countries, while Locustox laboratory in Senegal conducts analyses in pesticide residues also for The Gambia.

The Minamata Convention on Mercury

The Minamata Convention recognizes that mercury is a chemical of global concern owing to its long-range atmospheric transport, its persistence in the, its ability to bioaccumulate in ecosystems, and its significant negative effects on human health and the environment. Therefore, the Convention has provisions to control all stages of the mercury lifecycle, specifically: control mercury supply and trade; phase-out or phase-down mercury-containing products and use of mercury in processes; artisanal and small-scale gold mining; reduce mercury emissions and releases from major source categories; and ensure environmentally sound mercury storage and disposal. It is anticipated that coordinated implementation of the Convention will lead, over time, to an overall reduction in mercury levels in the environment as well as decreased human exposure to mercury, thus meeting the objective of the Convention of protecting human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds (UNEP, 2013).

The Gambia ratified the Minamata Convention in October 2016. The ratification and implementation of the Minamata Convention are expected to have a range of benefits such as:

- Protecting national populations from direct and indirect exposure to mercury and mercury compounds;
- Decreasing exposure of national populations through diet;
- Reducing contamination in national sources of water and soils;
- Improving control of mercury trade;

- Reducing the amount of mercury in products and therefore in the national waste stream;
- Facilitating access to technologies for mercury waste management and alternatives to mercury-containing products and processes that use mercury;
- Facilitating financing for implementation activities;
- Reinforcing and strengthening existing domestic policy on chemicals management;
- Complementing other international environmental obligations.

2.3. Assessment of POPs issues in the country

2.3.1. Assessment of POPs Pesticides (Annex A, Part I)

2.3.1.1. General

The chemicals in this category of POPs include: aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene (HCB), mirex, and toxaphane. More recently lindane (gamma-HCH), alpha HCH, beta-HCH, chlordecone and endosulfan has been listed. They are listed in Annex A of the SC along with the other POPs which are chemicals to be eliminated.

All organochlorine POPs pesticides are lipophilic, bioaccumulate and are toxic to humans and wildlife. Already 1962, Rachel Carson's questioned in her book "Silent Spring" the safety of DDT, heptachlor and other persistent chlorinated insecticides.

Today POPs pesticides have largely been phased out with the exemption of the use of DDT for malaria control and the use of endosulfan in some countries with exemptions or illegal use, PCP in wood treatment or sulfluramide use against ants.

However, in many parts of the world, poorly stored obsolete POPs-pesticides stocks and other hazardous pesticides in dumpsites, landfills, and warehouses await cleanup and final disposal.

2.3.1.2. Production/formulation and/or use

There is no production and formulation of pesticides including POPs pesticides in The Gambia. A substantial amount of pesticides is also illegally brought into the country via several channels through porous borders with neighbouring countries. No quantified data on this illegal trade is available. Spot-checks at the "Luumos" (the weekly markets) indicate that some of the products illegally brought into The Gambia include products that have been banned e.g., Spiridur containing methyl parathion, lindane etc.

There is no production, formulation and/or use of endosulfan for exempted uses or use of endosulfan for non-permitted uses. However, it was imported and used in the eastern part of the country for cotton production in 2009 and there is still a stockpile of endosulfan in the stores at the cotton ginnery (365 L) (Figure 2). The current situation of the stores is undesirable.

Figure 2. The old cotton project store in Basse; Obsolete cartons of endosulfan pesticide

Table 5. Areas suspected of having POPs pesticides in The Gambia

Region / Municipality	Storage area	Coordinates
Upper River Region	Old Cotton Store in Basse	Not available
West Coast Region	NEA Store in Banjulunding	N 13° 22' 363" Wo 16° 39' 013"
West Coast Region	PPS Store in Banjulunding	N 13° 22' 345" Wo 16° 39' 023"
Kanifing Municipality	GHE Store in Old Joshuang	N 13° 22' 140" Wo 16° 39' 240"

Use of lindane, PCP and sulfluramide

There is no production and formulation of pesticides including new POPs pesticides in The Gambia and it is also not imported in the country. However, it still reaches the communities through the porous borders to the “Lumos” (weekly markets). The Gambia does not require exemptions to use lindane as second line treatment for head lice and scabies because there are safer alternatives to be used, other than lindane.

The Gambia neither produces nor formulates PCPs and no record of its used is reported in the country.

Use of alfa-HCH, beta-HCH, Chlordecone and Pentachlorobenzene,

The Gambia neither produces nor formulates any of the above pesticides and their uses have not been reported in the country.

2.3.1.3. Import

POPs pesticides import and use can be traced back to the 1970s by the Crop Protection Services, renamed Agricultural Pest Management Unit, which is currently given another name, Plant Protection Services, operating under the Department of Agriculture.

The types of POPs pesticides imported were mainly grants donated to The Gambia Government from US and European countries to control agricultural crop pests in the field and stores and also for vector control. These POPs pesticides included Aldrin, Dieldrin, Lindane, DDT but no records of such grants are currently available. They were, however, distributed all over the country for use particularly in agriculture.

No importation of POP-pesticides from 1999 to 2003 was observed by the survey for the initial NIP. Equally, in the assessment for the NIP update from 2003 to 2015, there was no importation of POPs pesticides. However, the general trend of pesticide imports per year from 2003 to 2012 for specifically insecticides and herbicides (excluding POPs) are shown in Table 6 below

Table 6. Trends in volume of Pesticides imports (in tonnes) in The Gambia (2003-2008 and 2009-2012)

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total (2003-2008)	Total (2009-2012)
Insecticides	774	1,092	1,123	1,019	473	559	683	1,617	1,313	829	5040	4442
Herbicides	0	30	215	797	512	68	0	0	20	2	1622	22
Total	774	1122	1338	1816	985	627	683	1617	1333	831	6662	4464

The total Pesticides imported from 1997-2002 according to the NEA Database and shown in Table 7 was 1,509,718 kgs for solids and 1,962,762 m^3 for liquids, involving 20 trade names of insecticides, herbicides and fungicides combined. These figures include household pesticides and do not include those pesticides that were illegally smuggled across the porous borders from neighbouring countries.

Table 7. Pesticide Imports by Year Registered at the NEA Inspectorate

YEAR	PESTICIDE	
	Solid (Kg)	Liquid (m^3)
1997	249,488	18,925
1998	37,747	361,939
1999	985,089	203,864
2000	33,695	419,315
2001	178,334	693,586
2002	25,365	265,133
Sub-Total (1999 – 2002)	1,222,483	1,581,898
GRAND TOTAL	**1,509,718**	**1,962,762**

2.3.1.4. Export

No export of POPs pesticides has been identified in Gambia.

2.3.1.5. Future use of pesticides

The assessment in the update of the NIP revealed that there is no need for any exemptions for POPs pesticides.

2.3.1.6. Stockpiles and wastes

During the 1999 obsolete pesticides clean-up, the pesticide stores were cleaned-up. During the exercise, all the pesticide stocks were identified, packaged and transported to a central location, prior to shipment abroad for final disposal. These sites were revisited during the inventory exercise and no re-stocking of obsolete pesticides was found. Obsolete pesticides were shipped abroad for final disposal.

In the course of the previous NIP pesticide survey, obsolete and or waste pesticides were nowhere observed or reported in the country except in traces at few areas. Unlabelled dust formulations totalling 2.5 Kg were observed at the Luumos (weekly markets) of SareBojo, Bureng and Wassu. Samples of these and others from the store of the Regional Agricultural Coordinator in Jenoi, Lower River Region (LRR) were collected and delivered to the Pesticide Formulation Analysis Laboratory of the NEA, but the products could not be conclusively identified. For the current NIP pesticide inventory and assessment, some samples of products suspected of being Lindane, a new listed POPs since 2009 were also found. There is currently no functional pesticide formulation analysis laboratory at NEA to test and or authenticate these products for being a POP.

The commercial farms and major pesticide dealers kept good records and stock management of their pesticide products. They reported that demand exceeds supplies and therefore no obsolete stocks occur. In the commercial farms, empty pesticide containers are sold to collectors who usually sell them to the public for general use. The sale of pesticide containers to the public who end up using them for food or water storage; however, they are being advice not to reuse empty pesticide containers for health reasons and therefore these containers are confiscated whenever or wherever they are found.

During the previous NIP inventory, the mosquito coil called the Cock Brand Mosquito Coil containing DDT was banned and it was subsequently confiscated from dealers in the product throughout the country. It was only present in the country with other products as part of an obsolete and or banned stockpile, that was disposed of through an FAO/GCPF/UK/Gambia Government Project in1999. Long after this exercise, more other banned and or obsolete chemical products were retrieved and are presently stored away in Site III in Banjulunding, West Coast Region.

At present, there are two pesticide stores at Research Site III drying floor in Banjulunding. One is under the custody of NEA, while the other is under the custody of PPS. The coordinates of these stores are featured in Table 3. These stores are stocked with different chemicals and or pesticides some of which are banned and or obsolete. The NEA store is at this time stocked with confiscated items like: Super cock, Lengen micro-smoke, Fatala and Fumakilla all trade names for mosquito coils with the same active ingredient of allethrin which belongs to the Pyrethroids. There are many other obsolete products like fungicides all packed in the same store. On the other hand, the PPS store has similarly certain obsolete products such as Fugi One, Benlate and Lamdacyhalothrin.

Figure 3. NEA obsolete pesticides store in Banjulnding

Apart from these two areas, several and different pesticide stores, stalls or shops were visited in other areas. These include: GHE in Old Jeswang, Ryan Farm and Poultry in Bakau, Sangol Farms (Farmland) also in Bakau, Aja's shop in LatriKunda, Ministry of Health pesticide store in Banjul, Radville Farms store in ToubaKuta and the Luumo pesticide selling points at various villages.

Figure 4. Pesticides stall at Farafenni weekly market

At all these visited areas, no pesticides were seen and verified to be POPs pesticides, except for two areas (GHE and the old cotton project store in Basse) where endosulfan, one of the most recent pesticides categorised as a POP was uncovered. Five hundred litres (500 L) of endosulfan were reported to be in stock at GHE by the period of the visit of the team, while three hundred and sixty-five litres (365 L) of the same product were spotted in the old cotton store in Basse.

As regards to PCP, The Gambia does not produce PCPs and its use has never been reported and therefore, no stockpiles exist. Wood is also imported in the country and there is the likelihood of it being treated with PCP. No data on PCP treated wood and leather waste could be identified during the inventory.

2.3.1.7. Alternatives used for POPs pesticides

One alternative pesticide used in The Gambia are neonicotinoids such as imidacloprid (Diallo and Tasie 2016))[15]. While the risk for humans is low, they have considerable impact on bio-diversity/pollinators (van der Sluijs et al. 2015)[16] and ecosystem services (Chagnon et al. 2015)[17] including the aquatic ecosystem (Sánchez-Bayo et al. 2016)[18].

Regarding the current organic farming status, some small holder gardeners are now sometimes using organic manure and some botanical pesticides. However, there are no specific programs for organic agriculture supported by the government.

[15]Diallo B, OyinkanTasie O (2016) National Implementation of Regional Pesticide Policies In West Africa: The Gambia Case Study Report.

[16] van der Sluijs J P, et al. (2015) Conclusions of the Worldwide Integrated Assessment on the risks of neonicotinoids and fipronil to biodiversity and ecosystem functioning.Environmental Science and Pollution Researche 22, 148–154

[17]Chagnon M, Kreutzweiser D, Mitchell EA, Morrissey CA, Noome DA, Van der Sluijs JP (2015) Risks of large-scale use of systemic insecticides to ecosystem functioning and services. Environ SciPollut Res Int. 22(1), 119-134.

[18]Sánchez-Bayo F, Goka K, Hayasaka D (2016) Contamination of the Aquatic Environment with Neonicotinoids and its Implication for Ecosystems. Front. Environ. Sci. 4:71. doi: 10.3389/fenvs.2016.00071

2.3.1.8. Potential impacts

Gambia has used DDT until recently and therefore people are still exposed to DDT and the stable metabolite DDE.[19] Also endosulfan has been used in The Gambia until recently. Countries with recent DDT spray have elevated DDT/DDE levels in human milk. The monitoring capacity in The Gambia is weak and only old monitoring data are available.[20]

2.3.2. Assessment of PCBs (Annex A, Part II)

2.3.2.1 General

Polychlorinated biphenyls (PCBs) are a class of chlorinated aromatic compounds with 2 to 10 chlorine atoms substituted to biphenyl (a molecule composed of two benzene rings). The chemical formula for PCB is $C_{12}H_{10-x}Cl_x$. PCBs are man-made chemicals; they are not flammable, have high electrical resistance, and possess good insulating properties.

PCBs were widely used for many applications, especially as dielectric fluids—in transformers, capacitors, and coolants—but also in open applications like sealants, paints, plastic additives, or non-carbon copy paper. PCBs are carcinogens (category 1) and some congeners have dioxin-like activity. Further toxic effects associated with PCB congeners are endocrine disruption and neurotoxicity. Approximately 1.3 to 2 million tonnes of PCBs were manufactured over the period from 1930 to 1993, half of which were produced by Monsanto mainly in the US. In recent global inventory it was estimated that approx. 14 million tonnes of contaminated equipment (transformer, capacitor) and contaminated oils exist.[21] The original PCB producers are currently not stakeholders in the financing of PCB waste management.

It should be noted that polychlorinated naphthalenes (PCNs[22] listed in 2015 have been used in the same applications as PCBs including closed applications (capacitors, transformers) and open applications (e.g. paints, coatings, sealants, flame retardants in cables).[23] However, PCNs were mainly produced/used from 1930 to 1960 with lower productions in the 1970s and production was stopped around 2000.[23] Furthermore, the historic production volume was only about 10% of PCBs (150,000 t versus 1.5 million t). PCNs are also unintentional POPs (see Section 2.3.7) and present in technical PCBs at concentrations between 39 to 1300 mg/kg.[23]

[19] USEPA has classified DDE as a Group B2, probable human carcinogen

[20] P. Manirakiza et al. (2002) Persistent chlorinated pesticides in fish and cattle fat and their implications for human serum concentrations from the Sene-Gambian region. J. Environ. Monit., 2002,4, 609-617

[21] UNEP (2016) Consolidated Assessment of Efforts made towards the elimination of polychlorinated biphenyls. UNEP/DTIE CHEMICALS AND WASTE BRANCH, January 2016

[22] PCNs are a class of chlorinated aromatic compounds with 2 to 8 chlorine atoms substituted to naphthalene. The chemical formula for PCN is C10H8-xClx. PCN's are man-made chemicals; they are not flammable, have high electrical resistance, and possess good insulating properties.

[23] Secretariat of the Stockholm Convention (2017) Draft guidance on preparing inventories of polychlorinated naphthalenes (PCNs).Draft March 2017. UNEP/POPS/COP.8/INF/19

Therefore, stocks and waste of PCNs can be addressed within the management of PCBs and therefore will be addressed together with PCBs (see action plan). Also, the Basel Convention has included PCNs into the technical guidelines for managing PCBs.[24]

2.3.2.2 Import

No specific registration of any import of PCBs containing equipment has been discovered.

2.3.2.3 Export

There was no export of PCBs containing equipment registered in The Gambia and no PCB waste management with related export.

2.3.2.4 Use of transformers and other closed equipment

a) Transformers

During the inventory, it was found that sixty three (63) transformers containing PCBs were decommissioned. These transformers are considered waste and can be found in various NAWEC sub-stations and not as one stockpile stored at a central location.

There is no data available on the amount and type of the transformers in their various storage facilities. These transformers could be found to be leaking in various locations and in different magnitudes. The sites were the PCB transformers are likely stored have been marked as potentially PCB contaminated.

The updated inventory revealed in 2015 a total number of 19 PCBs containing transformers. Compared to the 2006 inventory 53 PCB containing transformers were missing.

It is reported that some PCB-containing equipment were unofficially scrapped and sold to metal scrap dealers. The quantity and type of equipment sold as scrap is unknown. Most likely the missing PCB transformers were also partly scrapped.

Furthermore in The Gambia there is no Sound Environmentally Management (ESM) particularly of PCBs and waste oils. Local motor bicycle mechanics and Blacksmiths re-use PCB oils in their operations.

[24]UNEP (2017b) Technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with polychlorinated biphenyls, polychlorinated terphenyls, polychlorinated naphthalenes or polybrominated biphenyls including hexabromobiphenyl. UNEP/CHW.13/6/Add.4.

Table 8. Number of PCBs containing transformers in use

Item	Type of Equipment	Total	
		2006	2015
1	Total number of equipment listed in the inventory (Nawec List; excluding Provinces)	**152**	**175**
2	Total number of equipment inspected	**55**	**31**
3	Total number of equipment not inspected		
4	Total number of PCB Transformers	**62**	**19**
5	Total number of PCB transformers in use		**19**
6	Total numbers of PCB transformers in stock		

[1]Difference in reduction of stock reflects scrap (unused) transformers and capacitors that are left at their original locations as shown in the coordinates map at section 6 of this report. These scrap transformers and capacitors represent the phased out stock. The phased out stock still remains in their original locations now considered to be the contaminated sites. Leakages and scavenging are possible pathways of the oil to the informal market, thus creating a possibility of cross contamination.

b) Capacitors

There was no data on capacitors containing PCBs. There are no large and old capacitors in the NAWEC system. Recently four new capacitors were introduced, but since these are all manufactured after the year 2000, they should not contain PCBs. Most of the inspected small capacitors were produced after 1990 and therefore assumed to be PCBs free. It is therefore concluded that even if small capacitors that are made before 1990 (and possibly PCBs containing) do exist in The Gambia this must be minimal.

c) Other closed applications

The inventory did not look at other close systems for PCBs. Even though there could be other equipment containing PCBs, they could not be inventoried because it was out of the scope of the inventory update.

2.3.2.5 PCB in open and semi-closed applications

a) PCB in hydraulic fluids (in particular mining)

There are no major mining activities in The Gambia except for sand and gravel mining for the construction industry. This has not been covered by this inventory.

b) PCB in open application: sealants in construction

It is assumed to be used in construction from 1950s to 1970s but an assessment was not covered by this inventory.

c) PCB in open application: paints and coatings

There is no production of paint in The Gambia. PCB containing paints used in the 1950th to 1970th might have been used in The Gambia. Since these paints were expensive it is assumed that the overall use was low.

2.3.2.6 Registration and control

Currently a UNITAR/UNDP project for managing PCBs has started which will finalize the PCB inventory and initiate the management of PCB stocks.

2.3.2.7 Stockpiles and wastes

Assessment of PCB stockpiles and wastes gone out of operation

During the inventory, it was found that fifty three (53) transformers containing PCBs were decommissioned. These transformers are considered waste and can be found in various NAWEC sub-stations and not as one stockpile stored at a central location.

Amount, type, condition and location of PCB stockpiles and waste

There is no data available on the amount and type of the transformers in their various storage facilities. These transformers could be found to be leaking in various locations and in different magnitudes.

2.3.2.8 Potential impacts

Workers maintaining transformers might be exposed to PCB oils. Also workers managing waste oils might be exposed to PCB contaminated oils. The recycling of PCB contaminated oils might expose further people to PCBs. No monitoring data available since Gambia has a weak monitoring capacity.

2.3.3 Assessment of POP-PBDEs (Annex A, Part IV and Part V), HBB (Annex A, Part I)

2.3.3.1 General

Polybrominated diphenyl ethers (PBDEs) are brominated flame retardants (BFRs) used in various products such as plastic in electronics, polyurethane foams in vehicles and, textiles, to reduce their ignitability to meet certain flammability standards. Due to the increase of flammable polymer materials, the global demand for PBDEs (and other flame retardants) has been growing rapidly from the 1970s to 1990s. This was also partly driven by industry lobby for uses which not necessarily would have required flame retardants.[25,26] Three commercial PBDE mixtures were produced and used in the market: commercial PentaBDE, OctaBDE and DecaBDE. However, due to their characteristics of persistence, bioaccumulation potential, long-range environmental transport and adverse effects on wildlife and humans, PBDEs have become ubiquitous environmental contaminants and aroused increasing concern. PBDEs can affect neurodevelopment, and thyroid hormone regulation in exposed animals and individuals.[25]

[25] Shaw SD, Blum A, Weber R, et. al. (2010) Halogenated Flame Retardants: Do the Fire Safety Benefits Justify the Risks? Reviews on Environmental Health 25(4) 261-305.
http://greensciencepolicy.org/wp-content/uploads/2013/11/Review-of-Env-Health-2542010-SHAW-BLUM-.pdf

[26] http://media.apps.chicagotribune.com/flames/index.html

Due to the environmental and health risk, commercial PentaBDE (c-PentaBDE) and commercial OctaBDE (c-OctaBDE) technical mixtures production stopped in 2004. The production of DecaBDE continued but also DecaBDE was listed as POPs in 2017.

Plastics of electrical and electronic equipment (EEE) are frequently flame retardant with PBDEs as a major BFR widely used as additives in the past. PBDEs were also used as flame retardants polyurethane in vehicles, furniture and insulation foam depending of the flammability standard. Also certain textiles were treated with PBDEs or other flame retardants.

For c-PentaBDE the main use (90%) was in polyurethane foam with use in car/transport, furniture, construction, or baby products with the major use in the US.[27]It was also used on textiles. The major use of c-OctaBDE was in plastic in electronics. The use in production has stopped 2004 but treated products are still in use and end-of life. DecaBDE is still used today in particular in the exemptions listed in the Convention. DecaBDE was not addressed in this inventory since it was only listed in 2017.

The aim of this inventory was to evaluate the situation in Gambia of the major articles and products in use and stocks and wastes impacted with POP-PBDEs. For PBDEs the inventory mainly focused on electrical and electronic equipment (EEE) and related waste (WEEE) and the transport sector.

Hexabromobiphenyl (HBB) is listed in annex A of the Stockholm Convention without exemptions. Due to the small production (probably less than 10,000 t) and limited use mainly in the 1970s, it is likely that most HBB-containing materials were disposed of decades ago. Hence, the chemical is of minor relevance for the inventory. Due to the similar former use as PBDEs (electronics and vehicles), the management of PBDE containing waste also would address possibly remaining HBB containing waste.

The methodology used to carry out the PBDE inventory was based on the Stockholm Convention inventory guidance document[28]. Methods used were data of the official statistics and suggested estimates according to the inventory guidance approach.

2.3.3.2 EEE and WEEE containing POP-PBDEs

Gambia has not yet established an EEE/WEEE inventory in the country. Therefore, this inventory exercise provided an opportunity to initiate the inventory by estimating the minimum POP-PBDEs amount in CRT in the country.

a) Tier I inventory

The estimated total amount of POP-PBDEs in stockpiled/in use EEE CRTs TVs and PCs ranges from 0.983 to 2.869 t, contained into amount of POP-PBDEs in stockpiled/in use EEE CRTs TVs and PCs monitors is 1 to 2.9 t contained in 1129 t of polymeric fraction.

[27]Alcock R.E, et al. (2003) Understanding levels and trends of BDE-47 in the UK and North America: an assessment of principal reservoirs and source inputs. Environment International 29, 691- 698.

[28] Secretariat of the Stockholm Convention (2017) Draft guidance on preparing inventories of polychlorinated naphthalenes (PCNs).Draft March 2017. UNEP/POPS/COP.8/INF/19

Table 9. Tier 1 estimate of POP-PBDEs in CRT in Gambia

Homologues	Distribution homologues c-OctaBDE	Total c-OctaBDE (t)
Inventoried c-OctaBDE		2.9
HexaBDE	11% x 1 to 2.9	0.11 - 0.319
HeptaBDE	43% x 1 to 2.9	0.44 - 1.25
Total		**0.55 - 1.57**

b) Tier II inventory

b.1) Import

The import statistics for CRTs in Gambia is weak. The total estimated amount of POP-PBDEs in EEE CRTs imported in The Gambia for 2011 ranges from 0.025 to 0.08 t, contained in 30 t of polymeric fraction.

b.2) In use/stockpiled

Institutional and corporate consumers

Some data on EEE CRT casings have been collected and where the case extrapolated at national level. The total estimated amount of POP-PBDEs in EEE CRTs stockpiled at institutional and corporate consumers ranges from 0.0781 to 0.23 t, contained in 90 t of polymeric fraction.

Private consumers (households)

The total estimated amount of POP-PBDEs in EEE CRTs stockpiled at private consumers (households) ranges from 0.51 to 1.5 t c-OctaBDE with 0.28 - 0.81 t POP-PBDEs, contained in 587 t of polymeric fraction.

This estimate is slightly lower but in the range of the Tier 1 assessment.

b.3) WEEE

Gambia has no WEEE inventory at the national level, therefore no data could be collected and no extrapolation could be made at the private consumers (households) and institutional and corporate consumers levels to be able to estimate the POP-PBDEs amount entering the waste stream.

The Global E-waste Monitor 2017[29] estimated a total of 2,200 t of e-waste was generated in Gambia in 2016. This amount is containing to 440 t of polymeric fraction (2,200 t x 20%) which is likely to contain POP-PBDEs but cannot be estimated at this time and more in-depth inventory is needed.

[29]Baldé CP, Forti V, Gray V, Kuehr R, Stegmann P (2017). The Global E-waste Monitor 2017.Quantities, Flows, and Resources.https://www.itu.int/en/ITU-D/Climate-Change/Documents/GEM%202017/Global-E-waste%20Monitor%202017%20.pdf

c) Summary of POP-PBDEs in EEE/WEEE CRTs in The Gambia

Table 10. Summary table on the amount of POP-PBDEs in CRTs in The Gambia

POP-PBDEs homologues	Amount of POP-PBDEs in import (t) in most recent year of data (2011)	Amount of POP-PBDEs (t) in stockpiles/use on private level	Amount of POP-PBDEs(t) in stockpiles/use on institutional and corporate consumer level	Amount of POP-PBDEs entering the waste stream
c-OctaBDE	0.08	1.5	0.23	Not estimated due to lack of data
HexaBDE (11%)	0.001	0.165	0.025	
HeptaBDE (43%)	0.004	0.645	0.1	

2.3.3.3 Transport sector

a) Registered vehicles
b) Imported vehicles

The POP-PBDEs amount could not be estimated due to the lack of information on the vehicle's fabrication year and regional origin.

c) Imported vehicles

Over the years 2007 to 2011, about 20% of the vehicles registered annually in The Gambia are imported second hand. The average age of vehicles in the national fleet is over five years. There is a high preponderance of over aged vehicles in the fleet that has resulted in low availability and high spare parts requirements.

As the imported cars are second hand it was assumed that were produced before 2005 and possible to contain POP-PBDEs, which was calculated as follows:

The total estimated amount of PUR foam contained in imported vehicles (2007 to 2011) was calculated to 328 t (183 t for cars/trucks and 144 t for buses) containing 0.461 t of c-PentaBDE.

d) End-of-life vehicles

No inventory of end-of-life vehicles exists in The Gambia so no estimation of POP-PBDEs entering the waste stream was possible at the moment and is to be further developed during the NIP implementation.

2.3.4 Inventory of HBCD (Annex A, Part I and Part VII)

2.3.4.1 General

HBCD is another prominent brominated flame retardant listed in Annex A of the Convention and was used mainly (>80%) in expanded and extruded polystyrene (EPS/XPS) in building insulation. HBCD has an exception for use in insulation materials for buildings.

