Kuwait National Implementation Plan to the Stockholm Convention on Persistent Organic Pollutants

Submitted to

Secretariat of the Stockholm Convention on Persistent Organic Pollutants

Prepared by Kuwait Environment Public Authority and Kuwait Institute for Scientific Research and Funded by Kuwait Foundation for the Advancement of Science

June, 2021

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State of Kuwait

June, 2021

Sheikh Nawaf AlAhmad AlJaber Al Sabah
Amir of the State of Kuwait

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Crown Prince of the State of Kuwait

FOREWORD

Persistent Organic Pollutants (POPs) are a group of chemicals, which persist in the environment for a long time, bioconcentrate and bioaccumulate in the food chain and in human tissues and they are toxic. The Stockholm Convention is a global treaty managed by the United Nations Environment Programme (UNEP) for the protection of human health and the environment from POPs. The Convention requires that Parties develop and introduce national measures aimed at reducing their releases of POPS into the environment.

Kuwait signed the Stockholm Convention on Persistent Organic Pollutants (POPs) on 23 May 2001 and became a Party to the convention after its ratification on 12 June 2006. Kuwait is an active player in international treaties and conventions for the purpose of ensuring sustainable chemicals management. Also, Kuwait serves as the host of the Stockholm Convention Regional Centre for West Asian Gulf countries (SCRC Kuwait), which was established in 2009 at Kuwait Institute for Scientific Research (KISR) to provide technical assistance and promote the transfer of technology to countries in the West Asia Region relating to the implementation of their obligations under the Stockholm Convention.

It is my pleasure to submit to the Secretariat of the Stockholm Convention the National Implementation Plan (NIP) for the State of Kuwait. The present Kuwait's NIP is the main output of a project conducted by KISR in close collaboration with the Environment Public Authority and with the participation of a number of ministries, authorities, industries, and nongovernment organizations (NGOs) in the State of Kuwait. Kuwait's NIP includes compiled data and an inventory of POPs in Kuwait, measures being taken to reduce releases, and a National Action Plan to implement for the Government and stakeholders in Kuwait. Kuwait's NIP and the National Action Plan will be subjected to periodic updating and revision as necessary in the future in response to Kuwait's obligations under the Stockholm Convention and to reflect decisions made by the Kuwaiti Government, or by the Conference of the Parties such as amendments to the Convention or its annexes. At the same time, the implementation of the NIP will ensure our national contribution to the global efforts for the elimination of POPs.

With the submission of Kuwait's NIP including the National Action Plan on the elimination and/or reduction of POPs, we are committing ourselves to the protection of our environment and the protection of human health in the State of Kuwait, and we fully comply with the obligations of the Stockholm Convention. In addition, within the framework of cooperation with the Secretariat of the Stockholm Convention and with the West Asia Regional Centre on POPs at KISR, the Environment Public Authority in Kuwait will continue to make use of the technical assistance and of technology transfer for the eventual elimination of POPs in Kuwait.

Sheikh Abdullah Ahmad Al-Hmoud Al-Sabah

Chairman of the Board and Director General

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State of Kuwait

ACKNOLWEDGMENTS

The Stockholm Convention is an international environmental treaty developed to eliminate or restrict the production and use of POPs, thereby protecting human health and the environment. Each Party to the Stockholm Convention is required to develop its National Implementation Plan for implementing its obligations under the Convention.

The development of Kuwait National Implementation Plan (NIP) to the Stockholm Convention on Persistent Organic Pollutants is the first step in the right direction for the sound management of chemicals and for the elimination of POPs in the State of Kuwait. The development of Kuwait National Implementation Plan (NIP) was the result of a national project conducted in collaboration between the Kuwait Environment Public Authority (KEPA) and the Kuwait Institute for Scientific Research (KISR) with financial support from the Kuwait Foundation for the Advancement of Science (KFAS).

The Kuwait NIP was built on the results of a comprehensive survey and inventory of all POPs sources and releases in Kuwait. The NIP describes in details how Kuwait will fulfil its obligations under the Stockholm Convention to reduce and eliminate POPs releases and carry out an environmentally sound management of POPs containing wastes and contaminated sites that pose risks to human health and the environment in the State of Kuwait.

The Kuwait Environment Public Authority acknowledges the good efforts of all those who actively participated in the development of Kuwait National Implementation Plan; particularly I would like to thank Kuwait Institute for Scientific Research for the successful implementation of the NIP project and the Kuwait Foundation for the Advancement of Science (KFAS) for the financial support to fund the project. Thanks are also due to the Ministry of Health, the Ministry of Electricity and Water, the Ministry of Oil, the Ministry of Commerce and Industry, the Public Authority of Agriculture and Fisheries Resources, the Public Authority for Industry, and Kuwait Fire Service Directorate for their valuable support and for providing the necessary information and data for compiling the POPs inventory. Special thanks to the members of the National Coordinating Team (NCT) who worked hard during the development of the NIP for the State of Kuwait.

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The Kuwait NIP document was developed as part of a national project conducted in collaboration between:

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Executive Summary

The Stockholm Convention (SC) on Persistent Organic Pollutants (POPs) was adopted on 22 May 2001 in Stockholm, Sweden, and entered into force on 17 May 2004. The objective of the SC is 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 and POPs used in industrial processes and consumer goods, and requires the reduction and minimization of the unintentional production and release of POPs formed as unintentional byproducts in industrial and combustion processes.

The Government of Kuwait signed the Stockholm Convention on POPs on 23 May 2001 and ratified the Convention on 12 June 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, Kuwait 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 Convention.

The NIP describes how Kuwait 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 risks to human health and the environment. The NIP supports Kuwait's policy objectives to integrate environmental considerations and pollution prevention into its Sustainable Development Goals (SDG) of the 2030 Sustainable Development Agenda to enhance the quality of life of all its citizens and secure a sustainable development of the industrial sector. The action plans described in the NIP should be mainstreamed into the related goals and strategies of the SDGs.

The current NIP has assessed the 28 POPs listed up to 2017 (COP8) and also includes dicofol (POP 29) listed in 2019 (COP9), having been banned already in Kuwait. Only PFOA listed 2019 has not been assessed for reason that no country has made the assessment yet, and no inventory guidance has been published by the Secretariat of the Stockholm Convention.

The goals of the NIP are the following:

I. To describe the actions that Kuwait has undertaken regarding the inventory, management, and reduction of the presence of POPs;

II. To propose actions that Kuwait 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 Kuwait's stakeholders about the national initiatives and projects designed to meet the requirements of the SC.

The NIP comprises three chapters as follows:

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 Kuwait's demographic, political, and economic status and gives basic information on Kuwait's status regarding the inventory, management, and monitoring of POPs;

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

During the NIP formulation, the situation of the POPs has been assessed and inventories have been developed. The main assessments done are subsequently discussed and presented.

POPs pesticides including DDT: Kuwait does not have the facilities to produce pesticides and did not produce POPs pesticides in the past. POPs pesticides are neither used nor registered in Kuwait, and no POPs pesticides can be legally imported. Almost all POPs are banned including dicofol, which was listed as POP in 2019. Low levels of POPs pesticides in the air demonstrate that there is no relevant illegal use. There are no POP pesticide stockpiles. However, it could not be assessed as to what extent pentachlorophenol (PCP) has been used for wood treatment in Kuwait. There is no documentation of disposed POPs pesticides. DDT is banned in Kuwait and has not been imported for the last 20 years.

Polychlorinated biphenyls (PCBs) and polychlorinated naphthalenes (PCNs): PCBs and PCNs have been used in the same applications; but, historic production volume of PCBs was about 10 times higher than that of PCNs. PCB-containing equipment, such as transformers and capacitors, had been imported into Kuwait in the past and had been mainly used in the electricity generation sector. At the present time, the import is prohibited. In the last years PCB-containing equipment have been exported for environmental sound management. There are no obsolete stocks of PCB-containing transformers and it is considered that all PCB-containing equipment have been managed. Soils and buildings where PCB-containing equipment were in operation or have been stored should be tested for contamination.

Polybrominated diphenyl ethers (PBDEs) and Hexabromobiphenyl (HBB): TVs, computers and other electronics frequently contain flame retardants in plastic parts. Commercial DecaBDE was the major PBDE used in electrical and electronic equipment (EEE), and decaBDE has been listed as POPs in 2017. The c-DecaBDE is still being produced and used, as the SC provided for a wide range of exemptions. The c-OctaBDE was mainly used in plastic casings, especially of Cathode Ray Tubes (CRT), which were produced in large quantities before the use of flat screens. For c-PentaBDE, the main use was in polyurethane foam for car/transport, furniture, construction, or baby products. The

production of the technical mixtures c-PentaBDE and c-OctaBDE have since stopped in 2004.

PBDEs evaporate from foam, electronic equipment, and other consumer products. PBDE concentrations were measured in the air of 70 homes and offices and in dust of 19 cars in Kuwait in 2014. PBDEs were detected in all homes, offices, and cars investigated, which demonstrated their ubiquitous distribution in indoor environments in Kuwait.

Import statistics show that about 10 million TVs and computers were imported into Kuwait from 2010 to 2019. Most of these are probably still in use in homes and institutions. It has been calculated that these TVs and computers consist of 19,286 tonnes of plastic, which contain approximately 55.4 tonnes of decaBDE and 7.3 tonnes of PBDEs listed in 2009. Kuwait is one of the biggest per capita e-waste producers. Most e-wastes are deposited on conventional landfills.

PBDEs were used in textiles, foams, and other plastic in vehicles. The 2 million registered cars (2016) contain approximately 124 tonnes of PBDEs. The use of decaBDE was largely stopped in 2016, and cars produced after 2016 can be regarded as free of PBDEs. Assuming a service life of 10 years, 200,000 cars might reach end-of-life every year. The end-of-life vehicles consist of 40,000 tonnes of polymers, which contain approximately 12.4 tonnes of PBDEs. These polymers are neither recycled nor recovered.

PBDEsare being used in furniture and articles, particularly in countries, such as the US, with flammability standards. Incidentally Kuwait imports furniture from the US. In this regard further assessment is needed.

HBB was produced in lower tonnages (5,400 tonnes), mainly in the US. Production was ceased in the 70s; therefore, HBB is not considered relevant for inventory and management in Kuwait.

Hexabromocyclododecane (HBCD): HBCD was never produced in Kuwait. HBCD was listed in the Convention in 2013 and was produced in high volume. Major use (90%) was in expanded and extruded polystyrene (EPS/XPS) in building insulation. This use has been exempted in the Convention. Other uses are considered to have stopped globally in 2013. From 2011 to 2018 imports of EPS and XPS to Kuwait were at 95,043 and 53,884 tonnes, respectively. What percentage had been flame-retarded with HBCD and used in insulation could not be assessed in this first inventory; but however, will be assessed during the NIP implementation. Workers who cut polystyrene insulation with hot wires are highly exposed. Building insulation has a long service life of 30 to more than 50 years. High volumes of HBCD containing polystyrene insulation will have to be managed as POPs waste during the years and in the coming decades. A minor use of HBCD was in high impact polystyrene (HIPS) for EEE. The overall amount of HBCD in this use is considered low.

HBCD was also added to textiles. Flame-retarded textiles are used in cars, furniture, curtains, tents or uniforms. In a Japanese study, it was estimated that passenger cars that were produced before 2017 contain 2 g of HBCD in plastic and polymers (including

textiles) on average. With 2 million registered cars in Kuwait (2016) this would make a total of 4 tonnes of HBCD contained in the registered cars. HBCD in textiles may have a higher exposure risk from fibres and related dust ingestion.

Hexachlorobutadiene (HCBD): HCBD has been listed in Annex A and C of the Stockholm Convention. HCBD is relatively volatile and water soluble and can contaminate ground and drinking water in areas where HCBD waste has been disposed. Kuwait is not importing or exporting HCBD as a product and current intentional use is unlikely. The most relevant source of HCBD is as byproduct in the production of chlorinated solvents. Kuwait has neither current nor past production of relevant organochlorines, and the country is therefore not expected to have major HCBD production, release, stockpiles or contaminated sites. Kuwait has had an elemental chlorine production since 1964 where HCBD is likely generated at low levels. The residues have likely been disposed in a landfill without specific safety measures. Minor amount of unintentionally HCBD might have been imported in perchloroethylene used for dry cleaning.

Short-Chain Chlorinated Paraffins (SCCPs): Chlorinated paraffins (CPs) are complex mixtures of substances. They are characterised by the carbon-chain length and chlorine content. They are categorised into short-chain CPs (SCCPs, C10–C13), medium-chain CPs (MCCPs, C14–C17), and long-chain CPs (LCCPs, C18–C30). Chlorinated paraffins are the largest semivolatile organochlorines in the market with a worldwide production, which is more than1 million tonnes/year. It has been estimated that the share of SCCPs in total CP production is 16.5%.

In May 2017, SCCPs with a content of chlorine greater than 48% by weight were listed in the SC. Additionally, a limit for SCCP content in other CP mixtures was set at 1% by weight. CPs with a SCCP content >1% are therefore also considered POPs. SCCPs were listed in the SC with specific exemptions for production, and the use, including polyvinyl choride (PVC), rubber, lubricants, adhesives, fatliquors for leather, paints and adhesives.

As yet, there has beenno production of SCCPs or other CPs in Kuwait. SCCPs are imported to Kuwait as chemical and in products, such as soft PVC, rubber, paints and coatings, or other products. The import volumes of plasticizers and products which possibly could contain SCCPs were compiled from import data by selected HS codes.

A) Import of chlorinated paraffins as chemicals

There is no specific harmonised system (HS) import code for SCCPs or for chlorinated paraffins. However, it is known that CPs including SCCPs are imported under certain HS codes of paraffin wax or plasticizers. CPs represent only a fraction of total imports under these HS codes. High amounts of plasticizers are imported under HS code 381220 ‘Plasticisers, compound; for rubber or plastics’, which between 2006 and 2018 amounted to approximately 4000 tonnes. Further assessment is needed to clarify the share of CPs and in particular of SCCPs in the plasticizer imports. From 2006 to 2016, more than 80,000 tonnes of chemicals were imported under HS code 382490 ‘Chemical products and preparations of the chemical or allied industries, not elsewhere specified or included’.

This high amount of unknown chemicals imported to Kuwait is one critical concern and as such, the share of chlorinated paraffins imported under this category has to be further assessed. The CP production in India is the second largest after China and for India some export data are available. In 2016 India exported CPs for US$ 75,000 to Kuwait, which translates to about 75 to 150 tonnes of CPs, likely including ca. 12 to 25 tonnes of SCCPs.

B) Import of chlorinated paraffins in soft PVC

The current largest use of CPs is likely PVC, and in particular, soft PVC. In the last decade, plasticizers like phthalates have partly been substituted by CPs. SCCPs are used mainly as secondary plasticizers, in addition to primary plasticizers. From 2006 to 2018, the highest PVC import volumes were floor, wall, or ceiling coverings of PVC in rolls or in the form of tiles. From 2006 to 2018, the import of plates, sheets, film, foil, and strip made from PVC containing plasticiser was 48,000 tonnes. However, since proportionate measures in individual PVC formulations and products containing SCCPs are yet not known; further evaluation studies to monitor the proportions as stated is required. Moreover, the necessary capacity has just been currently established. It will be a future challenge to separate PVC that contains SCCPs and other problematic additives like lead, cadmium, and other restricted or prohibited plasticizers.

C) Import of rubber potentially containing plasticizers and other additives

SCCPs and CPs are used in rubber production as flame retardants and/or plasticizers. Applications in rubber products include conveyor belts; transmission belts; sealants in housing; applications in the transport sector (cars, busses, trains, airplanes); cables; industrial rubber rollers; hoses; industrial sheeting; and shoe soles. The SC has exempted SCCPs as additives in the production of transmission belts in the natural and synthetic rubber industry and in spare parts of rubber conveyor belts in the mining and forestry industries.

A wide range of rubber types and products potentially containing SCCPs are imported to Kuwait. Between 2000 and 2017, import of conveyor or transmission belts or belting (HS4010); rubber tubes; pipes and hoses; of vulcanised rubber (other than hard rubber) (HS4009); articles of apparel and clothing accessories (including gloves, mittens and mitts); for all purposes, of vulcanised rubber (HS4015) and other articles of vulcanised rubber other than hard rubber (HS4016) were imported in volumes of 5759 tonnes, 23,786 tonnes, 16,373 tonnes and 54,800 tonnes, respectively. Between 2000 to 2018, about 4115 tonnes of ‘waste, parings and scrap of rubber (other than hard rubber); powders; and granules obtained therefrom’ (HS 4004) were imported to Kuwait and might have contained some CPs. CPs have been found in recycled granulates from rubber tyres in low concentrations.

D) Import of chlorinated paraffins in paints and coatings

SCCPs or other CPs containing SCCPs are used as plasticizers and flame retardants in paints and coatings. The paints are used mainly in industrial/specialised applications,

such as marine primer paints and fire-retardant paints, road marking paints, anti-corrosive coatings for metal surfaces, swimming pool coatings, and decorative paints for internal and external surfaces. Waterproofing and fire-retardant paints are listed in the SC as exemptions for SCCP use.

E) Imports of chlorinated paraffins in other products

Some uses of SCCPs are in production processes and not in the products *per se*. There are specific exemptions for use of SCCPs in the leather industry, in particular, fatliquoring in leather, and for metal working fluids, and the use as lubricants in a wide range of applications. Adhesives and sealants used in the construction sector can contain SCCPs in particular since adhesives are exempted for use in the SC.

Often consumer products are made from flexible PVC, such as electrical cable sheathing, in plumbing, imitation leather, phonograph records, inflatable products, or outdoor decoration bulbs. These products are normally not imported under PVC HS categories, but in the consumer product categories. In the last years, a range of products given notice through the European rapid alert system for dangerous products (RAPEX), for reason that SCCP concentrations exceeded the regulatory limit of 1500 mg SCCP/kg. These included, for example, plastic toys, beauty cases, exercise mats, stickers for wall decoration, and cables.

In this NIP, the amount of SCCPs in current use in Kuwait could not be assessed. Many of these products have a long service life like PVC products in construction or sealants and paints. The imports in the last 15 years have shown an indication on the possible main categories of SCCP-containing products in use. However, the share of SCCP use in individual product categories needs monitoring for purposes of clarification. Other products like metal working fluid and lubricants have a short service life, and can completely be released to the environment or working environment. Sampling and testing of individual products and materials should be conducted.

Perfluorooctane sulfonic acid (PFOS): PFOS, its salts and PFOSF are listed in Annex B of the Convention in 2009 with a range of specific exemptions and acceptable purposes.

Most firefighting foams for class B fires contained PFOS until 2009. The firefighting foams currently imported into Kuwait are not allowed to contain PFOS. However, PFOS foams were used in the past also in Kuwait and in 1991, there were approximately 700 fires in oil wells, storage tanks, and refineries in Kuwait and most likely PFOS containing firefighting foams were used in a large scale. PFOS and other per- and polyfluoroalkyl substances (PFAS) can contaminate groundwater, drinking water, and soil. Environmental assessment in these areas should include PFOS/PFAS monitoring.

In Kuwait, chrome plating industry exists but no PFOS is used.

PFOS-related substances have been used in large quantities as stain-repellent for textiles, apparel, home furnishing, and upholstery until 2002. Those PFOS-treated articles produced before 2002 have largely reached their end of life and have been disposed in

landfills from where PFOS may be released. Some synthetic carpets having long service life might still be in use.

The use of PFOS in oil drilling operations have been under the exemption category, and Kuwait most likely could have used PFOS in drilling and oil storing activities in the past.

The PFOS-related substance sulfluramid listed as an acceptable purpose for the use as insecticide against leaf cutting ants is neither registered nor used in Kuwait.

Unintentionally-produced POPs (UPOPs): Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), together with polychlorinated biphenyls (PCBs), hexachlorobenzene (HCB), pentachlorobenzene (PeCB), hexachlorobutadiene (HCBD) and polychlorinated naphthalenes (PCNs) are listed in Annex C of the SC as unintentionally-produced POPs (UPOPs). In incineration and other thermal processes, PCDD/Fs and the other listed UPOPs are formed together. The inventory of UPOPs is focused on PCDD/Fs, as these substances are indicative of the presence of other unintentional POPs.

The inventory of PCDD/Fs was compiled for inventory year 2018. The total emission from inventoried sources was 46.0 g TEQ. The highest emissions of PCDD/Fs resulted from open burning processes (17.0 g TEQ; 36.9 % of total releases) with major contribution from fires on landfills (16.96 g TEQ; 36.9% of total release). The second largest source group was the disposal of waste where PCDD/Fs present in the waste are disposed to landfills (estimated at 13.7 g; 30.0% of total). Waste incineration was estimated to release 3.7 g TEQ to air and additionally 6.45 g TEQ to ashes and 10.1 g TEQ.in total (22.0% of total release). Power and heat generation was estimated to emit 2 g TEQ to air (4.4% of total releases) and metal industry was estimated to emit 1.3 g TEQ (3% of total) with 0.3 g TEQ to air and 1.04 g TEQ to residues. The PCDD/F releases from oil production stem mainly from the catalytic reforming process and were 0.72 g TEQ/year (1.6 % of total releases) with a minor release from flaring (0.002 g TEQ). Other assessed sources were less than 1% of total. PCDD/F in imported chemicals and pesticides could not be assessed, but will be evaluated in the NIP implementation. Those shares just mentioned are the sources for the release inventory in 2018.

There are few processes where PCDD/F releases are not indicative for other UPOPs. These include unintentional PCNs and HCBD in the production of chlorine or PCB and PCNs in chlorinated paraffins. For a detailed inventory, these would need to be measured also for UPOPs other than PCDD/Fs. At the present time, the chlorine production in Kuwait makes use of modern Membrane Cell Technology, which is considered to have a low level of UPOPs formation and release.

Releases of PCDD/Fs in Kuwait from the main source groups to the release vectors in 2018[111]

Source Groups	Annual Releases (g TEQ/a)				
	Air	Water	Land	Product	Residue
Waste Incineration	3.681	0.000	0.000	0.000	6.450
Ferrous and Non-Ferrous Metal Prod.	0.420	0.000	0.000	0.000	1.620
Heat and Power Generation	2.014	0.000	0.000	0.000	0.000
Production of Mineral Products	0.286	0.000	0.000	0.001	0.000
Transportation	0.003	0.000	0.000	0.000	0.000
Open Burning Processes	16.435	0.000	0.555	0.000	0.000
Prod. of Chemicals & Consumer Goods	0.719	0.000	0.000	0.005	0.000
Miscellaneous	0.000	0.000	0.000	0.000	0,000
Disposal	0.000	0.137	0.000	0.000	13.677
Identification of Potential Hot-Spots					
Total	**23.558**	**0.137**	**0.555**	**0.006**	**21.748**
Grand Total			**46.00**		

Other major topics assessed and described in the Chapter 2 are the following:

- Future production, use, and releases of POPs – requirements for exemptions; existing programmes for monitoring releases, environmental and human health impacts;
- Current level of information, information exchange, awareness, and education;
- 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;
- Relevant activities of nongovernmental stakeholders;
- Overview of technical infrastructure for POPs assessment, measurement, analysis, alternatives, and prevention measures, research and development;
- Overview of technical infrastructure for POPs management and destruction;
- Identification and scale of impacted populations or environments and social implications for workers and local communities;
- Details of any relevant system for the assessment and listing of new chemicals and assessment of chemicals already in the market.

There is currently no POPs destruction capacity in Kuwait. Products containing POPs are largely landfilled. Some materials might be recycled such as oils/lubricants, rubber, or PVC. The end-of-life management of materials and products containing POPs should be assessed and modified.

In section 2.4, the implementation status of the SC is summarized.

Chapter 3 includes the **Policy Statement (3.1), strategies for NIP implementation (3.2)**, **NIP outlines the action plans** (**3.3) and priorities (3.4).**

The **strategies for NIP implementation (3.2)** include the following:

- Inter-ministerial and stakeholder coordination considering national priorities
- Adequate legal, institutional, administrative, and technical infrastructure
- Synergies among related Multilateral Environmental Agreements (MEAs)
- Addressing POPs phase out and use of alternatives within Sustainable Consumption and Production (SDG12) implementation.