Minor uses were in textiles and in high impact polystyrene (HIPS) in electronics. These latter uses are considered to have stopped globally in production around 2013 with the listing in the Stockholm Convention. The use in EPS/XPS) in building insulation has been exempted and continues. The HBCD inventory has been developed based on the Stockholm Convention inventory guidance for HBCD.[30]

2.3.4.2 Import

Only a polystyrene foam plant in the country, Construct Company, was visited. This company imports expanded polystyrene (EPS) beads, heat it, convert it into foam and mould it into shapes mainly for insulation in construction of buildings. In its specifications, which shows 93% polystyrene and 7% pentane, no HBCD or any other flame retardant is mentioned.

2.3.4.3 Export

There is most likely no export of HBCD containing material from The Gambia.

2.3.4.4 Use

Just like PBDEs, HBCD was used in plastic in EEE but at lower quantity. HBCD was also used in textiles and floor mats in vehicles. These are likely present in The Gambia. Uses of HBCD in specific textiles such as curtains in public buildings or uniforms for fire fighters or military has not been addressed in this inventory.

2.3.4.5 Potential impacts

The exposure to HBCD in The Gambia is considered very low and not relevant.

2.3.5 Assessment with respect to DDT (Annex B, Part II)

2.3.5.1 General

Dichlorodiphenyltrichloroethane (DDT) was one of the most prominent POPs pesticides and is listed in Annex B of the convention with the exemption of malaria vector control. The half-life of DDT in humans is more than 4 years and the half-life for the degradation product DDE is probably longer. DDT is highly toxic to insects, shrimps and fish, and adversely affects the reproduction of wild birds through thinning of egg shells triggering the “Silent Spring” book. DDT is an endocrine disrupting chemical (EDC) and higher levels in mothers were recently correlated with increase in autism disorder.[31]The global production of DDT for vector control was estimated to 4740 t in 2005 and 6300 t in 2007 in India alone.

[30] Stockholm Convention (2015) Guidance for the inventory, identification and substitution of Hexabromocyclododecane (HBCD), Draft March 2015.

[31] Brown AS, Cheslack-Postava K, Rantakokko P, et al. (2018) Association of maternal insecticide levels with autism in offspring from a national birth cohort. Am J Psychiatry. https://doi.org/10.1176/appi.ajp.2018.17101129.

2.3.5.2 Import

During the recent use of DDT 2009 to 2014, DDT was imported into the country e.g. as donation from Moroccan Government in the fight to control Malaria Vector(mosquitos). In 2014 DDT use and official import of DDT has been stopped.

However, quite a number of pesticides that may include DDT pass through The Gambia borders unnoticed (smuggled) and sold illegally in the weekly markets and within rural communities usually unlabelled. The National Environment Agency is responsible for regulating all matters relating to pesticides including DDT.

2.3.5.3 Export

No information on DDT export could be retrieved during the inventory update.

2.3.5.4 Production and use

The Gambia does not manufacture DDT but used it for Public Health purposes. During the review of the NIP document, 2009, the National Malaria Control Program (NMCP) has not fully used DDT in the form of Indoor Residual Spray (IRS) to combat malaria. It was in July 2008, in Janjanbureh, Central River Region (CRR) that the pilot phase was implemented. By 2010, the use of DDT in the form of IRS was fully implemented across the country (NMCP, 2010).

The Gambia re-introduced DDT in 2010 by government in order to address the issue of resistance to the existing insecticides at the time used in malaria vector control. The DDT formulation and used quantity for the period 2010 to 2014 was 72,582 kg containing 544 kg DDT (table below).

The use of DDT for Malaria control has been stopped since 2014 by NMCP and Ministry of Health and Social Welfare.

Table 11. Quantity of DDT used by NMCP, Ministry of Health and Social Welfare

YEAR	COMPOUND OR PRODUCT		FORMULATION	CONCENTRATION	TYPE OF APPLICATION	AMOUNT OF FORMULATION USED (KG OR L)	AMOUNT OF ACTIVE INGREDIENTS USED (a.i/gram)
2010	DDT		WP	75%	IRS	14,454	108
2011	DDT		WP	75%	IRS	10,727	80
2012	DDT		WP	75%	IRS	14,800	111
2013	DDT		WP	75%	IRS	19,974	150
2014	DDT		WP	75%	IRS	12,627	95
Total quantity used during 2010-2014						**72,582**	**544**

Source: NMCP Annual report on DDT/IRS Activities, 2014

According to a study ‘’Alternative Treatments for Indoor Residual Spraying for Malaria Control in a Village with Pyrethroid- and DDT-Resistant Vectors in The Gambia’’ by Medical Research council (MRC) and NMCP (2013), there was resistance of local vectors to ***pyrethroids*** and **DDT** (31% and 46% mortality, respectively) while resistance to bendiocarb and pirimiphos methyl was low (88% and 100% mortality, respectively). The *Anophelesgambiaes.s.*were the principal vectors in the study. From the village of Sare Alpha in Upper River Region, eight residential

compounds were each sprayed with either (a) bendiocarb, a carbamate, (b) DDT, an organochlorine, (c) microencapsulated pirimiphos methyl, an organophosphate, or (d) left unsprayed (Tangena et al., 2013). There was high residual activity after testing all four insecticides up to five months after application. The focus group discussion revealed that, IRS is a nuisance and that it may affect the utilization of bed nets in the communities(Tangena et al., 2013)

Based on the above highlight, NMCP, Ministry of Health and Social Welfare have decided to use bendiocarb as an alternative to DDT for the control of malaria in The Gambia.

Bendiocarb is an acutely toxic carbamate insecticide used in public health and agriculture and is effective against a wide range of nuisance and disease vector insects. Many bendiocarb products are or were sold under the tradenames "Ficam" and "Turcam (https://en.wikipedia.org/wiki/Bendiocarb). It has been used as an alternative to DDT for IRS to control malaria in many African countries.

Authorities in The Gambia have only limited awareness that there are other vector control measures including the clearing of weeds and bushes/shrubs around dwelling areas and clearing of potential rain water collection points or containers that hold rain water coupled with the introduction of a national cleansing day that is observed e.g. once each month. These are efforts to curb or interrupt mosquito breeding through environmental interventions.

Biological control measures are not an institutional phenomenon in The Gambia but a natural one in which paddy rice fields that provide ideal breeding for mosquitoes are naturally blessed with Tilapias (fish) which is a voracious feeder especially on mosquito larvae. Therefore, at that level, the populations of the mosquitoes would be checked naturally by the population of the tilapia fish.

Therefore, there is the need to venture into environmental control measures in order to reduce reliance on chemicals that are prone to resistance with transience of time. Integrated Vector Management approaches taking into account both environmental and chemical measures would save the environment as well as reduce reliance on synthetic chemicals.

2.3.5.5 Overview of the Partnership framework for malaria control in The Gambia

The Malaria Control Unit (MCU) now National Malaria Control Program (NMCP) was created in 1990 in recognition of the importance of malaria as a major public health problem. In 1993, the unit was placed under the Directorate of Disease Control to give it the attention it deserves. A clearly defined structure for management and coordination of the malaria control program exists, but difficulties in coordination and monitoring and evaluation of partner activities still remain. However there is strong political will for malaria control and prevention. The effective management and co-ordination of the Unit and building of partnership with stakeholders requires adequate logistical support. Like many other units in the MOH&SW, the program relies heavily on donor support. Over the last ten years, funding for malaria control and prevention, both from government and donor agencies have increased, but funding gaps still exist. The existence of funding gaps poses an enormous challenge for effective coordination and management. The importance of community participation in malaria control programs cannot be over-emphasized. There are many types of structures and organized informal groups, with considerable potential, in Gambian communities, and NMCP is taking full advantage of this great opportunity. The existing structures that are expected to facilitate management and co-ordination of activities at regional level have broad mandates and a wide range of sectoral

responsibilities. However, Regional Health Teams (RHTs) and peripheral facilities are being strengthened to enable them effectively manage, implement and monitor malaria control activities.

Extent of involvement of the population in decentralization

The legislative frameworks, i.e. Local Government Act 2002 and Local Government Finance and Audit Act 2004 have been enacted for the operationalization of Local Government reform and decentralization programme. Following the adoption of the local government Act, elections of all local government councils have been held. In all local government areas, structures such as Village Development Committees (VDC), Ward Development Committees (VDC) and Multi-Disciplinary Facilitation Teams (MDFT) have also been established to facilitate the decentralization process. Studies have been conducted to assess the state of preparedness of both the central and local government for the decentralization of selected services i.e. Agriculture, Health, and Education from the centre to the periphery. The findings of most of the studies indicated inadequate state of preparedness of both the central and the local governments. The major constraint identified was capacity problem, ranging from manpower, institutional, processes and logistics. The decentralization program is further derailed due to lack of a consolidated and well-coordinated strategy.

Partnership with the civil society (nongovernmental organizations, other community-based Organizations - CBOs)

The National Malaria Control Programme collaborates with many local NGOs and CBOs in malaria control and prevention interventions. The NMCP collaborates with Action Aid The Gambia (AATG), Catholic Relief Services (CRS), Nova Scotia Gambia Association (NSGA), and Health Promotion and Development Organization (HePDO) in the area of ITN/LLIN distribution and IEC/BCC activities. Medical Research Council (MRC) and Centre for Innovation against Malaria (CIAM) also collaborate with NMCP in the area of research and surveillance. At community level many CBOs such as NYAAMA, Bill Clinton Youth Association, NAWFA, CaDO ADWAC etc. are also involved ITN/LLIN distribution and IEC/BCC activities on malaria control and prevention.

Coordination of development partners' interventions in the context of bilateral and multilateral Cooperation

The Ministry of Health and Social Welfare is responsible for the coordination of development partners' interventions in the context of bilateral and multilateral Cooperation. The development/multilateral partners include the UN system, World Bank and ADB. These multilateral organizations support malaria control and prevention interventions by providing technical and financial assistance to strengthen health service delivery and scaling up of key interventions.

As part of The Gambia's endeavour to participate in the International Initiatives, especially those that deal with POPs and here DDT; would like to align itself with the Global Alliance for Alternative to DDT in the near future. This Alliance could help The Gambia exclude DDT as Public Health vector control pesticide by encouraging the use of environmentally friendly vector control pesticides and other measures as an alternative to DDT.

In the area of health, The Gambia enjoys bilateral technical cooperation with many sister countries such as the Federal Republic of Nigeria, Republic of Cuba, Egypt and Taiwan.

Through bilateral arrangements, the Cuban government is providing doctors to support health service delivery. The Cuban medical team is also supporting training of Medical doctors and teaching at the University of The Gambia Medical School. The government of Nigeria provides technical assistance through the provision of doctors and nurses to improve health service delivery.

Partners involved in malaria control

National Malaria Control Programme is responsible for coordination of malaria control at the national level. The NMCP will facilitate the need for rapid change that are needed by ensuring that approaches used are flexible, innovative, creative, cost effective and quality. The NMCP will also use a total approach involving both the health and non-health sector; a wide spectrum of interest groups, both at a horizontal and on a vertical level; promoting inter-sectoral, inter-disciplinary and community participation and commitment through open lines of communication, networking and consultation in the form of health forums, tasks groups, etc. Effective malaria control requires the participation of multiple partners at various levels with varying responsibilities. In the light of this, it is important that an effective framework for management, co-ordination and partnership is put in place at all levels. Such a system minimizes duplication of efforts and waste of scare resources. Both the private and informal sectors will be encouraged to play increasing roles in Roll Back Malaria. The Ministry of Healthand Social Welfare will continue to provide leadership and conducive policy environment for implementation of malaria control interventions and strategies. During the implementation of the previous strategic plan, NMCP established strong partnership with various stakeholders. There was also good collaboration with other line ministries, NGOs the private sector and community based organizations. This collaboration and partnership will be strengthened to sustain and build on the gains registered in reduction of malaria cases. The RHTs will co-ordinate implementation of malaria control activities at the Regional level as well as build partnership with public and private sector partners and communities. They will provide leadership and direction in their regions with support from the Regional Co-coordinating Committee. At the community level, VDCs and CACs will play a leading role in the implementation and co-ordination of malaria control activities. They will be supported by Multi-Disciplinary Facilitation Teams (MDFTs), basic health facility staff, NGO partners, volunteer advocates and the RHTs.

Coordination with other sectors of development

Coordination of malaria control and prevention is done through the RBM partnership at national level. Partnership meeting are conducted at the central level to facilitate the development of malaria control and prevention strategies as well as its implementation. Different coordination mechanisms exist at different levels e.g. RBM partnership, Regional Technical Advisory Committees (TAC), Multidisciplinary Facilitation Teams (MDFT) and Village Development Committees (VDC). These coordination committees operate at different levels to plan and implement issues related to health and development. They consist of different sectors of development both public and private including NGOs.

Contribution of the private sector

The private sector in The Gambia is currently investing in malaria prevention and control. A number of private clinics are involved in malaria control and prevention interventions. These

include the provision of (Intermittent Preventive Treatment) IPT, ITN/LLIN and malaria treatment services. Through their participation and provision of these services, they have contributed in increasing coverage of IPT services as well as promoting the use of ITNs/LLINs and increasing access to treatment by the target groups. This partnership will be strengthened and enlarged to include more private clinics in order to increase coverage. Private sector companies namely: banks, petrol filling stations, radio stations and GSM services provide support to the health system through donations, structural maintenance of hospitals/clinics and the provision of essential supplies to the health facilities. The Association of Health Journalists is a key partner in the area of advocacy and social mobilization. With a broad membership, the association is playing a vital role in increasing awareness about malaria and reporting malaria and other health events happening in the country.

Collaboration with countries of the sub-region

The Gambia is a member of many sub-regional initiatives namely: Health for Peace Initiative (HPI), West African Network for Monitoring Antimalarial Drug Resistance (WANMART) and West African Health Organization (WAHO)the Gambia is also collaborating with Senegal, Guinea Bissau and Guinea Conakry in the area of malaria research and surveillance. These collaborations are planned to be further supported and possibly intensified.

Community Involvement

Malaria control is an integral part of the activities of the Multi-Disciplinary Facilitation Team (MDFT), which is composed of field workers and community representatives at the district level. The communities have as part of their responsibilities:

- Social mobilization;
- Distribution of ITNs/LLINs and insecticide;
- Sensitization of households to prevent and recognized signs and symptoms and seek treatment for malaria;
- Resource mobilization for malaria control activities;
- Environmental management;
- Conduct annual bed net census.

2.3.5.6 Morbidity and Mortality patterns

The global estimated number of malaria cases decreased from227 million in 2000 to 198 million in 2013. Considering the growth of the population at risk of malaria during this same period (25% globally and 43% in the WHO African Region), the number of cases estimated per 1000 population at risk demonstrated a 30% diminution in case incidence worldwide and a 34% drop in the WHO African Region. In the last 13 years if the decline rate is maintained, malaria case is projected to fall by 40% and 35% for the globe and WHO African Region in 2015 respectively (WHO, 2014).

In The Gambia, malaria suspected cases accounts for 717 per 1000 of all out-patients and cases for all ages stood at 262 per 1000. During the period under review, fever suspected as being malaria accounted for 717 per 1000 of all out-patients. In 2006, the number of malaria cases of under-five at Reproductive and Child Health(RCH) were 1044 per 1000 with a mortality rate of 6.1 per 100 (NMCP strategy Plan 2009). In Africa, there is an estimated 550 million people at risk of getting malaria and the annual cases estimate is 247 million with an annual

death rate of 1 million under-five children. The *P.falciparum* is responsible for 75% cases of malaria and Africa account for 90% global cases of malaria (NMCP, 2009). According to WHO (2014) the reported morbidity and mortality rate for the year 2014 is240 792 confirmed cases and 262 reported death respectively.

Vector Sensitivity Patterns

A joint study on vector resistance to DDT and pyrethroids by Medical Research Council (MRC) and NMCP, in Upper River Region found that, there was resistance of local vectors to pyrethroids and DDT (31% and 46% mortality, respectively) while resistance to bendiocarb and pirimiphos methyl was low; 88% and 100% mortality, respectively (Julie-Anne A. Tangena et al., 2013).

Cost-effectiveness of preventive measures

According to Africa Fight Malaria (AFM) Indoor Residual Spraying (IRS) is a highly effective method of malaria control recommended by the World Health Organization. Instead of this strategy eradicating the diseases or sharply decreasing its prevalence, it remains underutilized in some part of sub-Saharan Africa, where, each year, malaria kills over a million people and drains the continent of US$12 billion (AFM, 2015)

WHO (2014) reported that the use of IRS for the control of malaria vectors has protected 124 million people from malaria representing 4% of the global population at risk. Within the WHO African Region, 7%, or 55 million people at risk were protected from malaria. This decreased from 11% in 2010 due to the withdrawal or downscaling of IRS programs in many countries of the African Regions (WHO, 2014).

With regards to the use of insecticide-treated mosquito net (ITN) during the past ten years, WHO reported that coverage with vector control interventions has increased substantially in sub-Saharan Africa. Half of the population at risk (49%, range 44–54%) in Africa had access to an insecticide-treated mosquito net (ITN) in their household. This compared to 2004, were the figure was 3% shows undoubtedly a significant progress in combating malaria. The same report estimated that 44% (range 39–48%) of the population at risk were sleeping under an ITN in 2013, compared to 2004 in which the figure was 2%. Pregnant women and children were more likely than the general population to sleep under an ITN (WHO, 2014).

Furthermore, regarding the use of long-lasting insecticidal net (LLIN) delivery, the year 2014 has been rated strongest year by WHO so far in the history of LLINs distribution. The projected nets to be delivered by the end of 2014, in the sub-Saharan Africa are 214 million nets. This brings the total number of nets delivered to the sub region to 427 million nets since 2012. In the Gambia, in 2014, 1 million LLINs were distributed countrywide by the Catholic Relief Service (CRS) The Gambia in collaboration with partners between the period of May to August contributing to the sub-regional figure of 214 nets distributed (CRS, 2014).

Another malaria control intervention is intermittent preventive treatment in pregnancy (IPTp) which has been increasing over time. In 2013, of all the 35 countries that adopt IPTp, 57% of pregnant women in these countries receive at least one dose of IPTp. Out of the 35 countries, only nine reported to WHO on the recommended number of three or more doses of IPTp. Only 17% of pregnant women receive three or more of the recommended doses. Antenatal attendance far outweigh IPTp administrations, this is attributed to missed opportunities to expand access to life-saving intervention to prevent malaria in pregnancy.

Domestic and international funding for malaria control and elimination totalled US$ 2.7 billion in 2013. Albeit this figure representing a threefold increase since 2005, it has not reached the global estimation of US$ 5.1 billion that is required to achieve global targets for malaria control and elimination. The WHO African Region accounted for 72% of the global total and international disbursements for malaria for this region increased at an annual rate of 22% between 2005 and 2013 with an average annual rate for domestic funding in the region of 4%.

WHO (2014) reported that as a result of the malaria control interventions,670 million fewer cases and 4.3 million fewer malaria deaths occurred between 2001 and 2013 than would have occurred had incidence and mortality rates remained unchanged since 2000, averting 4.3 million deaths between 2001 and 2013. Out of the 4.3 million, 3.9 were children (92%) aged under-five years in sub-Saharan Africa. The reduction in malaria deaths has led to the progress towards achieving the MDG target 4 which is to reduce by two thirds, the under-five mortality rate between 1990 and 2015 and contributes to SDG 3.

2.3.5.7 Stockpiles

The DDT stock balance at December 2014 was **1125kg.** NMCP intends to keep the balance for control studies during routine vector control activities but there is no plan in place for the re-introduction of DDT for malaria control in The Gambia in the future. The balance of DDT stockpiles are safely kept in their designated stores at various RHTs free from access to unauthorized persons. These are stores specifically built for the storage of insecticide stockpiles with restricted access and high monitoring and proper documentation system. The annual stockpiles are reported to the Stockholm Convention via National Environment Agency.

2.3.5.8 Potential impactsidentified by monitoring

Since DDT has long been used in Gambia the population is exposed from different sources in particular houses where DDT has been used. But also food from animal origin like eggs in DDT spray areas as shown for South Africa.[32]No monitoring data available. The monitoring capacity in Gambia is weak.

2.3.6 Assessment of PFOS, its salts and PFOSF (Annex B, Part III)

2.3.6.1 General

Per- and polyfluoroalkyl substances (PFASs) are a large group of more than 4500 fluorinated compounds[33], including oligomers and polymers, which consist of neutral and anionic often surface-active compounds with high thermal, chemical and biological inertness. PFASs are used in many different chemical products and articles because of their desirable properties and as a result they find their way into the environment. The substances have extremely poor environmental biodegradability (persistent, P) and many of them accumulate in living organisms (bio-accumulating, B) and are toxic (T). There is a lack of overall knowledge of highly fluorinated

[32]Bouwman H, Bornman R, van Dyk C, Barnhoorn I (2015) First report of the concentrations and implications of DDT residues in chicken eggs from a malaria-controlled area.Chemosphere. 137:174-177.

[33]OECD (2018) Toward a new comprehensive Global Database of Per- And Polyfluoroalkyl Substances (PFASs). http://www.oecd.org/chemicalsafety/portal-perfluorinated-chemicals/

substances and to prevent further pre-existing health and environmental problems from building up and persisting for a long time, it is important to control and where necessary to eliminate the use of these substances. Therefore, PFASs have been listed as issue of concern under the Strategic Approach of International Chemical Management (SAICM). Science statements such as the Madrid Statement[34] and the Zürich Statement[35] have stressed the need to control these highly persistent and mobile compounds.

Perfluorooctanesulfonate (PFOS) is one of the most relevant and toxic PFASs detected in wildlife and humans worldwide with associated health effects. PFOS and precursors of PFOS (PFOS related substances) were listed in Annex B with a range of specific exemptions and acceptable purposes.

Other PFASs are not listed in the Stockholm Convention but perfluorooctanoic acid (PFOA) has been assessed by the POPs Review Committee and will be listed as POPs in 2019. Additionally, PFHxS is currently assess by the POPRC and it has been concluded that it meets the POPs properties.

2.3.6.2 Production

PFOS and related substances were/are not produced in Gambia but were/are only imported in products.

2.3.6.3 Import

No information on PFOS and PFOS containing products/articles imported in The Gambia could be retrieved.

2.3.6.4 Use and stock of PFOS

A) Inventory of PFOS in firefighting foams

The major current use of PFOS potentially relevant for the region is in specific fire-fighting foams used for hydrocarbon fires (such as AFFF and similar foams) (SC PFOS inventory guidance).

Since these are used in firefighting media, fire stations, shops dealing with firefighting materials, Gambia Airlines, and photo stars were visited to gather data. At firefighting stations and dealer of firefighting materials, no PFOS was found in use or on sale however fluoroprotein foam (FFFP) might contain PFOS or another PFAS but this was not mentioned on the label of the foams. Other extinguishers were: water, CO_2, and dry powder (ABC) extinguisher, nit contain PFOS. It was found that bromochlorodifluoromethane was used in the past but is no longer in use.

It is not clear to what extent PFOS containing foams were used in the past and what amount has been used. Therefore the extent of PFOS contaminated sites in the country due to firefighting is unknown. However, the firefighting training site, Old Cap Road, Bakau; and the locations of major fire incidents in the country (Table 12), are considered potential PFOS contaminated sites.

[34] Blum A, et al. (2015) The Madrid Statement on Poly- and Perfluoroalkyl Substances (PFASs). Environ Health Perspect 1235 A107–A111. https://ehp.niehs.nih.gov/doi/10.1289/ehp.1509934

[35] Ritscher A, et al. (2018) Zürich Statement on Future Actions on Per- and Polyfluoroalkyl Substances (PFASs). Environ Health Perspect.126, 84502. https://ehp.niehs.nih.gov/doi/full/10.1289/EHP4158

Table 12. Location and year of major fire incidents in the Gambia

SN	Location	Year
1	BasseKaabakamma Petrol station (URR)	2005
2	Serrekunda Market (KMC)	2011
3	Brikama Elton Petrol station (WCR)	2016
4	Latrikunda Market (KMC)	2016

B) Inventory of synthetic carpets and other treated materials

PFOS has been used for surface treatment of synthetic carpets, textiles and leather (see PFOS inventory guidance chapter 5).

Synthetic carpets

Synthetic carpet (tufted carpets) was a major use area of PFOS. Synthetic carpets are considered a PFOS stockpile today. The main use was before 2002 (at the time of high PFOS production volumes). For the synthetic carpets, mainly the nylon fibres were treated with a PFOS polymer. Final PFOS concentration is approximately 0.3% (GUT 2011). Since synthetic carpets has a long service life of approx. 20 years and possibly longer, synthetic carpets from 2002 and earlier are still in use.

Since the specifications on the carpets being imported and used in The Gambia are not labelled and therefore do show if a carpet contains PFOS, no data was compiled on stockpiles of synthetic carpets in the countries. Internet search also suggests that the carpets today do not contain PFOS but that other PFAS are used for stain repellence. However synthetic carpets imported before approx. 2003 might contain PFOS and might be still in use or disposed to landfills (see below on contaminated sites).

Textiles, leather and paper

PFOS has been used in treated textiles like outdoor jackets, awning/sunblind, stain repellent furniture, umbrella etc.

PFOS treated paper was use in fast food, pizza boxes, backing paper, muffin cups, popcorn package etc.

For these applications PFOS has largely used before 2003 and where substituted by other PFAS.Treated textilesand paper have short service life and the PFOS treated textiles and papers mainly producedbefore 2003 have largely entered end of life and are in landfills and dumpsites with associated releases.

Since some years, alternatives to PFOS are used including other PFAS or non-fluorinated alternatives.

C) Inventory of PFOS in other uses

Aviation hydraulic fluid

PFOS has been used in aviation hydraulic fluid in air planes (see PFOS inventory guidance chapter 6).

At the airport in Banjul, Gambia International Airlines (GIA) uses global Aps (J-4) sl hydraulic oil and global Aps (J-4) sl automotive transmission as hydraulic fluids. These fluids have `been in used since before 2000 and none show PFOS in its specifications. Some photo stars were also visited to check on the use of PFOS in photo imaging. No PFOS was found there as well.

Sulfluramide (Mirex-S) insecticide for ants and termite

According to the inventory guidance, the PFOS precursor and PFOS related chemical "Sulfluramide" was and is used as insecticide in some countries (see PFOS inventory guidance chapter 6). This use is exempted for use for leaf cutting ants and red fire ants.

There is no record of use of sulfluramide in Agriculture for pest control in The Gambia and no exemptions are needed.

Oil drilling

PFOS was and is still used in oil drilling operations. A number of offshore and onshore blocks have been identified for drilling oil in The Gambia. Since oil drilling has not actually started in the country, use of hydraulic fluids that may contain PFOS, in oil drilling is not happening.

2.3.6.5 Potential impacts

Studies in Ghana and South Africa have shown that rivers used for drinking water can be contaminated with PFOS and PFOA.[36,37]There are no monitoring data available in The Gambia on PFOS in any media.

2.3.7 Assessment of releases of unintentional produced chemicals (Annex C)

2.3.7.1 General

Polychlorinated dibenz*o*-*p*-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), together with polychlorinated biphenyls (PCBs), polychlorinated naphthalenes (PCNs), hexachlorobenzene (HCB), pentachlorobenzene (PeCB) and hexachlorobutadiene (HCBD) are listed in Annex C of the SC as unintentionally produced POPs (UPOPs). PCBs, PCNs, HCB and PeCB have also been industrially-produced and used in several applications. PCDD/Fs were not produced commercially,[38,] and they have no known use.

PCDD/Fs and the other UPOP formation and/or releases arise mainly from four types of sources.

Three releases are process-related:

- Chemical production processes.E.g. the production of chlorine, chlorinated phenols and other chlorinated aromatic compounds; the production of chlorinated solvents and the oxychlorination of mixed feeds to make certain chlorinated solvents; the use of chlorine in industrial process like the production of magnesium, titanium oxide or pulp & paper;

[36]Essumang DK, et al. (2017) Perfluoroalkyl acids (PFAAs) in the Pra and Kakum River basins and associated tap water in Ghana. Sci Total Environ. 579, 729-735.

[37]Mudumbi JB, et al. (2014) Perfluorooctanoate and perfluorooctanesulfonate in South African river water WaterSci Technol. 69, 185-194.

[38]With the exception of analytical standards.

- Thermal and combustion processes: destruction of POPs and other organochlorine containing waste, general incineration of wastes, the thermal processing of metals—in particular metal production from metal scraps;
- Biogenic processes or photolytic processes, which can form PCDD/Fs from precursors mostly of anthropogenic origin such as pentachlorophenol and other chlorinated phenols. Also, the degradation of certain organochlorines can form UPOPs; e.g., pentachloronitrobenzene (PCNB; Quintozene) partly degrades to PeCB and is considered one of the largest sources of PeCB.[39]

Meanwhile, the fourth, and probably by far the largest source, is related to past releases of UPOPs[40]: Soils and sediments - which have accumulated PCDD/Fs and other (U)POPs over the last 100 years of releases from application of organochlorines containing UPOPs or releases from incinerators, metal industries or open burning. The PCDD/F-contaminated sites, soils, and sediments from the past release are still relevant for food contamination (e.g. fishes, chicken/egg, grazing cattle and milk and dairy products).[41]

Reservoir sources, such as landfills and dumps of PCDD/Fs and other UPOPs containing wastes from chlorine and organochlorine production. Historic inventories (e.g. release of historic PCDD/F from pesticide use in Japan of approx. 460 kg TEQ[40] or the landfill disposal of 330 to 854 kg TEQ from a single pesticide production in Germany[42] or dioxin release of more than 366 kg TEQ from spraying of defoliants in the Vietnam War[43] reveal that they have exceeded by far the documented releases from total contemporary global releases of 100 kg TEQ/year.[44].

Stockholm Convention obligation in respect to Dioxins/UPOPs (Article 5)

The framework for the activities and the action plan for PCDD/Fs and other Annex C chemicals is given by the obligations of Article 5 of the Convention.

Article 5 of the SC, covering the measures to reduce and eliminate releases from unintentional production, states that each Party shall, at a minimum, take the following measures to reduce the total releases derived from anthropogenic sources of each of the chemicals listed in Annex C, with the goal of their continuing minimization, and, where feasible, ultimate elimination (paraphrased and summarized):

Article 5 (a): Develop an action plan with the elements 5a (i-v) to facilitate its implementation (subparagraph (b) to (e)

[39] Stockholm Convention document from the 6th POP Reviewing Committee meeting (UNEP/POPS/POPRC.6/INF/21)

[40] For an overview: Weber R, Gaus C, Tysklind M et al. (2008) Dioxin- and POP-contaminated sites—contemporary and future relevance and challenges. Env Sci Pollut Res 15, 363-393.

[41] Weber et al. (2018) Reviewing the relevance of dioxin and PCB sources for food from animal origin and the need for their inventory, control and management. Environ Sci Eur. 30:42. https://rdcu.be/bax79.

[42] Götz R, Sokollek V, Weber R (2013) The Dioxin/POPs legacy of pesticide production in Hamburg: Part 2: Waste deposits and remediation of Georgswerder landfill. Env Sci Pollut Res. 20, 1925-1936.

[43] Stellmann MJ, Stellmann SD, Christian R, Weber T, Tomasallo C (2003) The extent and patterns of usage of Agent Orange and other herbicides in Vietnam. Nature 422, 681-687.

[44] Wang B, Fiedler H, Huang J, Deng S, Wang Y, Yu G (2016) A primary estimate of global PCDD/F release based on the quantity and quality of national economic and social activities. Chemosphere. 151, 303-309.

Article 5 (a) (i): Evaluate current and projected releases, including the development and maintenance of source inventories and release estimates, taking into consideration the source categories identified in Annex C.

Article 5 (a) (ii): Evaluate the efficacy of laws and policies to manage releases.

Article 5 (a) (iii): Identify strategies to meet dioxin reduction obligations, taking into account the evaluations in (i) and (ii).

Article 5 (a) (iv): Take steps to promote education and training and raise awareness of the strategies.

Article 5 (a) (v): Review, evaluate, and report on strategies every five years in meeting release-reduction obligations.

Article 5 (a) (vi): Develop a schedule for implementation of the action plan, including the strategies and the measures identified in them.

Article 5 (b): Promote the application of available, feasible, and practical measures that can readily achieve a realistic and meaningful level of release reduction or source elimination.

Article 5 (c): Promote the development and use of substitute or modified materials, products, and processes to prevent the release of Annex C chemicals.

Article 5 (d): Promote and, as soon as practicable, require BAT/BEP for new installations (sources) listed in Annex C Part II.

Article 5 (e): Promote BAT/BEP for existing installations (sources) listed in Annex C Parts II and III and for new sources listed in Annex C Part II.

2.3.7.2 Inventory of PCDD/Fs and other unintentionally produced POPs

The purpose of the unintentional-POPs inventory was to update the release of PCDD/F of all relevant sources compared to the baseline inventory from 2000.

The emission factors of the "Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs under Article 5 of the Stockholm Convention on Persistent Organic Pollutants", 2013; http://toolkit.pops.int/) was used in updating the inventory for PCDD/Fs. Since PCDD/Fs and the other listed unintentional POPs (PCBs, PCNs, HCB and PeCB) are formed together during incineration and other thermal processes, the UNEP Toolkit recommends, for practical reasons, that inventory activities be focused on PCDD/Fs, as these substances are indicative of the presence of other unintentional POPs (UNEP 2013)[45]. For these sources PCDD/Fs are considered to constitute a sufficient basis for identifying and prioritizing sources and control measures for all Annex C POPs and for evaluating their efficacy. Since the major UPOPs emission sources in Gambia are incineration and other thermal sources without organochlorine production, the inventory focused on PCDD/Fs as representative for all UPOPs.

This is the second PCDD/F inventory report Gambia after establishing a baseline inventory for 2000, and it presents estimates of release for the inventory year 2016where at the time of inventory development most data where available. For this purpose, the dioxin task team screened all 10 release source groups listed in the UNEP toolkit (see Tables 13 and 14).

[45]UNEP (2015) Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs under Article 5 of the Stockholm Convention on Persistent Organic Pollutants http://toolkit.pops.int/

Inventory source group 1: Incineration

In the Gambia, the only type of waste being incinerated is clinical waste generated from health facilities. These includes only needles and syringes. Accurate records were not available as to the total quantities; however, based on the assumption that an average weight of a safety box is 1kg, the following calculations were made for the incinerators visited at public health facilities with no air pollution control devices. It excludes data from the Medical Research Council which has one of the biggest capacity incinerators.

Table 13. List of Incinerators with their calculated t of waste incinerated per annum

Incinerator 1	120 boxes per day	120 x1 kg x 365days	4,380 kg	4.38 t
Incinerator 2	60 boxes per day	60 x 1kg x 365days	2,190 kg	2.19 t
Incinerator 3	60 boxes per day	60 x 1kg x 365 days	2,190 kg	2.19 t
Incinerator 4	75 Boxes per day	75 x 1 kg x 365days	27,375 kg	27.4 t
Incinerator 5	40 boxes per day	40 x 1 kg x 365days	14,600 kg	14.6 t
Incinerator 6	400 boxes per week	400 x 1 kg x 52	20,800 kg	20.8 t

These calculations combined lead to the conclusion that each year a total of71.56 t of needles and syringes is generated for public health facilities. This calculation assumes that perfect waste segregation practices have been put in place and are being followed at hospital/clinic level – which is the best-case scenario. However, healthcare waste is often not perfectly segregated into infectious, hazardous and non-hazardous waste streams. These incinerators are low technology combustion facilities with no emission control systems.

In addition, the Medical Research Council (MRC) operates incinerators at its main headquarters in Fajara and other field stations such as Basse and Keneba to burn medical wastes. These facilities are equipped with minimal air pollution control systems (scrubber systems) to reduce emission levels. The quantity of Waste Incinerated at various MRC field stations in the year 2016 are: Fajara (37,532 kg), Basse (3,823 kg), and Keneba (5,700 kg). The total quantity of waste incinerated is 42,812 kg which is equivalent to 47.19 t per annum.

Therefore, the total medical waste incinerated amounts to 119 t/year, resulting to an annual release of 3.0 g TEQ/a to air which was an increase due to increased capacity compared to the first inventory in 2000 (1.53 g TEQ) after recalculation with 2013 toolkit (see table below).

It is expected that the number of incinerators will increase in the next few years because of an already approved World Bank Project at the National Nutrition Agency (NaNA) that is building about 34 incinerators in major health centers across the country. With the knowledge that these incinerators are low technology with no air pollution control systems, increased emissions of dioxins and furans if proper control measures are not in place. On the other hand, the enforcement of the National Environment Management Act and its regulations such as the Waste Bill by the NEA, and the implementation of the provisions of the Minamata Convention on Mercury will compel health facilities operating sub-standard incinerators to improve on their combustion systems. The Environmental Management Discharge Permit Regulations (EMDPR) 2001, requires all health facilities to ensure that their wastes are disposed of and treated in the most environmentally sound manner.

Inventory source group 2: Ferrous and Non-Ferrous Metal Production

The total estimated amount of metal including thermal wire reclamation and e-waste recycling is 176 t/year; with the corresponding annual PCDD/F release of 0.1 g TEQ/a.

Foundries

The Gambia metal industry is more of an artisanal metal industry as there are no primary ferrous metal production of all kinds. However, there is significant recycling of metals from old vehicles and other metal equipment. The secondary metal production from recycled materials (spare part productions for Telecommunication and mechanical) taking place at Gambia Technical Training Institute (GTTI) is becoming an industry as it is the only facility that can reach certain high temperatures to melt pig iron.

The GTTI Steel Melting Plant (Electric Arc Furnace) was acquired in 1999 as a grant from the Government of Turkey in order to provide both training to students and render services to support the local industry. The foundry recycles metals and produced metal iron bars to be used for construction. However, due to the capacity of the foundry, most of the scrap metals are collected by metal scavengers and shipped to other countries like India. This has greatly reduced the availability of scrap metals and their recycling process.

The iron foundry at the Gambia Technical Training Institute (GTTI) represents one of the only production facilities in the formal sector. In the formal sector, the raw material used ranges from aluminium to cast iron. For heavy aluminium, they come from motor vehicle or engine parts and other big parts wholly or partly made of aluminium.

The discharges of dioxins and furans from foundry plants are attributed to the following:

- When the furnace is not fully fired as a result of the burnt oil coming into contact with the scrap metal it produces a shoot.
- The melting of waste metals contaminated with oils, PVC plastic, paints and other chlorinated and organic pollutants though very limited in furnace work.
- The fuel used (mostly old engine oils) in the process is also a source of PCDD/Fs.
- Because the slag and other residues from the smelting process is deposited somewhere expose to weather, during rains the residue contaminate the soil, there is a high risk of discharges of UPOPs and heavy metal release from the residues.

Currently, due to poor record keeping, the actual quantity of recycled ferrous metals is unclear however, it could be approximated at 150 t.

Aluminium Production

There are other local metal smelting activities taking place in all major growth centers, especially in the Greater Banjul Area. Wastes such as used cans, aluminium pots, etc. are melted to produce cooking pots and other cooking utensils. This activity is increasingly becoming widespread within communities, and the process of melting using various sources of energy from wood, plastics, charcoal, etc. poses a potential risk of pollution. The hazard is even worst due to the proximity of the activity to public places (mostly within market places). The quantity of used recycled material from local smelters is not known because there are no records kept. This is therefore reported as a data gap and requires detailed inventory at national level.

Thermal wire reclamation and e-waste recycling

Open burning of mainly cables but also circuit boards are a common practice in the country. These materials including tires which are burnt in open air to extract the metallic substance. Since it is an illegal practice, there is no accurate data for these source categories; however, the annual production could be approximated at 10 t. As a importing country of second-hand electronic goods, the open burning circuit boards and other electronic parts is expected to be high. This is because there is no proper collection and recycling mechanism of electronic waste. Such data are not readily available since the total imports of second-hand goods does not distinguish the various categories. This is also reported as a data gap.

Figure 5. Burning of tyres to reclaim wires

Inventory source group 3: Heat and Power Generation

Fossil fuel power plants, household heating and cooking using biomass, and domestic heating with fossil fuels constitutes the major PCDD/F releases in the Gambia. Biomass (25,350 TJ/a) is the highest sources of release (0.16 g TEQ/a) to air, followed by domestic heating using LPG, and fossil fuel for power generation. The woods are mostly free from contamination and considered as virgin wood.

Contaminated wood/biomass woods are sometimes used especially in smoking of fish and animal skin. However, this practice has greatly reduced as a result of the massive sensitization campaign that was launched as a recommendation of the first NIP. The use of contaminated wood/biomass in household cooking and in the artisanal smelting activities is reported as a data gap in this inventory as there is no data available and the practice is widespread.

Inventory source group 4: Production of Mineral Products

There is no production of minerals including cement and glass; and no oil shale processing and asphalt mixing processes. The major minerals produced include Lime from burning of oyster shells, Bricks (burnt bricks), and some small percentage of ceramics production. Both of these mineral production processes are declining as a result of the increasing amounts of imported products. However, the production of burnt bricks is expected to increase as we exhaust our sand resources for construction.

Lime and brick production in The Gambia results in insignificant amounts of PCDD/F releases. The estimated amounts of 55 t/a of lime and 10000 t/a of brick production results to 0.001 and 0.002 g TEQ/a of PCDD/F respectively to air.

Inventory source group 5: Transport

The combustion of unleaded fuel for both 4-stroke engines (4479 t/a) and 2-stroke (17918 t/a) engines also resulted to insignificant releases of PCDD/F (0.011 g TEQ/a) in the Gambia, mainly to air. The Gambia has banned the use of leaded fuel and the current transport sector is very small, with the majority in the Greater Banjul Area.

Inventory source group 6: Open Burning Processes

Open burning is the main form of waste (agricultural biomass and domestic waste) treatment in all regions. According to data obtained during this inventory, a total of 100,000 t/a of biomass (agricultural residues) is burnt in the field of cereal and other crops stubble, impacted, poor burning conditions. This results to the release of PCDD/F 3.0 g TEQ/a to air and 1.0 g TEQ/a to land. In addition, the total waste burnt at dumpsites is estimated at 191,593 t/a, leading to an approximate release of PCDD/F 17.5 g TEQ/a to air and 0.5 g TEQ/a to land. A total release of 20.5 g TEQ/a to air and 1.5 g TEQ/a to land is generated from open burning processes which is 77% of total release.

Open Burning of Waste and Accidental Fires

The waste management system in The Gambia is weak and under-funded. The discharges of dioxins and furans could be very high in dumpsites that receive a variety of wastes which are burnt on a daily basis. The collection, transportation and disposal of waste are not supported by enough infrastructure, and there are no operational sanitary landfill sites. In addition, wastes are not separated into various components before final disposal. The low collection rate has led to substantial increase in illegal dump sites and burning of waste in backyards and streets.

Solid waste management has been devolved to the local government authorities through the 2002 Local Government Act. In general, Municipal Cleansing Services provide for the collection, disposal and treatment of municipal waste. Information pertaining to municipal waste collection and disposal was relatively easily to come by for the Greater Banjul Area (Banjul City Council, Kanifing Municipal Council and West Coast Region). However, such information was not readily available for the other Area Councils (Kerewan, Mansakonko, Janjangbureh and Basse).

According to a research report by Wiedinmyeret al.2014[46], "*Global emissions of traces of gases, particulate matter, and hazardous air pollutants from open burning of domestic waste"*, the residential waste burnt, and the waste burnt at the dump site was 153601 t and 37992 t respectively. In the Gambia there is no segregation of waste either at the point of generation or at deposal sites, and the main deposal method currently done is open tipping and burning.

The composition of waste is mainly solid or semisolid, non-soluble material (including gases and liquids in containers), market refuse, demolition waste, industrial waste and municipal garbage. Apart from the continuous burning process that take place in dumpsites, scrap dealers often burn wastes to extract the ferrous or non-ferrous items they contain. Wastes are burnt openly, and there is a permanent phenomenon of self-burning in dumpsites that leads to continuous presence of smoke and stench. This burning process is slow and incomplete and have a great

[46]Wiedinmyer C, Yokelson RJ, Gullett BK. (2014) Global emissions of trace gases, particulate matter, and hazardous air pollutants from open burning of domestic waste. Environ. Sci. Technol. 48 (16), 9523–9530.

potential to release dioxins and furans. Among the burnt wastes, there are oil flows, derelict motor vehicles components, carcasses of animals, irrevocable electronic equipment, industrial wastes, medical wastes, plastic satchels and bags, used tyres, cables, etc.

Accidental fires in houses and vehicles with a high potential release to air are common incidents that happen every year in all communities. Due to the lack of data on these source categories, they are reported as data gaps that requires detailed assessment.

Inventory source group 7: Production and Use of Chemicals and Consumer Goods

The Gambia does not have any industries involved in the production of chemicals and consumer goods including pulp and paper mills, chemicals, textile, leather, paints, etc. However, as an agriculture dependent country, there is high importation and use of different chemicals for crop and livestock protection. Chlorinated and non-chlorinated chemicals are one of the major group of chemicals imported for use in various processes including water treatment, laboratory and industrial use. Furthermore, chlorinated and brominated aromatic compounds are used as flame retardants or pigments in many consumer products. Most of these products, after use, ends up in dump sites where they are mixed with other types of waste and subject to open burning. This therefore increases the potentials of UPOPs release but also heavy metals, brominated POPs and other pollutant release to the environment.

Details of the chemicals in consumer goods and other uses are not known.

Inventory source group 8: Miscellaneous

Smoke houses

In the Gambia, smoke houses are mainly those that smoke fish and animal skin by using different sources of fuel such as virgin/contaminated wood, used cartons, cloths, straw, etc. The Gambia recorded success in this area as the major fuel used is now clean wood as opposed to contaminated wood and other waste materials used previously. This was achieved by means of vigorous sensitization conducted after the completion of the first NIP in 2000. However, due to the high cost of virgin wood in the urban areas where there is high demand for smoked products, there is still cases of using contaminated woods and other materials to smoke fish and animal skin. The approximated quantity of contaminated wood used was not easy to come by due to poor record keeping; but it could be approximated at 55 t/a with an estimated release of 0.1 g TEQ/a PCDD/F.

Figure 6. Fish smoking house

Tobacco smoking

Tobacco smoking is a common practice in all areas of the country. There is no tobacco production company in the Gambia, all of the tobacco products (mostly cigarette) are imported from other countries. According to trade statistics, the annual cigarette imports in 2000 was 281 as compared to 160 in 1970, 250 in 1980, and 335 in 1995 (sticks in millions). The current annual cigarette imports in 2016 is estimated at 435 sticks in millions (The Gambia Trade Summary). This source has insignificant annual release of PCDD/F but high impact of PAHs to the smoker and the passive smoker with associated health effects.

Inventory source group 9: Disposal

Landfills, Waste Dumps and Landfill Mining

There are no sanitary landfills in the Gambia. The disposal of solid waste is done in the officially designated dumpsites mainly the Bakoeh dumpsite for the Kanifing Municipal Council, Mile II dumpsite for Banjul City Council, and Tambana for the West Coast Region. There are no properly managed dumpsites in the other regions of the country; wastes are disposed of indiscriminately and this makes it difficult to quantify to amounts of wastes being disposed in all regions. However, according to studies (*Wiedinmyer et. al)* the estimated total waste generated for the whole country is 319322 MT/y. The same study also revealed that the total waste uncollected is estimated at 256001 MT/y. Therefore, it can be calculated that the total quantity of solid waste disposed is 63,321 MT/y; and results to the annual release in PCDD/F of 0.03 g TEQ/a to water and 3.2 g TEQ/a to residues. Due to the poor methods of waste collection, wastes are not segregated and therefore mixed with other types of wastes at the dumpsites.

Sewage/sewage treatment

Similarly, the disposal of sewage waste is very poor and under-funded. It is only the Kanifing Municipal Council that operates a substandard sewage treatment plant with minimal sludge removal. This treatment plant receives sewage trucks on a daily basis to dispose of sewage from both domestic, urban and sometimes industrial wastes. The plant receives sewage waste from mainly Banjul City Council and the Kanifing Municipality. The other regions, on the other hand, do not have designated sewage waste disposal sites; thus the method of indiscriminate disposal is carried out. This also makes it difficult to quantify the annual sewage waste disposal and therefore reported as a data gap in this inventory. The total quantity of sewage waste produced annually in the Greater Banjul Area for the period 2016 to 2017 was estimated based on the size of sewer trucks and the number of trips. Assuming the average capacity of most sewer trucks in the Gambia is 5000L, and the average number of trips to the site is 5 times per week. One sewer truck will dispose up to 100,000L of sewage per month. The total number of trucks that registered according to the Discharge Permits Regulation is about 100 trucks. Therefore, the actual amount of sewage disposed for the whole year may be estimated at 120,000,000 L of sewage disposed at the sewage treatment plant in Kotu. At density 1500 kg/m3, the estimated is 180,000 t per annum. Based on this figure, there is no significant release of PCDD/F to all media.

Composting

Composting is not a common practice that is done formally. Although there are few individuals involved in small scale composting activities for gardens, composting of organic matter takes place continuously in farm lands and other places with suitable environment for the process.

Waste oil disposal

Waste oil disposal is a serious problem mostly in Kanifing Industrial Areas and in all informal auto-garages that do not have proper disposal mechanism of waste oil. The largest quantity of waste oil is generated by the power stations, mainly the Kotu Power Station and other regional power plants. Recently, there are two company SUNNY Enterprise and SinoAfric that recycles these waste oil to produce gasoline. This reduces the process of used oil disposal in open grounds as they are being collected and sold to these companies. The potential emission of PCDD/Fs is attributed to the processes involved in the recycling, mainly combustion. Waste oils might contain PCBs (and associated PCDF) and the recent listed SCCPs used as lubricants.

The total releases of PCDD/F for the inventory year is compiled in Table 14.

Table 14. PCDD/F release by source group to the release vectors for inventory year 2016

	Source Groups	Annual Releases (g TEQ/a)				
Group		Air	Water	Land	Product	Residue
1	Waste Incineration	3.00	0.00	0.00	0.00	0.02
2	Ferrous and Non-Ferrous Metal Production	0.13	0.00	0.00	0.00	0.00
3	Heat and Power Generation	0.16	0.00	0.00	0.00	0.00
4	Production of Mineral Products	0.00	0.00	0.00	0.00	0.00
5	Transportation	0.01	0.00	0.00	0.00	0.00
6	Open Burning Processes	20.54	0.00	1.53	0.00	0.00
7	Production of Chemicals and Consumer Goods	0.00	0.00	0.00	0.00	0.00
8	Miscellaneous	0.00	0.00	0.00	0.00	0.11
9	Disposal	0.00	0.03	0.00	0.00	3.17
10	Identification of Potential Hot-Spots					
1-10	**Total**	**23.85**	**0.03**	**1.53**	**0.00**	**3.29**
	Grand Total	**28.7**				

2.3.7.3 Baseline inventory and recalculation of baseline releases

The baseline inventory from 2000 was updated with the emission factors from the 2013 toolkit (Table 15). By this update the former estimate of 176.4 g TEQ was reduced to 41.4 g TEQ due to reduced emission factors for open burning. The comparison of the recalculated baseline inventory with the updated inventory from 2016 (28.4 g TEQ) demonstrated an overall decrease of 13 g TEQ (31%) (compare Table 14 and 15). This was mainly caused by a reduction of open waste burning. There was an increase in release from medical waste incineration (3 g TEQ compared to 1.5 g TEQ) observed due to the overall increase in incineration of hospital waste.

Table 15. Releases of PCDD/Fs to release vectors of the updated 2000 baseline inventory

	Source Group	Annual releases (g TEQ)				
Group		Air	Water	Land	Product	Residue
1	Waste Incineration	1.53	0.00	0.00	0.00	0.01
2	Ferrous and Non-Ferrous Metal Production	0.01	0.00	0.00	0.00	0.01
3	Heat and Power Generation	1.17	0.00	0.00	0.00	0.00
4	Production of Mineral Products	0.10	0.00	0.00	0.00	0.00
5	Transportation	0.02	0.00	0.00	0.00	0.00
6	Open Burning Processes	33.27	0.00	5.31	0.00	0.00
7	Production of Chemicals &Consumer Goods	0.00	0.00	0.00	0.00	0.00
8	Miscellaneous	0.00	0.00	0.00	0.00	0.00
9	Disposal	0.00	0.00	0.00	0.00	0.00
10	Identification of Potential Hot-Spots					
1-10	**Total**	**36.1**	**0.0**	**5.3**	**0.0**	**0.0**
	Grand Total	**41.4**				

2.3.7.4 Status on the BAT/BEP implementation

The obligations of State Parties to the Stockholm Convention under Article 5, Annex C, in relation to the implementation of measures to reduce/eliminate the releases of unintentionally produced POPs, have to some extent been implemented in The Gambia.

The Gambia is a member of the Best Available Techniques (BAT) and Best Environmental Practices (BEP) Forum in the ECOWAS region and the group of four (Central African Republic, Chad, Sao Tome and Principe, Mauritania). The forum is working on ways to cooperate with any relevant institution including the Regional Centres of the Basel and Stockholm Conventions (CRCBS-AF, BCC-Africa), and UNIDO for the revitalization of this forum with the involvement/collaboration of focal points.

One success: In The Gambia fish drying and preservation is traditionally done by burning any combustible material such as wood, old cartons, used clothes, plastics or old car tyres to generate the required smoke for fish smoking and drying. However, with financial support and collaboration from UNIDO, NEA conducted a massive sensitization campaign in 2014 to raise awareness of fish smokers and the general public on the health hazards associated with the use of contaminated materials for fuel to smoke fish. This campaign resulted that fish smokers now mainly using firewood for their smoking activities. In some instances, the challenge remains that with the expenses associated with firewood use, some backyard fish smokers still use old cartons, plastics and others alternate sources of fuel. This awareness raising could be continued by activities on PCP treated waste wood and related management in the NIP implementation.