Section 3.3 of this NIP outlines the action plans, including respective objectives, activities, and strategies for POPs management in Kuwait with suggested time frames for implementation and responsible implementing authorities and participating otherstakeholders. Individual action plans have been developed which can support the overall management of hazardous chemicals and POPs impacted waste fractions, support the development of best available techniques/best environmental practices (BAT/BEP) and boosting research in environmental monitoring, in recycling and industrial releases, as well as contributing to the following:

- 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 and waste, as well as considering integrated pest management, organic farming, and non-chemical solutions
- PCBs, PCNs, and SCCPs – import and export, use, identification, labeling, removal, storage, and disposal
- POP-BFRs (PBDEs, HBCD, and HBB) - regulation and life cycle management
- PFOS and related substances – regulation and life cycle management use, stockpiles, and wastes. To promote the synergy of the Stockholm Convention and Strategic Approach to International Chemicals Management (SAICM), the action plan is extended where appropriate to other PFASs, which is an issue of concern in SAICM.
- Registering for specific exemptions and the need for exemptions (Article 4)
- Measures to reduce releases from unintentional production of POPs (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 Annexes 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, and education (Article 10)

- Effectiveness evaluation (Article 16)
- Reporting (Article 15)
- Research, development, and monitoring (Article 11)
- Technical and financial assistance (Articles 12 and 13)

In Section 3.4, priority activities, regulatory development and capacity building are compiled. For the individual priorities, their link to the Sustainable Development Goals are mentioned. The main priority action areas include the following:

- Development of regulatory legislation, strengthening coordination between institutions and stakeholders
- Capacity building, education, information, and awareness raising
- Monitoring of POPs, effectiveness evaluation, and initiating research and collaborations
- Management of POPs stockpiles (PBDEs, HBCD, PFOS, PFOA, and SCCPs)
- Substitution of POPs and selection of green and sustainable alternatives to promote circular economy
- Contaminated sites assessment and management.

In Section 3.5, some insights on the timeframe for the implementation strategy and action plans, and in 3.6 some information on resource requirements are given.

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List of Abbreviations and Acronyms

ABS	Acrylonitrile-butadiene-styrene
AFFF	Aqueous film forming foams
ADHD	Attention-deficit hyperactivity disorder
ALS	Amyotrophic lateral sclerosis
ASD	Autism spectrum disorder and
BAT	Best available techniques
BEP	Best environmental practices
BEQs	The bioanalytical equivalents
BFRs	Brominated flame retardants
BHC	Benzene hexachloride
BRS	Basel, Rotterdam and Stockholm (Convention)
C&DW	Construction and demolition waste
CITES	Convention in Trade of Threatened and Endangered Species
COP	Conference of the Parties
CRT	Cathode Ray Tube
CSB	Central Statistic Bureau
DDE	Dichlorodiphenyldichloroethylene
DDT	1,1,1-trichloro-2,2-bis (4-chlorophenyl)ethane
DR-CALUX	Dioxin-Responsive Chemical Activated LUciferase gene eXpression
EEE	Electric and electronic equipment
EFSA	European Food Safety Agency
EIA	Environmental Impact Assessment
ELV	End-of-life vehicle
eMISK	Environmental Monitoring Information System of Kuwait
EPA	Environment Public Authority, Kuwait
ESM	Environmentally sound management
EU	European Union
E-waste	Electronic waste
FAO	Food and Agriculture Organization
GCC	Gulf Cooperation Council
GC-MS	Gas chromatography–mass spectrometry
GC-HRMS	Gas chromatography - high resolution mass spectrometry
GDP	Gross domestic product
GEF	Global Environment Facility
GHG	Greenhouse gas
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
GMP	Global Monitoring Plan
GMPr	Good manufactoring practice
HBB	Hexabromobiphenyl

HBCD	Hexabromocyclododecane
HCB	Hexachlorobenzene
HCBD	Hexachlorobutadiene
HCH	Hexachlorocyclohexane
HHPs	Highly hazardous pesticides
HIPS	High Impact Polystyrene
IPCS	International Programme on Chemical Safety
IPM	Integrated Pest Management
KAPP	Kuwait Authority for Partnership Projects
KCS	Kuwait Chemical Society
KEMC	Kuwait Environmental Monitoring Centre
KEPA	Kuwait Environment Public Authority
KFAS	Kuwait Foundation for the Advancement of Sciences
KISR	Kuwait Institute for Scientific Research
KNDP	Kuwait National Development Plan
KOWSMD	Kuwait Standards and Industrial Services Affairs
KUNA	Kuwait News Agency
L	Liters
MCM	Million cubic metre
MEAs	Multilateral Environmental Agreements
MFA	Material flow analysis
MMSCFD	Million standard cubic feet per day
MoCI	Ministry of Commerce and Industry
MoED	Ministry of Education
MoEW	Ministry of Electricity and Water
MoF	Ministry of Finance
MoH	Ministry of Health
MoHE	Ministry of Higher Education
MoHA	Ministry for Housing Affairs
MoI	Ministry of Information
MoJ	Minstry of Justice
MoO	Ministry of Oil
MoPW	Ministry of Public Works
MoSAL	Ministry of Social Affairs and Labor
NGOs	Nongovernmental Organizations
NIP	National Implementation Plan
OCPs	Organochlorine pesticides
ODS	Ozone Depleting Substances
OECD	Organisation for Economic Co-operation and Development
PAAFR	Public Authority for Agriculture Affairs and Fish Resource

PAHs	Polyaromatic hydrocarbons
PAI	Public authority of industry
PBDEs	Polybrominated diphenyl ethers
PBT	Persistent, bioaccumulative and toxic
PCBs	Polychlorinated biphenyls
PCDD	Polychlorinated dibenzo-p-dioxins
PCDF	Polychlorinated dibenzofurans
PCNs	Polychlorinated naphthalenes
PCP	Pentachlorophenol
PeCB	Pentachlorobenzene
PFASs	Per- and polyfluoroalkyl substances
PFHxS	Perfluorohexanesulfonic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonic acid
PFOSF	Perfluorooctane sulfonyl fluoride
PIC	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade
POPs	Persistent Organic Pollutants
PUR	Polyurethane
PVC	Polyvinyl Chloride
SAICM	Strategic Approach to International Chemicals Management
SC	Stockholm Convention
SCP	Sustainable Consumption and Production
SCRC	Stockholm Convention Regional Centre
SCRC Kuwait	Stockholm Convention Regional Centre for West Asian Gulf countries
SDGs	Sustainable Development Goals
SEA	Socio-Economic Assessment
SFA	Substance flow analysis
t	Tonne
TDI	Tolerable daily intake
TEQ	Toxic equivalent
TVs	Televisions
UNCCD	United Nation Convention to Combat Desertification
UNEP	United Nation Environment Programme
UNIDO	United Nation Industrial Development Organization
UPOPs	Unintentionally produced POPs
US EPA	United States Environment Protection Agency
UV	Ultraviolet
WEEE	Waste electrical and electronic equipment
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), its aims and its obligations. It also describes the mechanism used to develop the NIP and the stakeholder consultation process. A summary of the Persistent Organic Pollutants (POPs) issue provides the context and background outlining the chemicals, their uses, and the problems they cause.

1.1. Stockholm Convention

The Stockholm Convention (SC) on Persistent Organic Pollutants (POPs) entered into force on 17 May 2004. Kuwait signed the convention on 23 May 2001 and became a Party to the convention after its ratification on 12 June 2006.

The SC has imposed a worldwide ban or restriction 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 reduction of unintentional byproducts polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs) from 2004 onwards. In 2009, the Conference of the Parties (COP), by decisions SC-4/10 to SC-4/18, adopted amendments to annexes A (elimination), B (restriction), and C (unintentional production) of the SC to list nine additional chemicals as POPs. The latter are the pesticides as follows: chlordecone, alpha-hexachlorocyclohexane (HCH), beta-HCH, lindane (gamma-HCH), pentachlorobenzene (PeCB); industrial chemicals: hexabromobiphenyl (HBB), hexabromodiphenyl ether and heptabromodiphenyl ether, and tetrabromodiphenyl ether and pentabromodiphenyl ether, and perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF).

In 2011, the COP through its decision SC-5/3, adopted an amendment to list technical endosulfan and its related isomers in Annex A. In 2013, the COP in its decision SC-6/13 included hexabromocyclododecane (HBCD) to Annex A. In 2015, through its decisions SC-7/12, SC-7/13 and SC-7/14, the COP adopted amendments to Annex A (elimination), listing hexachlorobutadiene (HCBD) and pentachlorophenol (PCP), its salts and esters and polychlorinated naphthalenes (PCNs) and additionally PCNs also in Annex C. In 2017, through its decisions SC-8/10, SC-8/11, the COP adopted amendments and added decabromodiphenyl ether (decaBDE commercial mixture, c-DecaBDE) and short-chain chlorinated paraffins (SCCPs) in Annex A and by decision SC-8/12 HCBD also in Annex C. In 2019, through its decision SC-9/11 and SC-9/12 dicofol and PFOA, its salts and PFOA-related compounds were listed in Annex A. The POPs listed in 2019 are not assessed in this updated NIP since they need only to be considered later and guidance documents have yet to be developed. Accordingly, activities are proposed in the action plan to address also these POPs in the future.

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

Table 1. List of POPs in Annexes A, B, and C of the Stockholm Convention

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, dicofol, Endrin, Heptachlor Hexabromobiphenyl (HBB) Hexabromodiphenyl ether and heptabromodiphenyl ether Hexabromocyclododecane (HBCD) Hexachlorobenzene (HCB) Hexachlorobutadiene (HCBD) Alpha-HCH, Beta-HCH, Lindane (gamma-HCH) 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 perfluorooctane sulfonyl fluoride (PFOS, its salts and PFOS-F)	Polychlorinated dibenzo-p-dioxins (PCDD) Polychlorinated dibenzofurans (PCDF) Hexachlorobenzene (HCB) Pentachlorobenzene (PeCB) Polychlorinated biphenyls (PCBs) Polychlorinated naphthalenes (PCNs) Hexachlorobutadiene (HCBD)

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.

Table 2. Acceptable Purposes and/or Specific Exemptions for POPs Listed in the SC

Chemical	Annex	Specific exemptions / Acceptable purposes	Related document (decision)
Decabromodiphenyl ether (commercial mixture, c-decaBDE)	A	**Production:** As allowed for the parties listed in the Register **Use:** Vehicles, aircraft, textile, additives in plastic housings, etc., polyurethane foam for building insulation, in accordance with Part IX of Annex A	Not yet available
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 (commercial octabromodiphenyl ether)	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 and 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 perfluorooctane sulfonyl 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**: For the use below **Use**: Production of polyfluorinated naphthalenes, including octafluoronaphthalene	SC-7/14

Chemical	Annex	Specific exemptions / Acceptable purposes	Related document (decision)
Short-chain chlorinated paraffins (SCCPs)	A	**Production:** As allowed for the parties listed in the Register **Use:** Additives in transmission belts, rubber conveyor belts, leather, lubricant additives, tubes for outdoor decoration bulbs, paints, adhesives, metal processing, plasticizers	Not yet available
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 (commercial pentabromodiphenyl ether)	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 against diseases 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 (accessed on 05.01.2021)

These substances are designated as POPs and are toxic, persistent, and bio-accumulative, and can be transported over great distances through the air or water. POPs have harmful impacts on the environment, wildlife, and on human health. Exposure to POPs can lead to serious health effects including certain cancers, sterility, metabolic diseases, such as 5insulin resistance, disruption of the immune and hormone system, damages to the central and peripheral nervous systems, and greater susceptibility to disease. Environmental exposure to POPs has been linked to neurodevelopmental disorders, such as autism spectrum disorder (ASD) and attention-deficit hyperactivity disorder (ADHD) and to neurodegenerative diseases such as Alzheimer's disease, Parkinson's disease, and amyotrophic lateral sclerosis (ALS).

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 with respect to the substances covered by the SC and the strategies that have been 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 will be developing to meet the obligations of the SC.

1.2. Goals and Provision of the Stockholm Convention

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 plan must be transmitted to the Conference of the Parties within two years of the date on which the Convention was ratified by that Party.

The goals of the NIP are as follows:

I To set out the actions that Kuwait has undertaken regarding the reduction of the presence of POPs;

II. To propose actions that Kuwait will undertake in order to manage and eliminate POPs and to prevent POPs from entering the environment;

III. To inform the Conference of the Parties and Kuwait citizens about national initiatives and projects designed to meet the requirements of the SC.

The NIP describes how Kuwait 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 contaminated sites that pose high risks to human health, wildlife, and the environment, with a regional perspective.

The outcomes from the implementation of the NIP will include the following:

I. The protection of public health from the effects of POPs;

II. A structured POPs management;

III. Capacity building to maintain and monitor the quality of the environment; and

IV. Meeting the obligations under the SC.

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 guidances or guidelines.

1.3. NIP Development Methodology

The Environment Public Authority in the State of Kuwait is the Focal Point (FP) of the SC in Kuwait and coordinates in cooperation with the Kuwait Institute for Scientific Research (KISR) activities regarding the implementation of the SC, including the development of the National Implementation Plan (NIP).

Activities that have been conducted for developing the NIP were the following:

1. ***Establishing and strengthening coordinating mechanism*** through the Stockholm Convention Regional Centre for West Asian Gulf countries in KISR and the Environment Public Authority (EPA), Kuwait to guide the process leading to the formulation and approval of the NIP, along with the core project team;

2. **International and national consultants support**. Selection and hiring of an international as well as national consultants for supporting and guiding the NIP development process.
3. ***Training*.** Kuwait stakeholders participated in the inception workshop and inventory workshop to build and strengthen human capacity to develop POPs inventories for the individual POPs groups and to develop the NIP, to understand on how to control unintentional POPs releases, the necessary legislation to control POPs substances and contaminated sites. International expertise was engaged to conduct training to improve KISR, EPA and local staff's capacity.
4. **Establishment of basic and new listed POPs inventories and assessment of national, legal, infrastructure and institutional capacity to manage POPs has been executed**. The development of the baseline inventories for initial and new POPs was conducted within this project. Staff got acquainted with the current UNEP toolkit to elaborate inventories of unintentional POPs sources. Inventories for new listed industrial POPs using the Stockholm convention inventory guidance documents have been developed.
5. **National Priority** assessment and objective setting to accelerate reduction and elimination of POPs to support the implementation of the SC
6. **Development of action plans** for implementation of the reviewed and updated NIPs and their submissions
7. **Assessment of the NIP draft.** In order to assure a valid updated NIP, the NIP draft has been assessed and validated by the relevant stakeholders.

The NIP is consistent with the Global Environment Facility (GEF) initial guidelines for enabling activities for the SC on POPs, and the interim guidance for developing a NIP (UNEP and The World Bank Group), including strategies required under articles 5 and 6 of the Convention.

1.4. NIP Structure

The NIP comprises the three chapters as follows:

- 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 Kuwait'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 industrial POPs groups, and unintentional production POPs. The existing monitoring programmes and the information exchange and awareness are also described in this chapter. Overall, it gives basic information on Kuwait's status regarding the management of POPs.
- Chapter 3 includes the policy statement and implementation strategies and presents an overview of recommended activities and the action plans.
- The Appendices contain information on prohibited hazardous pesticides and chemicals subjected to control as well as a list of peer reviewed publication on POPs from SCRC Kuwait in KISR.

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 deaths 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; PM2.5), dioxins/UPOPs, PAHs, and heavy metals with plastic as a relevant contribution to open burning in urban area as fuel source.5 POPs, POPs-like chemicals [7] and other toxic chemicals (including e.g. heavy metals. Endocrine disrupting chemicals including POPs and their effects are main contributor to health associated costs also in industrial countries[8,9,10]. A recent assessment suggests that environmental chemical exposures contribute costs that may exceed 10% of the global domestic product.[11] Therefore, a more critical assessment of the burden of pollution from chemicals, industrial and other releases is needed.

References to socio-economic assessment can be found throughout the text of the Stockholm Convention.[12] These references indicate the importance of a socio-economic assessment when implementing the obligations under the Convention and when developing the updated NIP. GEF 2020 strategy suggests aligning global environmental objectives with priorities of national and global socioeconomic development.

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[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] Scheringer, M., Strempel, S., Hukari, S., Ng, C.A., Blepp, M., Hungerbühler, K. (2012) How many Persistent Organic Pollutants should we expect? Atmospheric Pollution Research, 3, 383–391..

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

[9] 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.

[10] 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.

[11] 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. 16:123

[12] 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.

Annex F Information on socio-economic considerations of SC 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 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 Conference of the Parties”.

The Conference of the Parties (COP), in its decision SC-1/12 requested the Secretariat of SC, in collaboration with other relevant organizations and subject to resource availability, to develop among others, additional guidance on social and economic assessment, and in doing so, to take into consideration 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 national implementation plan 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 the following:

- contamination of air, water, and soil and threat to food safety and drinking water safety;
- degradation of ecosystem services[13];
- 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.

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

The SEA assisted and will assist in taking actions that are appropriate and effective. SEA 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 bias decisions and need to be compensated by taking precautionary approaches.

SEA can help at any phase of development in the national implementation plan and during its implementation.

For Kuwait the following socio-economic considerations and cost benefit analysis are highlighted as relevant. At the same time these areas are partly relevant for Sustainable Development Goals (SDG)[14] which were adopted by all United Nations Member States in 2015[15]:

a) Food and water safety (including POPs exposure of population) (SDGs 2, 3, 6, and 14)
b) Exposure of vulnerable and highly exposed groups (SDGs 3, 5, 8)
c) Management of chemicals and waste (SDG 12)
d) Cost of destruction and end of life management and treatment of POPs and other hazardous waste (SDGs 3, 8, 11, and 15)
e) Cost of contaminated soil and site remediation (SDGs 3 and 15)

The aforesaid socio-economic considerations are highlighted as most relevant. Improper chemical and waste management have severe impacts.

1.5.2. 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. Biological factors, notably size and physiological differences between women and men and between adults and children, influence susceptibility to health damage from exposure to toxic chemicals. Social factors, primarily gender-determined occupational roles, also have an impact on the level and frequency of exposure to toxic chemicals, the kinds of chemicals encountered, and the resulting impacts on human health.[16]

It is important that these gender dimensions be reflected at both site and policy level interventions for sound chemical management. The gender analysis is used to identify, understand, and describe gender differences and the impact of gender inequalities in a sector or program at the

[14] Sustainable Development Goals (SDGs) https://www.un.org/sustainabledevelopment/sustainable-development-goals/

[15] The 17 SDGs are a call for action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030

[16] United Nation Development Programme, Gender Mainstreaming. A Key Driver of Development in Environment and Energy, Energy and Environment Practice. Gender Mainstreaming Guidance Series;

country level. Gender analysis is a required element of strategic planning and is the basic foundation on which gender integration is built. Gender analysis identifies disparities, investigates why such disparities exist, determines whether they are detrimental, and if so, looks at how they can be remedied[17]. There is increasing concern about the effects of chronic low-level POPs exposure. Women of childbearing age, pregnant women, and children need special protection. Because POPs are ubiquitous and bio-accumulative, human exposure to POPs starts before conception. In particular, fetuses, infants and children may be at high risk. There is rapid growth and differentiation of organ systems during early life and POPs exposures during "critical windows of vulnerability" of children's development may not manifest until later in their lives.

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

A brief country profile is given in order to place the NIP strategies and action plans in a country-specific context. It summarizes information on geography and population, membership in regional and sub-regional organizations, the country's political and economic profile, profiles of potentially important economic sectors in the context of the POPs issue, and overall environmental conditions and priorities in the country.

2.1.1. Country Geography and Population

2.1.1.1. Country and Geography

The State of Kuwait, formally established as a sheikhdom in 1756 by the Al Sab¯ah· family, is situated in the northeast of the Arabian Peninsula in Western Asia. From 1899 to 1961, it was a British protectorate. In 1961, Kuwait became the first of the Gulf Arab countries to gain independence.

The State of Kuwait is located at the north-eastern corner of the Arabian Peninsula (Figure 1) and has borders with Saudi Arabia to the south and Iraq to the north and west. Kuwait lies between latitudes 28°30'and 30°5' North and longitudes 46°33' and 48°30' East, covering a total land area of 17,818 km2 that includes nine uninhabited islands. Kuwait is roughly 170 km across from East to West and 200 km across from North to South. Kuwait shares a 495 km border with Saudi Arabia to the south and 195 km with Iraq to the north and west. The capital of Kuwait is Kuwait City. The country is divided into 6 administrative governorates, and the governorates are further subdivided

[17] United States Agency for International Development (2011), Tips for Conducting a Gender Analysis at the Activity and Project Level. Additional Help for ADS Chapter 201;

into administrative areas. The country's topography is predominantly flat sandy desert, and is characterized by two distinct areas, as follows:

- Northern zone. This area includes Kuwait Bay and five islands as follows: Boubyan, Warba, Maskan, Failaka, and Ouha. Kuwait Bay is a shallow but very important coastal and marine habitat with high productivity and diversity. Its coastal zone accounts for nearly half of the country shoreline. The two largest islands (Boubyan, 863 km^2 and Warba, 212 km^2) remain in an undisturbed condition and are home to migratory birds and rich marine biodiversity. Boubyan is the second largest island in the Arabian Gulf and is home to pristine marine and terrestrial ecosystems of regional and international importance. The northern half of the island is a designated marine protected area named Mubarak Al Kabeer Marine Reserve (MKMMR) - recently designated as a RAMSAR Convention Site.
- Southern zone. The area extends from Ras Al-Ardh to the border with Saudi Arabia. Its coastal stretches include sandy and mixed shores, as well as the coral reef islands of Kubbar, Qaruh, and Um Al-Maradim. Many intertidal marshes, known as sabkhas, are also found in this zone; the largest being Al-Khiran Sabkha that was transformed into a large waterfront city. The southern region of this zone is a monotonous plain covered by sand. Al-Ahmadi hill, 125-m high, is the sole exception to the flat terrain, while the Wadi Al- Batin and Ash-Shaqq are the only major valleys, portions of which lie within the western and southern reaches of the country, respectively. Rocks ranging in age from early Miocene (less than 24 million years) to recent are exposed within the boundaries of Kuwait.

Kuwait has an extensive, modern and well-maintained network of road infrastructure. In addition, Kuwait's most recent Midrange Development Plan (2017–2018) includes several ambitious projects that expand and upgrade the country's major highways and other means of transport and infrastructure.

Figure 1. Satellite image of the State of Kuwait. (Source: eMISK, EPA).

2.1.1.2. Land and Vegetation

Much of Kuwait is characterized by loose, mobile surface sediments. Soils are divided into ten groups, all of which have very low levels of nutrients and organic matter. Soil moisture content is also very low, not only because of high evaporation rates, but also due to widespread hard pans (known as gutch) that reduce water permeability. Less than 1% of Kuwait's land area is considered arable.

The vegetation of Kuwait is broadly classified as an open scrub of the Saharo - Arabian floristic region, which is contiguous with that of the Northern Plains of eastern Saudi Arabia.[18] Kuwait occupies part of the large, low-lying desert plain, covering most of Eastern Arabia and is mostly characterized by desert and coastal plains. Coastal areas comprise important marine habitats, many with high productivity and diversity, including salt marshes and tidal mudflats.

2.1.1.3. National Circumstances

Kuwait has a hyper-arid desert climate that is highly variable with recurrent extremes. Maximum daily temperatures can reach 50°C during the summer, during which there is no rainfall. Much of Kuwait is characterized by loose, mobile surface sediments that have very low levels of nutrients and organic matter. While rich in terrestrial and marine biodiversity, these systems are fragile and highly vulnerable to climate change. Kuwait is also one of the world's most water-stressed countries, with the lowest per capita renewable internal freshwater availability of any country, requiring extensive seawater desalination to meet water demand. The population is overwhelmingly urban and has grown rapidly since the discovery of oil in the late 1930s, with over 98% of the population currently living in urban areas which are mostly located along the coast. A modern country with an extensive, modern and well-maintained network of road infrastructure, Kuwait also has a modern healthcare system and a healthy populace; recent trends showed a decrease in the incidence of communicable diseases and an increase in life expectancy. Kuwait is one of the world's leading oil producers, possessing the world's fifth largest crude oil reserves and has one of the wealthiest economies in the Arabian Gulf region. Throughout its modern history, Kuwait has heavily relied on food imports; since only a negligible fraction of food demand can be met by local agriculture.

2.1.1.4. Population

Kuwait has an overwhelmingly urban population that has grown rapidly since the discovery of oil in the late 1930s, with over 98% of the population living in urban areas. Between 1996 and 2018 the total population increased from 1.6 million to 4.8 million, at an average annual rate of 4.0%. Over this time, the Kuwaiti population, as a share of the overall population, has declined from nearly 37.2% to nearly 30.4%. In contrast, the expatriate population has grown more rapidly over the same period – about 5% per year on average – while their ratio of total population rose from nearly 62.8% to 69.6%.[19]

[18] Royal Botanical Gardens-Kew, 2010. KNFP/PAAFR Restoration Planning for Damaged Lands in Kuwait – Initial Report. Kuwait National Focal Point. Kuwait.
[19] The Public Authority For Civil Information - State of Kuwait (PACI, 2018).

Kuwait's population, like those of its Gulf neighbours, is heavily skewed relative to age and gender. By the end of 2017, most of the total population (about 78%) were between 16 and 64 years of age, and males roughly comprised 63%. This is in large part due to the presence of a large number of expatriate workers in the country in that age bracket (about 86%) that are mostly male (nearly 69%).

In contrast, Kuwaitis under the age of 20 accounted for the majority, about 45.2%, of the Kuwaiti national population in 2016. On the other hand, the gender distribution in the case of Kuwaiti national population is modestly biased toward females (51%).

Regarding educational levels, illiteracy rate among the total population during the last 10 years was about 3%, while those who just read and write stood at 27%, and holders of school certificates ranging from primary to secondary represented 45.4% of the population.

In many developing countries where the populations are reliant on natural resources for their livelihoods, women commonly face higher risks and greater burdens from climate change impacts. Such conditions are not applicable in Kuwait society. The economic development driven by the oil and gas industry paved a path of socio-economic prosperity in Kuwait. In 1976, the government established Kuwait's Fund for Future Generations, and it has set aside 10% of the state's revenues annually for it. There are various calls and attempts to diversify the economy in Kuwait, with top down efforts leading toward establishing Kuwait as an economic centre in the region. In contrast, the youth are leading the bottom up trend of establishing various small and medium projects minimizing the dependence on the government jobs.

2.1.1.5. The role of women

Since the 1960s, a comprehensive scheme of social welfare was created. Kuwaiti women have enjoyed access to higher education and relative freedom to advocate for improved economic and cultural rights, particularly as compared to women in neighbouring countries. Women in Kuwait have almost equal access to various resources.

It is well-established that education has a dramatic impact on addressing the effects of global warming. General education in Kuwait is obligatory for all Kuwaitis between the ages of 6 and 14. Girls and women do seem to excel in all levels of education through advanced degrees. For example, the top percentage of high school graduates are girls, and about three-fifths of Kuwait University students are women. Women with more years of education have fewer, healthier children and actively manage their reproductive health. Education also enables women to face the most dramatic climatic changes. A 2013 study found that educating girls "is the single most important social and economic factor associated with reducing vulnerability to natural disasters".[20] This decreased vulnerability also extends to their children, families, and the elderly.

Although women have been empowered through education, their participation in higher levels of decision-making processes does not reflect their percentage relative to being higher degree holders and professionals. The social climate often prevents women from fully contributing to general policymaking, and particularly climate-related planning, policymaking, and

[20] Striessnig, E., W. Lutz, and A. G. Patt. 2013. Effects of educational attainment on climate risk vulnerability. Ecology and Society 18(1): 16.

implementation. Nonetheless, several women are very active in NGOs advocating measures to reduce environmental impacts in general and climate change, in particular.

2.1.1.6. Public Health

Due to a modern healthcare system, there has been a decrease in the incidence of communicable diseases and an increase in life expectancy over the recent past. Today, the burden of disease has shifted toward noncommunicable diseases and injuries. Trends are showing steady increases in the incidence of coronary heart disease, cancer, accidents, and injuries (mainly road traffic accidents). In addition, the incidence of diabetes and obesity is on the rise. Various NGOs have begun to focus attention on these conditions.

2.1.2. Climate and desertification

2.1.2.1. Climate

Kuwait has a hyper-arid desert climate that is highly variable with recurrent extremes. Maximum daily temperatures can reach 45°C during the summer during which, there is no rainfall. The climate is marked by four distinct seasons, with long, hot and dry summers, and short winters:

- Winter. The winter season occurs over a 2-month period between 6 December and 15 February. These months are cooler, often with a cold northwesterly wind. The lowest temperature recorded was −4°C recorded at the Kuwait International Airport in January 1964. Low temperatures, clouds, rain and a cold northwesterly wind called “Shamal” characterize this season.
- Spring. The spring season is a 3-month period from 16 February to 20 May and is characterized by moderate temperatures, rain, cloudy conditions, and hot southerly winds. The climate during the spring is divided into two distinct climatic periods. Two climatic periods within the spring season are evident.
- Summer. The summer season occurs over a roughly 5-month period from 21 May to 4 November and is characterized by a significant increase in both humidity and temperature. Summer is typically hot, dry and humid, with daily maximum temperatures ranging from 43°C to 48°C, with the highest-ever recorded temperature of 54.0 °C at Mitribah in northwest of Kuwait on July 21, 2016 (Kuwait Civil Aviation Meteorological Department). This was the highest-ever temperature reliably recorded on the planet in last 76 years, as documented by the World Meteorological Organization (WMO). The prior highest temperature (53.9°C) was also recorded at Mitribah.[21]

[21] World Meteorological Organization (2019) Press Release Number: 18062019 https://public.wmo.int/en/media/press-release/wmo-verifies-3rd-and-4th-hottest-temperature-recorded-earth

- Autumn. The autumn season is considered to occur over a single month- long period from 5 November through 5 December and is characterized by moderate temperatures, greater cloud cover, more frequent rain showers, and increasingly cold nights.

The climate of Kuwait is further characterized as follows:

Rainfall: is concentrated in the winter and spring months; totals are highly variable from year to year, and drought is a recurrent phenomenon. Average annual rainfall is typically around 112 mm/yr, varying from 75 to 150 mm/yr. Annual levels at Kuwait International Airport have been recorded as low as 34.4 mm and as high as 218 mm; while 319.5 mm was recorded in Umm Almaradim Island in October 2013.[22]

Humidity: From mid-August through September, humidity can exceed 95% in coastal areas. This is due to high seawater temperatures coinciding with tropospheric temperature inversions. Over the period 1987 through 2017, average relative humidity was 57%.

Dust storms: Given the geographical location, dust storms are a regular phenomenon in Kuwait. While they can occur in any season, dust storms are particularly frequent in summer and can reach speeds up to 150 km/h (Figure 2). Dust sources are the Mesopotamian region that includes Syria, Iraq, western Iran, and the north-eastern portion of the Arabian Peninsula. Dust activity in the Tigris-Euphrates basin begins around May, reaches a maximum in July and is much reduced by September–November. In spring, the region is affected by north-westerly Shamal winds that transport dust down to the Gulf. Dust storms are aggravated by practices of overgrazing and camping practices. They are known to contribute to serious health impacts in Kuwait such as asthma attack incidence rates of 175 per day, as well as increased road traffic accident rates that are over three times the normal rates.

Figure 2. Recent severe dust storms over Kuwait City.

Left: Storm on 17 June 2018. (Photo: Sarah Al-Sayegh); Right: Storm on 18 February 2018 (Photo: Kuwait Times, 19 February 2018

[22] EPA (2019) State of Kuwait Second National Communication.

2.1.2.2. Desertification

Several studies have assessed desertification in parts of Kuwait.[23,24] Seven processes or indicators of land degradation have been recognized, with a general agreement that these processes affect about 70% of Kuwait's land area. They are deterioration of vegetation cover, soil crusting and sealing, soil erosion by wind, soil erosion by water, soil compaction, soil contamination by oil, and soil salinization.

Wind erosion occurs naturally in many of Kuwait's desert surfaces, such as those consisting of active sand sheets and sand dune fields. Elsewhere, some vegetated sand sheets have also been mobilized where their stabilizing cover of vegetation has suffered from degradation and trampling. These mobile sediments represent a serious hazard to human activities. The annual costs of clearing sand encroachment from oil installations in Kuwait is more than US$1 million. The annual expenditure needed to remove sand from Ali As-Salem airbase is similar.[25] See also environmental challenges (section 2.1.5.3).

2.1.3. Political Profile, Economy and National Priorities

Kuwait is a constitutional emirate with a semi-democratic political system. The Emir is the head of state. The hybrid political system is divided between an elected parliament and appointed government.

The Constitution of Kuwait was ratified in 1962 and has elements of a presidential and parliamentary system of government. The Constitution stipulates that Kuwait must have an elected legislature (the National Assembly parliament). The Emir is the head of state, whose powers are defined in the Constitution.

The Prime Minister chooses the cabinet (government). The appointment of a new government requires the approval of the National Assembly. The Prime Minister is a member of the ruling family and is appointed by the Emir.

The Emir's powers are defined by the 1961 Constitution. Upon the death of the Emir, the Crown Prince succeeds. The Crown Prince must be approved by an absolute majority of the members of the National Assembly Parliament.

On September 30, 2020, Sheikh Nawaf AlAhmad AlJaber AlSabah became the 16th Emir of the State of Kuwait.

[23] Misak, R, Al-Awadhi, J, Omar, S,and Shahid, S. 2002. Soil Degradation in Kabd Area, Southwestern Kuwait City. Land Degradation & Development. 13: 403 - 415. 10.1002/ldr.522.

[24] Al-Awadhi, J., Omar, S., & Misak, R. 2005. Land degredation indecators in Kuwait. Land Degredation and Development. 16: 163-176.

[25] Ramadan, A, and Al-Dousari, A. 2013. Optimization of A KISR-Developed Sand Control System Using Wind Tunnel Simulations. Progress Report 1. KISR, Kuwait.

2.1.3.1. National and Regional Development Priorities and Objectives

Since 2010, the national development plan has been implemented with objectives and programs based on the vision of His Highness Sheikh Sabah Al-Ahmad Al-Sabah to transform the state of Kuwait into a financial, cultural, and institutional leader in the region by 2035, attracting investors, creating a competitive economy led by the private sector and promoting production efficiency.

The Kuwait National Development Plan (KNDP) sets the nation's long-term development priorities. The KNDP is organized around five themes, or desired outcomes, and seven pillars, or areas of focus for investment and improvement. Each pillar has a number of strategic programs that are designed to have the most impact on achieving the vision of a New Kuwait, and some projects have a direct relation to mitigation of greenhouse gas (GHG) emissions of the business as usual scenario and adaptation to the negative impact of climate change, as follows:

In the development of infrastructure, Kuwait seeks to develop and modernize the national infrastructure to improve the quality of life for all citizens. For example, in the land transportation system - The Sheikh Jaber Al-Ahmed Causeway project and the development project of the 4th ring road; in the marine transportation system - The Mubarak Al-kabeer Port project and the development projects for Shuwaikh, Shuaibah and Doha Ports; in the air transport system - The Kuwait Airport Expansion project Terminal II and the development of east and west runways at the international airport project; In the development and increase of production capacity of electrical and water energy - The construction project of the Doha Reverse-Osmosis Seawater Desalination Plant-Phase I, the supply, installation, operation, and maintenance project of gas turbine units with composite cycle system to increase electrical power at al-Sabiya power station and water distillation by 750 MW-Phase III, the supply, installation, operation, and maintenance of the gas turbine project (Phase I) at Al-Sabiya station to the combined cycle system, and the supply, installation, operation and maintenance of the gas turbine project (Phase III) at the Al-Zour Southern station site to the combined cycle system.

- In the utilization of renewable energy, Kuwait is embarking on the Al Sheqaya Renewable Energy Complex project; the supply, installation, operation and maintenance project of PV panels on the Sebiyyah's groundwater tanks; and the Water Desalination Centre project using renewable energy. To improve the efficiency of waste management, projects include the development and rehabilitation of landfill sites in different areas, and the municipal solid waste treatment project (Kabad).
- In order to develop a prosperous and diversified economy to reduce the country's dependence on oil revenues there are three main projects to be implemented in the oil sector – The Al-Zour Refinery project, Bio-fuel project, Olefins III, and Aromatics II integrated with Al-Zour Refinery project.

2.1.3.2. Profiles of the economic sector

Kuwait's economy is fairly small, comparatively rich, semi-highly dependent on oil exports. Petro accounts for the majority of gross domestic product (GDP), export revenues, and government income. Crude oil and natural gas sector dominates the economy. On average, it represents nearly 50% of the country's real GDP.

Other sectors are not actually fully independent of the oil and gas sector, as they are heavily dependent on oil and gas revenues. Social services, for example, are entirely funded by public oil revenues. The largest manufacturing industries are oil-based, and most other activities are heavily

subsidized with oil income. Figure 3 (left) shows the percentage contribution of oil and non-oil sectors to real GDP (at constant prices of 2010) between 2006 and 2015. Figure 3 (right) shows the growth trend of these two sources of real GDP during the same period. Because of such a reliance on oil income, Kuwait's economy continues to be highly vulnerable to changes in global oil demand, as well as international oil market price volatility.

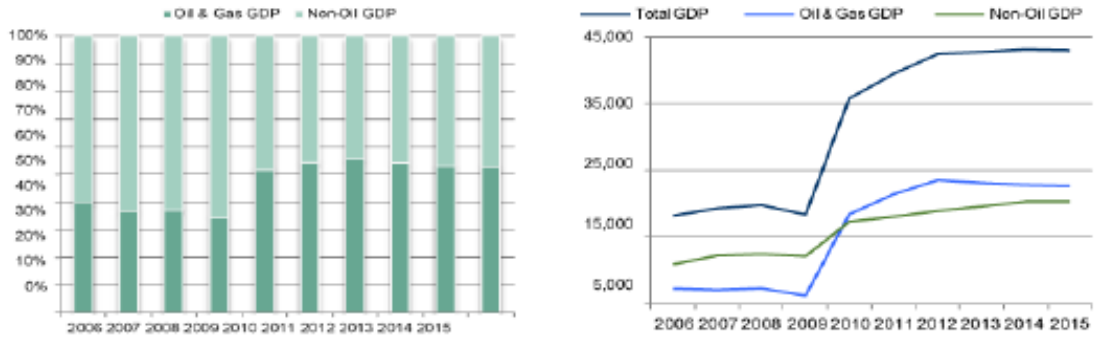

Figure 3. Shares of oil and gas sector and non-oil sectors of total real GDP, 2006-2015 (left); Trends in the contribution to total real GDP from oil and non-oil sectors,2006–2015(right)**.** (Source: A. Al-Mejren-2018)

Over the period 2006–2015, nominal GDP per capita has shown a decline of 12.6% from nearly US$ 30,700 in 2006 to nearly US$ 26,700 in 2015. However, during the same period of time, real GDP per capita has shown a strong growth of 63.6% from US$ 18,600 in 2006 to US$ 30,200 in 2015. Over the same period of time, the GDP per capita using the purchasing power parity basis has averaged US$ 80,400, which is one of the world's highest levels.

In addition to the oil and gas sector, there are four other activities with large GDP shares. They include social services, financial services, transport and manufacturing. Together, these sectors account for about 90% of the non-oil sector's contribution to real GDP and 42% of the entire real GDP, with the remaining 5% of non-oil GDP accounted for by agriculture, utility, construction, and trade sectors. An overview of the major sectors is subsequently provided. Figure 4 presents their relative contribution to GDP in 2015.

- Social services: The contribution of this sector to real GDP is in the form of government expenditures on basic services (e.g., health care). The overall contribution to overall real GDP in 2015 was about 17%.
- Financial services: This sector, which includes banking, insurance, real estate, and other financial and business services, plays a substantial role in the nation's economy with its contribution to real GDP to be about 14%.
- Transport: This sector includes road and ports development, storage and communication services. Its contribution to real GDP in 2015 was about 6%.
- Manufacturing: This sector consists primarily of petrochemical industries, building materials, metal and steel production. Its overall contribution to real GDP was about 5%.

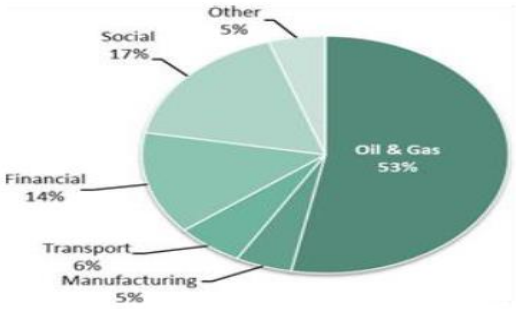

Figure 4. Sectoral contribution to Kuwait's real GDP 2015. (Central Statistical Bureau, Kuwait)

2.1.3.3. Oil

Kuwait, a member of the Organization of Petroleum Exporting Countries (OPEC), is one of the world's leading oil producers. It has the world's fifth largest crude oil reserves and is one of the ten largest global exporters of crude oil and oil products. As a result of Kuwait having a strong economy, it had a per capita GDP in 2015 of US$ 30,200. The country enjoys macroeconomic and financial stability and has a very solid financial position with an accumulation of considerable public and external accounts surpluses.

Kuwait Petroleum Corporation (KPC), Ministry of Oil, and Supreme Petroleum Council are the government institutions that are responsible for the petroleum sector in Kuwait. KPC is an umbrella establishment with multi subsidiaries including Kuwait Oil Company (KOC), which manages crude oil and natural gas production; Kuwait Gulf Oil Company, which manages offshore crude oil and natural gas operations in the Partitioned Neutral Zone between Kuwait and Saudi Arabia, the Petrochemical Industries, and Kuwait National Petroleum Company (KNPC), which operates the country's three oil refineries.

The Ministry of Oil estimates the country's proven oil reserves at 101.5 billion barrels, just over 7% of the world's total. Additional reserves of about five billion barrels are held in the Partitioned Zone with Saudi Arabia. Much of Kuwait's reserves and production are concentrated in a few mature oil fields that were discovered in the early to middle decades of the past century. Figure 5 shows the distribution of Kuwait's oil fields.

Figure 5. Kuwait's oil fields. (Source: eMISK, EPA)

Gross crude oil production in Kuwait reached about 2.883 million barrels per day in 2016 while natural gas production exceeded 1,200 million cubic feet per day in that year (Figure 6, left). In January 2018, KPC officials disclosed plans for the company to spend over $500 billion to boost

its crude production capacity to 4.75 million barrels per day by 2040. Nearly $114 billion of this amount was allocated over the next five years (2018–2022). Kuwait's current (2018) crude oil production capacity is about 3.15 million barrels per day (bpd).

About one-sixth of Kuwait oil and gas production is consumed in the domestic market. According to estimates by KNPC, which produces and markets the refined products, half of the domestic consumption goes to power plants and seawater desalination units, while the rest is consumed mainly by the oil industry itself, followed by the transport sector. Only a small proportion is consumed by households. Figure 6 (right) shows the Kuwait's daily consumption of crude oil and oil products in thousands of equivalent barrels of crude in the period1994–2016. The decline in oil consumption since 2009 was due, among other factors, to the shift toward the use of more natural gas in power stations and petrochemical industries. Finally, due to low natural gas production relative to consumption requirements, Kuwait has been a net importer of natural gas since 2009. In 2016, Kuwait's total imports of natural gas reached about 152.3 billion cubic feet, nearly 417 million cubic feet per day.[26]

2.1.3.4. Natural Gas

Regarding natural gas, Kuwait had an estimated 1.8 trillion cubic metres of proven natural gas reserves as of 2015. Kuwait's reserves are not considered significant relative to global reserves, and this has spurred an extensive drive in natural gas exploration. The utilization of the discovery of large non-associated gas reserves, which was discovered in the northern area of the country had been delayed by parliamentary opposition since 2006. However, in September 2016, Kuwait awarded contracts to international companies to enable the start-up of production of gas from these reserves by 2018. Yet, the $3.6 billion second phase plan of the project is on hold after tenders were unexpectedly cancelled in late 2017.

Total daily average production of associated and non-associated natural gas increased during 2016 to 1,737 million standard cubic feet per day (MMSCFD) against a target of 1,530 MMSCFD, i.e., higher by about 14%. In addition, average production of dry (non-associated) gas reached 1272 MMSCFD in 2016 (Figure 6). In addition, average gas exported to the LPG unit in KNPC amounted to 1625 MMSCFD, exceeding the target of 1465 MMSCFD. On the other hand, KOC has succeeded in reducing gas flaring to 1%, and strives to achieve less than 1% in line with its strategy. However, despite its efforts, repeated closure of KNPC's Acid Gas Removal Plant had pushed KOC's gas flaring rate to 1.31%, higher than the tolerance level of 1.15%.

[26] Kuwait National Petroleum Company (KNPC data).

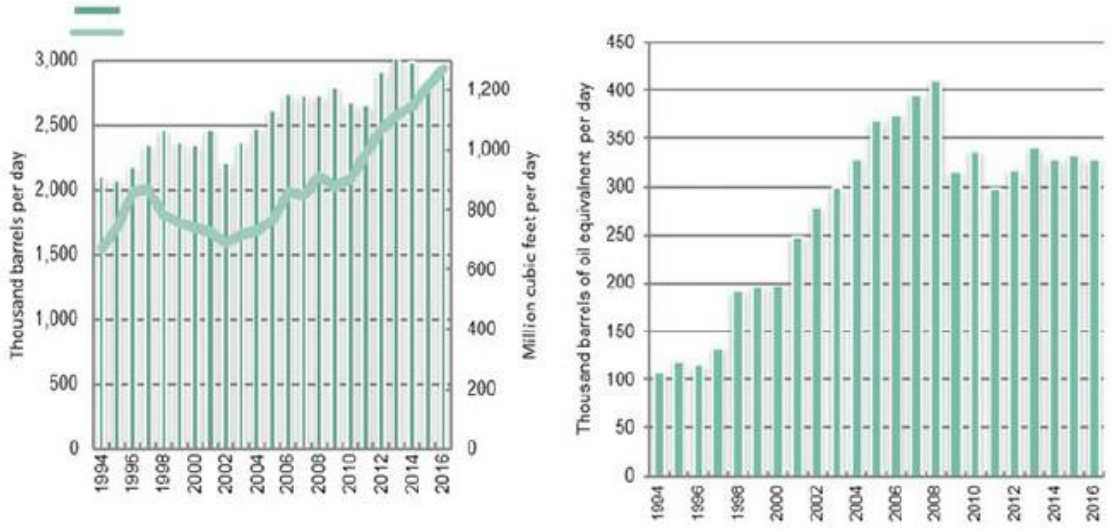

Figure 6. Kuwait's daily crude oil and dry natural gas production, 1994-2018 (Left). (Source: Kuwait Petroleum Corporation); Right: Kuwait's daily crude oil and oil by product consumption, 1994-2018. (Source: Organization of Arab Petroleum Exporting Countries (OAPEC) Data Base)

2.1.3.5. Industrial sector

In 2016, the industrial sector's contribution to GDP was 7.2% (current prices) and 5.7% (constant prices). Since 1994, nearly all manufacturing industries demonstrated some improvement in term of their contribution to the GDP (see Figure 4). Chemicals and chemical products exhibit an almost two-fold increase in the GDP through the years 2000-2016. This alone gives chemical industries a special significance. Although growing, recycling has the lowest GDP contribution compared to other manufacturing activities (Figure 7).

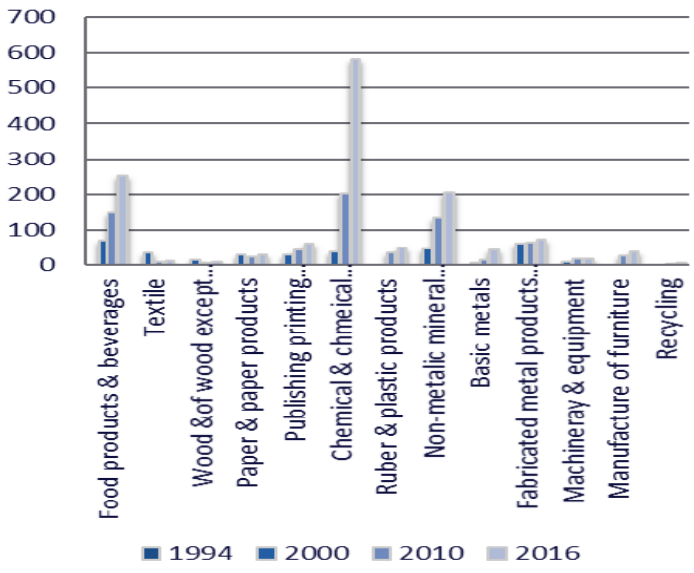

Figure 7. Contribution of manufacturing activities to GDP in million KD, 2016. (Source: Central Statistical Bureau).

2.1.3.6. Agriculture and Fisheries

An arid climate and poor soils mean that Kuwait's arable area is limited. The Public Authority for Agriculture Affairs and Fish Resources (PAAFR) records only 18,900 ha as being cropped; although crops provide 56% of the gross value of agricultural production in Kuwait.[27] In real terms, the agriculture sector's contribution to GDP is very small, 0.53% in 2016 (World Bank development indicators).

Farming systems are composed of small and intermediate holders, as well as specialized agribusinesses focused on growing date palms, greenhouses, open field vegetables, livestock production, and dairy/poultry production. Farms differ in size, productivity, profitability, and marketing potential (see Figure 7). Cropping systems are based on pure stand cultivation; monoculture and irrigation techniques vary from basin, furrow to micro-irrigation. Concerns related to yield limitation exist and are mainly caused by pests and poor crop management and systems' optimization practices.

Livestock and animal production provide about 38% gross value of agricultural production in Kuwait (CBS data). Livestock production under Kuwait's harsh climatic conditions and shortage of good quality fresh water at reasonable cost makes fodder production and livestock production in Kuwait difficult. All local livestock production is subsidized, particularly the dairy industry, and depends heavily on most animal feed being imported, which means higher costs of production, requiring subsidies for most local livestock products to compete pricewise with imported products. Grazing is widespread with sheep, goats and camels the main livestock involved (see Table 3).