2.3.7.5 Potential impacts

The levels of PCDD/F in human milk is considerably above the Tolerable Daily Intake (TDI) in all countries and therefore a relevant POPs exposure for society. Food products from animals grazing or picking at or around areas with open burning such as dump sites or domestic waste

burning sites might become contaminated with PCDD/F.[47] In The Gambia there is no monitoring data on food, humans as well health impact of POPs which need to be improved in NIP update (see action plan).

2.3.7.6 Project activities to address UPOPs under UNITAR/UNDP project

The Gambia has received a project to reduce unintentional POP in cooperation with UNITAR and UNEP. The project has started in 2018 and is planned until 2021. It addresses the improvement of waste management and reduction of open burning. The project also addressed PCB which also will reduce related PCDF releases from leakages.

2.3.8 Information on the state of knowledge on contaminated sites, identification, likely numbers, remediation measures, and data on releases from sites

2.3.8.1 Background

The production and use of POPs the last decades have resulted in the contamination of soils and sediments. Due to the persistence of these chemicals

The use and release of POPs to the environment over the last decades have resulted in global environmental contamination with POPs and depending on the extent and duration of releases such areas were transformed into contaminated sites.[47]

In this chapter the situation on POPs stockpiles and (potentially) POPs contaminated sites in Gambia are compiled for the individual POPs groups.

Assessment or securing/remediation measures have not been implemented in The Gambia due to the lack of capacity and funding. Currently also no general contaminated site database or national inventory or remediation plan exists in Gambia.

2.3.8.2 POPs pesticides contaminated sites

It was detected during the first and second inventory exercise that The Gambia has some POP pesticides stockpiles and contaminated sites in some of the regional stores causing risk to environment and human especially local people living near these areas. The contaminated soils and buildings were not removed. These (former) stores and surrounding are believed to be contaminated sites. There are no pesticides formulation and production sites in the country. However, most of the stores were found to contain fertilizers and food grains.

POPs pesticides were applied in the past in agriculture in farms and gardens. Furthermore DDT were sprayed indoor and in malaria prone areas. The soils at these sites can also be considered POPs pesticide contaminated.

[47] Weber R, Herold C, Hollert H, Kamphues J, Blepp M, Ballschmiter K (2018) Reviewing the relevance of dioxin and PCB sources for food from animal origin and the need for their inventory, control and management. Environ Sci Eur. 30:42. https://doi.org/10.1186/s12302-018-0166-9. https://rdcu.be/bax79

2.3.8.3 PCB contaminated sites

In the country, 14 sites have been identified by the task team as being likely contaminated by PCB and all these sites are situated within the Greater Banjul Area (G.B.A). These are locations of transformers with PCB oil, some of which have been leaking for sometimes and are believed to have contaminated the said sites. GPS coordinates of these sites have been taken and a map below produced (Figure 7).

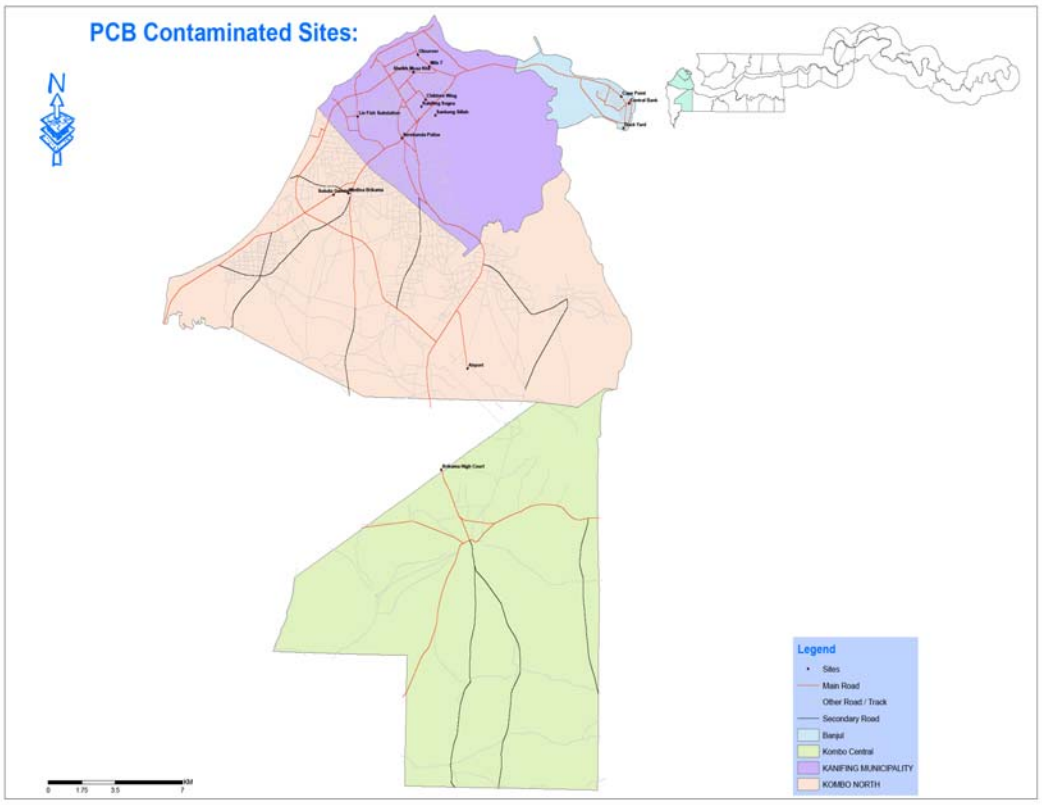

Figure 7. PCBs contaminated sites

There are other electricity substations and power transformers; however, these sites were not part of the assessment and therefore not accentuated for. It is sufficing to state that these stations are fairly new and may be using transformers that are free of PCBs given that the stations are built after the entry into force of the ban on PCBs.

The location of all the contaminated sites are critical and there are genuine concerns due primarily to high potential exposure of a cross-section of the society, through different pathways such as pollution of the marine ecosystems through runoff; livestock exposure through feeding (pasture) on grass grown on contaminated site(s); humans using the major health facility (Edward Francis Small Teaching Hospital- EFSTH) in Banjul, through wind erosion and, children and youth using beaches and other surrounding/nearby grounds for leisure via pollution of soil and water.

It was recorded that there was a total of 650 t of PCBs in the country. However, current reports stated that the above figured dropped to about 620 t. This means that about 30 t of PCBs is in the atmosphere caused by linkages of transformers. Imperatively more PCBs will continue to be released into the environment and atmosphere henceforth of continuous/unabated linkages at

the sites. The problem of exposure from contaminated sites will evidently be aggravated in the absence of decontamination of the sites due to lack of resources and technical capacity.

The informal concern is the scavenging of oil from abandon and linking transformers for petty commercial ventures and domestic re-use of the oil. This is a high possibility due to the proliferations of small local mechanical garages and high ignorance of the hazards of PCBs.

The other potential contaminated sites those in the rural growth centres. Some transformers and capacitors were installed in some rural growth centres to facilitate the rural electrification initiative. Furthermore, PCB oils or equipment has likely been disposed in dumpsites.

2.3.8.4 POP-PBDE, HBB and HBCD and contaminated sites and hotspots

A lot of articles especially electrical/electronic items, vehicle interior (textiles, mats and foams), furniture, and polystyrene foam from insulation were treated with POP-BFRs. Most items end up as wastes in dumpsites or are thrown into the environment in trenches and along roadside. So the major dump sites where most of these items are thrown could be considered as potential POP-BFR impacted sites. The major dumping sites and their locations are shown in Table 16.

Table 16. Major Dumping sites in The Gambia

SN	Name	Place/Region	Coordinates	
			Latitude	Longitude
1	Mile II Dumpsite	Banjul	13.462	16.600
2	Bakoteh Dumpsite	KMC	13.439	16.699
3	Charles Jaw Dumpsite	KMC	13.418	16.681
4	Abuko Dumpsite	KMC	13.402	15.534
5	Tambana Dumpsite, Brikama	WCR	----	----
6	Barra Swamp Dumpsite	NBR	13.483	16.542
7	Farafeni Dumpsite	NBR	13.574	15.617
8	Soma Dumpsite 2	LRR	13.425	15.534
9	Bansang Dumpsite 1	CRR	13.438	14.665
10	Basse Dumpsite 3	URR	13.306	14.220

PFOS contaminated sites and hotspots

PFOS is highly persistent and no degradation is known in soil and groundwater. Therefore, the PFOS released of the last 50 years to soil and ground- and surface water have likely accumulated in these environmental matrices or have been further transported in the environment.

PFOS contaminated sites are in particular generated from fire-fighting use[48] and industrial uses as well as releases from landfills and dump.[49] The related ground water contamination can lead to relevant contamination of drinking water as has been recently demonstrated for the United States.[48] But also, soil can be contaminated with PFOS and lead to further contamination of food.[50]

PFOS contaminated sites from fire-fighting foam storage, training and use in fires

As mentioned above in the fire-fighting chapter several sites might be contaminated from former fire-fighting use. The extent of PFOS contaminated sites in the country due to fire-fighting is unknown. Potential contaminated sites are the fire-fighting training site, Old Cape Road, Bakau; and the locations of major fire incidents in the country (shown in Table 17), are considered potential PFOS contaminated sites.

Table 17. Location and year of major fire incidents in The Gambia

SN	Location	Year
1	Basse Kaabakamma Petrol station (URR)	2005
2	Serrekunda Market (KMC)	2011
3	Brikama Elton Petrol station (WCR)	2016
4	Latrikunda Market (KMC)	2016

PFOS contaminated sites from industrial use

In this first PFOS inventory no particular use of PFOS for industrial use has been discovered.

PFOS contaminated sites from disposal of PFOS and related substances in articles

Most articles potentially containing PFOS (e.g. synthetic carpets, textiles, furniture) are finally disposed in dumpsites when the items reach their end of life. So, the major dump sites where most of these items are thrown could be considered as potential contaminated sites. The major dump sites and their locations in the country are shown in Table 16.

2.3.8.5 Potentially PCDD/PCDF and other UPOPs contaminated sites

Based on the assessment with UNEP toolkit, the following potentially PCDD/PCDF or other UPOPs contaminated sites might exist in The Gambia:

a) Application sites of PCDD/PCDF containing pesticides and other chemicals

Some pesticides (formerly) used in Gambia might have resulting in elevated PCDD/F levels in soils where they have been applied.

[48] Hu XC, Andrews DQ, Lindstrom AB, et al (2016) Detection of PFASs in U.S. Drinking Water Linked to Industrial Sites, Military Fire Training Areas, and Wastewater Treatment Plants. Environ SciTechnolLett. 11;3(10):344-350.

[49] Lang JR, Allred BM, Field JA, Levis JW, Barlaz MA (2017) National Estimate of Per- and Polyfluoroalkyl Substance (PFAS) Release to U.S. Municipal Landfill Leachate. Environ Sci Technol. 51(4), 2197-2205.

[50] Brambilla G, D'Hollander W, Oliaei F, Stahl T, Weber R (2015) Pathways and factors for food safety and food security at PFOS contaminated sites within a problem based learning approach. Chemosphere 129, 192-202.

b) Timber manufacture and treatment sites

There are wood treatment sites which are potentially contaminated with chemicals used for wood preservation. In this first inventory a detailed assessment of chemicals used for wood preservation has not been conducted. PCP might have been used at some of these sites with potential contamination of PCDD/Fs. PCP was only listed 2015 and has not been addressed in this first NIP but will be addressed in next NIP update.

c) Use of PCBs

PCBs have been used in The Gambia in transformers and capacitors and possibly other uses. Some potentially PCB contaminated sites have been found during the development of the PCB inventory. In particular the storage sites of PCB at NAWEC could be a potentially PCB contaminated site. The site might also be contaminated with PCDFs present in the PCBs.

d) Waste incinerators

There are some hospital waste incinerators in The Gambia. The incinerators are mostly small scale batch incinerators with high emissions (see inventory category 1). Areas close to the incinerator might become contaminated with PCDD/Fs and other UPOPs over time. The management of the ashes can also result in PCDD/F contamination.

e) Dumps of wastes/residues from source groups

Areas where ashes from waste incinerators are disposed or where long term open burning of wastes has been practiced can be contaminated with PCDD/Fs and other UPOPs and heavy meals. A detailed assessment for the disposal sites or open burning sites have not been conducted in this first inventory.

2.3.9 Future production, use and releases of POPs requirements for exemptions

2.3.9.1 Background

A range of POPs have been listed with specific exemptions or acceptable purposes and can be used if a country has registered for an exemption. If a country has registered for an exemption it can import and use the exempted POPs for the registered use.

In this section the current and potential future use and release of POPs and the need of exemption are shortly summarized for Gambia and the need for an exemption is mentioned.

2.3.9.2 Future use of POPs and exemptions

In the current assessment under NIP update no exemption for the POPs assessed (DDT, decaBDE, endosulfan, HBCD, lindane, PCP, PFOS) are needed and The Gambia has not registered for any exemption.

For SCCPs listed in 2017, no assessment has been conducted and the assessment if exemptions are needed will be conducted in the NIP implementation (see action plan).

There are likely current and future uses and releases for POPs in stocks and use in equipment and consumer products (PCBs, PBDEs, PFOS).

It need to be stressed that POPs which will further be used in Gambia due to exemptions will end in dumps/landfills due to the lack of destruction capacity and result in POPs- releases in future.[51]

2.3.10 Existing programmes for monitoring releases and environmental and human health impacts, including findings

There are currently no programmes for monitoring of POPs impacts to the environment and POPs impacts to human health and associated impacts. However, due to the use of POPs in the past on agriculture and related activities coupled with their persistent nature, there is the likelihood that environmental and human health impacts have been experienced.

There has not been any monitoring programme for in articles and products (e.g. PBDEs, HBCD, PFOS) in The Gambia. It is however known that some articles and products in circulation do contain PBDEs and hence the need to monitor their effects to exposed population and workers.

It has already been stressed in the first NIP that The Gambia as a developing country has only very limited resources for POPs monitoring, being particularly demanding in terms of laboratory facilities and consumables, as well as highly skilled personnel.

The Gambia will therefore opt for design and implementation of a global POPs monitoring / risk assessment programme, operated under a carefully selected UN Agency for implementation(with possible GEF support) in benefit of all countries; in particular the least developed ones. Since POPs pollution is a global issue, such global monitoring programme could be implemented in the most effective way utilising uniform analytical methods and procedures, hence producing coherent data, in already existing laboratory capacities across all Regions of the Earth.

2.3.11 Current level of information, information exchange, awareness and education

2.3.11.1 General

The dramatic global growth in the production and trade of industrial chemicals and pesticides and their indiscriminate use over the past decades, has raised concerns from both public and private sectors. The potential risks posed by these hazardous chemicals on human health and the quality of the natural environment could be in great danger due to improper use and management. The Gambia is prone to increasing environmental pollution and health hazards associated with the misuse of pesticides and other chemicals. There are currently many chemicals on the market and a vast majority of them lack even basic information on health effects and toxicity. This situation is exacerbated by the low level of awareness among end-users and the absence of effective national capacity for management and control of chemicals in the country.

The importation and use of other consumer goods are growing rapidly. These consumer goods that are of paramount public health and environmental concern include used batteries, fluorescent light bulbs, cosmetics, plastic materials for packaging, pater, textile, leather products and paints. Also, electronics and vehicles. Electronics and vehicles contain heavy metals,

[51]Weber R, Watson A, Forter M, Oliaei F (2011) Persistent Organic Pollutants and Landfills - A Review of Past Experiences and Future Challenges. Waste Management & Research 29 (1) 107-121.

brominated flame retardants and a range of other pollutants. Some paints are known to contain mercury, lead or other metals as preservatives.

This situation results that education of consumers becomes increasingly important.

2.3.11.2 Information and awareness status

The data obtained with regards to information and awareness status were analysed by the task team members with the following explanations.

Media: The information dissemination using the media was based on channels such as Radio, TV, Newspaper, Popular theatre, Visual aid and Extension. Based on the analysis, radio was identified as the best channel of information dissemination followed by, Television, popular theatre, Newspaper, extension and finally Visual aid.

The level of awareness of media personnel on POPs is still low. 70% of the respondents indicated that their level is very low, 20% low and 10% high. However 100% of the respondents mentioned that environmental information are made available and has been produced weekly on radios, newspapers, television, and online publication. 60% of the media have officers responsible for environmental issues but not specifically on POPs.

Table 18. Public: Total respondents: Percentage of respondents per sector.

Sectors	Total Female	% Female	Total Male	% Male	Total	Total % of total respondents
Farmers	4	21%	15	79%	19	32%
Civil Servants	3	18%	14	82%	17	28%
Public Health / Medical Services	6	43%	8	57%	14	24%
Petty Business	6	67%	3	33%	9	16%
Total	19	32%	40	68%	59	100%

32% of the total female respondents in the public health /medical services representing 10% of the total respondents are familiar with either the Convention, POPs and or PCB/HCB. The female whose works deal with chemicals constitute 37% of the total female respondents and 12% of the total respondents. Awareness about POPs among females is still low, only 26% of the total female respondents thus, representing about 5% of the total respondents know or are aware of POPs. With regard to the existence of a registrar of pesticides and chemicals at NEA, only 5% of the total female respondents representing 2% of the total respondents know that such an office exist. 68% of the total female respondents thus representing 22% of the total respondents have no means to get information about POPs. Invariably therefore, 68% of the total female respondents have very low awareness. On the other hand, 32% of the total female respondents (10% of total respondents) work with POPs laden equipment/materials/substances and, 26% of the total female respondents (9% of the total respondents) know that POPs are harmful to the environment.

2.3.12 Mechanism to report under Article 15 on measures taken to implement the provisions of the Convention and for information exchange with other Parties to the Convention

2.3.12.1 Background

Under Article 15 of the Stockholm Convention, Parties to the Convention are required to report to the COP on the measures which have been taken to implement the provisions of the Stockholm Convention and on the effectiveness of such measures in meeting the objectives of the Convention.

The Conference of the Parties (COP) by its decision SC-1/22 decided that in accordance with Article 15 of the Convention, each party should submit its first report by 31 December 2006 for consideration by the Conference of the Parties. The Conference of the Parties at its fourth meeting, by its decision SC-4/30 decided that each Party shall submit its second report pursuant to Article 15 to the Secretariat by 31 October 2010. The Conference of the Parties also decided that each Party shall submit its subsequent reports every four years thereafter for the consideration of the meeting of the Conference of Parties. The national reports shall be submitted every four years according to following reporting deadlines.

2.3.12.2 Country Reporting

Out of the 4th reporting, The Gambia transmitted only the first report on 26/04/2007. In this report the country provided information on the measures taken to implement the provisions of the Stockholm Convention and on the effectiveness of such measures in meeting the objectives of the convention. This is addressed in different articles of the convention. Currently the 4th reporting is prepared based on the information generated during updating of the NIP.

2.3.13 Relevant activities of Non-Governmental Stakeholders

In as much as SGG and Young Volunteers for the Environment (YVE) are the most pro-active environmental NGOs working in the areas of POPs chemicals and waste, further investigations would be made to identify current IPEN and PAN members in The Gambia to bring them on board.

There are a range of NGO activities on waste management. Concern Universal Gambia and Senegal an NGO supported by United Purpose a UK NGO supporting the region (https://united-purpose.org/senegambia). They have written “The State of Solid Waste Management in The Gambia – a review” as part of the Building Capacity for Sustainable Waste Management for Coastal Communities through Women and Youth Livelihoods project delivered in partnership with Brikama Area Council, The Gambia; Womens’ Initiative The Gambia; led by Concern Universal Gambia and Senegal.

2.3.14 Overview of technical infrastructure for POPs assessment, measurement, analysis, alternatives and prevention measures, research and development – linkage to international programmes and projects

In The Gambia there is no national technical infrastructure for POPs assessment. There is no particular assessment of alternatives. Currently also no research and development exists which has linkages to international research projects and programmes. However there is currently a

GEF project on PCB management and UPOPs reduction where international linkages are established.

Furthermore, the existing task teams that participated actively in the review and update of the NIP, would be maintained to be transformed into technical infrastructure responsible for and to facilitate all aspects of POPs management and control in the country

2.3.15 Overview of technical infrastructure for POPs management/destruction

2.3.15.1 POPs management and destruction capacity

In The Gambia there is no capacity in terms of human, technical and financial resources for POPs management. There is also no destruction and disposal capacity for POPs or other hazardous chemicals.

2.3.15.2 Capacity and Infrastructure for Contaminated Sites Assessment, Securing and Remediation

The capacity and infrastructure for contaminated sites assessment, securing and remediation are a big gap in The Gambia.

2.3.16 Identification of impacted populations or environments

In The Gambia majority of people are exposed to POPs via various means particularly via open burning of waste which is a common practice in the country. These people are therefore invariably impacted by these POPs. Extended exposure to toxic chemicals in water, food, air, and soil, as well as to chemical products, can cause or exacerbate many serious human health issues, including damage to reproductive and neurological systems, as well as cancer. There is an established link between poverty and the increased risk of exposure to toxic and hazardous chemicals. In for example urban areas, low-income or minority populations typically reside in neighborhoods considered undesirable, such as areas adjacent to factories, landfill sites, incinerators, and hazardous waste dumps. In rural areas, where three-quarters of the world's poor live, most chemical exposure is linked to pollution brought by polluted water sources as well as the use of pesticides in agriculture. The improper use, management, and storage of pesticides and chemical fertilizers can result in contamination of air, food, soil, and drinking water (e.g. through pesticide and nitrate run-off), leading to increased human exposure and associated risks.

Needless to mention that the ever increasing generation and accumulation of waste and undesirable management and falling standards of household hygiene, the other uses of chemicals in the homes will be proliferated thus, subjecting women and children to chemical exposure.

The Gambia does not have a monitoring capacity of impacted population or environment; however suspected contaminated sites are the dumpsites that have been highlighted in the inventory report, the fire occurrence sites, the PCB contaminated sites that have been identified in the Greater Banjul Area. These are locations of transformers with PCB oils which have been

leaking for some time and are believed to have contaminated the sites. There is no available monitoring data for workers who have been exposed to these transformers.

2.3.17 Details of any relevant system for the assessment and listing of new chemicals

The Sahelian Pesticides Committee a sub-regional body which the Gambia is a member to, is the only structure where The Gambia benefits from a system for the assessment and registration of new pesticides. During the assessment all relevant documentation such as the material safety data sheet, labels, field trials and efficacy tests of the pesticides are evaluated by a committee and make final decision on the pesticides whether to register it or not. The Gambia also participates in the work of the Chemical Review Committee of the Rotterdam Convention for listing of chemicals in annex III.

There is no system to assess industrial chemicals or chemicals used in consumer goods.

2.3.18 Details of any relevant system for the assessment and regulation of chemicals already in the market

There is a sub-regional system for assessment and regulation of chemicals in the market. The Gambia is poised to set up a National Pesticides Management Committee which will take up this reasonability at the national level. There are legal provision for banning of pesticides in the market. There is no system in place for the assessment of chemicals in products or industrial chemicals.

2.4 Implementation status

Information on the implementation status of the SC in Gambia is compiled in Table 19.

Table 19. The Gambia's level of NIP Implementation status in respect to initial POPs listed in the Convention Annexes

Convention Article	Implementation	Comments
ARTICLE 3 Measures to reduce or eliminate releases from intentional production and use	For POPs pesticides see information in chapter 2.3.1.	
	For PCBs see information in chapter 2.3.2.	
ARTICLE 4 Register of exemptions	No exemptions were registered	
ARTICLE 5 Measures to reduce or eliminate releases from unintentional production	For UPOPs see information in chapter 2.3.7.	
ARTICLE 6 Measures to reduce or eliminate releases from stockpiles and wastes	For POPs pesticides see information in chapter 2.3.1.	
	For PCBs see information in chapter 2.3.2.	
	For UPOPs see information in chapter 2.3.7.	

Convention Article	Implementation	Comments
ARTICLE 7 Implementation plans	The Gambia submitted its first NIP on 21/03/2009.	
ARTICLE 8 Listing of chemicals in Annexes A, B and C	Gambia never proposed the listing of new substances to the Convention Annexes.	
ARTICLE 9 Information exchange	See information in chapter 2.3.11.	
ARTICLE 10 Public information, awareness and education	See information in chapter 2.3.11.	
ARTICLE 11 Research, development and monitoring	See information in chapter 2.3.10.	
ARTICLE 12 Technical assistance	During the initial NIP implementation The Gambia received technical assistance from UNITAR, UNDP and, UNIDIO	Currently The Gambia is implementing a POPs management project for UPOPs reduction and PCB management
ARTICLE 13 Financial resources and mechanisms	During the initial NIP implementation The Gambia received financial assistance from GEF UNITAR, UNDP and UNIDO	
ARTICLE 15 Reporting	The Gambia transmitted only the first report on 26/04/2007.	Gambia is preparing the 4th reporting
ARTICLE 16 Effectiveness evaluation	Participation of our experts if any was undocumented	
ARTICLE 17 Non-compliance	No compliance mechanism exists under the Convention, so no compliance check took place for The Gambia.	
ARTICLE 19 Conference of Parties	The Gambia attended all meetings of COPs.	Gambia is planning to attend COP9 04/2019
ARTICLE 21 Amendments to the Convention	The Gambia accepted all Convention amendments.	
ARTICLE 22 Adoption and amendment of annexes		
ARTICLE 24 Signature	The Gambia signed the Stockholm Convention on 23. 05. 2001.	
ARTICLE 25 Ratification, acceptance, approval or accession	The Gambia ratified the Stockholm Convention on 28. 04. 2006.	
ARTICLE 26 Entry into force	Stockholm Convention entered into for the Gambia on 27. 07. 2006.	

3 Strategy and action plan elements of the NIP

Chapter 3 addresses the formal policy statement and the implementation strategy and action plan for the NIP. The implementation strategy sets out specific action plans or strategies to achieve Convention obligations and other additional objectives set by the country.

3.1 Policy statement

The Government of The Gambia is committed to the effective implementation of the provisions and obligations of the Stockholm Convention on POPs.

The overall objective of the sound management of POPs in The Gambia is to safe life-cycle management, pollution control, reduction, treatment and finally elimination of POPs to meet the requirements of the Stockholm Convention, contribute to protecting human health and environment toward sustainable development.

Cross cutting objectives:

1. Appropriate institutional capacity, regulatory frame and stakeholder coordination for POPs and hazardous chemical management and substitution.
2. Enhanced capacity in science and technology for assessment and management of POPs and other hazardous chemicals in the life cycle with appropriate knowledge and information management and related infrastructure.
3. Broad stakeholder awareness on POPs and other hazardous chemicals on environmental health problems related to POPs and POPs management solutions (restrict use, assess alternatives, substitute, phase-out, disposal and destruction).
4. Synergistic implementation of relevant conventions and SDGs where appropriate and integration in national chemical and waste management and sustainable development.