Table 3. Breakdown of agricultural subsidies, 2015–2016[28]

Subsidy	Value of Subsidy (million US$)	Subsidy share (%)
Subsidy for plant productions	8.2	27%
Subsidy for fodders	15.7	51%
Subsidy for fisheries	0.5	2%
Subsidy for milk and cows	3.9	12%
Subsidy for palm trees	1.8	6%
Other Subsidies	0.5	2%
Total	30.6	100%

The Public Authority for Agricultural Affairs and Fish Resources (PAAFR) was established in 1983 to manage all types of activities in the agriculture sector and to formulate policies for developing plant, animal, and fishery resources, including land allocation. In order to support local agricultural production, PAAFR heavily subsidizes selected agricultural activities. A portion of the subsidies is directed toward the expansion of protected agriculture production in greenhouses, encouraging

[27] Central statistical Bureau, Kuwait (CBS data).

[28] Public Authority for Agricultural Affairs and Fish Resources

water saving irrigation technology, and the utilizing treated wastewater in irrigation. Over the years, Kuwait's food production has been growing substantially.

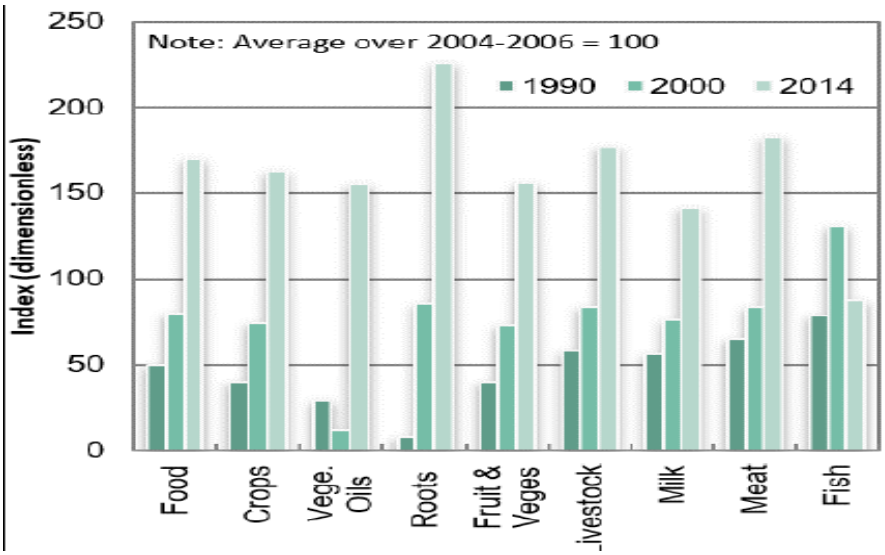

Figure 8 reflects the growth of the value of such production for three years (1990, 2000, and 2014), using the index number of each type of food production (excluding cereals because of the sharp increase in its 2014's value). Kuwait's crops, which are mostly grown in greenhouses in Wafra, Abdally, Jahraa and Sulaibiya, include tomatoes, cucumber, pepper, okra, green beans, marrow, eggplant, strawberry, onion, mallow, coriander, peppermint, melon, parsley, cabbage, lettuce, snake cucumber, dill, cauliflower, purslane, watermelon, and red radish. Roots and tubers include potatoes, radishes and root beets; while vegetables are varied including onions, and green leafy vegetables. Total value of crops products has increased threefold from 2006–2007 to2016–2017.

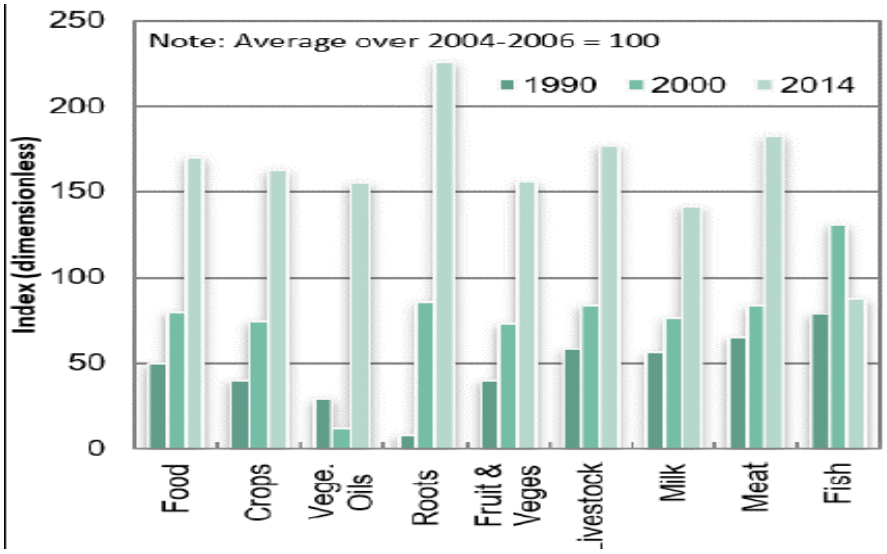

Figure 8. Values of Kuwait food production indices. (Source: PAAFR)

The country's key policy objective in agriculture is to provide for some of the local needs. To enhance the locally available food, 500 plots of land (Figure 9), each with 50,000 square metres, were allocated by PAAFR in Al-Abdali, the northeastern town, to support meat and poultry production in particular.

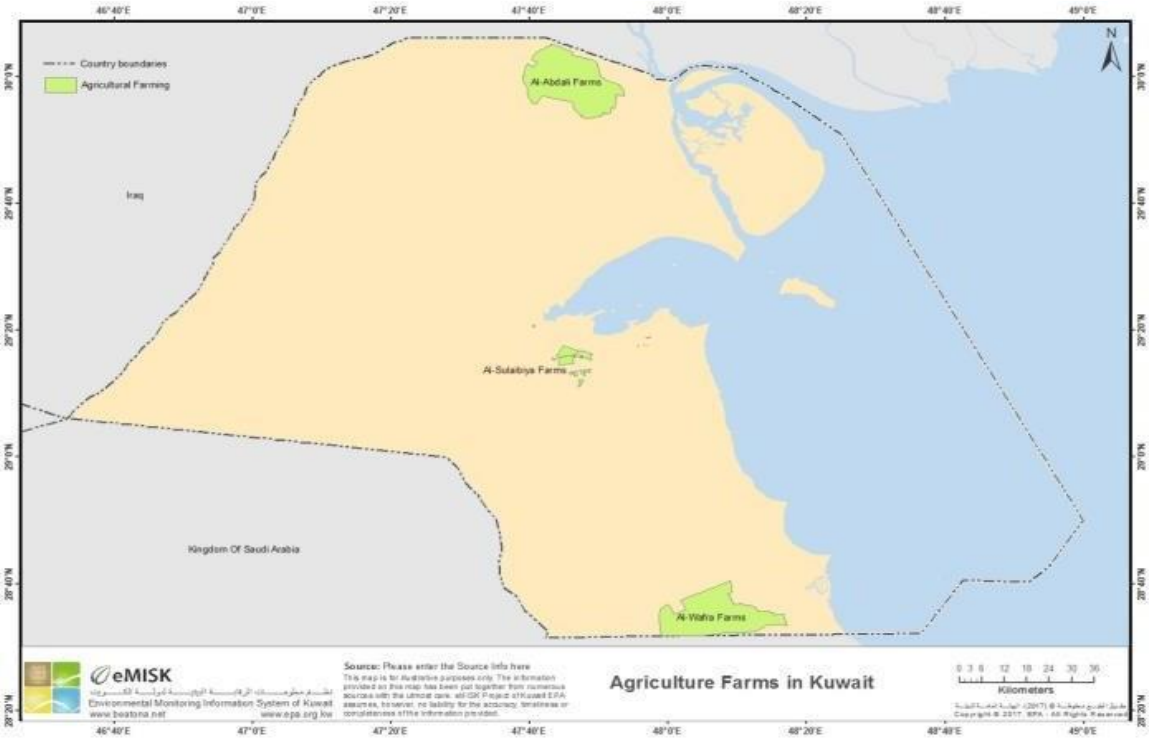

Figure 9. Agriculture areas in Kuwait. (Source: eMISK)

A sub-project of 200 integrated farms was also launched aiming to increase plants, crop production and to support other agricultural activities such as sheep farming, fish farming, poultry, and other activities. However, 50 larger plots, each with 170,000 square metres for raising cattle and milk production are being removed, as the current location obstructs a proposed railway route.

Since the 1990s, overfishing and environment degradation caused 50% decline in the total local fisheries product.[29] Fish products are actually the most important renewable food resource (finfishes and shrimps) with an annual production of about 4,500 tonnes, representing only 16% of total demand. Most of the commercial important species are zobaidy (Pampus argenteus), harmoor (Epinephelus coioides), suboor (Tenualosa ilisha) and newaiby (Otolithes ruber). Total imported fish products including both fresh and frozen reached 23,285 tonnes in 2012.

Aquaculture practices have been growing in response to the emergence of protected coastal and marine areas. The reduced access to fishing has been partly offset by fish farming projects. These projects provide fish and shrimp to local market throughout the year at reasonable prices. Among these projects is a 10-km^2 pilot project of floating fish culture in the Al-Khiran area, with an expected productivity of nearly 2,000 to 3,000 tonnes of fish annually. The proposed Boubyan Island project has an expected yield of 3,000 tonnes of fish, 3000 tonnes of shrimp, and 60 tonnes of marine algae.

Other proposed projects include the cultivation of wild fish in Al-Sulaibia, Al-Wafra, and Al-Sabia, utilizing treated wastewater for fish farming. The proposed 8-km^2 Al-Sabia shrimp farm project will include 300 breeding ponds and two water pumping stations with an expected production capacity of 2,000 tonnes of shrimp annually. In addition, there is a shrimp reproduction plant with an annual capacity of six million shrimp larvae.

Aquaculture is a relatively new and potential source of fish production in Kuwait. It is currently being expanded to supplement local depleted landings from capture fisheries. Two types of aquaculture systems are practiced in Kuwait as follows: (i) culture of Nile tilapia (Oreochromis niloticus) in concrete tanks using brackish water in agricultural farms, and (ii) culture of marine species such as gilthead bream (Sparus auratus), European sea bass (Dicentrarchus labrux) and sobaity sea bream (Sparidentex hasta) in cages located in the Kuwait Bay. Two key events – the mass fish kills in 2001 in the Kuwait Bay and the Iraq war in 2003 – crippled production. Most of the cages were destroyed as nobody was allowed to go near the cages due to security reasons during the war.

As for green areas, PAAFR is active in establishing parks and gardens, as well as projects of planting trees and greenery on the sides of roads and in public squares. In this regard, there are 134 public parks and 635 projects of side road planting extending to nearly 1,700 km long. The

[29] Al-Husaini, M &, Bishop, J, Al-Foudari, M, and Al-Baz, Al. 2015. A review of the status and development of Kuwait's fisheries. Marine pollution bulletin. 100. 10.1016/j.marpolbul.2015.07.053.

landscaping areas cover about 1.2 million square metres. The projects are divided into 12 sites with an area of 34 thousand acres, in addition to a number of parks such as Al-Salmiya Bolivar, Al-Wafra, and Al-Abdali.

2.1.3.7. Food Security

Throughout its modern history, Kuwait has heavily relied on food imports, since only a negligible fraction of food demand can be met by local agriculture. Kuwait produces roughly 1% of its crops from its arable land, using traditional agriculture practices.[30] Almost all of its fruits and vegetable produce come from hydroponic or horticulture practices.

Kuwait has always faced a unique set of food security challenges due to its climate, limited arable land, and water scarcity. Full food self-sufficiency, meaning the country producing all its food requirements, is understood to be an impractical and unachievable goal with an expectation of continued reliance on international food trade markets. The Council of Ministers established a Ministerial Committee to supervise the development of a Food Security Investment Strategy for Kuwait. The overwhelming conclusion of the evaluation was that Kuwait currently enjoys a high level of food security.

Food is readily available and accessible to all residents, and Kuwait ranks internationally as one of the most food secure countries due to its economic circumstances and government policy.

Kuwait is resource-rich, has a large international wealth reserve, easy access to the global food markets, a generous government food subsidy program, and significant strategic reserves of basic food commodities. However, opportunities have been identified for improving efficiency through the use of incentives and reforms, including the reforms to the system of subsidies, reduction in food waste, and encouraging greater efficiency through competition within the supply chain.

2.1.4. Waste and Wastewater Management

Despite the small geographical area of the country and the relatively small population, Kuwait has one of the highest per capita rates of municipal solid waste (MSW) generation in the world, 1.32 kg/capita/day. Kuwait produces more than 1.9 million tonnes of municipal solid waste annually, with the largest share being organic food wastes at 45%. Paper and plastics, prime candidates for recycling and reuse, together make up 40% of total solid waste generation.

Until recently, the dominant MSW disposal method has been landfills. In contrast to its limited area, Kuwait used to have a relatively large number of landfills sites (15 in total; see Figure 10), of which 11 have been closed prior to achieving their capacity, because of improper disposal methods and concerns related to public health and environment. Such landfill sites generate huge amount of toxic gases (methane, carbon dioxide etc.) and are plagued by spontaneous fires.

[30] Mordor intelligence (2017) Analysis of Hydroponic Agriculture in Kuwait - Market trend, Growth and Opportunities (2015-2020), December 2017.

Characteristics of the three remaining active landfills - Mina Abdullah, Al-Jahra and South of 7th Ring Road - are summarized in Table 4. The total area of these landfills is estimated at 9.44 km^2. A fourth active landfill site is located in Kabd area for receiving construction/demolition wastes.

Table 4. Municipal solid waste generation, 2016[31]

Landfill	**Area size** (km^2)	**Solid waste** (thousand t)
Mina Abdullah	2.42	478.3
South of 7th ring road	5.35	1,381.80
Al-Jahra	1,67	465
Total	**9.44**	**2,325.20**

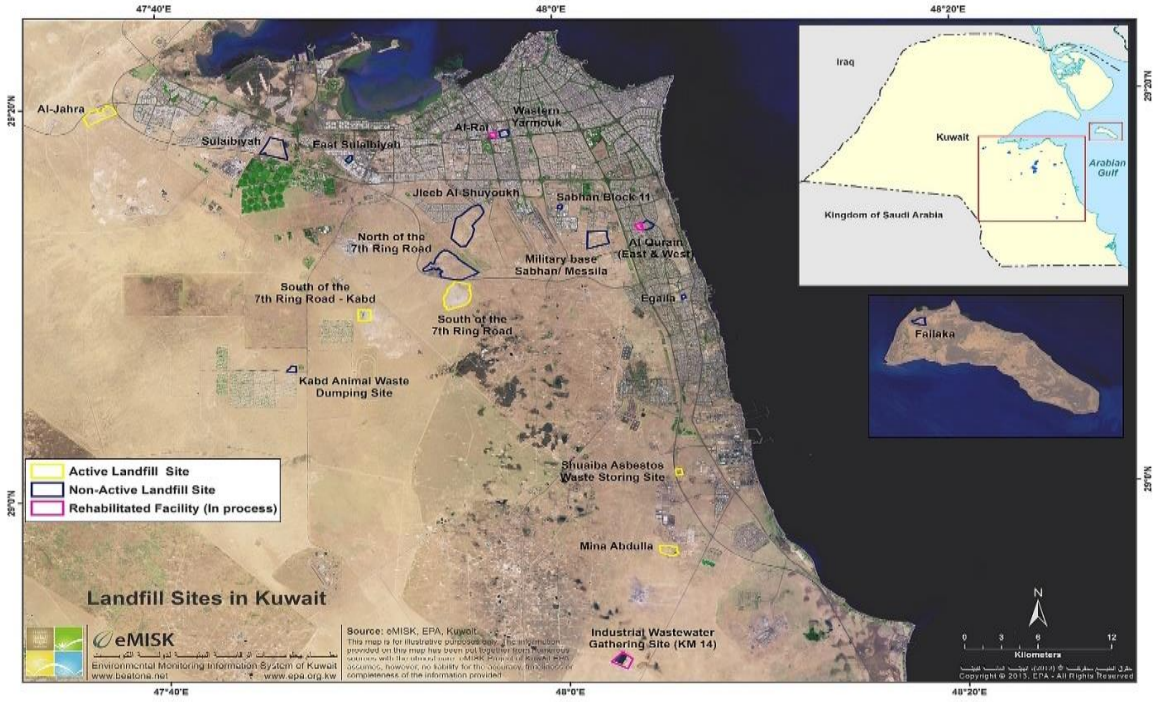

Figure 10. Landfill sites in Kuwait (Source: eMISK/KEPA)

The management of domestic wastewater is the responsibility of the Ministry of Public Works. In 1965, the first sewer system was established in Kuwait, and the first domestic wastewater

[31] Source: KM

treatment plant was commissioned in1970, with a capacity of 100,000 m^3/d. By 1994, there were 3 established domestic wastewater treatment plants; and to meet the further increase in the rate of water consumption per person (275 L/d) more domestic wastewater treatment plants were built, making the number reached to a total of 7 treatment plants. Table 5 lists the domestic wastewater treatment plants, along with the treatment type, design values, and daily inflow.

Table 5. Domestic wastewater treatment plant characteristics[32]

Treatment plant	**Treatment type**	**Design inflow (m^3/day)**
Sulibiyah (Al-Ardeiah)	Reverse Osmosis	425,000
Kabd (Al-Jahra)	Tertiary treatment	180,000
Al-Reqah	Tertiary treatment	180,000
Um-Alhaiman	Tertiary treatment	27,000
Wafrah (not working)	Tertiary treatment	4,500
Subah Al-Ahmad Marine city	Tertiary treatment	5,000
Khiran City (not functional yet)	Tertiary treatment	1,500

Figure 11 below shows the industrial and workshop areas in Kuwait. In the past, most of these industrial and workshop areas were not connected to the sewer system, resulting in the industrial wastewater effluents discharged directly to the environment without treatment.

In 2010, an industrial wastewater treatment plant was established in Al-Wafra area with a capacity of 8,500 cubic metres per day, with the possibility of increasing the capacity to about 15 thousand cubic metres per day. With the passing of Environment Law No. 42 in 2014, as amended by Law No. 99 in 2015; Article 35 committed all government agencies and the private sector to treat industrial wastewaters produced by their facilities. Accordingly, the Central Station was designated to receive the industrial treated wastewater from the different sectors.

The Ministry of Health is responsible for the disposal of medical wastes, the treatment of such wastes through sterilization by autoclave and final backfilling in the Kuwait Municipality landfill sites. Most medical wastes are sent to incinerators. Currently, the Ministry of Health manages three incinerators (see section 2.3.9).

Currently, Kuwait, in cooperation with a German institution and company (Fraunhofer Institute and BlackForest Solutions) developed a waste management master plan for Kuwait. Within the preparatory activities, a waste survey was established and waste data were collected to create a reliable and comprehensive database, giving detailed information about the situation of waste management in Kuwait. This database represents the essential basis of the later development of National Waste Management Strategy. Related reports are with EPA. An exchange of information between this national waste management project and the development of the NIP has been facilitated in October 2019 which concluded further information exchange between the two

[32] Source:MPW

activities. Furthermore, the SC implementation plan should link to the waste management master plan and should consider common implementation where appropriate.

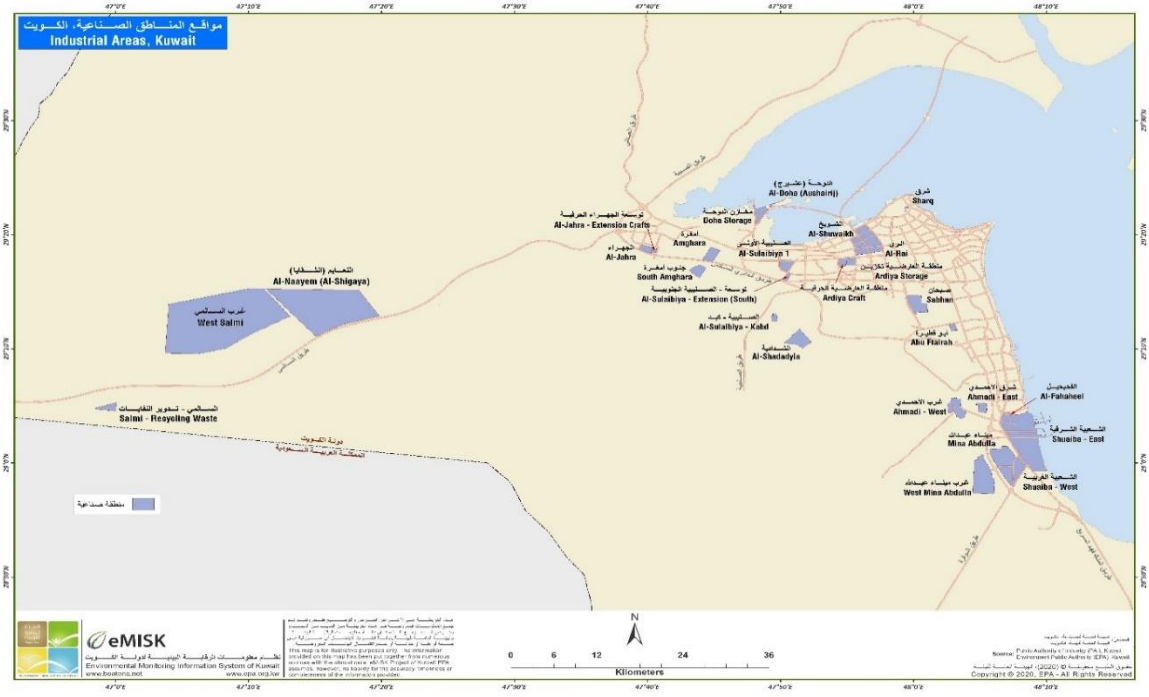

Figure 11. Industrial and workshops areas in Kuwait (Source: eMISK/EPA)

2.1.5. Overview on the main environmental concerns

2.1.5.1. Climate Change

As a result of the geographic location of the State of Kuwait, climatic conditions, geological nature, characteristics of its soil, attributes of vegetation cover, and patterns of land use, Kuwait suffers from these numerous environmental challenges including higher temperatures, higher airborne dust and sand falling ratio, increased frequency of sandstorms, lack of seasonal rains, increased desertification and decline of vegetation cover.[33] These environmental challenges have been aggravated dramatically with the beginning of the twentieth century as a result of global climate change. The State of Kuwait is suffering from a rise in average temperatures. It is expected that the annual average temperature would increase by 1.6 °C during the period from 2010 to 2035 to reach its highest average temperature which is 28.7 °C. In summer months (May to October), the maximum temperature reaches to more than 50 °C in the shade.[33]

[33] The State of Kuwait (2015) Intended Nationally Determined Contributions. November 2015

2.1.5.2. Water Scarcity

Due to its climate, Kuwait suffers from a scarcity of conventional freshwater. Endogenous precipitation is 121 mm/yr (long-term average), which amounts to 2,156,109 m^3/yr in 2014, which is low.

With the increasing growth of population, water from wells is no longer sufficient, and so the government built a desalination plant in Kuwait in 1953, followed by two in Doha with a capacity reaching 138 M gal/d. A third plant was built nearby for desalination by reverse osmosis. There are three main water sources for urban and agricultural uses in Kuwait, desalinated water, groundwater, and treated wastewater[34].

There are no permanent rivers in the country, and the high level of evaporation means that streams and runoff water only last a few hours after rain. Groundwater replenishment is even scarcer due to the dryness of the soil and the high evaporation rate. The groundwater produced internally amounts to virtually nothing, as is the surface water, meaning in that, there is no overlap between the ground and surface water. The accounted groundwater inflow from Saudi Arabia through lateral underflow is estimated to be 20 million cubic metres (MCM)/yr[35] and groundwater in Kuwait does not flow into neighbouring countries' groundwater basins. The total renewable water resources per capita are 5.139 km^3/yr in 2014.[35]

Groundwater in Kuwait can be categorized into three classifications according to the salinity level in the water. Fresh groundwater has less than 1 g/L of a soluble salt, and it is mainly considered a freshwater reservoir for drinking water rather than used for irrigation. Due to the precipitation patterns, which include intense rainfall in a short period of time, and the soil types that allow filtration, fresh groundwater can be found in the fields of Raudhatain and Umm Al Eish. Water extraction rates at these aquifers are 5,500 and 3,500 m^3/d respectively. This area is particularly vulnerable for groundwater pollution.

Another type of groundwater is the saline groundwater. The content of soluble salts in this type of groundwater is between 7 g/L and 20 g/L. It cannot be used for either agriculture or domestic use. The brackish groundwater is another type of groundwater present in Kuwait. It contains higher amounts of soluble salts than the fresh groundwater coming at an amount of 1 to 7 g/L. This type of water is used domestically, for agriculture and drinking water for animals, namely cattle. The sources of this water are the Al Shaya, Al Qadeer, Al Solaybeia, Al Wafra, and the Al Abdali fields. The outtake from these fields is estimated at 545,000 m^3/d [36], which is significantly higher than the fresh groundwater outtake.