Appropriate actions, activities and strategies prepared in the NIP will be implemented to reduce and eliminate POPs from the environment as envisaged under the Stockholm Convention. The Gambia NIP takes into account the existing work and assessments and forms an integral part of the national integrated chemicals and wastes management. It also takes due account of the aims of the national sustainable development agenda in terms of social, economic and environmental policies and actions in order to maximize their overall benefits. This will avoid “reinventing the wheel” and link the NIP to related national chemicals and waste management priorities and initiatives where possible to ensure maximum efficiency and reduce duplication of effort.

The Gambia is aware that POPs are only a part of the sound chemical management task and the hazardous waste management challenge. Therefore, The Gambia aims to link and harmonize the different activities on chemical (other chemical Conventions and SAICM) and related hazardous waste management (POPs, mercury, ozone depleting substances, and plastic).

Also the waste management and the destruction of hazardous chemicals need to be addressed in a holistic manner and should consider all type of hazardous chemicals and hazardous wastes and their destruction where appropriate securing co-funding in implementation.

It is The Gambia’s view that dealing with the POPs issues in an integrative manner, as part of country’s framework action plans (chemicals management plans, waste management plans, contaminated sites management, plastic management etc.), will result in an effective implementation, as well as attract international development partners.

3.2 Implementation strategy

3.2.1 Inter-ministerial and stakeholder coordination considering national priorities

At the governmental level, relevant ministries will be involved in the NIP implementation with varying responsibilities respective to their roles and functions. Furthermore, chemicals and waste and their management are important for a range SDGs of the 2030 Sustainable Development Agenda which will be considered in the coordination of SDGs and the implementation of the SC:

- Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture
- Goal 3: Ensure healthy lives and promote wellbeing for all at all ages (specifically Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination).
- Goal 6. Ensure availability and sustainable management of water and sanitation for all (specifically Target 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally).
- Goal 8 Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all (Specifically Target 8.8 Protect labour rights and promote safe and secure working environments for all workers…)
- Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable.
- Goal 12: Ensure sustainable consumption and production patterns (specifically Target 12.4: By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment).
- Goal 14 on life below water contributing to reduction of marine litter and related POPs contamination of the marine environment.[52]
- Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss (specifically Target 15.1: By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements; and Target 15.3: By 2030, combat desertification, restore degraded land and soil).

To address the national priority of chemicals and waste, a coordinated approach will be adopted, with co-operation among all relevant stakeholders at all levels and sectors. Responsibilities related to the sound management of chemicals and waste as well as those involved in activities that influence chemical safety, including the private sector, industry, labour, science and public interest groups will be assigned. This inter-ministerial coordination group would address all chemical and waste related topics.

[52]Gallo F, Fossi C; Weber R; Santillo D; Sousa J; Nadal A, Romano D (2018) Marine litter plastics and microplastics and their toxic chemicals components: the need for urgent preventive measures. Environ Sci Eur. 30(1), 13.

Here also the science–policy interfaces would be better developed. A well-established science-policy interface is critical in shaping environmental governance and sustainable development. Currently science and other forms of knowledge are not used effectively in policymaking; policymakers do not always effectively inform scientists about their needs for scientific knowledge. In this regard, an improvement in the science-policy interface is needed and is included in the action plan.

3.2.2 Adequate legal, institutional, administrative and technical infrastructure

For the implementation an adequate legal, institutional, administrative and technical infrastructure needs to be in place. This should consider three levels:

1. Policy level: preparative and executive legislative actions, international co-operation on policy issues.

2. Management level: support legislative work, daily scientific/technical expert implementation work, and coordination/co-operation between ministries.

3. Enforcement level: enforcement and monitoring, co-operation/co-ordination between institutions for enforcement and supervision.

The legal frame needs to consider approaches which support financing of chemicals and waste. An international guidance has been developed to support financing of chemical management this respect.[53] Furthermore, Extended Producer Responsibility (EPR)[54] and Polluter Pays Principle (PPP) are approaches supporting sustainable financing of chemical and waste management (see below Section 3.6).

Furthermore, an adequate technical infrastructure is needed for the management of POPs impacted wastes or the analysis and monitoring of relevant POPs.

Appropriate actions are proposed in the action plans below.

3.2.3 Synergies among related Multilateral Environmental Agreements (MEAs)

At the international level, the COPs to the chemical conventions called for greater cooperation and coordination, and measures to be taken for a more harmonized implementation. Gambia has ratified and is a signatory to these and other international conventions and agreements and is also aware that efforts should to be made for a harmonized implementation at the national level.

Moreover, the Strategic Approach to International Chemicals Management (SAICM; www.saicm.org) aims at an overall management of chemicals and has POPs related emerging policy issues and issues of concern.[55] Here the implementation of the SC can and should facilitate the implementation of SAICM and vice versa. The government seek to follow the SAICM beyond 2020 process and to strive for an overall chemical and waste management considering all hazardous substances and waste including POPs.

Hazardous waste management is an important requirement for the adequate implementation of SC and BC. However, Gambia has limited waste destruction capacity, and therefore, is currently

[53] UNEP (2015) Development of Legal and Institutional Infrastructures for Sound Management of Chemicals and Measures for Recovering Costs of National Administration (LIRA-Guidance).

[54] OECD (2016) Extended Producer Responsibility - Updated Guidance for Efficient Waste Management

[55] http://www.saicm.org/Implementation/EmergingPolicyIssues

disposing most of the chemicals, products and materials imported to the country at the end of their useful life to dumpsites. Only a minor fraction of the materials is recycled or exported. The leaching of POPs and other chemicals from landfills and dumps into ground- and surface water and related impact to the environment and biota emphasize the need for an improvement of the situation and an integrated management approach of the import, consumption and treatment of POPs chemicals and POPs and similar chemicals in products.

Due to the challenge of POPs management and the high cost of export, the Government became aware that hazardous chemicals, which cannot be disposed in the country, are a burden, which need to be tackled and solved. The expensive and time-consuming waste management and export efforts for PCBs, POPs pesticides, but also Ozone Depleting Substances (ODS), have alarmed the Government and the private sector to seek a more sustainable management of chemicals and products containing hazardous chemicals.

Furthermore, international efforts in protecting the Ozone Layer (Montreal Protocol/Vienna Convention) on ODS address partly the same waste categories containing POPs: air conditioners in cars or HBCD containing extruded polystyrene (XPS) normally containing 8% hydrofluoro-carbon (HFC) as blowing agent (often HFC-134a with high global warming potential (GWP) value of 1300). The inventory of vehicles, electronic waste and building insulation in the framework of the SC for POP-PBDEs and the improvement of their end-of-life management can at the same time be used for a better management of ODS present in these products and wastes.

Overall, it became obvious that another policy for imports of chemicals and products containing hazardous chemicals is needed. This becomes also obvious considering consumer products and related waste fractions containing to some extent new industrial POPs like plastic from electrical and electronic waste (WEEE; e-waste), car shredder residues, synthetic carpets, waste wood treated with PCP or waste oils or impregnated furniture, mattresses, synthetic carpets, textiles or paper. Such bulk wastes containing POPs, POPs-like chemicals or other hazardous chemicals have entered the country in thousands of tonnes over the last three decades and are currently largely disposed in dumpsites. This highlights that another waste management, extended producer/importer responsibility and import policy is needed to cope with the materials and articles containing hazardous chemicals of modern consumer society.

3.2.4 Addressing POPs phase out and use of alternatives within Sustainable Consumption and Production (SDG12) implementation

In accordance with the provisions of the Article 7(3) of SC, “Parties shall endeavour to utilize and, where necessary, establish the means to integrate national implementation plans for persistent organic pollutants in their sustainable development strategies where appropriate”, the country is aiming to address POPs in connection to sustainable development and consumption and production efforts (SDG 12).

The contamination of several potential recycling flows by POPs revealed the negative impact and threat for a more circular economy and resource recovery and conservation56. This includes e.g. treated wood or polymer fractions such as WEEE plastic or PVC and BFR containing polymer fraction of end-of-life vehicles and construction & demolition wastes. Also, rubber and

[56] European Commission; Circular Economy http://ec.europa.eu/environment/circular-economy/index_en.htm

lubricants/industrial oils can be impacted by new industrial POPs. These wastes are at the same time important resources for recycling and recovery. The policy is to recycle the non-impacted products and treat POPs containing wastes in an environmentally sound manner possibly with energy recovery. For thermal recovery the negative impact of halogens need to be considered.

A policy approach considered, is extended producer and importer responsibility as stipulated e.g. by the European WEEE Directive57. The option of a better management of resources in these material flows can contribute to sustainable consumption and production (SCP) if waste management can be improved. Improved recycling and recovery are also opportunities for development of small and medium sized companies and therefore of eradication of poverty and improvement of standard of living for people. The recycling efforts are linked to sustainable production and consumption. Considering the challenges of managing POPs, a policy and strategy will be developed within the implementation of SC and BC that POPs and similar chemicals should not be imported.

Several POPs have exemptions for continued use often in products (HBCD, DecaBDE, SCCPs, PFOS, PFOA). The use of these POPs would generate more POPs stockpiles and waste in the future. Furthermore, there are hundreds of POPs-like chemicals58,,59, and chemicals of concern (SAICM synergy) which need to be controlled to protect human health and the environment. The implementation strategy is not to use POPs or POP-like chemicals but to use the most appropriate alternatives considering green and sustainable chemistry principles. The alternative chemicals are best selected considering a “green and sustainable chemistry“ approach, which represents the design of chemicals and processes that reduce or eliminate the use and generation of hazardous substances. This approach is securing recycling and reuse and therefore supporting circular economy and SCP.

Such efforts can also be linked to sustainable consumption of the population. POPs can be used here as an awareness raising tool for stakeholder groups.

3.2.5 Gender policy in NIP development and implementation

Efforts to ensure sound management of chemicals, including POPs have important gender dimensions, because in daily life, men, women, and children are exposed to different kinds of chemicals in varying concentrations[60].

Gambia will take care that these gender dimensions are reflected in the implementation of the NIP and in the sound chemical management

Consistent with the GEF policy on gender mainstreaming, GEF projects funded under this strategy will not only acknowledge gender differences within their design but determine what actions are required to promote both women and men’s roles in chemical management, disproportionate chemical exposure and vulnerability.

[57] http://ec.europa.eu/environment/waste/weee/index_en.htm

[58] Scheringer et al. (2012) How many Persistent Organic Pollutants should we expect? Atmospheric Pollution Research 3, 383–391.

[59] Muir DC, Howard PH (2006) Are there other persistent organic pollutants? A challenge for environmental chemists. Environ Sci Technol. 40(23):7157-7166.

[60] UNDP (2011) Gender & Chemicals. Energy & Environment Practice Gender Mainstreaming Guidance Series

3.3 Action plans, including respective activities and strategies

3.3.1 Activity: Institutional and regulatory strengthening measures

There is no comprehensive and streamlined legislation for chemicals management and waste management in the country although some aspects are found in various laws within the country. The Stockholm Convention on POPs requires Parties to take certain measures to achieve the objective of the Convention. Furthermore, other ratified chemical Conventions should be considered in particular Rotterdam and Basel Conventions. Moreover, the Strategic Approach on International Chemical Management (SAICM) aims at an overall management of chemicals and has POPs related emerging policy issues and issues of concern. Here the implementation of the Stockholm Convention can facilitate the implementation of SAICM and vice versa.

A successful implementation of the Convention would therefore attempt an integrated approach with Basel/Rotterdam Convention and SAICM and integration of some related provisions into the current institutional and regulatory framework for managing chemicals in the country.

The most readily available tool for government to ensure adequate flow of information on hazards and safe use, handling and transport of chemicals on the market is the national adoption of the internationally agreed information system found in the GHS.[61] Introduction of this system on chemical labelling and safety data sheets will also be an important step that governments can take to raise enterprise, worker and public awareness of chemical risks.

The POPs action plan aims at improving the existing institutional and regulatory framework in the country and facilitate chemical and waste management. One objective is to support the development of an overall frame of chemical and waste management by a synergy approach with Basel Convention and SAICM implementation

The current action plan wants to support the development of a larger institutional frame for chemical management (synergy SAICM) and waste management (Basel Convention).

Table 20. Institutional and Regulatory Strengthening Measures

Objectives	Activities	Indicators	Time Frame	Implementers
To assess, harmonize existing legal/policy framework on POPs hazardous chemicals including POPs	• Compile and assess existing legal instruments for the life cycle management of POPs (and other hazardous chemicals) in the country. • Review existing legislations on management of POPs and other hazardous chemicals in selected other countries. • Draft and promulgate regulations to prohibit/eliminate the production, use, import and	Compiled and updated inventory. Proposals for legislative and policy review. Draft regulation.	5 years	NEA, MECCNAR, MOJ Medicine Control Authority

[61] It need to be stressed that GHS does not adequately address chemicals in products and wastes which is a major issue and problem for POPs and other hazardous chemicals in products and related waste management.

Objectives	Activities	Indicators	Time Frame	Implementers
	export of listed POPs (considering exemptions). • Improve or develop an overall chemical regulatory frame including the assessment of chemicals in use and chemicals for registration for their POPs (and other hazardous properties).	An overall draft chemicals law		
Assessment of responsibilities of ministries and other authorities for the life cycle management of POPs (and other hazardous chemicals)	• Compile and assess responsibilities of institutions for life cycle management of POPs (and other hazardous chemicals) and related gaps and needs assessment. • Addressing gaps and improving capacity for the life cycle management of POPs (and other hazardous chemicals). • Assessment if the responsible institutions can implement the respective legislation, further gap assessment and improvement	Needs assessment conducted Modalities for upgrading physical capacities in place	3 years	NEA and partners
To inform, sensitize and capacitate institutions and stakeholders on regulations and on enforcement and compliance of regulations on POPs and other hazardous chemicals (SAICM)	• Development of information materials on regulatory requirements for the respective POPs tailored for institutions and industrial and other stakeholders. • Organize information and sensitisation workshop on regulatory issues for stakeholder groups for individual POPs • Developing materials for education and conduct trainings and workshops	Workshop organised	4 years	NEA and partners
To assist relevant institutions to implement compliance and enforcement for POPs ((i) POPs Pesticides (ii) PCBs (iii) new industrial	• Assign institutions with specific responsibilities to control POPs and hazardous chemicals in the life cycle • Form a compliance and enforcement network on managing POPs and hazardous chemicals in the life cycle.	MOU in place Compliance and enforcement network operational.	2 years	NEA, PPS , Customs, JOC, MOA, MOH

Objectives	Activities	Indicators	Time Frame	Implementers
POPs (iii) UPOPs.) and other hazardous chemicals (SAICM)	• Continued capacity building of personnel from institutions. e.g. recruitment and training of staff. • Develop monitoring plan of activities for relevant institutions.	Well-equipped institutions Operational monitoring plans		

3.3.2 Activity: Measures to reduce or eliminate releases from intentional use

The Gambia does not have intentional production of POPs chemicals facility. However, there are several POPs in use including POP-PBDEs in articles or PFOS in stocks such as products and articles. Furthermore, recently listed POPs such as SCCPs and DecaBDE have a range of exemptions, which have not yet been assessed for The Gambia in the current NIP update. These are likely used in some processes and are certainly present and used in articles and products.

Article 3 of the Convention summarises activities that need to be put in-place to reduce and eliminate releases from intentional production. These activities include legal and administrative measures. This action plan presented below (Table 21) identifies measures to reduce or eliminate releases from intentional production and use of POPs.

Table 21. Measures to reduce or eliminate releases from intentional use

Objectives	Activities	Performance indicators	Time frame	Implementers
Assessment of current use of POPs and reducing and eliminating releases and use of POPs	Update inventory of annex A and B chemicals imported and used considering the recent listed SCCP and DecaBDE and PCP.	Overview of Annex A & B Chemicals currently imported and in use in The Gambia	3 years	NEA, Customs, MOA, MOH
	Analyse pattern of usage of annex A and B chemicals	Use pattern and processes of POPs identified		
	Control and reduce release of POPs and POPs in products	Products containing POPs managed in ESM		
	Phase out of current use of identified POPs and substitution (PFOS and likely SCCPs)	Substitution by more sustainable chemicals and non-chemical alternatives		
Restricting or prohibit import of Annex A & B chemicals	Develop regulatory framework to restrict or prohibit	Prohibition of import of POPs and POPs in products	3 year	NEA, MOJ, Customs, MOA, MOH

3.3.3 Activity: Production, import and export, use, stockpiles export and waste of Annex A POPs pesticides (Annex A, Part I chemicals)

Most POPs pesticides listed in the Convention have been banned in Gambia. The presence of PCP listed in 2015 has not been assessed in this NIP. Therefore, there is the need for assessment and control. Activities required are included in this action plan.

Most of POPs pesticides have been substituted in the past 20 years by other pesticides. Often the alternatives pesticides used were not sufficiently assessed and frequently other highly hazardous pesticides (HHPs) have been introduces or pesticides with an impact on pollinators and ecosystem.[62, 63] Also in Gambia imidacloprid and other neonicotinoids were a main substitute of POPs pesticides. Imidacloprid, clothianidin and thiamethoxam have been banned in Europe due to the impact on biodiversity in particular pollinators.

For successful implementation of the strategy, the gaps in the current system should be addressed in particular the selection of alternative pesticides. Another gap is that information about the risks of pesticides to the environment and ecosystem including pollinators and human health should be analysed to ensure the safety of farmers, consumers, and pesticide dealers.

Furthermore, clear guidelines should be developed for the storage, disposal, and transportation of pesticides.

The overall objective of the NIP Strategy and Action Plan in respect to pesticides is to stop POPs pesticides and to use less pesticides and to ensure a safe use of pesticides for environmental and human health. The strategy that is currently being executed is based on:

1. Banning the use of POPs and highly hazardous pesticides (HHPs) and
2. Integrated Pest Management (IPM), Integrated Vector Control (IVM) and organic farming
3. Use of environmentally safe pesticides and responsible and safe use of potential hazardous pesticides
4. ESM and disposal of pesticide contaminated waste including pesticide containers.

Table 22. Action plan import and export, use, stockpiles, and wastes of POPs pesticides (Annex A) and highly hazardous pesticides (HHPs; SAICM synergy)

Objective	Activities	Indicator	Time	Implementers
Development of an adequate legislative frame and policy	Updating the existent regulations to restrict/address all listed pesticides by banning and regulating of new/all listed POPs pesticides	Updated legislation, regulation and list of banned pesticides	4 years	NEA, PPS, MOH, MOJ, Customs
	Assessing of the need and possibly listing of exemptions (DDT, Endosulfan, PCP, Lindane, PFOS)	Pesticides needing an exemption reported to Secretariat		

[62]Rahman MM, Weber R, Tennekes H, Sanchez-Bayo F (2012) Substitutes of persistent organic pollutant (POP) pesticides in Bangladesh and the need for a sustainable substitution process. Organohalogen Compounds 74, 1178-1181 http://www.dioxin20xx.org/wp-content/uploads/pdfs/2012/1302.pdf

[63]Chagnon M, Kreutzweiser D, Mitchell EA, Morrissey CA, Noome DA, Van der SluijsJP.EnvironSciPollut Res Int. 2015 Jan;22(1):119-34. doi: 10.1007/s11356-014-3277-x. Epub 2014 Jul 19. Risks of large-scale use of systemic insecticides to ecosystem functioning and services.

Objective	Activities	Indicator	Time	Implementers
	Implementation of GHS and related labelling	GHS implemented		
	Develop regulatory measures to combat illegal traffic of banned pesticides and counterfeit pesticides	Regulatory measures in place		
	Regulatory frame for good agricultural practice, IPM and organic farming	Regulatory measures in place		
	Regulatory frame for wood treatment and for management of PCP (and hazardous chemical) treated waste wood	Legislation for wood treatment and management of wood established		
Develop/update POPs pesticides inventory	Improvement of POPs Pesticide inventory possibly considering FAO PSMS (overall stockpiles; avoiding reoccurrence of obsolete pesticides stocks)	Updated inventory	2 year	NEA, PPS
	Inventory of PCP treated wood and PCP wood treatment sites (link to Dioxin/UPOP)	Validated Inventory		
	Inventory of former PCP use and treated materials (leather, textile, paper, agriculture)	Validated inventory		
Life cycle management of POPs Pesticides including handling, storage, transfer and disposal of POPs pesticides and POPs pesticides wastes	General improvement of POPs pesticides and general pesticide management	Life cycle management of pesticides established considering FAO guidance documents	5 years	NEA, MOA, MOH, NDMA, GFRS
	Establishing of an empty containers collecting and management system, with specific attention to address the use and recycling of pesticides empty containers	Report on empty container program		
	Establishing of proper POPs and waste pesticide storages and securing them	Sufficient pesticide storage built		
	Establishing capacity to address emergencies and disasters related to POPs pesticides and HHPs (poisoning, spillage, fires contamination)	Poisoning Control centres established and operative		
	Assessing the country's capacity	Capacity assessed and options of		

Objective	Activities	Indicator	Time	Implementers
	for disposing of obsolete POPs pesticides stockpiles and/or considering the export for environmental sound disposal	disposal documented (report)		
	Disposal of POPs pesticide	POPs pesticides are disposed in an environmental sound manner		
Education and awareness of stakeholders (customs, farmers NGOs and the public)	Strengthen the inspection on pesticides for custom and for competent authority (market survey, sales, storage, usage and disposal including counterfeit and illegal pesticides).	Number of educated customs and competent authority	5years	NEA, Customs, MOH, MOA
	Education of policy makers on health hazards of POPs pesticides and HHPs and the benefits of IPM and organic farming	Policy makers in relevant ministries understood relevance		
	Education of farmers on POPs pesticides, HHPs, counterfeit pesticides and the use of IPM and organic farming	Number and share of educated farmers		
	Education of public and NGOs on POPs pesticides, HHPs, counterfeit pesticides and organic farming and organic products	Number of educated public and NGOs		
Assessment of POPs pesticides and HHPs (SAICM Synergy) **and alternatives used and implementation of substitution and IPM and organic farming.**	Compilation of information on alternatives to POPs pesticides and HHPs (SAICM Synergy) including a risk assessment for POPs pesticides and HHPs and their alternatives using existing and possibly generating new data, including the risk to humans and biota and ecosystem indicators,	Report on assessment on alternatives to POPs and HHPs.	5years	NEA, MOA, MOH, and NGOs & CSOs
	Supporting implementation and research on IPM/IVM, including the use of alternatives as a measure for reducing POPs pesticides and HHP use	Shift to IPM/IVM (report)		
	Selection of the most sustainable alternative chemicals and non-chemical solutions in the different applications and including promotion of organic farming.	Report on alternatives Target for organic farming		
	Education and capacity building on alternatives and organic farming and implementation	Number of farmers educated Share of alternatives and organic farming		
Established analysis and	Strengthening and developing laboratory capacity to analyse	Laboratory capacity	5	NEA, MOH, Labour

Objective	Activities	Indicator	Time	Implementers
monitoring of POPs pesticides and HHPs (SAICM synergy) (products, environment, food, exposure)	pesticides (including POP and Highly Hazardous Pesticides)	established and accredited	years	department, DWR, FSQA, MOA
	Assessment of occupational exposure to POPs pesticides and HHPs	Report on occupational risk		
	Monitoring and establishing a pesticide monitoring programme (food, soils, water, consumer)	Report on POPs pesticide and HHP pollution situation and risk for human, environment and Ecosystem indicators		
Established capacity of risk and socio-economic assessment	Development of knowledge, capacity, tools and indicators to better assess the risks and socio-economic impact of POPs/HHPs	Experts or institution with capacity in risk and socio-economic assessment	2 years	NEA, MOA, MOH, NGOs CSOs
The action plan for POP pesticide contaminated sites is integrated in the general action plan on POPs contaminated sites				

3.3.4 Activity: Import and export, use, identification, labelling, removal, storage, and disposal of PCBs and equipment containing PCBs (Annex A, Part II Chemicals)

There is no and has never been any production of PCBs in the country. However, importation and use of closed, semi-closed and open application equipment have entered into the country the last 60 years but are not properly monitored and documented.

The proposed activities define specific actions in respect of managing PCBs, both in the short and the long term in a manner that is consistent with the obligations of the Stockholm Convention (phase out by 2025 and management before 2028). The overall objective is a reduction and ultimate elimination of PCBs use, the prevention of releases of the chemical into the environment, and to provide for environmentally sound disposal or final elimination of PCBs waste.

While the major focus of this action plan is on management of PCBs, also PCNs are addressed by this action plan. PCNs have been listed in the Convention in Annex A and C in 2015. PCNs have been used in the same application as PCBs but mainly in the 1930s to 1960s: In closed application mainly in capacitors and less in transformers and hydraulic oils (UNEP 2017)[64]. PCNs have also been used in the same open applications as PCBs (additives in paints, sealants, rubber, cable sheets, as metal working fluids). The total production was approx. 150,000 t (10% of global PCB production). Due to the lower use volume and the earlier production/use, industrial PCNs have much lower overall relevance compared to PCBs and it is

[64] UNEP (2017) Draft guidance on preparing inventories of polychlorinated naphthalenes. UNEP/POPS/COP.8/INF/19.

unknown if any relevant amount of PCNs are present in the former uses. PCNs can be managed within the frame of PCB management. They are detected by the chlorine test kits for screening of PCBs in transformers and would be integrated in the instrumental screening for chlorine positive samples.

Furthermore, Short Chain Chlorinated Paraffins (SCCPs) have been listed recently at COP8 (05/2017) as POPs with a range of exemptions. SCCPs have substituted PCBs and PCNs in a wide range of open applications (e.g. paints, coatings, sealants, plastic additive/flame retardant, rubber, lubricants, and metal working fluids). Since SCCP will need to be addressed in the next NIP update and since the use is in these applications, an inventory of open applications would address all three POPs.