In 1993, the water withdrawal was calculated to be 538 MCM; however, in 2002, it has increased to 913 MCM and that is due to the increasing water consumption by the Kuwaitis. Forty-four percent of the water withdrawn is being used for domestic use, 2% for industrial purposes, and the rest is for irrigation, which amounts to 492 MCM; 80% of it is for productive agriculture, 300

[34] Villacampa Esteve Y., Brebbia CA, Prats Rico D. (2008) Sustainable Irrigation Management, Technologies and Policies II. eISBN 978-1-84564-319-5WIT Press, Southampton UK,

[35] Food and Agricultural Organization of the United Nations, 2016, AQUASTAT.

[36] Y. VILLACAMPA (2008), Sustainable Irrigation Management, Technologies and Policies II, University of Alicante, Spain, C.A., WIT Transaction on Ecology and the Environment,Vol 112, www.witpress.com, ISSN 1743-3541 (online).

MCM is brackish water from the Al Abdali and Al Wafra private wells; 66 MCM is treated wastewater.

The quality of the groundwater is deteriorating due to the excessive withdrawal which reached its peak in 2006 at 164.7 MCM. Whereupon the Ministry of Electricity and Water (MEW) realized that water preservation was necessary for future prosperity. Thus, the fresh and brackish water consumption started gradually decreasing as of2007–2008. The current groundwater withdrawal rate from each of the Wafra and the Abdali wells is estimated to be 300,000 -– 400,000 m^3/d.

Raudhatain, which is a freshwater field in the north, started with a production rate of above 9090 m^3/d in the years1963–1967, now pumping about only 4545 m^3/d. The decrease of outtake is due to the increasing relativity of the total dissolved solids in the water acquired. By the year 1989, the water produced from the two water wells decreased to about 300 m^3/d.

Producing groundwater, be it fresh, brackish, or saline water has the accompanying costs of pumping and desalination treatment. The cost of the thermal process is largely dependent on the consumption of energy during the operation, accounting to about 50% of the water unit cost. In 2014, desalination capacity was recorded to have reached 2.4 M m^3/d. Wastewater treatment has similar cost priorities; over 90% of the population of Kuwait has access to a central sewage system collecting both domestic and industrial wastewater.

In 2004, a municipal wastewater treatment plant was constructed by a private consortium on Build – Operate – Transfer (BOT) formula in Sulaibiya, where the plant uses the reverse osmosis process (RO) with the capacity of 375,000 m^3/d. In 2006 the efficiency of the plant was at 94.7%, producing 355,102 m^3/d of treated wastewater from a 375,000 m^3/d influent.[37]

Future demand for water is increasing and does not show any signs of stabilising. The availability of desalinization capacity will depend on the economic growth in the country. Burney et al. carried out a study projecting the water demand in Kuwait by 2025, and results showed that it will rise to 2 M m^3/d to 8.3 M m^3/d. There seemed to be several available options for rationalizing water demand, one of the many is to reduce the gap between the increase of income and the government-fixed price of water; another is the used of reclaimed municipal wastewater. In 2007, 76% of the treated wastewater was used for landscaping and agriculture.[38]

2.1.5.3. Desertification

As aforementioned, research has assessed desertification in some parts of Kuwait, and seven processes or indicators of land degradation have been recognized, with a general agreement that

[37] Abdel-Jawad, M., Eltony, N., Al-Shammari, S. & Al-Atram, F. (1997), Municipal wastewater desalination by reverse osmosis (Report No. KISR5224). Kuwait Institute for Scientific Research, Kuwait. 3 (2018) 425–435

[38] Mukhopadhyay & A. Akber (2018), Sustainable Water Management in Kuwait: Current Situation and Possible Correlation Measures, Water Research Centre, Kuwait Institute for Scientific Research, Kuwait, Int. J. Sus. Dev. Plann. Vol. 13, No. 3 (2018) 425–435.

these processes affect about 70% of Kuwait's land area. They are the following: deterioration of vegetation cover; soil crusting and sealing; soil erosion by wind; soil erosion by water; soil compaction; soil contamination by oil; and soil salinization.

Deterioration of vegetation cover and a decline in the alpha diversity of plant species are two of the most obvious indicators of desertification in Kuwait's desert ecosystem. Overgrazing is considered the prime driver of this vegetation degradation on rangelands, a conclusion supported by several studies that documented much greater vegetation cover in areas fenced off and unavailable to livestock.[39] This form of desertification is particularly severe around watering points where it is exacerbated by soil trampling and compaction due to the congregation of animals.[40]

Local sources of fine particulates contribute to the numerous dust storms that affect Kuwait, although, the country is also affected by desert dust transported from neighbouring countries. Associated impacts include hazards to aircraft and maritime traffic, effects on oil operations and green energy production, and serious human health problems due to the low air quality.

2.1.5.4. Waste management and circular economy

Kuwait has a high generation of waste per capita. Currently, the recycling of waste in Kuwait is not well-developed as can be seen from the low contribution to the GDP. Major materials recycled are metals, and to a minor share cardboard, plastic and glass. Overall, a large share of waste is disposed to landfills, and resources are lost. However, there has been recovery of wastes on landfills including cardboard, plastic, metals, wood, and some glass.

There is currently no waste incineration facility in Kuwait which can treat POPs waste. Therefore, it is unclear how waste containing PFOS/PFOA/PFASs (e.g., treated synthetic carpets, treated furniture, sludge from plating industry) or waste containing PBDEs or HBCD (e-waste plastic, insulation foams, treated textiles) should be treated at the end of life.

Currently, a waste management master plan has been developed to improve the situation.

2.1.5.5. Contaminated sites

Contaminated sites are a result of inadequate waste management, mismanagement, or of the deposition of hazardous chemicals to soil (e.g., use of persistent pesticides or POPs in other material released to the environment, like PFOS use in specific fire-fighting foams) or releases from mining and oil drilling operation. Furthermore, the uncontrolled releases of persistent and toxic substances from industries and other facilities to air, water, and soil can lead to contaminated

[39] Shahid SA, Omar SA, Al Ghawas S. 1999. Indicators of desertification in Kuwait and their possible management. Desertification Control Bulletin. 34: 261–266.

[40] Al-Awadhi, J., Omar, S., & Misak, R. 2005. Land degredation indecators in Kuwait. Land Degredation and Development. 16: 163-176.

sites over time. Above all, there is a tremendous lack of education in the proper handling of chemicals to prevent contamination via chemical waste.

Industrial development and associated releases have contaminated sites, which have become a large burden to industrialized economies.[41] Industrial and commercial activities, as well as the treatment and disposal of waste, are reported to be the most important sources. Although considerable efforts have been made already, it will take decades to clean up the legacy of contamination. The costs for these activities are likely to be enormous and include remediation of not only soil, but also groundwater and sediments. These enormous costs and associated assessments [42] demonstrate that only prevention of contaminated sites in the first place represents a sustainable solution and a means to arrest the continued development of contaminated site challenge. It has been highlighted that with the continuing shift of industrial activities to developing countries and countries in transition with a lack of regulation, additional challenges in relation to contaminated sites are expected to emerge globally.[43,44]

Kuwait's major contaminated site challenge stems from oil production, in particular from the oil pollution resulting from the Gulf War activities in 1991. In addition, within the SC inventory process of POPs, it has been discovered that for different POPs groups (PFOS/PFOA, PCB, UPOPs), possibly contaminated sites exist for Kuwait and would need further assessment (see section 2.3.10).

2.2. Institutional, policy, and regulatory framework

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.

2.2.1. Introduction

Kuwait, which gained independence from the United Kingdom on June 19, 1961, is a constitutional emirate with a parliamentary system of government. Its constitution combines aspects of both presidential and parliamentary systems of government. Kuwait organizes its government into three distinct branches as follows: Executive, Legislative, and Judicial.

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[41] E.g. https://www.eea.europa.eu/data-and-maps/indicators/progress-in-management-of-contaminated-sites-3/assessment

[42] see e.g. Montague P (2006): The modern approach to problems: Prevention. Rachel's Democracy & Health News #845, http://rachel.org/?q=en/node/6408

[43] Weber R, Gaus C, Tysklind M, Johnston P, Forter M, et al. Dioxin- and POP-contaminated sites - contemporary and future relevance and challenges. Env Sci Pollut Res 15, 363-393 (2008).

[44] Weber R, Aliyeva G, Vijgen J. (2013) The need for an integrated approach to the global challenge of POPs management. Environ Sci Pollut Res Int. 20, 1901-1906. http://link.springer.com/content/pdf/10.1007%2Fs11356-012-1247-8.pdf

As part of the Executive Branch, the head of government is the Prime Minister. The Emir is a hereditary position, and it is he who appoints the Prime Minister and his deputies. The Branch also encompasses a First Deputy Prime Minister and three Deputy Prime Ministers. The Prime Minister also appoints a Cabinet/Council of Ministers which is approved by the Emir. Under the Legislative Branch, Kuwait's National Assembly has 66 seats, of which 50 are elected by popular vote and 16 cabinet ministers are appointed by the Prime Minster. Elected members serve for four years. Under its Judicial Branch, Kuwait employs a civil law system, with an independent judiciary. Sharia law is "significantly used for personal matters.

Kuwaiti regulations are published in the Official Gazette of the State of Kuwait, Al Kuwait al-Youm (available at http://kuwaitalyawm.media.gov.kw/ and https://epa.org.kw/ExecutiveLists).

Several ministries and institutes within the Government have tasks and responsibilities related to environmental management.

One of the main priorities of the government is the establishment of an adequate legal framework for environmental management, which is the Environmental Framework Law. The Pesticide Act and the Negative Lists are at the moment the main legislative instruments to regulate POPs.

Kuwait is member of the Gulf Cooperation Council (GCC). The GCC was established in 1981 as a trade block for the Arab nations of the Persian Gulf. This includes Kuwait and Saudi Arabia, Bahrain, Oman, Qatar, and the United Arab Emirates. The GCC's goal is to create internal cooperation through unified regulations in 11 distinct sectors, including the environment and hazardous chemicals. In recent years, the GCC has experienced rapid industrial growth. To help prevent any environmental problems, the GCC published the 1997 General Regulations of Environment in the GCC States.

2.2.2. Institutional framework

The Environment Public Authority, Kuwait (EPA) was established in 1995 by Article 2 of Law No. 21 (amended in 1996 by Law No. 16).[45] The EPA is considered a "public authority" under the Judicial Branch, with budgetary responsibility for environmental affairs, over which it has jurisdiction. It falls under the Council of Ministers and under the supervision of the Supreme Council of Environment. The First Deputy Prime Minister and Minister of Foreign Affairs is the Chairman of the Supreme Council for the Environment (Supreme Council). The Supreme Council comprises the considerable number of representatives as follows:[46,47]

- The Minister of State for Cabinet Affairs and Minister of Information;
- The Minister of Social Affairs and Labor and Minister of State for Economic Affairs;
- The Minister of State for Housing Affairs and Minister of State for Services;
- The Minister of Health;
- The Minister of Public Works;

[45] Law No. 21 of 1999 Establishing the Public Authority for the Environment. Arab Law Quarterly, 14(1), pp. 79–87.
[46] Wenk MS (2018) Chemical Regulation in the Middle East..2018 John Wiley & Sons Ltd. Published 2018 by John Wiley & Sons Ltd. ISBN: 9781119223641
[47] Supreme Council of the Environment (https://epa.org.kw/en-us/OrganizationalChart/Details#1)

- The Minister of Oil and Ministry of Electricity and Water;
- The Minister of Endowments (Awqaf) and Islamic Affairs
- The Minister of State for Municipal Affairs
- General Authority for Agriculture and Fisheries Affairs;
- The Head of the Voluntary Work Centre;
- The Member of the Supreme Council; and
- The Chairman of the Board – Director General of the Public Authority for the Environment – Rapporteur of the Supreme Council for the Environment.

The EPA of Kuwait is an independent governmental organization dedicated to environmental action, and domestic and international legislation and policy regarding the environment. EPA serves as the epicentre of governmental action regarding the preservation of the environment in Kuwait.

EPA consists of 3 Sectors (The Environmental Monitoring Affairs Sector, The Technical Affairs Sector, and The Administrative & Financial Affairs Sector) 27 departments (see Figure 12), and 75 Sections including e.g.:[46,48]

- Chemical Safety Department;
- Planning and Environmental Impact Assessment Department;
- Administrative and Training Department;
- Coastal and Desertification Monitoring Department;
- Water Pollution Monitoring Department;
- Air Quality Monitoring Department;
- Administrative Affairs Department;
- Legal Affairs Department;
- Engineering Affairs Department; and
- International Affairs Department.

[48] Organizational Structure of KEPA (https://epa.org.kw/en-us/OrganizationalChart)

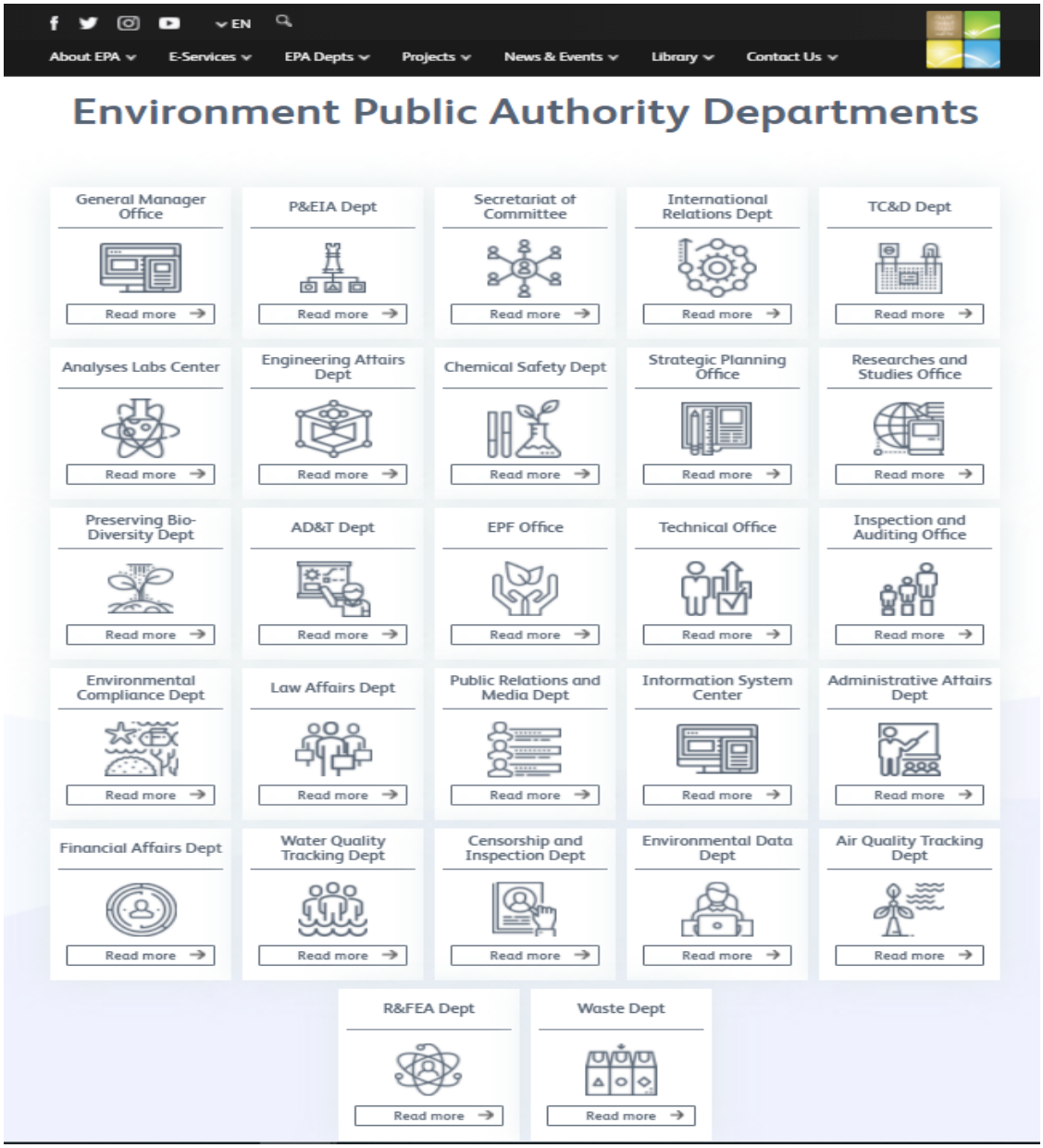

Figure 12. Departments of the Environment Public Authority Kuwait (Source: EPA)

Since its establishment, the Environment Public Authority of Kuwait has been actively participating on a local-, regional-, and international-scale with environmental legislation.

Some of the key areas in which EPA has involvement and/or authority are the following:[49]

1. Setting and applying the general policy to protect the environment and setting strategies and work plans;

[49] Kuwait EPA, Director Message. Environment Public Authority

2. Defining lists of pollutants and setting standards for environmental quality, as well as preparing drafts of law, by-laws and requirements concerning environmental protection;
3. Setting the general framework for programs of environmental education and awareness, and leveraging this level of awareness to achieve increased environmental protection; and
4. Setting standards and requirements for project and establishment owners, and enforcing penalties against violators of these standards and terms.

EPA also enforces environmental legislation, alongside the Environmental Police of Kuwait, with penalties that vary depending on the environmental crime committed.

2.2.3. Legal framework, roles, and responsibilities

Kuwaiti regulations are published in the Official Gazette of the State of Kuwait, Al Kuwait al-Youm. In 1987, Kuwait implemented a national monitoring system for chemicals.

A good overview on environmental legislation and regulation including the links to the legal texts can be found at the FAO website in the FAOLEX database (http://www.fao.org/faolex/country-profiles/general-profile/en/?iso3=KWT).

The Environment Public Authority in collaboration with the relevant authorities in Kuwait established several programs for monitoring and controlling the importation and exportation of chemicals, hazardous chemicals, ozone depleting substances and hazardous wastes. These programs assist the Environmental Public Authority in Kuwait to comply with its commitments to the international environmental agreements and treaties such as; the Stockholm Convention related to persistent organic pollutants (POPs), the Rotterdam Convention related to the application of prior approval procedures for the handling of chemicals and pesticides in international trade, the Montreal Protocol of the Vienna Convention for the protection of the ozone layer from ozone depleting substances (ODS), the Basel Convention on the control of transboundary movements of hazardous wastes and their disposal, and the UN Global Agenda 2030 that embraces the sustainable development goals (SDG). The Electronic Environmental Compliance Platform at KEPA regulates and controls the issuing of necessary license for importing and exporting chemicals, hazardous chemicals, hazardous wastes and ozone depleting substances listed in the aforementioned international conventions and protocols[50].

2.2.3.1. Law No. 42 of 2014 Promulgating The Environment Protection Law:

This Law is aimed at protecting and maintaining the natural balance of the environment and its resources; combating the pollution and its damages, at both short- and long-term; banning any party whatsoever, whether a company or institution or consultation office from carrying out any work in this field without prior consent of EPA; obliging all firm owners in the country to implement all the engineering and environmental requirements set by EPA; planning programs for economic, agricultural, industrial, touristic and urban development to improve the level of livelihoods; guaranteeing a sustainable development and preserving the biodiversity; protecting the health of human beings and other organisms; and protecting the environment from the dangerous effects

[50] https://epa.org.kw/en-US/EnvCompliance

from neighbouring countries. The Law consists of 181 articles divided into 10 sections. Introduction mainly explains the environmental management system, with its three bodies, namely Supreme Council, EPA, and Environmental Protection Fund. Development and Environment (I): regards the assessment of the environmental impact in the first chapter, while the second chapter deals with the compliance with certain environmental standards at the workplace, especially if closed. Territory protection from pollution (II): deals with the management of chemical substances and hazardous, solid and health-care waste. It treats also the protection of wild and agricultural lands from the pollution. Protection of outdoor air from pollution (III): the Public Authority shall offer continual monitoring and evaluation of the situation and prepare research and studies to protect the quality of the air from the harmful effects of greenhouse gas pollutants. The aquatic environment and coastal zones protection from pollution (IV): it is divided in marine environment and drinking water and groundwater. The first area takes into consideration − scope of the protection, pollution from ships and land-based sources, registration and administrative procedures, judicial proceedings, and providing sanctions on those who commit any action that happens or pollutes the marine environment with harmful substances, except for vessels and military transports.

The second area is regulated according to the standards of WHO and the requirements prescribed by the Regulations to the Law.

The third chapter of this Section regulates coastal protection from pollution. Biodiversity (V): concerns both the endangered species of wild fauna and flora regulated by the Convention in Trade of Threatened and Endangered Species (CITES) and the natural reserves.

Environmental management (VI) deals with Environmental strategies, environmental police, environmental data management, authority management system, and media and environmental awareness.

The Law ends with Penalties (VII), Civil Liability and Compensation for environmental damages (VIII) and Final Provisions (IX).

The law is implemented by the following:

- Decree No.3 of 2017 on the Executive Regulations on Biodiversity. (2017-04-11)
- Decree No.7 of 2016 on the Regulations for the Protection of the Land and Agricultural Environment. (2016-07-19)
- Decree No.5 of 2016 on the Executive Regulations on Chemicals Management. (2016-07-19)
- Decree No.12 of 2017 issuing the Executive Regulations for the Protection of the Aquatic and Coastal Environment from Pollution. (2017-08-21)
- The Environmental and Social Impact Assessment System in the State of Kuwait, issued by Resolution No.2 of 2015. (2015-11-23).

The law is amended by Law No. 99 of 2015, amending some provisions of the Environmental Protection Law No.42 of 2014. (2015-08-24).

Chapter Two: Scope of Enforcing the Law and Its Objectives (Article 2)

The provisions of this law are applicable to all public and private entities, as well as the individuals.

According to Article 3, this law aims at achieving the objectives as follows:

1. Protection of the environment and its natural resources and maintaining the natural balance in the entire territory of the State

2. Combating the environmental pollution and degradation in all its forms and avoiding any immediate or long-term damage resulting from the plans and programs of economic, agricultural, industrial, touristic, architectural development or other activities and development programs that are aimed at improving the living standards

3. Development of natural resources and ensuring the achievement of the sustainable development objectives and the conservation of biodiversity in the full territory of the State

4. Protection of society, human health, and living organisms against all hazard activities

5. Protection of the environment against the hazard activities and actions that take place outside the territory of the State.

Chapter Three concerns the Management of Environment Affair.

According the **Article 4**, the Environment Supreme Council shall be formed under the chairmanship of the Prime Minister or the First Deputy Prime Minister and the membership of a number of Ministers to be selected by the Chairman of the Supreme Council. The Director General of the Authority shall be a member of the Council and its rapporteur. The Supreme Council shall include in its membership three members who shall be duly competent and experienced in the field of environment protection, to be appointed in a virtue of a decree for four years renewable for another similar term. Such decree shall fix their remunerations. The Supreme Council shall issue an internal regulation that regulates its work procedures and the manner of adopting its decisions. The Supreme Council shall work within the frame of the general policy of the government, and shall take all necessary measures that protect the State territorial areas against pollution regardless of its source, and shall achieve of the objectives stated in this law.

Also, the Supreme Council shall be concerned with the following:

1. Drafting the general policy of environment protection in the State

2. Approving the national plans for environment protection and emergency plans for confronting environmental disasters

3. Following up the implementation of all concerned governmental authorities of the provisions of this law, and settling any disputes or conflicts in the jurisdictions that may hinder the achievement of policies and objectives and clauses therein

4. Approving the Authority annual balance sheet

5. Selecting the representatives of two nongovernmental societies concerned with the environment affairs for the membership of the Board of Directors

6. Approving the internal regulation of the Board of Directors pursuant to the proposal made by the Board

7. Approving the Authority annual work plan as well as reviewing and assessing the same periodically

8. Following up the environmental situation and working on the enhancement of the environment quality and management in the country

9. Reviewing and approving the annual report of the environmental performance of governmental agencies, and following up the remedy of any default by the State agencies stated in such report

10. Adopting the financial regulations of salaries and wages of the Authority employees

11. Approving the organizational structure of the Authority

12. Adopting the formation of the auxiliary standing committees and adopting their financial budgets

13. Imposing legal penalties on companies, establishments and agencies in violation of the provisions of this law and the environmental regulations and standards provided for in its Executive Bylaw.