Table 23. Action Plan: Import and export, use, identification, labelling, removal, storage and disposal of PCBs and equipment containing PCBs (Annex A, Part II chemicals)

Objective/aim	**Activity**	**Indicators**	**Time frame**	**Implementers**
Development and implementations of legislative frame, policy and measures for control and management of PCBs and PCNs in closed and open applications (equipment, materials and wastes).	Assessment of the performance of regulations in managing and eliminating PCBs/PCNs in use and out of use, ban the importation and strengthening the current legislative package.	Amending Decree Negative List 1999 Approval by Council of Ministers	18 months	NEA, NAWEC, MOPE
	Establishing penalties/fines for the improper management of PCB/PCN containing equipment.	Penalties/fines included in regulatory frame and communicated to PCB owners.		
	Developing and implementing incentives for electric utilities to comply with the phase-out of PCBs/PCNs,	Incentives established		
	Defining a National PCBs/PCNs Elimination Plan, define the responsibilities for institutions and companies for PCB/PCN containing wastes management and disposal	National plan for phase out developed		
	Strengthening the control/inspection for PCB/PCN containing equipment still in use, and for interim storages and disposal facilities.	Inspectors trained and equipment	2 years	

Objective/aim	Activity	Indicators	Time frame	Implementers
Development/update of a PCB/PCN inventory in closed and PCB/PCN and SCCP inventory in open applications where relevant	Completing inventory of PCB/PCN containing equipment (in use and out of use).	Inventory of transformers, capacitors and other equipment	3 years	NEA, NAWEC, Partners
	Assessment of the past use of PCBs/PCNs and current/past use of SCCP in open applications (e.g. sealants, paints, rubber, chloroprene, plastic additive, industrial oils) in the country and, where relevant, developing inventory of PCBs/PCNs and SCCPs in open applications.	Assessment of use (report). Inventory of open applications	3 years	
	Assessment of waste oil management and use and inventory of potentially PCB/PCN and SCCP contaminated waste oils. Assessment of risk of (waste) oils for humans, food, feed and environment.	Monitoring/inventory report	3 years	
	Developing and regularly updating a database for PCB/PCN containing equipment (in use and storage) and open applications (e.g. buildings/constructions)	Database	3 years	
Life cycle management (handling, storage, transport and disposal) of PCBs/PCNs, PCB/PCN-containing equipment, open applications and PCB/PCN containing and contaminated	Assessing the current situation and improvement needs of interim storage and disposal for PCB/PCN containing equipment and wastes	Assessment report	1 year	NEA, NAWEC, Partners
	Establishing ESM procedures for PCBs/PCNs equipment and wastes considering existing technical guidelines.	Authorities and staff trained	1 year	
	Establishing inspection/control on the handling, storage, transfer	Inspectors trained Inspections conducted	1 year	

Objective/aim	Activity	Indicators	Time frame	Implementers
wastes	and disposal of PCB/PCN containing equipment and PCB/PCN containing wastes	(reports)		
	Phase-out PCB/PCN in closed and open applications and monitoring of the progress	Phase out of equipment by 2025. Documented management and export	5years	
	Environmentally sound management and disposal of PCB/PCN containing equipment and waste	Disposal of equipment by 2027		
Awareness, education and training of stakeholders (policy makers; customs, related industries, NGOs and the public) on PCBs/PCNs in closed and open applications (linked to the awareness on chemicals in products (SAICM synergy))	Awareness/education of policy makers and other stakeholders on health hazards of PCBs, PCNs and SCCP and the related risk for humans, environment and food.	Number of awareness activities conducted	2 years	NEA, NWAEC, Partners
	Strengthen the inspection capacity for customs and other competent authority (in use; mark/sales, storage, disposal).	Customs and inspectors trained (number of trainings; participants)	2 years	NEA, NWAEC, customs
	Education of utility sector, maintenance workers and industry owing transformers, capacitors and other PCB/PCN containing closed equipment and open applications on PCBs, PCNs and alternatives. Education of citizens and NGOs on PCBs and PCNs including open applications relevant for consumers (paints and sealants).	Workers and stakeholders trained (number of trainings; participants)	1 year	NEA, NWAEC, staff
Established monitoring and analysis of PCBs and PCNs (closed and open applications, environment,	Monitoring and analysis of PCBs and PCNs for closed and open applications (see above)	PCB/PCN inventory in closed application	3 years	NEA, NWAEC, laboratory
	Monitoring of occupational exposure (maintenance and management/remediation	Monitoring data of potentially exposed staff	5 years	NEA, NAWEC, MOPE, FSQA

Objective/aim	Activity	Indicators	Time frame	Implementers
food, exposure)	staff)			
	Monitoring of PCB/PCNs and SCCP (human, environment biota, imports, food) by own capacity or regional/international collaboration	Monitoring data	3 years	
Assessment and promotion of sustainable alternatives used for PCBs and PCNs in closed and open applications	Compilation of information on alternatives in closed and open applications of PCBs/PCNs and SCCPs and assessment of alternatives used	Reports (compiling available information from e.g. POPRC)	2 years	NEA, NAWEC
	Education on alternatives of PCBs/PCNs and SCCP in closed and open applications	Trainings conducted (numbers of participants)	3 years	NEA, NAWEC
	Promotion of most sustainable alternatives in closed applications considering chemical and energy aspects	Selected alternative equipment (e.g. ecolabel; Green public procurement)	5 years	NEA, NAWEC,
	Promotion of the most sustainable alternatives in (former) open applications of PCBs/PCNs and SCCP	Selected alternatives (e.g. ecolabel)	5 years	
The action plan for PCB/PCN contaminated sites is integrated in the general action plan on POPs contaminated sites below				

3.3.5 Activity: Import and export, use, stockpiles, and wastes of POP-PBDEs (Annex A, Part IV & V chemicals), HBCD and HBB (Annex A, Part I chemical)

According to the PBDE inventory POP-PBDEs listed in 2009 have been imported via electrical and electronic equipment and related waste (EEE/WEEE). in vehicles and possibly other goods and is present in stocks at consumer levels or as wastes. Furthermore, in May 2017 DecaBDE has been listed as POPs which had by far the highest use volume of all PBDEs (approx. 1.3 million t compared to only 100,000 t c-OctaBDE). Therefore, the total amount of POP-PBDE in products and waste is considerably higher compared to the current first PBDE inventory considering only POP-PBDEs listed in 2009.

The action plan focuses on setting objectives and actions need to lead to managing and controlling POPs-PBDEs and HBCD (POP-BFR) containing products still in use, currently recycled, stockpiled, or landfilled. The implementation can only be successful if the overall management of EEE/WEEE, end of life vehicles and construction & demolition waste is

appropriately developed. This is considered and addressed in this action plan but need to be addressed in and linked to the larger frame of the national waste management action plan.

For managing PBDEs, the life cycle management (import, export, use, recycling, destruction) of POPs containing articles/products and waste needs to be developed, in particular for EEE/WEEE and vehicles and end of life vehicles. In addition, HBCD, DecaBDE and to a less extend PBDE listed in 2009 are used in insulation (polyurethane and polystyrene) and other plastic and polymer applications in buildings.

For these three large material and waste flows also resource recovery and recycling need to be considered, following the waste management hierarchy for the recovery of resources and to move to a (more) circular economy. At the same time pollutants such as PBDEs, HBCD and other POPs/PBTs need to be phased out of the recycling.

Furthermore, the three waste categories WEEE, end-of-live vehicles and construction & demolition waste contain a large share of the total plastic/polymer volume which needs to be managed considering the impact on plastic/polymers on marine litter and on the role as fuel for open burning. Here the Stockholm Convention COP 8 gave the mandate to the regional Stockholm/Basel Centers to address plastic waste and marine plastic litter in future which also need to be considered for the national implementation plan.

The action plan also considers where appropriate the synergy of Stockholm Convention and the Strategic Approach of International Chemical Management (SAICM). POP-BFRs are prime examples of Hazardous Chemicals in Products (SAICM emerging policy issue) and are closely linked with the SAICM policy issue “Hazardous substance within the life cycle of electrical and electronic products” and “Endocrine-disrupting chemicals”.

Table 24. Options for action plan activities for elimination and management of POP-BFRs (PBDEs, HBCD and HB[B65])

Objectives	Activities	Indicators	Time Frame	Implementer
Established regulatory frame for management of POP-BFRs (hazardous chemicals) and related articles and waste categories	• Inclusion of PBDEs, PBB and HBCD in list of banned or restricted substances. (or list as exemption)	▪ PBDE, PBB and HBCD restricted (or exemption listed)	1 years	NEA, MoJ Partners
	• Assessment of regulatory frameworks for these substances and the products and wastes containing these substances.	▪ Overview of international regulations compiled	1 year	
	• Development of regulatory frame for EEE/WEEE management[66]	▪ Regulatory frames for EEE/WEEE developed	3 years	

[6565] HBB have been produced and used in minor amounts (approx. 5000 t) in the 1970s mainly in the ÚS and are not considered relevant today. HBB is included in the monitoring action plan to verify this.

[66] see e.g. EU WEEE directive & EU POP regulation; but also developing countries like Nigeria or Ghana have developed a regulatory frame for WEEE

Objectives	Activities	Indicators	Time Frame	Implementer
	● Development of a regulatory frame for vehicles management (importation, end of life management; see e.g. EU ELV directive).	▪ Regulatory frames for vehicles developed	3 years	
	● Development of a regulatory frame for HBCD in insulation. ● Assessment/listing if exemption needed for HBCD in insulation? (frame)	▪ Regulatory frame for HBCD insulation foams developed	3 years	
Updated and refined inventory of PBDEs (including DecaBDE) and HBCD containing articles and wastes/resources and developed/updated appropriate databases for information management	▪ Update PBDE inventories considering DecaBDE (and other update if necessary)	▪ Updated inventory report	1 year	NEA, MOH, Partners
	▪ Develop dynamic MFA/SFA inventory for POPs/PBTs (and resources) in EEE/WEEE ▪ Develop dynamic MFA/SFA inventory for POPs/PBTs (and resources) in vehicles	▪ Dynamic substance flow analysis of POP-BFR containing products and waste (report)	2 years	NEA, University
	▪ Data management system for product and waste categories containing BFRs (for general waste management)	▪ Databank for EEE/WEEE, vehicles, established	2 years	NEA, Partners
Assessment of DecaBDE in current production and substitution of DecaBDE with better alternatives	● Assessment if DecaBDE is used in production (textiles, plastic, PUR foam insulation). ● Assessment of chemical alternatives and non-chemical alternatives, ranking of alternatives and selection of the best alternatives. ● Education and capacity building on alternatives assessment. ● Phase in of substitutes for DecaBDE in the respective uses.	▪ Inventory of current use of DecaBDE in production ▪ Report on alternatives for decaBDE suitable for Pakistan (using available documents) ▪ decaBDE substituted in the uses and documentation	5 years	NEA Partners
Assess of current use of HBCD and substitution with better alternatives	▪ Compilation of information on alternatives to HBCD containing EPS/XPS insulation (see SC HBCD BAT/BEP guidance; POPRC). ▪ Selection of the most	▪ Assessment Report	3 years	NEA, UTG, Partners

Objectives	Activities	Indicators	Time Frame	Implementer
	sustainable alternative chemicals and non-chemical solutions in the different applications. ▪ Phase in of sustainable chemicals and non-chemical alternatives to HBCD.			
Sound Life Cycle Management of PBDE and HBCD containing product and waste categories (EEE/WEEE, end of life vehicle, insulation foam)	● Compilation of information of management for POP-BFR containing products and waste including fate of other pollutants. ● Assessment of management and destruction option of waste categories containing POP-BFR (WEEE; ELV, insulation foam, furniture). ● Assessment of recycling options and limitations of product/waste categories containing POP-BFR. ● Compile guidelines and guidance on safe handling of POP-BFR polymers in EEE, ELV etc. and develop national guidance for management of POP-BFRs containing insulation foam from construction.	▪ Report on the pollutants including possibly monitoring of pollutants. ▪ Compilation on current situation of the treatment and evaluation of the individual technologies including recommendation for manage. ▪ Guidelines and BAT/BEP (see SC BAT/BEP guideline) adjusted to Pakistan circumstances.	5 years	NEA, Partners
	● Development of sound management (financing, collection, storage, treatment according to waste hierarchy) of POP-BFR containing plastic and other polymer in EEE/WEEE within the frame of hazardous substance management in EEE life cycle. ● Development of sound management of POP-BFR containing plastic and other polymer in end of life vehicles within the frame of hazardous substance management in the life cycle of EoL vehicles. ● Development of sound	▪ EEE plastic and related PBDE management is addressed in WEEE ▪ MOU in place ▪ Compliance and enforcement network operational. ▪ Institutions have appropriate capacity ▪ Operational monitoring plans in place	2 years	NEA, Partners

Objectives	Activities	Indicators	Time Frame	Implementer
	management of POP-BFR containing plastic and other polymer in buildings and construction within the frame of POPs (PCBs, PCP, POP-pesticide in wood, SCCP) and hazardous substance management in buildings and construction. ● Development of sound management of POP-BFR containing plastic and other polymer in other uses found relevant ● Including POP-BFRs and other hazardous substances in a larger frame of plastic management (link to marine litter, open burning etc.)			
	▪ Identify destruction and energy recovery options for POP-BFR containing waste. ▪ Develop phase out/destruction options for identified PBDEs sources.	▪ Phase out/destruction options identified. ▪ Phase out/destruction options programmes in place	5 years	NEA, Partners
Awareness of major stakeholders on POP-BFR containing products and waste created (integrated in the overarching frame on awareness of "Chemicals in Products" and "Management of hazardous chemicals in the life cycle of EEE" (SAICM synergy)	▪ Develop awareness creation strategy on impact (health, recycling, environment) of POP-BFRs (PBDEs, HBCD) and other hazardous chemicals in the life cycle of EEE, vehicles, buildings, textiles and other impacted product categories. ▪ Developing awareness raising materials on POP-BFRs and other hazardous substances in EEE, ELVs, buildings etc. ▪ Awareness raising campaigns for stakeholders (policy makers, authorities, industry, recyclers, research and public) on POP-BFRs within a larger awareness campaign on chemicals in products. ▪ Awareness of the public on POP-BFR impacted plastic within a general awareness	▪ Development of awareness creation materials	5 years	NEA, Partners

Objectives	Activities	Indicators	Time Frame	Implementer
	on plastic and marine litter and sustainable consumption ▪ (Conducting awareness creation campaigns to reduce/eliminate the practice of open burning of EEE/WEEE and ELV polymer scrap.)			
Built knowledge and capacity for management of POP-BFR impacted materials and waste categories within the life cycle management of hazardous substances in EEE, vehicles, buildings, furniture, textiles	▪ Carry out policy and regulatory needs assessment and develop recommendations. ▪ Capacity building of authorities and institution for developing the regulatory frame for life cycle management of EEE, ELVs, construction sector and others ▪ Develop training materials and programmes to monitor the enforcement of the regulatory frame for WEEE. ELV, insulation in buildings and other impacted waste management and related polymer and POP-PBDEs management ▪ Capacity building for implementation of the regulatory frames for managing WEEE, ELVs and other impacted wastes ▪ Develop procedures on inspections and maintenance of stockpiles and waste of plastic and other polymers in EEE. ▪ Training/education of customs authorities on control of import of import control of WEEE, ELVs and other relevant products.	▪ policy and regulatory Needs assessment report ▪ Resource persons identified ▪ Training materials developed Procedures on inspections and maintenance of stockpiles and waste developed.	1 year	NEA, Partners, MOHERST
	▪ Development of education and training materials for life cycle management of POP-BFRs (considering already available materials) and training of related recyclers and waste management sector for relevant sectors within the life cycle management of hazardous	▪		

Objectives	Activities	Indicators	Time Frame	Implementer
	substances in EEE, vehicles, buildings, furniture, textiles ▪ Capacity building of life cycle management for POP-BFRs (considering available materials) and training of recyclers and waste management sector for relevant sectors within the life cycle management of hazardous substances in EEE, vehicles, buildings, furniture, textiles.			
Established monitoring of POP-BFRs and pollutants in the atmosphere and other priority areas	▪ Assessment of options for monitoring of POP-BFRs (international collaboration or own/regional capacity) ▪ Establish of monitoring approach for POP-BFRs (PBDEs, HBCD, PBB). ▪ Monitoring of major product categories and related wastes/recycling. ▪ Improvement of inventory by monitoring approach where knowledge gaps have been identified. ▪ Monitoring of humans, biota and environment for POP-BFR for effectiveness evaluation and in priority areas (e.g. contaminated site).	▪	2 years	NEA, Partners
Identification and established assessment and management of potentially POP-BFR (and PBDD/F) contaminated sites and securing /remediation.[67]	▪ Develop/update legislation to set criteria for determining contaminated sites. Legislation on liability related to contamination and clean-up procedures. (general activity on contaminated site framework) ▪ Develop methodology and guidelines for risk assessment of sites where POP-BFR containing waste (e.g. WEEE, ELV) were	▪ Method for risk assessment developed ▪ Best securing and remediation measures identified and personnel trained	4 years	NEA,MOJ, Partners

[67]At sites where WEEE and end of life vehicle and other PBDE containing waste is treated the final pollution is a mixture of many pollutants (Wong et al. 2007). Wong MH, Wu SC, Deng WJ, Yu XZ, Luo Q, Leung AO, Wong CS, Luksemburg WJ, Wong AS (2007) Export of toxic chemicals - a review of the case of uncontrolled electronic-waste recycling. Environ Pollut. 149(2):131-140.

Objectives	Activities	Indicators	Time Frame	Implementer
	treated considering the toxicity of mixtures. ▪ Database and conceptual site models of potentially contaminated sites ▪ Prioritization of the sites (risks) for further assessment and securing. ▪ Train and upgrade skills of personnel in the assessment, securing and remediation of contaminated sites ▪ Develop strategies for the environmentally sound management of POPs contaminated sites. ▪ Take measures to secure the contaminated sites to stop human exposure and environmental releases ▪ Identification of clean-up measures and initiate clean-up procedures starting with high priority sites.			

3.3.6 Activity: Import and export, use, stockpiles export, use and wastes of DDT (Annex B Chemicals) if used in the country)

DDT was used in Gambia in the past for public health purposes. DDT were brought in by Gambia and used from 2010 to 2014. Since the use was prohibited after 2014, no export, registration, and control of DDT have been recorded. The current inventory review did register some DDT stocks in the country which are controlled.

Table 25. Action plan Import and export, use, stockpiles and wastes of DDT (Annex B chemical)

Objectives	Activities	Outputs	Time Frame	Implementers
Improved Malaria vector control	Strengthen the network Participation and cooperation with the Global Alliance for Alternative to DDT	Active participation	2 years	**MOH, Partners**
Strengthen research on controlling Malaria by IVM	Compilation of information on state of art of IVM Research on IVM suitable for The Gambia circumstances Education stakeholders including public in IVM Active promotion of IVM campaigns.	Report on current state of art IVM measures Pilot research projects conducted All stakeholders educated and trained Country wide IVM campaigns conducted	5 years	**MOH, Partners**
Decision of future vaccination against Malaria	Assessment of the outcome of malaria vaccine implementation programme (MVIP) Discussion with WHO on options to participate in future	Report on outcome Dialogue with WHO and pilot countries. Decision if vaccination useful for Gambia	5 years	**MOH, Partners**
Further assessing and controlling illegal imports of pesticides including DDT	Further assessment of illegal import activities including counterfeit pesticides Training of custom to control imports of illegal pesticides	Report on the import situation of illegal pesticides Training on illegal pesticide import included in general training for customs	3 years	**NEA, Customs**
Manage the DDT stockpile	Keep storage of stockpile in an ESM Export of DDT stockpile for destruction	Stockpile destroyed in an ESM		MOH, NEA

3.3.7 Activity: Import and export, use, stockpiles, and wastes of PFOS, its salts and PFOSF (Annex B, Part III chemicals)

According to the inventory, PFOS and related substances are not manufactured in the country. However, PFOS and related substances entered the country in consumer products and articles.

The major stocks of PFOS are firefighting foams, which have been used in the past with generation of potentially contaminated sites and ground water.

Currently there is no monitoring capacity in the country to assess contaminated sites or potentially PFOS containing products.

The main issues to be considered in the action plan are contaminated sites and ground water. Also the identification, management, safe handling and treatment of waste potentially containing

PFOS is a problem for stakeholders (enforcement authorities, waste management and recycling industry) to address.

PFOS and related substances have been substituted mainly by other per- and polyfluorinated[68] substances (PFASs). PFASs are an issue of concern under the Strategic Approach of Chemical Management (SAICM)[69]. To promote the synergy of Stockholm Convention[70] and SAICM, the action plan is extended to other PFASs where appropriate.

Table 26. Action plan with objectives, activities and indicators for measures to reduce or eliminate PFOS and control PFASs (SAICM Synergy)

Objectives	Activities/tasks	Indicators	Time Frame	Implementers
To establish policy and regulatory framework for management of PFOS and related substances and other PFASs (SAICM synergy)	Assessment of regulatory frameworks of other countries for controlling PFOS and related substances and other PFASs	Assessment report	1 year	NEA, MOJ, MECCNAR
	Amend laws or develop laws related to the control and management of PFOS and other PFASs. Banning of PFOS	Law and policy in place Legislation updated	3 years	NEA, MOJ, MECCNAR
	Custom control and improvement of the traceability of PFOS and other PFASs in imports (including chemicals in products)	Customs trained		Customs, NEA, Partners
	Extended producer/user responsibility for management of PFOS and other PFASs throughout product life cycle (including disposal)	EPR in place		NEA, Industry
Updated and refined inventory of PFOS, PFOA and other PFASs (SAICM synergy) use and containing articles and wastes and developed/ updated databases for information management	Refining inventory of PFOS and other PFASs in firefighting foams Refining of inventory of PFOS and other PFAS in consumer and other products and industrial applications Refining of inventory of stocks and waste of PFOS and other PFASs (including landfills) Material and substance flow analysis of PFOS/PFASs(Option)	Updated inventory with robust data and list of data gaps	3 years	NEA, Partners
Life cycle management of	Compilation of information of management situation of PFOS	Report	4 years	NEA, Partners

[68]Polyfluoroalkyl substances are considered under SAICM if they have perfluorinated degradation products.

[69] SAICM http://www.saicm.org/Implementation/EmergingPolicyIssues/tabid/5524/language/en-US/Default.aspx

[70]Perfluorooctanoic acid (PFOA) is suggested for listing as POPs and perfluorohexanesulfonic acid (PFHxS) id assessed by the POPs Review Committee under the Stockholm Convention

Objectives	Activities/tasks	Indicators	Time Frame	Implementers
PFOS/PFASs containing products, stockpiles and waste.	and other PFASs containing products in the country			
	Assessment of management and destruction option of PFOS and other PFAS containing stocks and wastes	Management & destruction options assessed (report)		
	Policy and strategy for control and management of PFOS and other PFAS-containing products and wastes	Strategy incorporated in National Chemical and Waste Management Plan		
	Environmental safe storage of PFOS-containing materials	PFOS containing waste stored		
	Stop recycling of PFOS containing products or extract/remove PFOS before recycling			
	ESM of PFAS containing products; destruction or export of PFOS containing waste considering Basel synergy and extended producer responsibility;	PFOS stocks and waste disposed; Compliance and enforcement of the SC		
PFOS alternatives in use/exempted uses are assessed and PFOS is substituted by the most sustainable chemical and non-chemical solution	Compilation of information on alternatives to PFOS and related substances (considering available information of e.g. POPRC)	Information materials developed (report) and disseminated.	3 years	NEA, Partners
	Education and capacity building on alternatives and alternative assessment	Alternatives assessment guidance document		
	Selection of the most sustainable alternative chemicals and non-chemical solutions in the different applications	Phase in and use of alternatives		
Training and awareness raising for stakeholder groups on PFOS and other PFASs	Development of related education and awareness materials for stakeholder groups (considering already available materials)	Education materials developed Awareness created	5 years	NEA, Customs, fire fighters, other Partners

Objectives	Activities/tasks	Indicators	Time Frame	Implementers
and establishing approach for information exchange	Inform and educate stakeholders including users (e.g. fire fighters; paper/leather/furniture/aviation industry), policy makers and public on the environmental and health impact, environmentally sound management and on alternatives of PFOS and related substances.	Number of workshops/seminar conducted		
	Training/education of customs authorities on PFOS (and other POPs and other hazardous substances) in articles and products.	Number of trained personnel Education/awareness of staff		
Established monitoring of PFOS and other PFAS in priority areas	Assessment of options for monitoring of PFOS and PFAS (international or regional collaboration) Monitoring of major drinking water supplies Improvement of inventory by monitoring approach where knowledge gaps have been found. Monitoring of chemicals and chemicals in products/articles known to contain PFOS and other PFASs. Monitoring biota and soil samples for PFOS especially in vicinity of suspected contaminated sites (see contaminated site action plan).	Monitoring approach for PFOS and related substances has been established. Monitoring of Priority areas including major drinking water reservoirs conducted	5 years	NEA, DWR, MOA, Partners
The action plan for PFOS contaminated sites is integrated in the general action plan on POPs contaminated sites below				

3.3.8 Activity: Register for specific exemptions and the continuing need for exemptions (Article 4)

Article 4 of the Stockholm Convention on POPs requires the establishment of POPs register for the purpose of identifying parties that have specific exemptions listed in Annex A or B. All registrations of specific exemptions are subject to periodic review.

The listed POPs with specific exemptions and acceptable purposes have increased and meanwhile 9 POPs have been listed with exemptions (HBCD, DecaBDE, SCCPs, PFOS, DDT, Lindane, PCP and recycling of PBDEs). To decide if an exemption is needed an informed decision need to be made considering alternative chemicals and non-chemical solutions. Such an assessment is made by appropriate research institutions and committees. If after such a scientific assessment an exemption is needed, then the Secretariat of the Stockholm Convention/COP would be informed, and the exemption registered. Therefore, in this action

plan an activity is included to establish an appropriate systematic methodology of an exemption is needed to appropriately meet the obligations under Article 4 in future.

Table 27. Register for Specific Exemptions and Acceptable Purposes (Article 4)

Objectives	Activities	Indicators	Time Frame	Implementers
To establish an informed registration process for needed exemptions of individual POPs.	(a) Organize stakeholder consultation to establish criteria for assessment and selection of exemptions for chemicals listed under Annex A or B (b) Assess for PFOS, PFOA, HBCD, PCP, DDT, DecaBDE, and SCCP future listed POPs with exemptions. (c) Notification of Convention Secretariat on specific exemptions if needed (d) Periodic review to assess the need for continued exemptions and alternatives and stop exemption and use more sustainable alternatives as soon as feasible	Stakeholder consultation held and outcomes documented Country assessment of current listed POPs with exemptions Notification submitted and exemption listed Review report	Annually	NEA, Partners
	Inform Secretariat of the Stockholm Convention/COP on the needed of exemption after thorough assessment of the need and alternative options	Secretariat of the Stockholm Convention/COP is informed on the needed exemption and exemption is registered		

3.3.9 Activity: Measures to reduce releases of unintentional POPs (Article 5)

In this section activities are proposed for the action plan to reduce the release from unintentionally produced POPs (PCDD/PCDFs and unintentional PCBs, PCNs, HCB and PeCBz). In the action plan the activities have been set by considering the listing of the priority sources in Annex C of the SC, the contemporary releases as an outcome of the inventory process and considering point sources with potential risk to humans.

PCDD/PCDF and PCB levels are globally still above the Tolerable Daily Intake (TDI) for breast fed children.[71] Furthermore the European Food Safety Authority reduced the Tolerable Intake by a factor of 7 and now a large share of European population but also globally are above the TDI/TWI[72]. Therefore, further reduction of PCDD/PCDF and PCB releases is a relevant task. PCDD/PCDF and other unintentional POPs (PCBs, PCNs) are endocrine disrupting chemicals (EDCs) and contribute to overall exposure of humans to EDCs. Also, the overall exposure to EDCs need to be reduced considering the high external cost of EDCs to society.[73,74]

For an adequate assessment and priority setting of UPOP emissions from emission sources and related impact of reduction, the total impact of release reduction from addressed individual sources (industrial emissions, open burning, indoor cooking/heating and transport etc.) are needed. This includes other major pollutants to be considered for an appropriate risk assessment on air and soil pollution prevention.

Other major pollutants to consider include:

- other releases from industrial processes (e.g. heavy metals, particulate matter (PM), carbon black, PAHs).
- other releases from open burning, cooking/heating, transport (e.g. particulate matter (PM), carbon black, PAHs, heavy metals)

Since these releases are one of the main sources for ambient air pollution causing between 9 to 12.6 million deaths in particular in developing countries (WHO 2016[75], Lancet Commission on Pollution and Health [76]), the reduction of the release of these pollution as a whole (Dioxins/UPOPs, particulate matter, heavy metals, PAHs, black carbon) should be a priority for many countries. Integrated actions to address the different sources and the multiple pollutants need to be implemented if the exposure of the population is to be adequately decreased. The proposal therefore is an action plan for reducing the unintentional releases of POPs as well as other relevant co-pollutants (particulate matter (PM), black carbon, PAHs, heavy metals) from these sources in an integrated manner towards an integrated pollution prevention and control (IPPC) approach.

[71] Since human milk is the best nutrition for a baby and the benefits of breastfeeding far outweighs the presence of POPs human milk is exclusively recommended for at least 6 month by WHO (http://www.who.int/nutrition/topics/exclusive_breastfeeding/en/).

[72] EFSA (2018) Risk for animal and human health related to the presence of dioxins and dioxin-like PCBs in feed and food https://www.efsa.europa.eu/en/efsajournal/pub/5333

[73] Attina TM, Hauser R, et al. (2016) Exposure to endocrine-disrupting chemicals in the USA: a population-based disease burden and cost analysis. Lancet Diabetes Endocrinol. 4(12), 996-1003.

[74]Trasande L, Zoeller T et al. (2015) Estimating Burden and Disease Costs of Exposure to Endocrine-Disrupting Chemicals in the European Union. J Clin Endocrinol Metab. 100(4), 1245–1255.

[75] WHO (2015) http://www.who.int/mediacentre/news/releases/2016/deaths-attributable-to-unhealthy-environments/en/

[76] The Lancet Commission on pollution and health. http://www.thelancet.com/commissions/pollution-and-health

Table 28. Options for objectives/aims and action plan activities for reduction and elimination of Dioxins/UPOPs including timelines, responsible authorities and stakeholders and associated cost

Objectives	Activities	Indicators	Time frame	Implementers*
To establish policy and legal framework for reduction and minimization of unintentional POPs	• Undertake law and policy assessment on PCDD/F and other UPOPs and possibly co-pollutants. • Possibly amend existing laws, or develop new laws where needed, related to the management of UPOPs possibly within an integrated pollution prevention and control approach.	Updated legislation	3 years	NEA, MOJ, MECCNAR
Updated sources inventories for PCDD/F and possibly other listed UPOPs with data management and harmonization with related release inventories.	▪ Refine/update Dioxin/UPOP inventory ▪ Incorporate new listed unintentional POPs where useful ▪ Regularly update of the UPOP inventory and reporting as appropriate ▪ Quantify other co-pollutants (e.g. PAHs; carbon black)	Updated Dioxin/UPOP inventory	4 years	NEA, Partners
	▪ Development of a mechanism ensuring appropriate storage and management of data ▪ Development of an integrated database of pollutant releases (e.g. Dioxin/UPOPs, mercury, GHG; carbon black)	Integrated database developed	2 years	
Reduced releases from open burning of wastes (private burning & landfill fires) and biomass burning by improvement of waste management (waste hierarchy; circular economy).	• Regulatory frame for waste hierarchy and circular economy • Regulatory frame for control of open burning • Development of waste catalogue and related management options considering waste hierarchy • Implementation of sound management of waste with increased reuse, recycling and recovery (3/Multi R concept towards a more circular economy). • Energy recovery in cement plants and boilers/incinerators • Construct engineered landfills for remaining waste disposal	Improved legislative frame for waste management Improved overall waste management Improved recycling rates	4 years	NEA, Partners, MOJ
	• Develop a guidance and awareness materials for detection, extinguishing and prevention of landfill/dumpsite	Awareness materials prepared	2 years	

Objectives	Activities	Indicators	Time frame	Implementers*
	fires. • Closure of dump sites and stop illegal dumping of wastes (fines). • Develop an awareness for landfill operators on the impacts of open waste burning and implement education program for control • Awareness raising program and fines for open waste burning on private level	Awareness campaigns conducted		
To reduce and minimize release of UPOPs from hospital waste incinerators	• BAT/BEP standards for hospital waste incinerators • Education of operators and competent authorities on minimizing Dioxin/UPOPs release and emission control • Implementation of regulatory frame including BEP and BAT for meeting regulation limits. • Monitoring frame for incinerators		5 years	NEA, MOH
	• Implement BEP and where required BAT in existing medical waste incinerators • Assessment of technologies to treat medical waste • Selection and implementation of sound treatment of medical waste including also non-incineration technologies • Develop guidelines for sound management of medical waste (WHO “Safe management of wastes from health-care activities”) • Strengthen institution and human resource capabilities to implement environmentally sound medical waste management		5 years	
Adoption of BAT/BEP and IPPC in Ferrous and non-Ferrous metal production and to reduce and minimize release of PCDD/Fs, other UPOPs and other priority	• Improve the overall situation of metal recovery and treatment • Assessment of the individual industries for BEP options for UPOPs reduction and options for BAT • Assessing synergies for the reduction of unintentional POPs, mercury, PM, GHG and other relevant pollutants and where feasible address pollutants in an	Metal recovery and recycling improvedl	1 year	NEA, Partners

Objectives	Activities	Indicators	Time frame	Implementers*
pollutants	integrated manner. • Introduce and effectively implement BEP and where required BAT UPOP reduction measures (within integrated pollution prevention and control) • Develop and/or promote institutions with technical expertise to support the implementation of cleaner production (BEP) and BAT			
To conduct awareness raising and establishing network	• Develop of education and awareness materials on the health and environmental impact of Dioxins and other UPOPs • Sensitize the public and stakeholders on the environmental and health impact of UPOPs • Develop awareness creation strategy on impact UPOPs and releases of other hazardous pollutants • Awareness raising campaigns on Dioxins and UPOPs and other pollutants of concern for relevant stakeholders and sources (open burning, industrial sources, industries, waste wood).	Awareness materials prepared Awareness campaigns conducted	Continues	NEA, CSOs
Established monitoring of PCDD/F and other relevant pollutants from Annex II and III sources and human exposure	• Assessment of the need and the options for monitoring Dioxins and other UPOPs from priority sources and for human exposure (food, feed, soils) in the region (ECOWAS). • Establish and strengthen the national capacity for UPOPs monitoring considering bio-assay and international/regional co-operations. • Monitor priority environmental and foods samples for Dioxins and possibly other UPOPs (e.g. samples with potential human exposure for residents around suspected contaminated sites).		3 years	NEA, FSQA, MOA

3.3.10 Activity: Identification and management of stockpiles, waste and articles in use, including release reduction and appropriate measures for handling and disposal (Article 6)

Toxic releases from stockpiles and waste constitute serious threat to human health and the environment. This calls for their safe, efficient and environmentally sound management. Activities geared towards the development of appropriate strategies and measures to stem releases through actions such as proper handling, collection and transport and disposal of such stockpiles and waste are outlined below and in the action plans for the individual POPs above.

In addition to remaining PCB and pesticides, large volumes of POP-BFR containing wastes and stocks have been generated (WEEE plastic; plastic/polymers of end of life vehicles; insulation foam from construction). A similar situation exists with PFOS and related substances (PFOS precursors) and SCCPs and related containing stockpile (carpets and possibly others). Currently perfluorooctanoic acid (PFOA) and perfluorohexanesulfonic acid (PFHxS) are evaluated by POPRC as POPs and SAICM has all perfluorinated alkylated substances as an issue of concern and related wastes will need to be managed/destroyed in future. Wastes containing these POPs and other PBT chemicals need to be managed. Activities for the management of POPs specific waste are listed in the individual action plans and would be considered/linked to the activities listed in this generic action plan.

Safe, efficient and environmentally sound management of stockpiles as well as proper handling and disposal of articles in use, which contain POPs, and other hazardous chemicals are important for the achievement of the country obligations under the Stockholm Convention (Article 6) and the Strategic Approach of Chemical Management (SAICM synergy). E.g. also related stockpiles and wastes containing perfluorinated alkylated substances (SAICM issue of concern) or hazardous chemicals in electronics (SAICM emerging policy issue) need to be managed that these and other hazardous chemicals do not enter the environment and impact human health and the environment including wildlife. Therefore, appropriate end of life management of impacted waste categories is important to achieve such goals.

At the same time only a part of these waste categories are impacted. Furthermore, they contain valuable resources to be recovered considering the need to move to a (more) circular economy.[77] Therefore, an appropriate approach on material recovery, energy recovery and destruction of pollutants need to be developed. Within these activities the synergies with Basel Convention and related activities need to be considered.

Table 29. Identification and management of stockpiles, waste and articles in use, release reduction and appropriate measures for handling and disposal

Objectives	Activities	Outputs/Indicators	Time Frame	Implementers
Please note: The management of the stockpiles of the individual POPs (PCBs, pesticides, PFOS, PBDEs, HBCD) is in the action plans of individual POPs above				
To manage stockpiles in a safe and environmentally	▪ Identify appropriate storage facilities for interim storage of	▪ Meetings to develop guidelines for safe storage	2 years	NEA, MOA, MOH, NAWEC

[77]GEF (2018) Circular Economy.Sixth GEF Assembly Viet Nam 2018.

Objectives	Activities	Outputs/Indicators	Time Frame	Implementers
sound manner	stockpiles ▪ Upgrade existing information for safe management of stockpiles	▪ Facilities to handle stockpiles in place ▪ Workshops to train personnel in management of stockpiles		
To develop measures for safe handling, separation and sound disposal of stockpiles of chemical and articles in use and to appropriately recover resources and energy to move to more circular economy.	▪ Develop manuals for safe handling and disposal. ▪ Develop guidelines for the transport of articles in use to safe locations. ▪ Establish collection scheme for POPs containing articles in use. ▪ Establish appropriate separation, recycling and energy recovery schemes for impacted waste categories.	▪ Meetings to develop manuals for safe handling and disposal ▪ Guidelines on transport developed ▪ Collections points/scheme for articles in use established	3 Years	NEA, MOPE,MOA, MOTC
Destruction, disposal or export of POPs and other hazardous chemicals and waste in an ESM	▪ Destruction of POPs containing waste and other hazardous chemicals containing waste in an ESM ▪ Export of POPs and other hazardous chemical waste which cannot be treated or disposed in the country ▪ ESM and disposal of hazardous waste	▪ POPs and other hazardous chemical waste (including hazardous chemicals in products) managed in ESM	5 years	NEA, MOTIE, Customs

3.3.11 Activity: Identification of contaminated sites (Annex A, B, and C Chemicals) and, where feasible, remediation in an environmentally sound manner

To date, there is no intergovernmental policy instrument that addresses the identification and remediation of contaminated sites. Countries that have ratified the Stockholm Convention (Parties) must however endeavour to develop strategies for identifying sites contaminated with POPs (Article 6 SC). While not explicitly requiring remediation of contaminated sites, the Stockholm Convention stipulates that any remediation attempts must be carried out in an environmentally sound manner (Article 6 SC)

The activities for the identification and assessment of POPs-contaminated sites should be harmonized with the general strategy of Gambia to assess and remediate contaminated sites and hotspots.

The individual POPs inventories have shown that all POPs groups have resulted or have likely resulted in some contaminated land. The details are compiled above in Section 2.3.8.

Depending on the pollutant, different securing and remediation technologies might be applied which need to be explored for the individual location and pollutant.

Article 6 of the Stockholm Convention requires that Parties develop appropriate strategies for the identification of sites contaminated with chemicals listed in Annex A, B or C and if remediation of such sites is carried out to do it in an environmentally sound manner. The country strategy is as outlined below.

Table 30. Identification of Contaminated Sites (Annex A, B and C Chemicals) and Securing and Remediation in an Environmentally Sound Manner

Objectives	Activities	Indicators	Time Frame	Implementers
Regulatory frame for contaminated sites	▪ Develop/update legislation to set criteria for determining contaminated sites for relevant POPs. ▪ Establish guidelines for soil and ground water assessment ▪ Legislation on liability (Polluter Pays Principle (PPP) related to contamination and clean-up procedures.	Draft regulation developed on contaminated sites and soils. Draft Legislation on liability (Polluter Pays Principle (PPP) related to contamination and clean-up	3 years	NEA, MOJ, Partners
Methodology to identify and prioritize sites contaminated with Annex A, B and C chemicals	▪ Develop methodology to systematically identify and prioritize POPs contaminated sites considering available guidance documents[78] ▪ Establish methodology for ground water and soil assessment ▪ Develop list of potential contaminated sites (see individual POPs below) ▪ (Preliminary) prioritization of POPs contaminated sites ▪ To participate in or to follow the UNEP working group on POPs contaminated sites	General procedures for investigations developed Expert nominated for contact/ participation UNEP BAT/BEP group	2 years	NEA, Partners

[78] See e.g. UNIDO POPs contaminated site Toolkit http://chm.pops.int/Implementation/BATandBEP/AdditionalResources/tabid/1493/Default.aspx or UNEP Toolkit Category 10 (http://toolkit.pops.int/Publish/Main/II_10_HotSpots.html).

Objectives	Activities	Indicators	Time Frame	Implementers
Secure POPs contaminated sites, and were feasible conduct remediation of contaminated sites	▪ Standard procedures for securing and labelling contaminated sites ▪ Identify potential remediation technologies available. Develop strategies for the environmentally sound management of POPs contaminated sites ▪ Train and upgrade skills of personnel in the assessment, securing and remediation of contaminated sites	▪ Procedures for securing contaminated sites identified and isolated. ▪ Compilation and selection of available environmentally sound remediation methods (report) ▪ Draft guidelines on clean up procedures ▪ Trained staff on contaminated sites;	5 years	NEA, Partners
Countrywide database for POPs contaminated sites considering relevant co-pollutants	▪ Assessment of database systems for contaminated sites in other countries ▪ Selection of database approach and establishing POPs contaminated site database considering co-pollutants integrated in a general contaminated site database	▪ Report on database with recommendation ▪ Database selected and established	3 years	NEA, GBoS, Partners
Identification, assessment, securing and possibly remediation of POPs pesticides contaminated sites	▪ Assessing of potentially POPs pesticides contaminated sites (sites of storage, use and disposal) ▪ Overall risk assessment of the sites (toxicity of mixture present)[79] and prioritizing sites ▪ Securing of sites and remediation of sites as appropriate	Potential POPs pesticide contaminated sites are assessed, ranked for priority and secured	3 years	NEA, MOA, Partners

[79] See for example: Pieterse B, Rijk IJC, Simon E, van Vugt-Lussenburg BMA, Fokke BFH, van der Wijk M, Besselink H, Weber R, van der Burg B (2015) Effect-based assessment of persistent organic pollutant- and pesticide dumpsite using mammalian CALUX reporter cell lines. Environ SciPollut Res Int. 22:14442-14454.

Objectives	Activities	Indicators	Time Frame	Implementers
Identification, assessment, securing and possibly remediation of PCB contaminated sites	• Assessing of potentially PCB contaminated sites (storage, use and disposal PCB equipment) • Securing of sites and remediation of sites as appropriate	Potential PCB contaminated sites are assessed, ranked for priority and secured	3 years	NEA, NAWC
Identification, assessment, securing and possibly remediation of POP-PBDE contaminated sites.[80]	▪ Develop method for risk assessment of sites where WEEE, ELV or other POP-BFR waste have been treated ▪ Train and upgrade skills of personnel in the application of identified remedial measures and safe handling ▪ Assessment and securing and possibly remediation of contaminated sites	Method for risk assessment developed Best securing and remediation measures identified and personnel trained	5 years	NEA, Partners
Identification, assessment, management, of potentially PFOS and PFAS contaminated sites and securing /remediation needs	▪ Use guidelines for identification and assessment of PFOS/PFAS contaminated sites ▪ Database and maps of potentially contaminated sites and prioritization of the sites (risks) for further assessment and clean-up ▪ Analytical confirmation of POPs contamination for the identified locations (according to prioritization list) ▪ Take measures to secure the contaminated sites to stop human exposure and environmental releases ▪ Identification of clean-up measures and initiate clean-up procedures considering priority sites.	Contaminated site criteria defined and legislation develope Guidelines on identification developed Workshops conducted, staff trained Priority sites determined Pollution assessed Strategies for addressing sites developed Measures to secure sites implemented	3 years	NEA, MOA

[80]At sites where WEEE and end of life vehicle and other PBDE containing waste is treated the final pollution is a mixture of many pollutants (Wong et al. 2007). Wong MH, Wu SC, Deng WJ, Yu XZ, Luo Q, Leung AO, Wong CS, Luksemburg WJ, Wong AS (2007) Export of toxic chemicals - a review of the case of uncontrolled electronic-waste recycling. Environ Pollut. 149(2):131-140.

Objectives	Activities	Indicators	Time Frame	Implementers
Assessment, management, database of potentially PCDD/PCDF and other UPOPs contaminated sites and securing /remediation needs	▪ Use guidelines[81] for identification and assessment of UPOPs contaminated sites ▪ Training in identification and management of contaminated sites ▪ Database and maps of potentially contaminated sites and prioritization of the sites (risks) for further assessment and clean-up ▪ Analytical confirmation of UPOPs contamination for the identified locations (considering prioritization) ▪ Develop strategies for the environmentally sound management of POPs contaminated sites ▪ Take measures to secure the contaminated sites to stop human exposure and environmental releases ▪ Identification of clean-up measures and initiate clean-up procedures considering the prioritization.	Contaminated site criteria defined and legislation developed Guidelines on identification developed Workshops conducted, staff trained Priority sites determined Pollution assessed Strategies for addressing sites developed Measures to secure sites implemented	4 years	NEA, Area Councils, MOH

3.3.12 Activity: Facilitating or undertaking information exchange and stakeholder participation

This activity is supporting and establishing a system for exchanging information on POPs at national, regional and international scale. Referring to Articles 9 and 10 of the Convention, the Parties provide the access to information to the community and constantly update the information on POPs.

The information exchange between the Parties of the Stockholm Convention is performed via the National Focal Points and with the support of the Secretariat of the Stockholm Convention.

Regarding the content of the information exchange, the Parties to the Convention exchange information on the activities directed to reduce or eliminate POPs and on the risk imposed by POPs to humans and environment, including information of involved socio-economic costs.

Information exchange and stakeholder involvement are activities to be elaborated for the implementation of the NIP. The development of a comprehensive strategic information

[81] See e.g. UNEP Toolkit Category 10 (http://toolkit.pops.int/Publish/Main/II_10_HotSpots.html) or UNIDO POPs contaminated site Toolkit
http://chm.pops.int/Implementation/BATandBEP/AdditionalResources/tabid/1493/Default.aspx

exchange and communication plan will be one step to take in order to achieve successful implementation of the NIP. The communication plan must also ensure that POPs-management issues will be addressed through various media - a website and other means of communication, in order to raise public awareness and to receive full collaboration. This activity is closely linked with the action plan on awareness raising in chapter 3.3.13 below. A national activity for institutional information exchange will be developed through regular workshops to ensure full stakeholder engagement.

Due to the complexity of the increasing numbers of POPs and POPs like chemicals close information exchange on regional and international level is needed to take place.

Table 31. Activities for facilitating information exchange and stakeholder participation activities

Objectives	Activities	Indicator	Time frame	Implementers
Information exchange on POPs in the region and internationally	Development of a mechanism that information generated in the Stockholm, Basel and Rotterdam Secretariat and SAICM Secretariat reach the country and the stakeholders. Mechanism that information on POPs from the country with regional or international relevance are communicated to the regional Basel and/or Stockholm centres and to the BRS secretariat	Information exchange on POPs in the region and internationally is ensured	3 years	NEA, Partners
Access of information and documents for national stakeholders	Establish mechanism and possibly website that key documents, information and news on POPs and hazardous chemicals can be found by stakeholders. Evaluation Stockholm Convention documents and decide if any document should be translated.	Key documents and information accessible to stakeholders	3 years	NEA, Partners
Improved information exchange on national level between stakeholders	Facilitate the dialogue between industry, users, research and policy makers Establish or improve dialogue between science community and policy makers for improved science-policy dialogue.	Information exchange on national level between stakeholders take place	2 years	NEA, UTG, MOHERST, Partners

3.3.13 Activity: Public/stakeholder awareness, information awareness and education (Article 10)

Article 10 of the Stockholm Convention on public awareness, information and education, requires parties to promote and facilitate awareness among policy and decision makers with regard to POPs. Parties should ensure that all available information on POPs is made available to the public and the information is kept up to date. Also, tailor made information for policy makers, industry and curricula are needed. In pursuance of this article, parties should ensure that appropriate education programmes are put in place for groups such as women, children and the least educated, as well as for workers, scientists, educators and technical and managerial personnel.

The successful implementation of the Stockholm Convention on POPs in the country will only be achieved when the relevant stakeholders (policy makers, industry, science community, civil society and general population) are sensitised on the nature of POPs, other hazardous chemicals and their effects on human health and the environment. By an appropriate awareness of stakeholders, the needed commitment is reached for the achievement of the Convention objective. It is therefore important for action to be directed at promoting the continuous and detailed awareness, information and training programmes on POPs and hazardous chemicals in the life cycle (SAICM synergy). Information need to be individually developed and targeted for specific stakeholder groups including policy and decision makers, industry as well as the general public. The individual stakeholders should be trained to be appropriately informed to play their respective roles.

The awareness activities will be linked to general awareness on chemical safety, on public health, and on green economic development, as well as awareness programs on sustainable consumption and production - all aimed at broad awareness raising for sustainable development.

A range of suggested awareness activities have been included in the individual action plans of this NIP for pesticides, PCBs, UPOPs, and new industrial POPs (POP-BFRs and PFOS). These activities will be coordinated and addressed collectively where appropriate. In this section general activities on awareness of POPs and hazardous chemicals are compiled.

Table 32. Activities for stakeholder awareness, information and education activities

Objectives	Activities	Indicators	Time Frame	Implementers
General Awareness on POPs and on POPs-related SAICM issues and general hazardous chemicals as appropriate (For specific awareness activities for individual POPs see the	Compile available state of art awareness and education materials on POPs and other hazardous chemicals and GHS	Awareness and education materials on POPs and other hazardous chemicals and GHS compiled	1 year	NEA, The Media, CSOs, MOA, MOH
	Adopt education and training materials on POPs & hazardous chemicals tailor made for target groups (policy makers, industry, public, curricula) considering available materials and translate selected materials into the country languages	Education and training materials on POPs & hazardous chemicals tailored to target groups	2 years	

Objectives	Activities	Indicators	Time Frame	Implementers
respective action plans of individual POPs and coordinate)	Implement trainings and programs for teachers and lecturers about toxicology, environment and ecology issues related to POPs and hazardous chemicals	Trainings and workshops conducted (number participants)	3 years	
	Providing training and guidance for stakeholder groups that are directly exposed, treating equipment and waste containing POP (see individual POPs action plans)	Training and guidance for stakeholder groups that are exposed, treating equipment and waste containing POP (see individual POPs action plans) provided	3 years	
	Implement communication activities, raise awareness on POPs and POP-like chemicals; exchange and dissemination of information on these chemicals in media outlets targeted to stakeholder groups and the public.	Number communication activities and number of stakeholders reached		
	Implement the activities to raise awareness and training for chemical inspectors; customs, enforcement officers, on the contents related to POPs management	Trainings and workshops conducted		
	Integrating POPs and hazardous chemicals in the environmental education syllabus of basic and secondary schools	Updated syllabus of basic and secondary schools		NEA, MOBSE, MOHERST
Raising awareness on POPs & alternatives to POPs and introduction of green and sustainable chemistry approach	Compile information materials available on alternatives to POPs and Green and Sustainable Chemistry	Materials compiled (place on POPs website)	1 year	NEA, MOBSE, MOHERST
	Develop education modules on Green and Sustainable Chemistry versus POPs/POPs-like chemicals for curricula of secondary and tertiary education	Modules for curricula developed and used in secondary and tertiary education	3 years	
	Develop information materials on Green and Sustainable Chemistry for selected industries	Training on alternatives to POPs considering green and sustainable chemistry (numbers; participants)	5 years	

3.3.14 Activity: Effectiveness evaluation (Article 16)

Article 16 of the Convention requires parties to establish mechanisms for providing comparable monitoring data on the presence of Annex A, B and C chemicals. According to Article 16 (paraphrased): Parties, in accordance with their technical and financial capabilities and using existing monitoring programmes and mechanisms (where possible), are to co-operate on a regional basis, when appropriate, and contribute to a global monitoring programme for the SC. This evaluation shall be conducted on the basis of available scientific, environmental, technical and economic information including national reports. As main matrices selected for assessment of the effectiveness of the implementation, human milk and air have been chosen. These activities are coordinated in the frame of the global POPs. UNEP together with WHO and the Stockholm Convention Secretariat are conducting and supporting human milk surveys in developing countries.[82]

Table 33. Activities for effectiveness evaluation (Article 16)

Objectives	Activities	indicator	Time	Implementers
Conduct a monitoring of POPs in human milk or human blood	Monitoring of POPs in human milk or blood	Data on POPs in human milk/blood	3 years	NEA, Partners
Evaluating the effectiveness of the implementation of the Convention by other approach	Develop further national performance evaluation criteria. Assessment of the implementation and progress performance	Criteria Developed. Assessment report	5 years	NEA

3.3.15 Activity: Reporting (Article 15)

According to Article 15, Parties are required to report periodically on the measures taken, and on their effectiveness in meeting the objectives of the SC. Article 15 of the Stockholm Convention on POPs mandates parties to report to the Conference of Parties (COP) on measures taken to implement the provisions of the Convention as well as the effectiveness of the measures taken. In addition, each party is to provide to the Secretariat, statistical data on its total quantities of production, import and export of each of the chemicals listed in Annex A and B as well as a list of states from/to which it has imported/exported each of such substances. The article 15 reports provide a substantial input to the effectiveness evaluation of the Convention (Article 16) and are submitted every four years. This Action Plan therefore aims at collecting/collating all information relevant to the provisions of the Convention and packaging them in a suitable manner for reporting to the secretariat and the COP.

[82] http://www.who.int/foodsafety/areas_work/chemical-risks/pops/en/index1.html

Table 34. Activities for reporting under Article 15 of the Stockholm Convention

Objectives	Activities	Performance indicator	Time frame	Implementers
Setting up mechanism for Article 15 reporting	Develop a mechanism for complying with the reporting requirements by submission of reports within the given deadlines	Mechanism established	1 year	NEA, Partners
	Setting up responsibilities for data compilation and filling the reporting form	Data compiled	1 year (for 2018 reporting)	
Complying with article 15 reporting	Compile information for reporting (updated inventory and other information) Submit report to the secretariat (website)	Reporting submitted deadlines met	reporting 2018; then 4 year cycles	Stockholm Focal Point

3.3.16 Activity: Research, development and monitoring (Article 11)

Article 11 of the Stockholm Convention mandates parties to undertake appropriate research, development, monitoring and cooperation pertaining to POPs. The overall research capacity in Gambia on POPs contamination in the environment, food or humans is low and virtually not existing.

For POPs research and monitoring, international and regional cooperation with experienced institutions are a promising approach for progress in this topic. In this respect, capacity building activities offered in the frame of the Stockholm Convention such as the Global Monitoring Plan will be considered for possible participation.