According the **Article 5,** a decision shall be issued by the Supreme Council for the formation of the Authority Board of Directors for a term of four years, renewable for one similar term. The Board of Directors shall be under the chairmanship of the Director General and the membership of the following:

1. A representative for each of the Ministry of health, Ministry of Interior, Ministry of Communication, Ministry of Electricity and Water, Ministry of Commerce and Industry, Ministry of Public Works, Ministry of Information, Ministry of Oil, Kuwait Municipality, Public Authority for Industry, Kuwait University, Kuwait Institute for Scientific Research, Public Authority for Agricultural Affairs and Fish Resources, provided that the grade of each representative shall not be less than an Assistant Undersecretary, to be selected by the Competent Minister

2. Two representatives of the Public Utility Societies concerned with the environment.

In 1987, Kuwait implemented a national monitoring system for chemicals. It has a national committee on pesticides and ozone-depleting chemicals. This committee has been in service since 1990, and includes 16 concerned parties from Ministries and Nonovernmental Organizations (NGO), as well as a secretariat that is associated with the Ministry of Environment. Kuwait has been planning executive legislation on chemicals management.

2.2.3.2. Decision No. 210/2001

On October 2, 2001, EPA issued “Decision No. 210/2001 Pertaining to the Executive By-Law of the Law of Environment Public Authority” (Decision No. 210). Entities, defined in Article 2 as “all governmental, joint, private parties and others,” undertaking any of the activities listed in Appendix No. 1 of Decision No. 210/2001, “Development and Environment –The Environmental Impact of the Developmental Projects Project List” [sic], must submit a plan to KEPA. These activities include the following:[51]

1. Natural resources projects of fossil origin (e.g. drilling projects);

2. Natural resources projects of non-fossil origin (e.g., sand projects; aluminium fusion, manufacture, and storage projects; manufacture and storage of cement);

3. Other industrial projects (e.g., “manufacture, filling and storage of all the chemical projects,” “manufacture, filling and storage of all pesticides projects”);

4. Communication projects (e.g., communication and transmission towers erection);

[51] Environmental Protection Authority (2001, October 2). Decision No. 210/2001 Pertaining to the Executive By-Law of the Law of Environment Public Authority

5. Food, animal, and agricultural resources projects (e.g., fish farming, tanning, and manufacture of animal skins);

6. Projects related to housing and industry;

7. Projects of special nature (e.g., hospitals and health facilities, military projects);

8. Waste Appendix No. (1) related projects (e.g., treating waste projects);

9. Power generation and water desalination; and

10. Land, air, and marine transport (e.g., expressways, railways, tunnels).

The requirements for such a plan are ambitious. Article 4 requires the party/parties to submit an initial report to EPA, which will "study and to [sic] give its opinion" within 60 days. Such a report should include the items as follows:[51]

1. A complete technical description of the specified project, or the modification or expansions which are proposed to be introduced to an existing project, together with the necessary engineering plans, type of technology, equipment [sic], means and materials which would be used in the building or the expansion;

2. A statement of the economic and social feasibility of the suggested project;

3. A comprehensive description of the environmental project and the surrounding areas, which may be affected by the project execution, or introduction of modifications, or expansion to an existing project;

4. A comprehensive statement on the expected impacts on environment as a result of the proposed project execution;

5. An evaluation of negative, positive, accumulative and non-accumulative, direct and indirect impacts on the short-term and long-term stages, on the environment during the various phases of the project execution (as from the preparation stage, execution, operation, maintenance, accomplishment until after the expected age of the project or cancellation thereof), as well as the scientific illustration applied in assessment of these effects;

6. An overall statement of the steps that should be brought about in order to restrain or reduce the negative effects of the project on environment, which may be exposed to harm on the short- and long-run; and

7. A commitment of [sic] applying continuous protection measures after project accomplishment, with necessary monitor and control systems that must be followed.

After obtaining EPA's approval on the initial report, the applicant(s) should work with the EPA to determine the time needed to prepare and submit the final report, which will include the environmental impact of the proposed project. As before, EPA has 60 days to review the final report and give its opinion. Additionally, Article 5 allows EPA to ask for desired information, statements, or documents, or to require the carrying out of additional studies related to the environmental impacts on the suggested project prior to presenting the final report.

Chapter III, "Chemical Resources Management," is perhaps the section most directed toward chemical substance management. In fact, the section's subtitle – "The environmental criteria for chemical substances production, safety, transport, storage, import and export from and to the State of Kuwait, and the customs transit through its territories" – brings this aspect home quite clearly. Article 14, the first Article in this Section, as the Article numbers carry forward from previous Chapters, defines those to which the Chapter is applicable:

All parties which produce, fill, handle, transport, import, export and deal with customs transit of chemicals should abide by the environmental conditions and criteria stipulated herein, and comply with the classification of dangerous chemicals mentioned in Appendix No. (10-1).[51]

As per Article 15, any party who "would produce, import or export chemicals" must obtain a license from the "concerned authorities." Such licensing authority may cancel the license if the product is shown to be harmful to the environment or human health.

Beginning with Article 16, Chapter III details the requirements applicable to those who produce, import, or export chemical materials (the Parties). Under Article 16, "The parties who produce, export and import chemicals should maintain a record numbered and sealed by [the] Environment Public Authority containing the information as follows:"

(1) Type and quantity of the raw materials used in production

(2) Type and quantity of the chemical product

(3) Any other details specified by the Environment Public Authority.

Article 17 discusses the requirements for the Parties to observe when refilling containers with chemical product. Specifically, the Article covers the following:

1. The container requirements ("The refill should be of good quality from inside that suit[s] the substance inside it, and may not be affected by acids, alkaline, and solutions.

The refill must be painted with a substance resistant to rust, erosion, and reaction.

It should be tightly closed, not to be fragile and can bear all transport circulation, vibration, and thermal changes circumstances.").

2. The labelling requirements, including the adequate size of the container to contain applicable labelling ("The volume of the refill must be suitable to contain all signs, information, pictures, drawings, and symbols internationally recognized and which show dangers [of] toxicity of these substances, how they can be opened emptied, used, or disposed thereof. All these details must be placed clearly on the refill, and details cannot be removed, or modified according to the instructions listed in the Appendix Nos. (10-2, 10-3) attached with this by-law."). The text should be written in Arabic, and should contain the data as follows: [51]

- Name of the manufacturing company, production and expiry dates, operation and registration numbers;
- Refill content, chemical and trade names, activity substance, total and net weights, concentration degree, type of danger and toxicity;
- Steps to be taken in emergency cases that may cause harm to the environment and public hygiene; and
- The appropriate storage.

Further, Article 17 gives specific requirements for those entities that import and/or export chemical substances. Section (iv)(1) requires the following details to be submitted to EPA to import or export chemical substances:[51]

1. A list of ingredients;

2. The ["]serial number["] of the substance;

3. Health and environmental impacts;

4. Purpose, the importing or the exporting party;

5. Precautions that should be applied upon emergency cases;

6. Chemical and physical specifications;

7. Product classification number or the customs statistical number according to the organizing system; and

8. Ideal method of substances discharge or their containers.

Additionally, the importing and exporting Parties of chemicals should abide by the provisions of prior approval agreements (e.g. Prior Informed Consent under the Rotterdam Convention), as well as other international agreements effective in Kuwait.

Finally, Article 18 relates to the requirements relevant to the construction requirements for warehouses which (will) contain hazardous chemical substances. These requirements cover the warehouse site and specifications, as well as the storage conditions (including material separation/segregation).

The remaining chapters of Decision No. 210/2001 cover various areas of chemical substance management specific to certain uses or locales. Chapter IV addresses the management of household, hazardous, healthcare, and sludge wastes. Chapter V regulates the protection of the marine and coastal environment. Chapter VI, somewhat uniquely when compared with other international chemical regulations, addresses "Protection of Earth Crust [sic] from Pollution." Chapter VII relates to air pollution requirements; Chapter VIII addresses "Biodiversity Diversification" (a phrase that is, perhaps at least somewhat, redundant), and Chapter IX lays out the "General Provisions," including "Legal Control" and "Reconciliation Rules." Chapter X will be discussed in more detail in the "Occupational Safety and Health Regulations" section, as the bulk of the data contained in Chapter X regulates the work environment.

2.2.3.3. The draft regulation "Cosmetic Products – Safety Requirements of Cosmetics and Personal Care Products" GSO 01/ DS 1943/2014

In 2015, Kuwait's Standards and Metrology Department, under the auspices of the Public Authority for Industry, notified the World Trade Organization (WTO) of a draft of the technical regulation, concerning cosmetics and personal care products. The draft regulation, "Cosmetic Products – Safety Requirements of Cosmetics and Personal Care Products" (Standard), is Kuwait's national implementation of the GCC Standardization Organization's (GSO) "GSO 01/ DS 1943/2014" [52] of the same title. The draft addressed the safety parameters and general requirements for all cosmetics and personal care products. It further specified the definitions of the products, as well as the safety requirements, labelling, product claims, packaging, and rules for acceptance and rejection, with a proposed date of entry into force six months from the regulation's publication in the country's Official Gazette.

The scope of the Standard is laid out in Section 1.1, as being applicable to "the safety parameters and general requirements for all cosmetics and personal care products", with an illustrative list of cosmetics being provided in Annex 1 of the Standard. Specifically, the Standard sets out six

[52] Kuwait Standards and Meteorology Department; Cosmetic Products – Safety Requirements of Cosmetics and Personal Care Products.

functions which, if a substance or preparation meets at least one, it may be considered a “cosmetic product”: “to clean,” “to perfume,” “to change the appearance,” “to protect,” “to keep in good condition,” or “to correct body odours.” Interestingly, however, Section 1.2 only identifies that these six items may meet the definition – it does not specify where functions must appear descriptively (e.g., on the product label, in marketing material).

Section 3.1 defines “cosmetic and personal care products” collectively as: Any substance or mixture intended for use on external parts of the human body (epidermis, hair system, nails, lips and external genital organs) or with the teeth and the mucous membranes of the oral cavity with a view exclusively or mainly to cleaning them, perfuming them, changing their appearance, protecting them, keeping them in good condition or correcting body odours.

Section 3.2 defines a “substance” under the Standard fairly broadly as “a chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition,” and Section 3.3 defines a “mixture” somewhat reflexively as “a mixture or solution composed of two or more substances.” Section 3 discusses a variety of specific product classifications [e.g. “Sunscreen Product” (Section 3.4), “Fragrance” (Section 3.5), “Colorant” (Section 3.8), and “Nanomaterial” (Section 3.6), definitions of “Manufacturer” (Section 3.10), “Importer” (Section 3.12) – there is no Section 3.11 in the Standard – and “Distributor” (Section 3.13), and a variety of product packaging-related terms such as “Single application products” (Section 3.15), “Impracticable packaging products” (Section 3.17), and “Non-pre-packaged products” (Section 3.18)].

Section 4 of the Standard, “General Safety Requirements,” defines the requirements which cosmetic and personal care products “shall fulfil.” Foremost among these, speaking to the Muslim faith, is the requirement that “products shall be completely free from any ingredients that are not aligned with halal practice and rules e.g., Pork, lard [sic].” Further, such products “shall be safe for human health when used under normal or reasonably foreseeable conditions of use,” and “homogenous, stable, and their properties shall not change during its shelf life and used per the instructions.”

Section 4.4 provides a list of prohibited substances, primarily those listed in Annex II, as well as several lists of restricted substances, with reference to Annex III, Annex IV (colorants, except for hair-colouring products), Annex V (preservatives), and Annex VI (UV filters). Section 4.6 relates to the requirement to comply with Good Manufacturing Practices (GMPr); specifically, “Compliance with good manufacturing practice shall be presumed where the manufacture is in accordance with the relevant harmonized standards such as GSO ISO 22716.”475 As written in the legislation, GSO ISO 22716 is not the only external standard that may be applied to achieve GMPrs, but it is specifically enumerated as one in which GMPrs will be presumed compliant when followed.

Section 4.8 of the Standard begins a series of sections which address specific criteria for a variety of product types. Section 4.8 itself identifies the microbiological limits for the presence of specific microorganisms. The Section also splits the limits into two categories – “Products specifically intended for children under three years of age, the eye area or the mucous membranes” and “Other products.” The microorganisms cited are relatively “common” for such limitations, including *Escherichia coli, Pseudomonas aeruginosa,* and *Staphyloccocus aureus*. Section 4.9 sets forth

the limitations for substances present in the product, again differentiating between two categories. The first category addresses "the non-intended presence of small quantity [sic] of a prohibited substance, stemming from impurities of natural or synthetic ingredients, the manufacturing process, storage, migration from packaging, which is technically unavoidable in good manufacturing practice…" and states that the foregoing "shall be permitted provided that such presence is in conformity with Article 4.2." Interestingly, however, the term "small quantity" is not defined either in Section 4.9 or in the Standard as a whole.

Five heavy metals – lead (10 ppm), arsenic (3 ppm), cadmium (3 ppm), mercury (3 ppm), and antimony (5 ppm) – should not exceed these limits, and in the event they do, "products with values above these limits may undergo an assessment to determine the level of risk posed by the product, which would then determine the appropriate enforcement action according to the National Standardization Body (NSB)."

Section 5 relates to the "General Marking and Labelling Requirements" applicable to cosmetic and personal care products; while Section 6 relates to the "Specific Marking and Labelling Requirements." Categories which are listed in Section 6 (e.g., "toilet soap") have more detailed requirements than those in Section 5. Section 5 marking and labelling should include the following information in "indelible, easily legible, and visible lettering."

All requirements other than the product function and/or use, the warnings and precautionary information, and storage instructions for safe use, which must be presented in both Arabic and English, may appear in Arabic and/or English.

PFASs are used in cosmetics but are not yet regulated in cosmetics in Kuwait. Also triclosan is used in cosmetics, liquid soap and toothpaste which contains unintentional PCDD/F.[53] In a recent survey, participants from Kuwait had 7 times higher triclosan concentrations in urine compared to participants from Saudi Arabia; but still, 6 times lower levels compared to participants from US.[54]

2.2.3.4. Pesticide regulations

With respect to the Pesticides Act, Kuwait has transposed it into national law, via "Law No. 21 of 2009 approving the Pesticides Act in the countries of the Cooperation Council for the Arab States of the Gulf."[55]

On March 30, 2010, Kuwait's Public Authority for Agriculture Affairs and Fish Resource (PAAAFR) announced the implementation of a law on pesticide registration and circulation. The law prohibited the import or manufacture of pesticides without prior permission from the PAAAFR. For an agriculture or public health pesticide to be registered for import into and use in Kuwait, the applicant company must have a license to import pesticides, or has applied to obtain one from the Ministry of Health. "High risk or extremely poisonous pesticides may not be registered, unless proved that other alternatives which are less poisonous are not available. This is decided by the

[53] Halden RU, Lindeman AE, Aiello AE, et al, (2017) The Florence Statement on Triclosan and Triclocarban. Environ Health Perspect. 125(6), 064501. https://ehp.niehs.nih.gov/ehp1788/

[54] Iyer, A. P., Xue, J., Honda, M., et al.. (2018). Urinary levels of triclosan and triclocarban in several Asian countries, Greece and the USA: Association with oxidative stress. Environmental research, 160, 91–96.

[55] Law No. 21 of 2009 Approving the Pesticides Act in the Countries of the Cooperation Council for the Arab States of the Gulf.

Joint Permanent Committee for the Organization of the Pesticide Manufacturing, Importation and Usage." Five samples of the finished pesticide product and one standard sample of the active substance(s) must be submitted. These samples will be subject to biological experiments and examination to determine their effectiveness on the targeted insect or pest, as well as to chemical analysis.

The label provided must be written in "clear" Arabic and English, and cannot be removed or changed. The content of the label and information it must include is defined by the law.[55]

Additionally, the country has plans to implement a customs system for chemicals management. It is expected that the Globally Harmonized System of Classification and Labelling of Chemicals (GHS), whenever implemented, will facilitate this effort. Challenges are foreseen, however, as the number of chemicals transactions that cannot be adequately controlled continues to increase, and unregulated storage of chemicals is a problem. There also continues to be a general lack of awareness and resources around chemicals management.[46]

2.2.3.5. Waste regulations

According to a study by Alsulaili et al.[56] "Currently, there are sixteen landfills in Kuwait. Thirteen are closed; only three are active. Unfortunately, there is not one landfill that meets the criteria of a sanitary landfill. Instead, all of the waste is dumped into random holes." Waste in Kuwait is managed primarily through a pair of Laws which have been examined in other contexts previously: Decision No. 210/2001 Pertaining to the Executive By-Law of the Law of Environment Public Authority and Law No. 42 of 2014 Promulgating the Environment Protection Law.

2.2.4. Relevant international commitment obligations

In order to improve efforts to contribute to the global protection of nature, the Government of Kuwait has ratified several international environmental agreements. Kuwait ratified the major chemicals-related agreements including the Basel, Minamata, Montreal, Stockholm, and Rotterdam Convention.

For the Strategic Approach to International Chemicals Management (SAICM), Kuwait has appointed a focal point and considered the national reporting.[57]

Kuwait also ratified the International Maritime Organization Convention for the Prevention of Pollution from Ships (1973), as modified by the Protocol of 1978 (MARPOL 73/78).

Furthermore, Kuwait together with five other Gulf countries (Bahrain, Oman, Saudi Arabia, the United Arab Emirates (UAE), and Qatar) are working on aligning their chemical hazard

[56] Alsulaili, A., AlSager, B., Albanwan, H., Almeer, A. and Al Essa, A. (2014). A Integrated Solid Waste Management System in Kuwait. 5th International Conference on Environmental Science and Technology, Vol. 69. IACSIT Press, Singapore.

[57] UNEP (2009) Ratification and implementation status of existing international instruments and programmes. SAICM/ICCM.2/INF/1

communication system (classification, safety data sheets and labelling) with the fifth revised edition of UN GHS (UN GHS Rev. 5). The GCC Standardization Organization (GSO) published a draft technical standard adopting GHS Rev 5 in Oct 2019. The Gulf region's standards body sent a final draft regulation on the UN's GHS of classification and labelling of chemicals to member countries for approval on 16 March 2020, according to an industry association. The six countries in the trade bloc of the Gulf Cooperation Council (GCC) – Bahrain, Kuwait, Oman, Saudi Arabia, the United Arab Emirates (UAE) and Qatar – would then need to transpose this into their domestic legislation, which could take two to three years.[58]

Kuwait is committed to its international obligations regarding the conservation of its native biodiversity. On 5 June 2017, Kuwait ratified the Nagoya Protocol, which is a supplementary agreement to the Convention on Biological Diversity that sets forth obligations on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization. With this ratification, Kuwait became the 100th Party to such Protocol. On the same date, Kuwait also ratified the Cartagena Protocol on Biosafety to the Convention on Biological Diversity and became its 171st Party.

In 1995, Kuwait has also ratified the United Nations Convention to Combat Desertification (UNCCD). Sheikh Abdullah informed the Kuwait News Agency (KUNA), that the UNCCD has provided Kuwait with a framework from which to alleviate the effects of drought and desertification.

Also, Kuwait signed the Kuwait Regional Convention for Cooperation on the Protection of the Marine Environment from Pollution and the related protocols on the following:

- Protocol Concerning Regional Cooperation in Combating Pollution by Oil and other Harmful Substances in Cases of Emergency;
- Protocol concerning Marine Pollution resulting from Exploration and Exploitation of the Continental Shelf;
- Protocol on the Control of Marine Transboundary Movements and Disposal of Hazardous Wastes and Other Wastes;
- Protocol for the Protection of the Marine Environment against Pollution from Land-Based Sources.

2.2.5. Regulations for POPs and monitoring requirements

2.2.5.1. Restriction of POPs

Kuwait has restricted the 21 POPs listed until COP4 in 2009 within Resolution No. 5 of 2016 in the executive regulations for chemicals management (Table 6). Therefore, the other 9 POPs listed since 2011 need to be added to this list.

Table 6. List of restricted chemicals in Kuwait from POPs list of the Stockholm Convention:

No.	Chemical name	HS code
1	Aldrin	29038200
2	Chlordane	29038200

[58] Chemical Watch (2020) Gulf GHS regulation sent to member countries for approval. 18 March 2020.

3	Dieldrin	29104000
4	Endrin	29109000
5	Heptachlor	29038200
6	Hexachlorobenzene	29039200
7	Mirex	29038900
8	Toxaphene	38080000
9	Polychlorinated biphenyls (PCBs)	38248200
10	DDT	29039200
11	Polychlorinated dibenzo-p-dioxins(dioxins) and Polychlorinated dibenzofurans	29039200
12	Hexachlorobenzene	29039200
13	Alpha – Hexachlorocyclohexane	29038100
14	Beta- Hexachlorocyclohexane	29038100
15	Chlordecone	29147000
16	Hexabromobiphenyl	29030000
17	Hexabromodiphenyl ether and Heptabromodiphenyl ether	29093000
18	Lindane (gamma-hexachlorocyclohexane)	29038100 38085000
19	Pentachlorobenzene	29030000
20	Tetrabromodiphenyl ether and Pentabromodiphenyl ether	29093000
21	Perflurooctanesulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF)	29049000

2.2.5.2. Limit values for POPs

Currently there are no limits for POPs in food or feed. Also, there are currently no limits for POPs in soil, sediment and water including drinking water. Also, no limits have been established for POPs in industrial emissions, or in products, or recycling, such as plastic.

2.2.5.3. Requirements of monitoring POPs

There are no legal requirements for monitoring of POPs such as in drinking water, food or industrial emissions. Similarly, there are no requirements to monitor POPs in products or wastes.

2.3. Assessment of POPs issues in the country

The assessment of current POPs issues and management in Kuwait is based on inventories and assessment of POPs pesticides, polychlorinated biphenyls (PCBs), polybrominated diphenyl ether (PBDE), hexabromocyclododecane (HBCD), perfluorooctanesulfonic acid (PFOS), and related substances, and unintentional production of POPs (UPOPs: polychlorinated dibenzo-para-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), hexachlorobenzene (HCB) and PCBs) are described in this section. This section also presents information on current POPs stockpiles, contaminated areas and waste, remediation of contaminated areas, POPs levels in different environmental media, prediction of future POPs production, use and release, POPs monitoring in Kuwait and the region, as well as current information level, knowledge and education levels of each target group, and the mechanism for information exchange with other parties of the SC.

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

2.3.1.1. General

The majority of the initially listed 12 POPs were pesticides including aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, HCB, mirex, and toxaphene. In the past decade, more POPs pesticides were newly listed in the Convention including chlordecone, dicofol, alpha-/beta-HCH, lindane (gamma-HCH), PCP and sulfluramide (a PFOS related substance). Almost all POPs pesticides are listed in Annex A of the SC and need to be eliminated with a few granted specific exemptions for endosulfan, lindane, and PCP (Table 1). Only DDT and sulfluramide are listed in Annex B with accepted purpose (see Table 2) and are therefore addressed in section 2.3.7 and 2.3.8.6 respectively.

All POPs pesticides are organochlorine pesticides (OCPs) and are lipophilic, bioaccumulate, and are toxic to humans and wildlife. Only sulfluramide as PFOS-related substance is an organofluorine substance, which is not lipophilic.

At this present time, the listed POPs pesticides have largely been globally phased out. 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. The first major POPs pesticide management project in Africa revealed challenges and high cost for elimination of POPs pesticides in countries without their own destruction capacity, and therefore, the need to be exported at high cost [Independent Evaluation Group (IEG) World Bank Group 2016].[59]

Most of POPs pesticides have been substituted in the past 20 years by other pesticides. Often, the alternative pesticides used were not sufficiently assessed and frequently, other highly hazardous pesticides (HHPs) have been introduced or systemic pesticides with an impact on pollinators and the ecosystem.[60,61].

2.3.1.2. Production

Kuwait does not have facilities to produce pesticides and has not been producing POPs pesticides in the past.

[59] IEG World Bank Group (2016) Project Performance Assessment Report. Africa Stockpiles Programme. Ethiopia, Mali, Morocco, South Africa, Tanzania, Tunisia.

[60] van der Sluijs, J.P., Amaral-Rogers, V., Belzunces, L.P. et al. (2015) Conclusions of the Worldwide Integrated Assessment on the risks of neonicotinoids and fipronil to biodiversity and ecosystem functioning. Environ Sci Pollut Res 22, 148–154 (2015).

[61].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

2.3.1.3. Import

Kuwait mainly imports pesticides for controlling pest and diseases in the agricultural industry. These pesticides are imported by private companies that are specifically focused on the agricultural sector. Household insecticides are also imported.

There is a specific procedure to register and assess pesticides in Kuwait (see section 2.2.3.4). Most of POPs pesticides are banned in Kuwait, and none of the POPs pesticides are registered in Kuwait. Therefore, no POPs pesticides can be legally imported to Kuwait.

A study on POPs pesticide concentration in Kuwait documented overall low values in the atmosphere.[62] This would indicate that also, no POPs pesticides are imported illegally to the country.

2.3.1.4. Registration

No POPs pesticides are registered in Kuwait. A detailed regulation for registration and evaluation of pesticides (see section 2.2.3.4) will prohibit the registration of POPs pesticides.

2.3.1.5. Use and release

None of the POPs pesticides are used in Kuwait. The low levels of POPs pesticides in the air in Kuwait (Figure 13, Figure 14, and Figure 15)[62] demonstrate that there is also no relevant illegal use of POPs pesticides. No import data on pesticides are available prior to the year 1995 at the time POPs pesticides were used.