Another relevant research area are alternative assessments to POPs and candidate POPs. Considering that several POPs are in use and a large amount of POPs-like chemicals are identified in international research, a wider frame of research capacity is needed to address POPs and hazardous chemicals and to select appropriate alternatives to POPs and other hazardous chemicals of concern.

Science–policy interfaces are critical in shaping environmental governance and sustainable development. Science has globally delivered many assessments, syntheses and reviews to inform on chemical pollution and health effects which could facilitate the conventions' implementation. However, science and other forms of knowledge are not used effectively in policymaking; and policymakers do not always effectively inform scientists about their needs for scientific knowledge. An effective science-policy interface is needed and robust institutes or working groups which can generate and compile the necessary science-based information and communicate it in a way that the information can be used for policy making.

This section identifies activities in addressing the research, monitoring and science-policy needs.

Table 35. Action plan for research, development and monitoring (Article 11)

Objectives	Activities	Indicator	Time frame	Implementers
To develop institutional and research capacity to manage POPs and other PBTs and other hazardous chemicals (SAICM synergy)	▪ Identify institutions with the potential to undertake research into POPs and other hazardous chemicals (SAICM Synergy) ▪ Strengthen national scientific and technical research capacity and infrastructure to gather, evaluate and exchange information on chemicals ▪ Establish capacity on health, exposure and risk assessment to POPs and other hazardous chemicals ▪ Develop networks among identified research institutions on national and international level ▪ Establish procedures for communicating research and development findings to the public	▪ Institutions identified, contacted and agreement ▪ Needs of national scientific and technical research capabilities relation to POPs and other hazardous chemicals established ▪ Meetings to identify proper avenues for networking ▪ Research into health effects of POP initiated ▪ Linkages for communication established	5 years	NEA, MOH, NARI, MOHERST
Improved and operative science-policy interface established and contributing to decision making	▪ Assessment of current science-policy interface in decision making. gaps and improvement needs ▪ Establish/improve science policy interface for chemicals and waste/resources ▪ Use the S-P-interface for assessing the impact of POPs and hazardous chemicals to the SDGs and indicators, ecosystem services[83] and other policy drivers.	▪ Gap assessment of science-policy interface ▪ Compilation of impact of hazardous chemicals to SDGs and related indicators ▪ Science-policy assessment report on chemicals and waste/resources	3 years	NEA, MOHERST

[83] See

Objectives	Activities	Indicator	Time frame	Implementers
Socio economic assessment, life cycle costing and external cost for policy making	▪ Compile information and develop capacity on life cycle cost, external cost and socio-economic analysis of POPs and other hazardous chemicals ▪ Contribute information on life cycle cost, external cost and socio economic assessment on POPs and hazardous chemicals to the science-policy dialogue	▪ Institute or working group with expertise on external costing and socio-economic established. ▪ Reports and policy documents for key areas ▪ Information reached policy makers and are referenced in policy decisions and policy and legislation background documents	3 years	NEA, Partners
Appropriate monitoring capacity for POPs developed	▪ Assessment on analytical capacity need (see other action plans) ▪ Develop laboratory capacity and/or international cooperation for POPs considered relevant for the country. ▪ To identify cooperation partners for POPs and PBT monitoring and research on national and international level	▪ Laboratories established ▪ Equipment purchased ▪ Staff trained ▪ International standard methods selected ▪ Laboratories accredited for all relevant ▪ Cooperation with partners established	5 year	NEA, Partners
To monitor POPs and other relevant PBTs needed for the implementation of the individual action plans (see other POPs AP)	▪ Support the monitoring needs of the action plans of the individual POPs groups	▪ Sample matrices identified ▪ Methods for sampling selected ▪ Sample collected ▪ Analysis Results	5 years	NEA, Partners
To establish mechanism for quality assurance and control of monitoring activities	▪ Establish effective quality assurance and quality control system ▪ Setting up of review panel to evaluate data prior to acceptance	▪ Protocol for ensuring QA/QC in place ▪ Procedure for data evaluation developed ▪ Workshop to identify review panel organised	3 years	NEA, Partners

Objectives	Activities	Indicator	Time frame	Implementers
Proper management of data	▪ Establish procedures for the management of analysis results and other data ▪ Consider internationally recognized guidelines for data generation and interpreting monitoring results and presenting monitoring reports	▪ Procedure for management of analysis results established ▪ Good Laboratory Practice used, ▪ International standards accredited ▪ Harmonized methodology for reporting interpretation of results	2 years	NEA, Partner
Research on alternatives to POPs and Green and Sustainable Chemistry	▪ Compilation of information on alternative assessment ▪ Research on alternatives to POPs ▪ Develop research into Green and Sustainable Chemistry (G&SC))	▪ Workshops on G&SC ▪ Research project(s) on G&SC developed ▪ G&SC modules in curricula ▪ Research initiatives into finding alternatives to POPs	2 years	NEA, NARI, MOH, MOHERST

3.3.17 Activity: Technical and financial assistance (Articles 12 and 13)

Article 13 of the Convention requires each Party to provide financial support and incentives for carrying out the national implementation programme in support of the Convention's objectives.

Developed countries are expected to provide new and additional resources to enable developing country Parties and Parties with economies in transition to meet the agreed full incremental costs of implementing measures which fulfil their obligations under this Convention. This funding should be made available on a timely and sustainable basis.

The Convention provides for setting up a financial mechanism for the provision of adequate and sustainable financial resources to developing country Parties and Parties with economies in transition on a grant or concessional basis to assist in their implementation of the Convention.

The ability of the country to fulfil its obligations under the POPs Convention depends partly on the provision of adequate financial and technical assistance. The Gambia needs technical and financial assistance and will seek this assistance when implementing its NIP.

The following actions are suggested to enable the country obtain the needed financial and technical support required for the successful implementation of activities and actions to be carried out to achieve the POPs overall objectives.

Table 36. Technical and Financial Assistance (Articles 12 and 13)

Objectives	Activities	Key performance indicator	Time frame	Key implementers
To source for technical assistance towards the successful implementation of the Convention (Article 12)	▪ Assess technical needs ▪ Identify sources of technical assistance	▪ Documentation of needs ▪ List of sources of technical assistance ▪ Number of proposals prepared and submitted and acceptance	2 - 5 years	NEA, Universities and Research Institutions
To source for financial assistance towards the successful implementation of the Convention (see 3.6)	▪ Financial needs assessment ▪ Identify sources of financial assistance ▪ Requisition for financial assistance through proposal writing	▪ Studies evaluating and demonstrating financial needs ▪ List of potential donors identified ▪ Number of proposals prepared and submitted	3 year	NEA

3.4 Priorities and development/capacity-building proposals

As priority areas for the implementation of the SC, the following areas have been discovered during the inventory development process and the stakeholder workshops including the NIP workshop where priorities have been discussed with relevant stakeholders. The order of the priority areas listed below does not mean a prioritization between the areas.

The SC activities should be linked and harmonized with national priorities and should support the sustainable development of the country. The sustainable development where possible and appropriate, the implementation of the SC should seek synergies with the implementation of other chemical Conventions and SAICM. Also synergies and cooperation

I. Strengthening the coordination between institutions and stakeholders

A strong coordination mechanism between the different ministries, institutions and other stakeholders is needed for an effective implementation of the action plan and for general hazardous chemical and waste management. Therefore, the strengthening of cooperation between the different ministries, institutions and other stakeholder is an important factor (priority) for an effective implementation of the Stockholm Convention NIP and other conventions on chemical and waste including SAICM (synergy approach). Such a coordination mechanism should facilitate the overall management of chemicals and waste and link it to sustainable development agenda and implementation of the SDGs.

The activity contributes to SDG 3, 4, 11, and 16. It can also contribute to SDG 8 and 9.

II. Institutional strengthening and development of legislation and related implementation

Harmonization and improvement of legislation on POPs and general chemicals and their management is needed. Where gaps have been discovered appropriate legislation should be developed. This is detailed for POPs in the respective action plans in 3.3.

Also an improved legislation for wastes containing POPs and general hazardous waste management is needed. A range of waste fractions potentially containing POPs need particular control and regulatory frames for their management (e.g. PCB equipment; e-waste and related plastic; end-of-life vehicles, waste oils, waste wood, used acid-lead batteries).

There is a need for institutional strengthening of chemical and waste possibly with employment of additional staff for chemical and waste management to have the necessary capacity for the needed national tasks. Also other ministries need institutional strengthening for chemical and waste management. This strengthening of institutions is needed for the development of the appropriate legislation and regulation and for the implementation of the regulatory framework and the action plans.

The activity contributes to SDG 3, 4, 8, 9, 11, 12 and 16.

III. Capacity building, education, information and awareness raising

For all POPs groups (pesticides, unintentional POPs, PCBs, PFOS and related substances, POP-PBDEs, HBCD) education and awareness raising activities are needed and a priority. This includes the education and awareness of the public but also of policy makers and individual stakeholder groups including those particularly exposed.

The awareness on POPs would best be integrated in a general education and awareness on hazardous chemicals and related risks and health impacts. This also should include awareness

and education on waste management for policy makers, relevant stakeholders and the public. Synergies with other chemical and waste conventions should be elaborated with a common but differentiated approach.

Since some of the new industrial POPs are present in consumer products (electronics, vehicles, synthetic carpets, treated textiles, furniture, mattresses, etc.), the awareness raising materials and awareness communication can nicely be linked to sustainable consumption and production.

The activity contributes to SDG 1, 2, 3, 5, 8, 9, and 12 and 16.

IV. Management of POPs stockpiles (PCB, pesticides; POP-PBDES, HBCD and PFOS)

The management of existing POPs stockpiles is considered a priority to protect human health and the environment.

Management capacity in Gambia need to be built and destruction capacity and limitations in the country need to be assessed and developed.

The total volume of PCB stockpiles need first to be assessed and the option of destruction or export evaluated. A project with UNITAR and UNDP is currently on-going.

A minor POPs-pesticide stock (Endosulfan; possibly the remaining DDT if not further kept) need also be managed and destroyed or exported.

Large stocks of POP-BFR containing wastes are present in plastics and polymers of e-waste, end-of-life vehicles, insulation in construction and other uses. While the exposure risk is normally lower compared to PCBs or pesticides, these materials are “fuel” for landfill fires and backyard burning with associated releases of POPs, unintentional POPs, particulate matter and carbon black. Furthermore, these plastics and polymers are sources for marine litter and associated pollution.

PFOS stocks in particular in fire-fighting foam are a threat to ground water, drinking water and soil and the use need to be stopped and stocks managed appropriately. Also PFOA stockpiles and wastes are likely present. Furthermore, PFASs is an issue of concern under SAICM and should be addressed in a synergistic way.

The activity contributes to SDG 3, 12, 14 and 15.

V. Improvement of waste management and introduction of waste hierarchy towards circular economy and reduction of unintentionally formed POPs from open burning.

Open waste burning is a main source of PCDD/F release. Also Gambia does not have an appropriate capacity for POPs waste destruction. Therefore, such capacity needs to be developed or POPs containing waste (PCBs; pesticides) require expensive export. New industrial POPs (in particular PBDEs, HBCD, PFOS and SCCPs) can be present in several large waste streams (electronic waste, car shredder residues, treated synthetic carpets, textiles, rubber, and PVC etc.). These wastes are currently largely disposed in dumpsites. Therefore, and considering other contaminants (e.g. heavy metals) in the waste, the lack of waste management presents a serious threat to soils and related food safety (SDGs 2,3,6, 11,12)[84], to ground water, and the wider environment.

[84] Bell et al (2016) Assessment of POPs contaminated sites and the need for stringent soil standards for food and feed safety. Working document for UNEP Dioxin Toolkit and BAT/BEP group. October 2016.

The improvement of waste management is, therefore, of high priority for current and future control of unintentionally produced POPs release and for the management of new industrial POPs in waste streams. This includes also the development of an overall concept to finance waste management.

Furthermore, the introduction and implementation of the waste hierarchy towards a more circular economy[85] is crucial for recovery of valuable resources contributing to sustainable consumption and production and it contribute to the reduction of GHG emission and carbon footprint.

The improvement of waste management and the implementation of the waste hierarchy towards a (more) circular economy therefore contribute to the integrated approach to tackling interconnected issues and generating multiple benefits as aimed in the GEF 7 strategy.[85] At the same time increased recycling lead to job creation and generation and involvement of green and sustainable industries and therefore can catalyse private sector activities.

The activity contributes to SDGs 1, 2, 3, 6, 8, 11 and 12.

VI BAT/BEP for Dioxin/UPOPs reduction and integrated pollutant prevention and control

Most of the facilities in Gambia which are listed in Annex C of the Stockholm Convention with PCDD/F release (medical waste incinerators; metal industries) do not comply with BAT/BEP. The improvement of technology for hospital waste incinerators and other facilities with relevant PCDD/F release is a priority to reduce total PCDD/F and other UPOPs.

The Stockholm Convention BAT/BEP guidance stresses the integrated pollution prevention and control as mentioned as a general guiding principle. The approach of Gambia is that the implementation of BAT/BEP should contribute to the overall reduction of pollution release (UPOPs, heavy metals, particulate matter) and is an important cornerstone for the overall reduction and control of soil, air and water pollution.

BAT/BEP also can contribute to reduction of energy consumption and related reduction of GHG emission.

BAT/BEP with an integrated pollution prevention and control approach of facilities and industries therefore contribute to the integrated and system approach to tackling interconnected issues and generating multiple benefits as aimed in the GEF 6 and 7 strategy.

The activity contributes to SDG 2, 3, 6, 11 and 12 and can contribute to SDG1 and 8 in particular if local working force and technologies are used where possible and appropriate.

VII. Monitoring of POPs, effectiveness evaluation and initiate research and collaborations

There is a lack of POPs monitoring capacity in Gambia. For the implementation of the Convention, levels of POPs in human are needed for effectiveness evaluation and support for priority setting. POPs monitoring is needed for assessment of POPs in products, the assessment of contaminated sites, contaminated drinking water or the implantation o BAT/BEP and release control. These activities should be combined and lead to the establishment of POPs research and international collaboration with increased capacity of science policy advice.

The activity contributes to SDG 3, 4, 5, 6, 8, 11, 12, 14 and 16.

[85]GEF (2018) Circular Economy. Sixth GEF Assembly Viet Nam 2018

VIII. Substitution of POPs and selection of green/sustainable alternatives to promote circular economy

Some of the new listed POPs including SCCPs, PFOS/PFOA, DecaBDE and HBCD are still used in products (insulation foams, textiles, PVC, rubber) or in processes (e.g. lubricants, metal working oils, fatliquoring) and increase the total POPs stockpiles and waste increasing future exposure, management challenge and cost. Therefore, assessment and substitution of POPs and POPs-like chemicals are needed. Strengthening of capacity for assessment of alternative and selection of green and sustainable chemicals or non-chemical alternatives is needed to avoid regrettable substitution.[86] This contributes also to GEF Strategic Priorities[87].

Considering the SAICM synergy, also highly hazardous pesticides (HHPs) and other pesticides with serious health and environmental threats should be substituted by more sustainable alternatives, IPM and organic agriculture.

Furthermore the substitution of highly persistent and water soluble PFOS, PFOA and other PFASs (SAICM synergy) contribute to Enhancing Water Security (GEF International Water Focal Area).

The activity contributes to SDG 3, 4, 6, 8, 9, 12, 14 and 16. The use of green and sustainable chemicals also contributes to SDG 2, 14 and 15.

IX. Contaminated site assessment and management

The assessment and inventory in this updated NIP revealed that for all POPs groups (Pesticides, PCBs/PCNs, Dioxin/UPOPs, PFOS and PBDEs) a range of sites are possibly or likely contaminated. Contaminated sites negatively impact several SDG including 3, 6, 11, 14 and 15. Currently, there are only preliminary assessments and initial measurement for one PCB storage site and samples sent to laboratory for some potential pesticide contaminated sites. Therefore, it is of high priority to initiate a more comprehensive assessment, mapping and securing of POPs-contaminated sites. In particular sites with potential contamination of ground and drinking water with PFOS or sites where food producing animals are grazing/feeding. The activities should result in the establishment of a database of contaminated-sites.

The activity contributes to SDG 3, 6, 11, 14 and 15.

A large share of activities in the different action plans are addressed by these high priority areas. These activities are not repeated in this summary of priorities but can be found in the action plans described for the different areas and are listed in the action plan tables in section 3.3.

[86]Fantke P, Weber R, Scheringer M (2015) From incremental to fundamental substitution in chemical alternatives assessment. Sustainable Chemistry and Pharmacy 1, 1-8.

[87] GEF (2017) GEF-7 REPLENISHMENT OVERVIEW: GEF-7--GLOBAL CONTEXT AND STRATEGIC PRIORITIES. December 22, 2017, GEF/R.7/11

3.5 Timeframe for the implementation strategy and action plans

The individual action plans and activities developed and compiled in Section 3.3 contain individual timeframes for implementation of the individual activities. Time frames are short term (2 years and less), medium term (3 to 5 years) and long term (10 years).

3.6 Resource requirements

For the priority areas, tentative budget requirements have been estimated (Table 37). Details on funding requirement will be elaborated during the respective development of projects. The Gambia is aware that the financial resources from GEF and other UN funding do not sufficiently cover the full implementation costs; hence, co-funding has to be considered. Therefore, potential sources of funding need to be identified. The government shall ensure the necessary resources, while mobilizing the contributions of international financing sources for the NIP implementation.

The Government should create a legal basis and favourable conditions to encourage and attract the participation of all related economic sectors, domestic and foreign organizations, as well as investors for the implementation of the National Plan. In addition, National Plan implementing authorities should take maximum advantage of the financial resources allocated by international financial organizations and other countries by conducting appropriate campaigns to attract capital from donors for the National Planning, creating a legal basis for encourage international sponsorship.

This framework will take into consideration and identify specific human resources, stakeholder contributions and requirements for possible GEF incremental cost and funding by development/donor partners. Considering the larger share of co-funding needed for GEF projects, appropriate and robust co-funding sources and approaches are needed. Following approaches and strategies are considered for co-funding:

The SC NIP will be coordinated and mainstreamed where appropriate with other related national plans and programs in particular for Hazardous Waste Management, climate change, plans on resources management, or programs or projects on science and technology, in order to attract investments and increase capital efficiency. By linking to general chemical and waste management co-funding can partly come from national budgets dedicated to chemical and in particular to waste management.

For the management of POPs contaminated stocks and wastes, extended producer responsibility (EPR) contributions can become an important funding source for the environmentally sound management of waste fractions. Several waste fractions related to POPs could be addressed by an extended producer responsibility frame:

- PCBs and related equipment
- E-waste including e-waste plastic
- End of life vehicle (including the polymers)
- Empty pesticides containers and stockpiles
- Synthetic carpets

The implementation of extended producer responsibility needs the development of an respective policy and regulatory frame. Such a frame is already existing in some countries for some of the categories and the OECD has developed related information.

Owners of POPs waste have to contribute a share of the management cost:

- Owners of PCBs (utility sector) have major responsibility for a large share of the PCB containing transformers and other equipment
- Producers or importers of POPs containing plastic, foams, sealants or paints
- Owners of buildings with POPs containing insulation foams, sealants or paints
- Owners of PFOS firefighting foams
- End of life vehicle (including the polymers)

Since a range of POPs and other pollutants are included in consumer products, also the consumers need to bear a part of the cost by appropriate waste management fees.

In the set-up of funding of the waste management also the value of the waste needs to be considered as co-financing source. E.g. vehicles have an inherent value (200 to 400 US$) mainly from metals and this value should be used to also manage the non-valuable fraction of plastic and other polymers and pollutants. Also, certain e-waste fraction have a value and can contribute to the finance of e-waste management. This requires the development of a waste management frame which does not allowing to just pick out the valuables like metals ("cherry picking") without consideration on managing the remaining non-valuable fractions.

The improvement or establishment of recycling and recovery schemes also can contribute to financing of waste management including POPs management. E.g. from experience in Europe, more than 50% of e-waste plastic can be recycled after separation with a reasonable price for the separated plastic fraction. The separation of recyclable plastic at the same time reduces the volume of the plastic fraction which need to be treated/disposed.

The polluter pays principle (PPP) can be used in the area of contaminated sites and hot spots. Before the principle can be applied the related regulatory frame need to be set-up that PPP can be used as co-financing source.

Overall, the NIP will be implemented through mobilization of various finance resources such as state budget, bilateral grant aid, GEF grants, financing from organizations and individuals, extended producer responsibility contribution, polluter pays principle contributions, loan, improved resource recovery from wastes, and other appropriate options.

Strengthening international cooperation should be carried out in various areas such as technical cooperation, grant aid for project development, improve capacity, institutional improvement, supporting under projects, resolving health and social benefits problems for the stakeholders.

The elaboration, allocation, and cost estimate decisions, as well as the management, use and settlement of funds for implementation of the National Plan will be conducted transparent in accordance with regulations.

Table 37 gives an overview on budget estimates for priority activities for POPs management in Gambia. These budgets are indicative and a rough estimate. Some of the activities cannot be estimated since the necessary data are not available but are generated during the implementation of the NIP. E.g. the cost for the PCB management can only be estimated after the amount of PCB containing transformers, capacitors and other wastes is known based on a detailed inventory. Also, the cost for the management of PBDE can only be calculated within the overall management of e-waste, end-of-life vehicle and other impacted wastes. Only after such a frame is established and the approach for plastic/polymer management from e-waste and ELVs is clarified (separation/recycling or just disposal or energy recovery in e.g. cement kiln) the cost for the treatment of POP containing plastic/polymers can be calculated.

As described above, the financing of the suggested budget would be a mix of governmental funding, international funding and funding from industries and citizens. E.g. the estimated cost for contaminated site assessment would come also from the owner of potentially contaminated sites like the airport.

Furthermore, the proposed activities can partly be financed by the regular waste management budget since PBDE in e-waste or end-of-life vehicles belongs to the general waste management tasks of the country. Here funding can come largely from extended producer responsibility and for vehicles and some of the electronics co-funding can (partly) come from the value of the resources in the waste.

Furthermore, integrated implementation with other national and internationally funded activities can be a (co-) funding source. E.g. the EU project on dumpsites and similar projects should be linked to the activities where appropriate. A range of activities like the coordination mechanism, strengthening institutions, regulatory development and implementation of chemical and waste management can be done in a synergistic and integrated manner with related co-funding considerations.

Table 37. Estimated budget for priority activities for POPs management in Gambia

Priority Activities (details are in individual action plans)	**Estimated Budget in US $**
Coordination, institutional strengthening, regulatory development and implementation	
Coordination mechanism between ministries, institutions and stakeholders for POPs and chemical and waste management (SAICM synergy)*	300,000
Strengthening governmental institutions including employment of further staff (SAICM synergy)*	750,000
Development of policy, legislation and regulatory (consider SAICM synergy)*	400,000
Guiding the implementation of the regulatory framework	250,000
Education, information and awareness raising	
Information and awareness raising on POPs, hazardous chemicals and chemistry[88] for general public (SAICM synergy)	500,000
Education and awareness raising in curricula	150,000
Please note: Education and capacity for expert is in individual priority action below	
Manage of POPs stockpiles (PCBs/PCNs, pesticides; POP-PBDES, HBCD and PFOS)	
Develop technical capacity for better management of obsolete POPs pesticides, HHPs and empty containers	200,000
Management of endosulfan and DDT stockpile	20,000
Inventory development of PCBs	Covered by UNITAR/UNDP project

[88] The use of functional chemicals is a necessity in daily life. In addition to education on the risks of POPs and other hazardous chemicals, also the basics of chemistry of chemicals used in everyday life would be included in the education including benefits and drawbacks for informed decisions on use.

Priority Activities (details are in individual action plans)	Estimated Budget in US $
Knowledge and technical capacity for the management of PCBs	Covered by UNITAR/UNDP project
Management of PCB containing transformers and wastes	Estimate after UNDP/UNITAR project
Knowledge and technical capacity for management of POP-BFRs containing waste (WEEE, ELVs, others)	200,000
Management of POP-PBDE containing waste	Within the management of WEEE and ELVs (see below)
Management of HBCD containing stock	Estimate if discovered
Education and knowledge capacity for management of PFOS and PFAS (SAICM synergy) containing waste (Firefighting foams, carpets, treated textiles, furniture, paper etc.)	200,000
Management of PFOS containing waste	Estimate after detailed PFOS foams/waste inventory
Improvement of waste management and introduction of waste hierarchy and reduction of unintentionally formed POPs from open burning.	
Improvement of waste management of waste categories containing POPs (WM) (e.g. WEEE; EoL vehicles, waste oil, waste wood, carpet)	Cost depend on recovery of cost by recycling, reuse & reduction
Overall improvement of waste management for reduction of open burning of dumps/landfills and on private level	Cost depend on recovery of cost by recycling, reuse & reduction
Assessment of options for destruction or ESM of POPs containing waste in Gambia or the region and developing frameworks	Cost depend if own capacity
Awareness, education and capacity building of stakeholders (industries, authorities and the public) on reduction, reuse and recycling (3R), and POPs containing waste separation.	300,000 (link to UNDP/UNDP BAT/BEP project)
BAT/BEP for Dioxin/UPOPs reduction and integrated pollutant prevention and control	
Knowledge and technical capacity for the control and reduction of PCDD/F and other UPOPs	75,000
Implementation of BAT and/or BEP for UPOPs sources (medical waste incinerator, iron smelter, crematory, chlorine production)	Facilities need a detailed assessment for cost estimate
Monitoring of POPs, effectiveness evaluation and initiate research and collaborations	
Update inventories, databases for POPs, hazardous chemicals, pollutant releases/PRTR (SAICM synergy)	200,000
Knowledge development for analysis/monitoring of POPs and other priority pollutants (SAICM synergy)	100,000
Development and improvement of technical analytical capacity	Depends on decision what to establish
Network development and cooperation with international partners for monitoring and assessment of POPs and POPs-like chemicals	250,000
Monitoring projects in priority area	500,000

Priority Activities (details are in individual action plans)	Estimated Budget in US $
Substitution POPs and selection of green and sustainable alternatives	
Capacity building for the assessment of alternatives chemicals and non-chemical alternatives and green/sustainable chemistry	150,000
Substitution of POPs in use (SCCPs, PFOS, PFOA, decaBDE) by more green and sustainable chemicals and non-chemical alternatives	Estimate after assessment of recent listed POPs in use
Contaminated site assessment and management	
Capacity building for the assessment, inventory, securing and remediation of POPs contaminated sites	200,000
Database for contaminated sites	100,000
Assessment of pesticides contaminated sites	300,000
Securing and possibly remediation of pesticides contaminated sites	Estimate after assessment
Assessment of PCB contaminated sites	300,000
Securing and possibly remediation of PCB contaminated sites	Estimate after assessment
Assessment of PFOS/PFAS contaminated sites	300,000
Securing and possibly remediation of PFOS/PFAS contaminated sites and cleaning of drinking water if pollution discovered	Estimate after assessment
Assessment of POP-BFR contaminated sites	100,000
Securing and possibly remediation of POP-BFR contaminated sites	Estimate after assessment
Assessment of Dioxin/UPOPs contaminated sites	300,000
Securing and possibly remediation of Dioxin/UPOP contaminated sites	Estimate after assessment