The monitoring study of POPs pesticides in different sampling location in urban, remote, and industrial site showed the highest level in the urban environment (Figure 13) most probably from former uses. This is supported by the positive correlation of POPs pesticide levels in the air and the temperature (Figure 14), indicating desorption of POPs pesticides from soils and possibly, from treated wood. HCB and PeCB had a negative correlation with temperature[62] indicating that they are not mainly desorbed from soils and other reservoirs. Therefore, the detected HCB and PeCB are rather from unintentional POPs, for example, from combustion sources.

The highest concentrations were from dieldrin and HCB followed by DDTs (Figure 15). This indicated that these were major POPs pesticides formerly used in Kuwait, most likely in the 1960s to 1980s. HCB can stem also from unintentional formation, which likely this present time, is the major source, as indicated by the negative correlation with temperature.

During the inventory, it could not be clarified as to which extent PCP has been used for wood treatment in Kuwait.

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[62] Gevao, B., Porcelli, M., Rajagopalan, S., Krishnan, D., Martinez-Guijarro, K., Alshemmari, H., Bahloul, M., & Zafar, J. (2018). Spatial and temporal variations in the atmospheric concentrations of "Stockholm Convention" organochlorine pesticides in Kuwait. The Science of the total environment, 622-623, 1621–1629.

It is worth noting that the use of non-POP pesticides in Kuwait is high, and the second highest use of the Middle East countries with 21% of fruits and vegetables were contaminated by non-POP pesticides above the maximum residue limits (MRL).[63,64] The detected pesticides above their MRLs were imidacloprid, deltamethrin, cypermethrin, malathion, acetamiprid, monocroto-phos, chlorpyrifos-methyl, and diazinon.[64] Aldrin, as POP, was detected in one sample below MRL.[64]

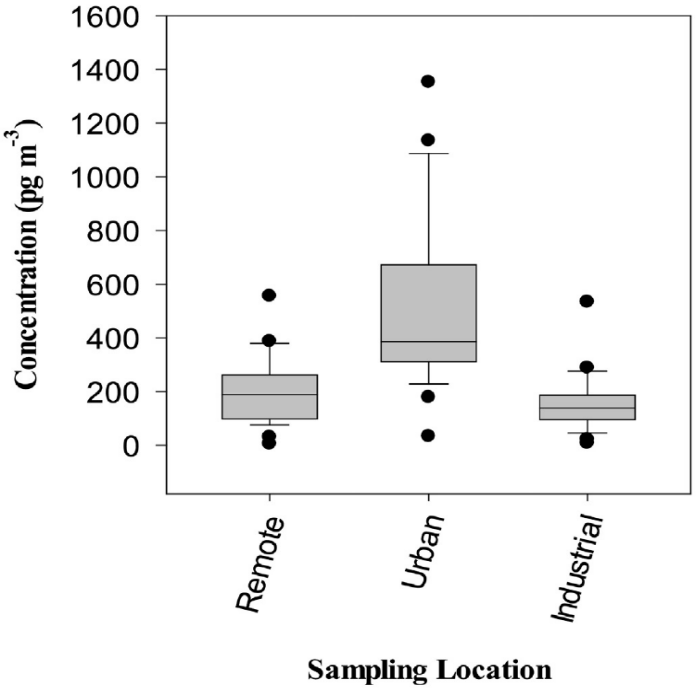

Figure 13. Average concentration of ΣPOPs OCPs in air (pg/m^3) determined by high volume air samples at three locations in Kuwait[62]

[63] Arab Times (2018) 21% of Kuwaiti vegetables, fruits contaminated with pesticides. http://www.arabtimesonline.com/news/21-of-kuwaiti-vegetables-fruits-contaminated-with-pesticides/

[64] Jallow MFA, Awadh DG, Albaho MS, Devi VY, Ahmad N. (2017) Monitoring of Pesticide Residues in Commonly Used Fruits and Vegetables in Kuwait. Int J Environ Res Public Health. 14(8):833.

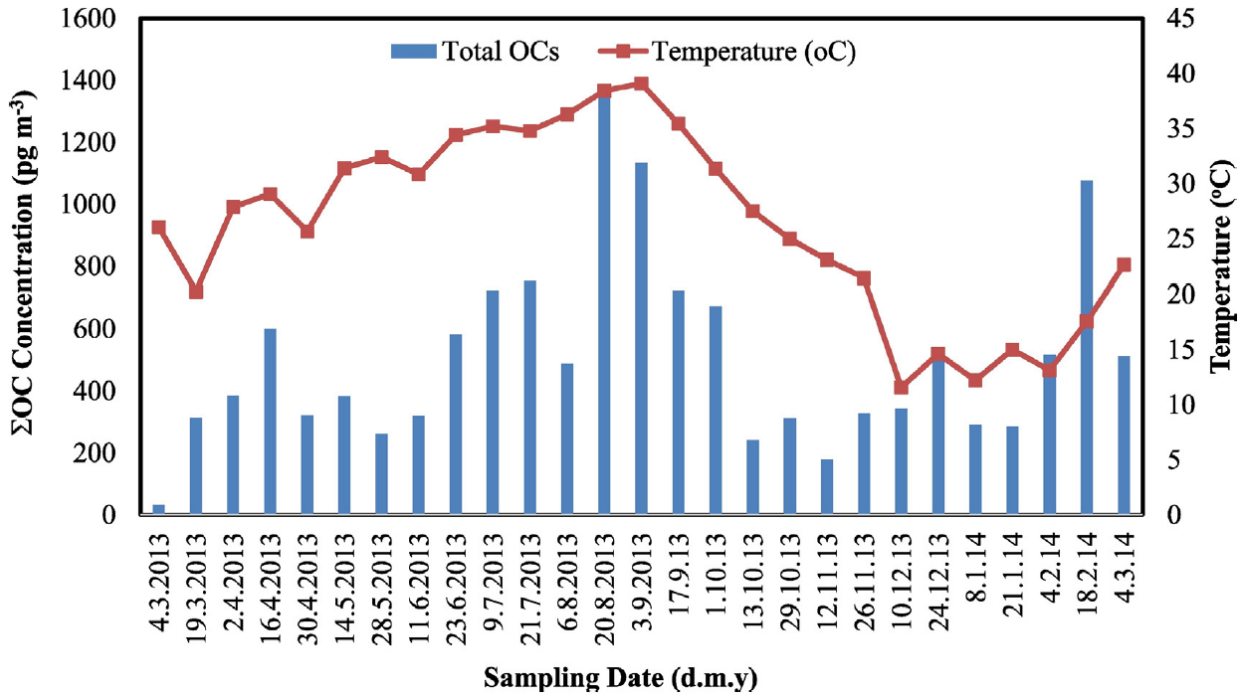

Figure 14. Annual variations in ΣPOPs OCPs concentrations (pg/m^3) and average temperature over the study period (03/2013−03/2014) at the urban site in Kuwait[62]

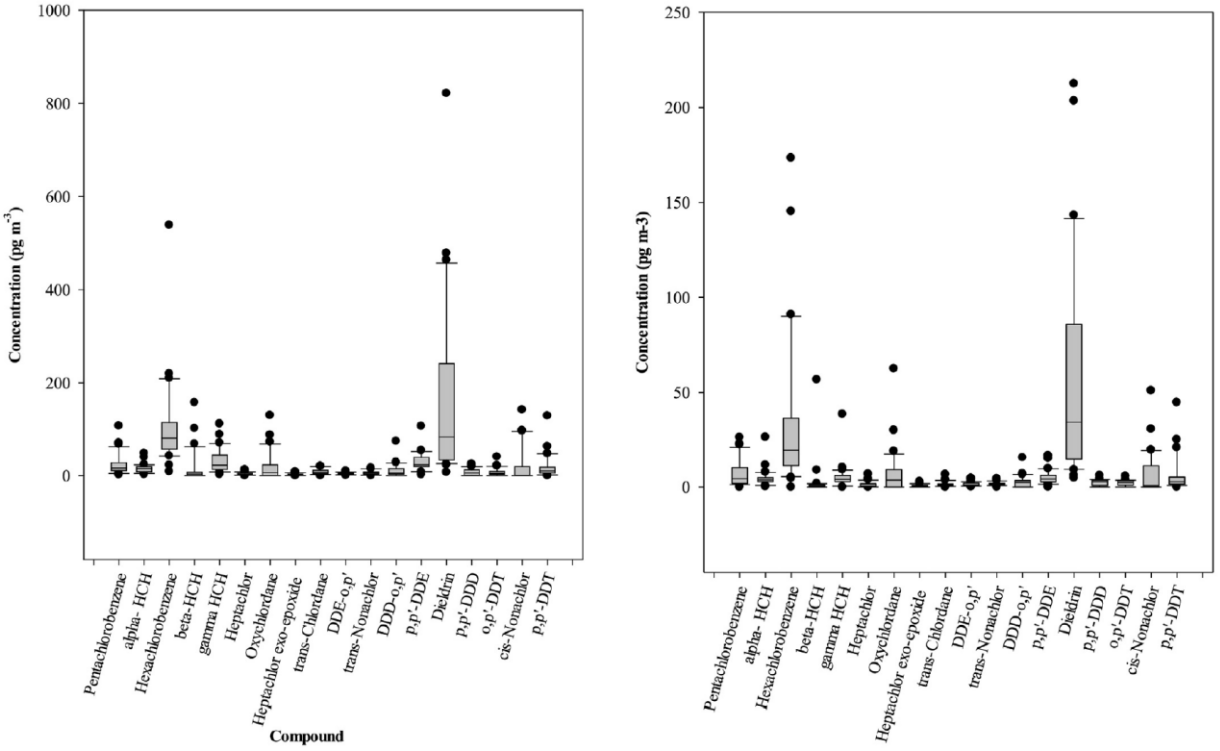

Figure 15. Average concentrations of pesticides measured at the urban site (left) and industrial site (right) in Kuwait between March 2013 and March 2014[62]

2.3.1.6. Future use and monitoring of pesticides

There is no plan of using any POPs pesticides in Kuwait. However, the study on the presence of the current used non-POPs pesticides in commonly consumed fruits and vegetables in Kuwait concluded, that there is an urgent need to develop comprehensive intervention measures to reduce the potential health risk of pesticides to consumers. The need for the regular monitoring of pesticide residues and the sensitization of farmers to better pesticide safety practices, especially the need to adhere to recommended pre-harvest intervals is recommended.

2.3.1.7. Storage

There are no POPs pesticide in storage However, the study on the current used pesticides "Pesticide Knowledge and Safety Practices among Farm Workers in Kuwait" revealed that 20% of farmers stored pesticides within living areas. [65] Therefore the storage practice for pesticides in Kuwait should be improved.

2.3.1.8. Disposal

There are no POPs pesticide stockpiles in Kuwait for disposal. Also, there has been no specific documentation of disposed POPs pesticides in the recent past.

However, the recent study on Pesticide Knowledge and Safety Practices among Farm Workers in Kuwait revealed that many farmers are disposing of their pesticide wastes. Respondents adopted unsafe practices such as discarding, incinerating, or burying empty pesticide containers on-farm, or reusing the containers. Farmers also reported disposing leftover pesticide solution or old pesticide stocks on-farm or in the sewer.[65]

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

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.[66] PCBs are carcinogens (category 1), and some congeners have dioxin-

[65] Jallow MF, Awadh DG, Albaho MS, Devi VY, Thomas BM. Pesticide Knowledge and Safety Practices among Farm Workers in Kuwait: Results of a Survey. Int J Environ Res Public Health. 2017;14(4):340.

[66] Wagner U, Schneider E, Watson A, Weber R (2014) Management of PCBs from Open and Closed Applications – Case Study Switzerland. Report for GIZ. http://www.global-chemicals-waste-platform.net/fileadmin/files/doc/Management_of_PCBs_Case_Study_Switzerland.pdf

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. Large volumes of PCBs still exist in developing countries with associated challenges in inventory and management.[67] Furthermore, even industrial countries have challenges in managing open PCB applications such as sealants[68]

The releases of PCBs during the past 90 years have contaminated large areas in the environment in particular soils and sediments and the food chain with associated exposure risk for humans.[68] To avoid further contamination and reduce environmental and human exposure, PCBs need to be controlled and eliminated. According to the SC, Annex A Part II, (a) the use of PCBs in equipment (e.g., transformers, capacitors, or other receptacles containing liquid stocks) need to be eliminated by 2025; and according to Annex A Part II, (e) determined efforts need to be made to lead to environmentally sound waste management of oils containing PCBs and equipment contaminated with PCBs above 50 ppm, no later than 2028.

Polychlorinated naphthalenes (PCNs) are a class of chlorinated aromatic compounds with 2 to 8 chlorine atoms substituted to naphthalene. The chemical formula for PCN is $C_{10}H_{8-x}Cl_x$. PCNs are man-made chemicals; they are not flammable, have high electrical resistance, and possess good insulating properties. PCNs were listed as POP in Annex A and C in 2015.

PCNs 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). [69] However, PCNs were mainly produced/used from 1930 to 1960 with lower productions in the 1970s, and production was stopped around 2000.[69] Furthermore, the historic production volume was only about 10% of PCBs (150,000 tonnes *vs* 1.5 million tonnes). PCNs are present in technical PCBs as unintentional POPs (see Section 2.3.9) at concentrations between 39 to 1300 mg/kg.[69]

Therefore, stocks and waste of PCNs can be addressed within the management of PCBs and hence, are addressed here together with PCBs. Also, the Basel Convention has included PCNs into the technical guidelines for managing PCBs.[70] While the low POPs content for PCBs has been set at 50 mg/kg (ppm), the low POPs content for PCNs was set at 10 mg/kg which must be considered in the management.[70]

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

[68] Weber R, Herold C, Hollert H, Kamphues J, Ungemach L, Blepp M, Ballschmiter K (2018) Life cycle of PCBs and contamination of the environment and of food products from animal origin. Environ Sci Pollut Res Int. 25(17), 16325-16343;

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

[70] 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.

2.3.2.2. Import

Based on Customs Instructions No. 96 of 2007 issued regarding the prohibition of importing transformers, cables and generators containing PCBs and Article 25 of Environment Public Authority Resolution No. 210 of 2001 regarding the executive regulations of the Authority's law, The Environment Public Authority prohibits the import of hazardous wastes or permits their entry or passage into the territory of the State of Kuwait. The Environment Public Authority requests the General Administration of Customs to take necessary action towards preventing the import of transformers, cables and electrical generators containing PCBs and circulating them on outlets

The decision was implemented as of 10/30/2007.The import of PCB and PCB-containing equipment is prohibited; and therefore now and in future, no PCB-containing equipment can be legally imported to Kuwait.

PCB-containing equipment, such as transformers and capacitors containing insulating oils, have been imported into Kuwait in the past. These equipment and materials might have partly contained PCNs, at least, as unintentional POPs. Most PCB-containing or contaminated equipment were used in the electricity generation sector but have been phased out (see 2.3.2.4).

2.3.2.3. Export

PCB containing equipment has been exported for environmental sound management in the past. Presently, it is considered that no PCB containing transformers are present in Kuwait; and therefore, it is not expected that PCB-containing equipment will be exported in the future. In the unlikely case that a PCB-containing equipment would be discovered in the future, it would be managed and exported, following the Basel Convention guidelines and procedures.

2.3.2.4. Use of transformers and other equipment

In the assessment, if PCB-containing equipment exist in Kuwait, the responsible Ministry of Electricity and Water (MoEW) and other authorities and companies informed that all PCB-containing equipment have been managed years before; and that, there is no PCB transformer or other equipment in operation in Kuwait. This also includes the oil sector of Kuwait petroleum companies. The used capacitors are dry type which do not contain oil.

2.3.2.5. Storage and release

There are no obsolete stocks of PCB-containing transformers.

Transformers which have been stored in the past might have had PCB releases at the storage sites. Assessment of the soils or buildings should be conducted.

2.3.3. Assessment of PBDEs (Annex A, Part IV & 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 electrical and electronic equipment (EEE), polyurethane foams in vehicles and furniture, and textiles, to reduce their ignitability to meet certain flammability standards. Due to the increase of flammable polymer materials and related standards, the global

demand for PBDEs (and other flame retardants) has been growing rapidly from the 1970s to 1990s.[71]

Three commercial PBDE mixtures were produced and used in the market, namely 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 were listed as POPs.[72].

For reason of the environmental and health risk, c-PentaBDE and c-OctaBDE technical mixtures, their production was stopped in 2004. The total former production of these commercial mixtures was approximately 100,000 tonnes each (see Table 7). DecaBDE listed in 2017 is still being produced and used, and a range of specific exemptions have been granted, such as plastic in EEE, certain vehicle parts, textiles, and insulation foam.[72]

Table 7. Estimated total global production of PBDE commercial mixtures, 1970−2005[72]

Commercial mixture	Tonnes
c-PentaBDE	91,000 to 105,000
c-OctaBDE	102,700 to 118,500
c-DecaBDE	1,100,000 to 1,250,000

The main use of c-PentaBDE (90%) was in polyurethane foam with use in car/transport, furniture, construction, or baby products with the major use in the US. The c-OctaBDE was mainly used in plastic casings in electrical and electronic equipment (EEE) while decaBDE has been used in all applications listed as exemptions.

One challenge is how to practically monitor and control PBDEs in articles and the recycling flows.

PBDEs were monitored in 70 homes in Kuwait.[73] In all homes and offices investigated, PBDEs were detected with patterns similar to the distribution in the commercial PentaBDE formulation. The ubiquitous distribution of these compounds in indoor environments in Kuwait may be due to the volatilization of these chemicals from foam (e.g., foam-padded furniture, mattresses); electronic equipment (e.g., TVs, printers, computers); and other consumer products to which they are added as flame retardants.[73] PBDEs were also detected in all dust samples from cars used in Kuwait.[76] PBDEs seem to be ubiquitously present in indoor environments in Kuwait, putting the population at risk of continuous, low-level PBDE exposure.

The methodology used to carry out the inventory was based on the SC inventory guidance document. Methods used were national statistics and national reports.

[71] Shaw SD, Blum A, Weber R, et al. (2010) Halogenated Flame Retardants: Do the Fire Safety Benefits Justify the Risks? Rev. Environ. Health 25(4), 261-305.

[72] UNEP (2019) Preliminary draft guidance on preparing inventories of decabromodiphenyl ether. UNEP/POPS/COP.9/INF/18

[73] Gevao B, Bahloul M, Al-Ghadban AN, et al. (2006) Polybrominated diphenyl ethers in indoor air in Kuwait: Implications for human exposure. Atmospheric Environment 40(8):1419–142 DOI: 10.1016/j.atmosenv.2005.10.053

Hexabromobiphenyl (HBB) also listed as POPs has only been produced at 5,400 tonnes mainly in the US from 1970 to 1976. Production of HBB has not been reported for other countries. Production and use of HBB ceased in most, if not all, countries in the 1970s, and therefore, are not considered relevant for inventory and management.[72]

2.3.3.2. EEE and WEEE containing PBDEs

Certain electrical and electronic equipment (EEE) and related waste (WEEE), in particular TVs, computers, and other electronics which get hot during use, often contain brominated or other flame retardants in plastic parts. The major PBDE used in electronics is c-DecaBDE, which has been listed in 2017 as POPs. CRT casings, which were largely produced some years ago before the use of flat screens, partly contain c-OctaBDE, which has meanwhile been phased out. Freezers and refrigerators normally do not contain BFRs.

In this preliminary PBDE inventory, the focus was on TVs (CRTs and flat screens) and computers (laptops and desktops).

Import

Import statistics were assessed from 2010 to 2019 for TVs and computers. Every year, about 1 million of these devices were imported in average (see Table 8). In total, about 55,426 tonnes of TVs and computers containing 19,286 tonnes of plastic have been imported during these 10 years. This EEE included an estimated 55.4 tonnes of decaBDE and 7.3 tonnes PBDEs listed 2009 (HexaBDE and HeptaBDE). During the last 10 years only very few CRTs were imported (less than 100 tonnes) since CRTs have been largely substituted by flat screens before 2010.

Export

Currently, most WEEE have been sent to landfills in Kuwait.

Use/storage

The EEE imported in the period 2010–2019 are considered largely still in use and stocked at home and in institutions. Therefore, the total amount of plastic in this EEE amount is at least 19,286 tonnes, containing approximately 55.4 tonnes of decaBDE and 7.3 tonnes PBDEs listed in 2009 (HexaBDE and HeptaBDE). The total amount of plastic and PBDEs in EEE is higher since small household equipment and other EEE have not as yet been estimated in this preliminary inventory.

Since some households and institutions still keep old electronics in the basement or garage, the total amount of EEE and PBDEs could likely be considerably higher. For this assessment, a detailed inventory for EEE and WEEE needs to be developed.

WEEE and end-of-life management

In almost all GCC countries, there is minimal to zero legislation on e-waste, with minor differences between the respective counties.[74] Kuwait, one of the biggest per capita e-waste producers among the GCC nations, uses the same landfills for both conventional and e-waste. The total

[74] Widmer R (2020) E-Waste Management in the GCC: Perspectives. April 12, 2020 https://www.bioenergyconsult.com/e-waste-gcc/

amount of WEEE per capita/ year in Kuwait is 17.2 kg[74] which would translate to a total of 75,142 tonnes of WEEE per year, containing approximately 15,000 tonnes of WEEE plastic.

As recently highlighted in many GCC countries, the need for e-waste legislation is widely recognized.[74] E-waste management provides an opportunity and a huge potential in the entire Middle East, primarily due to four reasons.[74] First, e-waste management is a source of employment for both highly skilled and unskilled workers. This could help to transfer employment from the public to the private sector, which is a goal of many Gulf countries. Second, e-waste recycling can also minimize costs, as less landfill space is being used. Furthermore, e-waste contains valuable resources like precious and other metals which should be recovered. Recycling and recovery also could reduce GHG emissions. Table 8 shows total PBDEs in imported EEE.

Table 8: Total PBDEs in Imported Electrical and Electronic Equipment (EEE) (CSB 2020)

Year	PBDEs in Imported Electrical and Electronic Equipment (EEE) to Kuwait				
	Total number of units (computers&TVs)	**Item total weight (tonnes)**	**Total polymer fraction (mean) (tonnes)**	**Hexa-/heptaBDE content (from c-OctaBDE) (mean) in plastics (tonnes)**	**DecaBDE content (mean) in plastics (tonnes)**
2010	1,171,543	7,795.19	2,748.66	0.82	7.82
2011	902,638	8,164.18	2,830.33	1.14	8.15
2012	1,067,655	6,821.40	2,340.47	1.09	6.79
2013	937,249	5,066.93	1,782.04	0.56	5.08
2014	745,417	4,444.70	1,557.57	0.52	4.45
2015	1,751,884	5,470.75	1,870.99	0.91	5.44
2016	1,113,860	4,610.18	1,613.85	0.55	4.62
2017	1,175,196	4,912.26	1,694.54	0.73	4.90
2018	1,077,723	5,092.93	1,774.87	0.65	5.09
2019	377,286	3,047.69	1,072.75	0.33	3.06
Total	**10,320,451**	**55,426.20**	**19,286.06**	**7.30**	**55.39**

2.3.3.3. Transport sector

The major used PBDE in the transport sector was decaBDE in interior textiles (seat) and a wide range of plastic parts which are partly exempted.[72, 75] In addition, c-PentaBDE (containing

[75] Liu H, Yano J, Kajiwara N, Sakai S (2019) Dynamic stock, flow, and emissions of brominated flame retardants for vehicles in Japan. Journal of Cleaner Production 232, 919-924, DOI: 10.1016/j.jclepro.2019.05.370.

tetraBDE, pentaBDE, hexaBDE and heptaBDE) has partly been used in polyurethane (PUR) foam in seats or head rest in cars, trucks, and other vehicles, mainly in the United States.[72] The most robust study on PBDEs in the transport sector estimated an average use of 62 ± 21 g decaBDE per conventional passenger vehicle (CPV) produced before 2017.[75] These 62 g decaBDE are contained in approximately 200 kg of plastic and polymers per vehicle.

A study on PBDEs in dust of normal cars in use in Kuwait detected concentrations of 68 to 17,200 ng/g. BDE-209 (decaBDE) was the dominant congener in all cars examined with concentrations, ranging from 52 to 16,100 ng/g, which on average, accounted for 77% of the PBDEs measured.[76]

Import

The vehicles imported to Kuwait are largely new vehicles. Since the use of DecaBDE was largely stopped in 2016, vehicles produced after 2016 can be regarded as PBDE-free, as there have been no relevant imports of PBDEs in vehicles since 2017. The only ongoing exemptions are in vintage cars in particular from the US, which might have contained c-PentaBDE with a risk of PBDE exposure[77].

Use/storage

The amount of PBDEs in current stocks was calculated by the amount of registered vehicles in 2016 (2,001,940 vehicles). It was found that the decaBDE content of the Japanese study of 62 g resulted in a total estimate of 124 tonnes of decaBDE in the current vehicle fleet in Kuwait. The total amount of plastic and polymers in these vehicles was 400,388 tonnes.

End-of-life

The main treatment activity of whole end-of-life vehicles (ELV) in Kuwait was undertaken at the industrial sites of Amghara and Na'eem. There are approximately 100 active workshops that are engaged in depollution, dismantling, and trading of car parts and scrap. In Na'eem, 900 small shops, workshops, garages, and traders are located. Many of these workshops process also other scraps, aside from ELVs.

Considering a service life of cars of approximately 10 years, about 200,000 cars might reach their end of life every year in Kuwait. These contain approximately 12.4 tonnes of PBDEs. These are contained in approximately 40,000 tonnes of polymers. A part of end-of-life vehicles might be exported from Kuwait, while the largest part is likely being scrapped in Kuwait. The dismantling garages sell spare parts to private customers, as well as car shells to recycling facilities like MRC for metal recovery. MRC, as one of the main treatment facilities in the sector has an average input of about 62,000 t/yr of metal scrap largely from ELVs.

[76] Gevao B, Shammari F, Ali LN (2014) Polybrominated diphenyl ether levels in dust collected from cars in Kuwait: Implications for human exposure. Indoor and Built Environment 25, 106-113.

[77] Imm P, Knobeloch L, Buelow C, Anderson HA. (2009) Household exposures to polybrominated diphenyl ethers (PBDEs) in a Wisconsin Cohort. Environ Health Perspect. 117(12):1890-1895. doi:10.1289/ehp.0900839

The polymers in the end-of-life in Kuwait are neither recycled nor recovered. This can be derived for example, from the waste management of tyres of more than 10 million tires being stored and for a few years, shredding has started[78],[79].

2.3.3.4. POP-PBDEs in other articles/products

PBDE was used as flame retardants in polyurethane foam and textiles in furniture (sofas, seat etc.), in particular in countries with particular flammability standards, such as the United States[72,80] A part of furniture in Kuwait is imported from the US. In this preliminary inventory, details of types of furniture and estimated amount of PBDEs in furniture could not be estimated, thus, would need further assessment.

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

2.3.4.1. General

HBCD is a brominated flame retardant formerly produced in high volume and listed in 2013 in Annex A of the Convention. It was mainly used (90%) in expanded and extruded polystyrene (EPS/XPS) in building insulation. Minor uses were in textiles and in high impact polystyrene (HIPS) in electronics. These latter uses are considered to have stopped globally in production in 2013. The use of HBCD in EPS/XPS insulation materials has been exempted in the Convention. Therefore, EPS/XPS in building insulation are of particular relevance for HBCD inventory. The HBCD inventory has been developed based on the SC inventory guidance for HBCD.[81]

2.3.4.2. Production

There was and has been no HBCD production in Kuwait.

2.3.4.3. Inventory of HBCD in polystyrene (EPS and XPS) in current use and stock

The total amount of expanded polystyrene (EPS) imported to Kuwait from 2011 to 2018 were 95,043 tonnes. The total amount of extruded polystyrene (XPS) imported to Kuwait from 2011 to 2018 were 53,884 tonnes (Table 9).

In this first assessment it could not be clarified how much of the EPS and XPS were flame retarded with HBCD or with another flame retardant. Also it could not be assessed what percentage of these EPS/XPS was used in insulation. This assessment will be conducted during the NIP implementation (action plan).

[78] Daily Mail (2013) World's biggest tyre graveyard: Incredible images of Kuwaiti landfill site that is home to SEVEN MILLION wheels and so huge it can be seen from space. https://www.dailymail.co.uk/news/article-2337351/Worlds-biggest-tyre-graveyard-Incredible-images-Kuwaiti-landfill-site-huge-seen-space.html
[79] https://www.arjes.de/en/news/shredding-under-the-dessert-sun/
[80] Stapleton HM, Sharma S, Getzinger G, et al. (2012) Novel and high volume use flame retardants in US couches reflective of the 2005 PentaBDE phase out. Environ Sci Technol. 46(24), 13432-13439. doi:10.1021/es303471d
[81] UNEP (2017) Guidance for the inventory of Hexabromocyclododecane (HBCD) (Draft March 2017)

Table 9. Imported polystyrene EPS/ XPS from 2011 to 2018:

Item description	2011	2012	2013	2014	2015	2016	2017	2018	G total
	Weight (tonnes)								
Extruded XPS	0	14,707.5	16,594	16,791	19,014	14,092	8,108.0	5,735	95,043
Expanded EPS	**0**	**3,433**	**4,043**	**8,307**	**4,798**	**8,531**	**12,117**	**12,654**	53,884

There is also some polyurethane insulation used in Kuwait. During the inventory it was clarified that the flame retardant used is tris(1-chloro-2-propyl)phosphate (TCPP) and not any POP-BFR.

2.3.4.4. Other products

High impact polystyrene (HIPS) in electronics

A minor amount of HBCD has been used in high impact polystyrene (HIPS). HIPS is a versatile, economical and impact-resistant plastic that is easy to machine and fabricate. It is used for TVs and audio-visual equipment parts, bicycle trailers, as well as in automotive industry for instrument panels and fittings. Within this first inventory it could not be assessed how many of the EEE contain HIPS, and if HBCD has been used as a flame retardant.

Other polystyrene products

For other polystyrene products, such as drinking cups and boxes and food contact materials, it is assumed that no HBCD is present, and they were therefore, not considered in the HBCD inventory.

HBCD use in textiles

Flame retarded textiles are used in cars, bus, trains, planes, furniture, curtains, tents, or uniforms.[81]

For polymers including textiles and mats in vehicles, an assessment and inventory of HBCD and PBDEs in cars have recently been established in Japan.[75] The average of approximately 2 g of HBCD for each car has been considered[75] indicating an overall low use in this application. For the registered cars in Kuwait imported before 2017, a total of 4 tonnes of HBCD can be estimated.

In this inventory, no particular assessment has been conducted for other textiles in Kuwait.

2.3.4.5. End-of-life management

The HBCD containing EPS/XPS has been used for insulation in buildings, mainly in the last 10 to 20 years and has a service life of 30 to more than 50 years. Therefore, the insulation foams in current buildings are still in use and will enter the end-of-life phase only years and decades later.

Currently, there has been no POPs destruction capacity in Kuwait. Hence, the end-of-life management of these POP containing polymers has to be planned. It is useful to look at the end-of-life management in Europe where these wastes already appear in the current construction and demolition waste with associated challenges.

2.3.5. Assessment of hexachlorobutadiene (HCBD) (Annex A, Part I)

2.3.5.1. General

HCBD has been listed in Annex A and C of the SC. Like all POPs, HCBD has toxic properties in particular for aquatic organisms and birds, resists degradation, and bioaccumulates in fatty tissues.[82,83,84] HCBD is a relatively volatile and water soluble (3.2 mg/L) POP, and therefore, can contaminate ground and drinking water in areas were HCBD waste has been disposed.[85]

The most relevant source of HCBD was (and is) the production of chlorinated solvents (tetrachloroethylene/perchloroethylene, trichloroethylene, tetrachloromethane/carbon tetrachloride), and hexachlorocyclopentadiene (intermediate of cyclodiene pesticides), and the related waste and landfills from (former) production.

The HCBD inventory guidance document stresses that Parties that have neither current nor past production of relevant organochlorines in their countries are not expected to have major HCBD production, release, stockpiles, or contaminated sites. This is the case for Kuwait. As a consequence, such Parties can prepare inventories that are limited to possible imports of HCBD and imports of impacted organochlorines.

2.3.5.2. Production

Kuwait does not produce HCBD and has no organochlorine production process where HCBD could be generated at levels where HCBD separation for intentional production is possible.

Kuwait has an elemental chlorine production where HCBD is likely generated at low levels.

2.3.5.3. Import and export

Kuwait is not importing or exporting HCBD as a product. Minor amount of unintentionally HCBD might be imported in perchloroethylene used for dry cleaning (see section 2.3.9).

2.3.5.4. Use

No current intentional use of HCBD is likely noted in Kuwait.

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[82] UNEP (2011) Proposal to list hexachlorobutadiene in Annexes A, B and/or C to the Stockholm Convention on Persistent Organic Pollutants. UNEP/POPS/POPRC.7/3

[83] Secretariat of the Stockholm Convention (2017) Draft guidance on preparing inventories of hexachlorobutadiene (HCBD). UNEP/POPS/COP.8/INF/18

[84] IPCS (1994) International Programme on Chemical Safety, Environmental Health Criteria 156, Hexachlorobutadiene, WHO.

[85] Clark CS, et al (1982) An environmental health survey of drinking water contamination by leachate from a pesticide waste dump in Hardeman County, Tennessee. Arch Environ Health. 37(1), 9-18.

2.3.5.5. End-of-life management

Wastes which might contain impurities of HCBD, in particular, wastes from dry cleaning using perchloroethylene are disposed to dump sites.

Residues from the chlorine production operated since 1964 in Kuwait might have contained HCBD. The residues have likely been disposed in a landfill without specific safety measures.

2.3.6. Assessment of SCCPs (Annex A, Part I and Part VII)

2.3.6.1. Background

Chlorinated paraffins (CPs), or polychlorinated n-alkanes, are complex mixtures of substances with the general molecular formula CxH(2x-y+2)Cly. CPs are characterised by the carbon-chain length range of their n-alkanes and by the chlorine content of the product. According to their chain length, CPs are categorized into short-chain CPs (SCCPs, C10–C13), medium-chain CPs (MCCPs, C14–C17) and long-chain CPs (LCCPs, C18–C30).[86]

In May 2017, short-chain chlorinated paraffins (SCCPs) with chain lengths ranging from C10 to C13 and a content of chlorine greater than 48% by weight were listed in the SC. Additionally, a limit for the presence of SCCPs in other chlorinated paraffin (CP) mixtures was set at 1% by weight. CPs with an SCCP content >1% are therefore also considered POPs.

SCCPs were listed with specific exemptions for production and the use including PVC, rubber, lubricants, adhesives, fatliquors for leather, paints, and adhesives.

Chlorinated paraffins are the largest semivolatile organochlorines in the market with a total production of 1 million tonnes in 2013[86], which meanwhile have reached approximately 2 million tonnes/year. It is estimated that the share of SCCPs of total CP production is 16.5%.[87]

2.3.6.2. Production

There has been no production of SCCPs or other CPs in Kuwait.

2.3.6.3. Import of SCCPs as chemical and in products

A) Import of chlorinated paraffins as chemicals

There is not a specific HS import code for SCCPs or for chlorinated paraffins. However, it is known that chlorinated paraffin including SCCPs are imported under certain HS codes of paraffin wax or plasticisers (see Table 10).

Chlorinated paraffins are only a fraction of the total amount of the imported chemicals under these HS codes. High amount of plasticisers are imported under HS code 381220 “Plasticisers, compound; for rubber or plastics” which between 2006 and 2018 amounted to approximately 4000

[86] UNEP (2019) Detailed guidance on preparing inventories of short-chain chlorinated paraffins (SCCPs). (Draft 2019). Secretariat of the Basel, Rotterdam and Stockholm Conventions, United Nations Environment Programme, Geneva
[87] Glüge J, Wang Z, Bogdal C, Scheringer M, Hungerbühler, K. 2016. Global production, use, and emission volumes of short-chain chlorinated paraffins – A minimum scenario Science of The Total Environment, 573, 15, 1132-1146

tonnes (Figure 16). Further assessment is needed to clarify the share of CPs and in particular, of SCCPs in the plasticizer imports.

Large amount of chemicals are also imported under category 382490 “Chemical products and preparations of the chemical or allied industries, not elsewhere specified or included” with a total amount of more than 80,000 tonnes from 2006 to 2016 (Figure 17). In recent years, more than 10,000 tonnes per year are imported under this non-specified category. While the share of chlorinated paraffins imported under this category is unknown, such a high amount of unknown chemicals being imported to Kuwait is definitely an area of concern.

Table 10. HS codes which are normally used for import of chlorinated paraffins potentially including SCCP

HS Codes	Classification
382490	Chemical products and preparations of the chemical or allied industries, not elsewhere specified or included
271220	Paraffin wax; containing by weight less than 0.75% of oil, obtained by synthesis or by other processes, whether or not coloured
271290	Paraffin wax; containing by weight 0.75% or more of oil, obtained by synthesis or by other processes, whether or not coloured
381220	Plasticisers, compound; for rubber or plastics

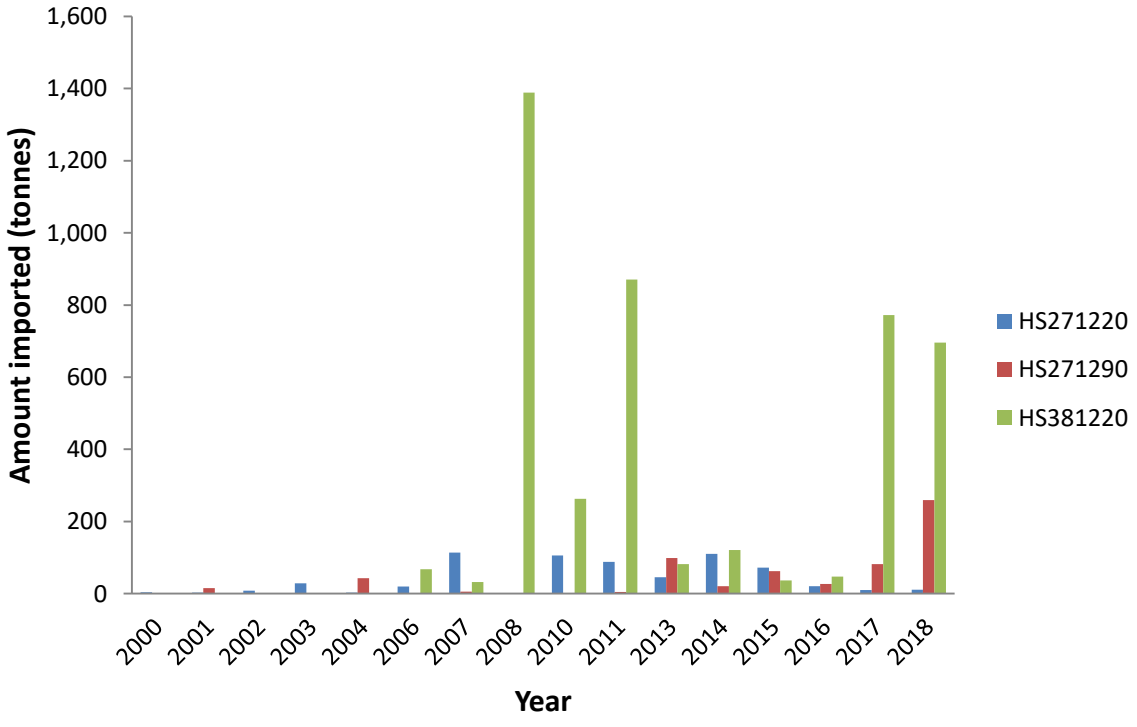

Figure 16. Import of chemicals to Kuwait under HS codes which potentially contain SCCPs or other chlorinated paraffins contaminated with SCCPs (UN Comtrade Database)

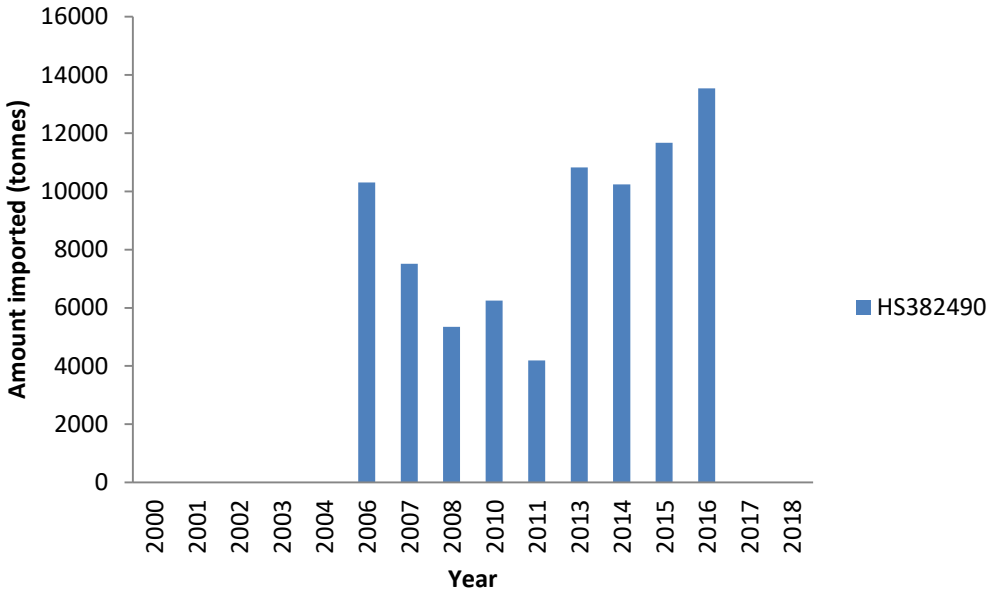

Figure 17. Import of chemicals to Kuwait under HS code 382490 "Chemical products and preparations of the chemical or allied industries, not elsewhere specified or included" (UN Comtrade Database)

China and India are the largest producers of chlorinated paraffins. For India some export data of chlorinated paraffins to Kuwait are available (Figure 18). In 2016, chlorinated paraffins for US$75,000 were imported to Kuwait. Considering a price between US$500 and 1000/tonne, the total amount would be 75 to 150 tonnes of chlorinated paraffin import alone. Considering that the average SCCP share in total CP production is approximately 16%, the amount of imported SCCP as chemical might be 12 to 25 tonnes in these imports. Since by far the largest producer is China, the total import could be considerably higher.

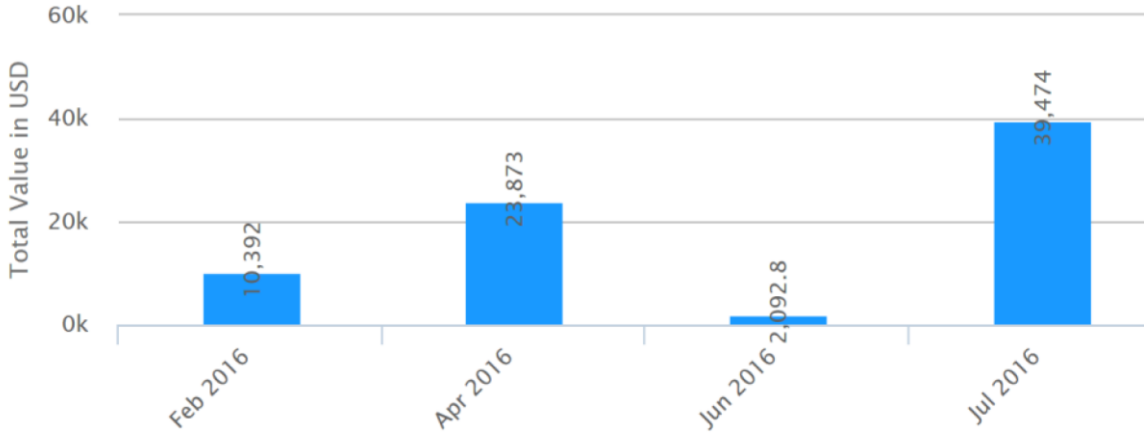

Figure 18. Import of chlorinated paraffins as chemicals to Kuwait from India in 2016 (source: Infodrive India https://www.infodriveindia.com/)

B) Import of chlorinated paraffins in soft PVC

The current largest use of chlorinated paraffins is likely PVC, in particular, soft PVC containing a high share of plasticisers. In the last decade plasticisers like phthalates have partly been substituted by chlorinated paraffins. The specific exemptions for SCCPs include secondary plasticizers in flexible PVC, except in toys and products for children, where the use is not allowed.[86]

SCCPs or CP mixtures containing SCCPs are used mainly as secondary plasticizers. The primary plasticizers are generally phthalates or phosphate esters. Primary plasticizers in PVC are used to increase the elongation properties and softness of the polymer. Secondary plasticizers, when used in combination with primary plasticizers, cause an enhancement of the plasticizing effect, and so are also known as extenders.[86]

Large and increasing amounts of PVC are imported to Kuwait over time (Figure 19 and Figure 21). The assessment of the import volumes of plasticized PVC which possibly could contain SCCPs as secondary plasticizer were compiled from import data by selected HS codes of PVC which likely include plasticisers (Table 11). These include, e.g., plates, sheets, film, foil, and strip plasticised with >6% plasticizer; plasticized PVC in primary forms. The import volumes of PVC containing plasticizers are increasing over time (Figure 21). From 2006 to 2018, the highest import volumes were floor, wall, or ceiling coverings of PVC in rolls or in the form of tiles. The amount of plates, sheets, film, foil, and strip with high content of plasticiser (≥6%; HS 392043) imported from 2006 to 2018 were 23,000 tonnes, and therefore, slightly less compared to the same products with <6% plasticizer (25,000 tonnes; HS392049) (Figure 20).

Table 11. HS codes of PVC imported to Kuwait containing plasticizer and possibly SCCPs

HS Codes	Description
(3904)	(Polymers of vinyl chloride or of other halogenated olefins, in primary forms)
390422	Vinyl chloride, other halogenated olefin polymers; plasticised poly(vinyl chloride), in primary forms, mixed with other substances
391530	Vinyl chloride polymers; waste, parings, and scrap
391810	Floor, wall or ceiling coverings; of polymers of vinyl chloride, whether or not self-adhesive, in rolls or in the form of tiles
392043	Plastics; polymers of vinyl chloride, containing, by weight not less than 6% of plasticisers; plates, sheets, film, foil, and strip (not self-adhesive), non-cellular and not reinforced, laminated, supported, or similarly combined with other materials
392049	Plastics; polymers of vinyl chloride, containing, by weight, less than 6% of plasticisers; plates, sheets, film, foil, and strip (not self-adhesive), non-cellular and not reinforced, laminated, supported, or similarly combined with other materials
392112	Plastics; plates, sheets, film, foil and strip, of polymers of vinyl chloride, cellular

Source: https://www.foreign-trade.com/reference/hscode.htm?code=3904

Currently, it is unknown up to what extent individual PVC formulations and products contain SCCPs. This needs to be assessed by monitoring studies. The necessary capacity is currently established. The challenge will be in the future as to how to separate PVC containing SCCPs and other problematic additives like lead, cadmium, and softeners which are already restricted under some regulatory frames (e.g., European Union has restricted Di(2-ethylhexyl)phthalate (DEHP) and three other phthalates in consumer products)[88].

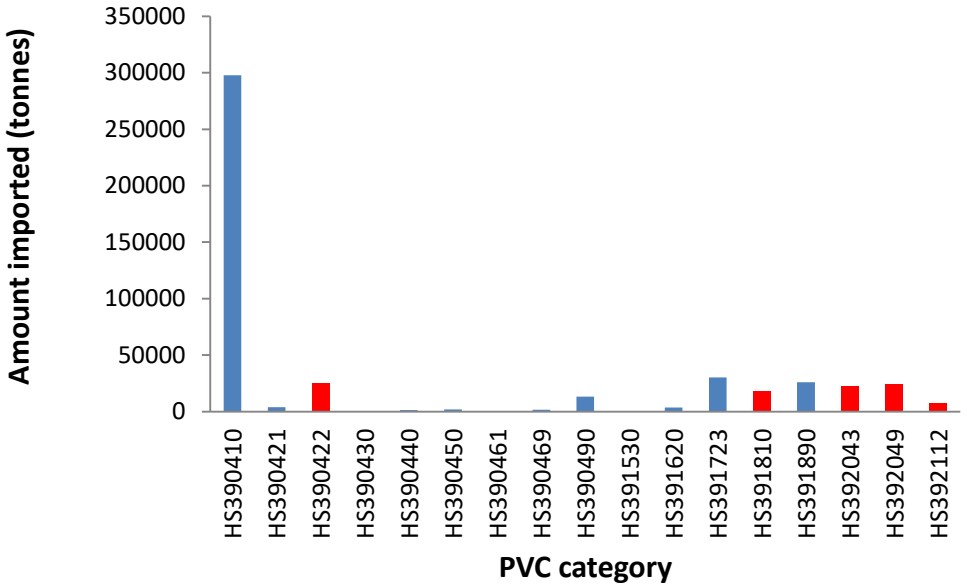

Figure 19. Categories of PVC imported to Kuwait 2006 to 2018 (the red marked categories contain or likely contain softeners or plasticizers

[88] The European Commission has adopted a Decision to amend the REACH Regulation and restrict the use of the phthalates, Di(2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP) and Diisobutyl phthalate (DIBP) in consumer products on the EU market. The restriction, will take effect from 8 July 2020.

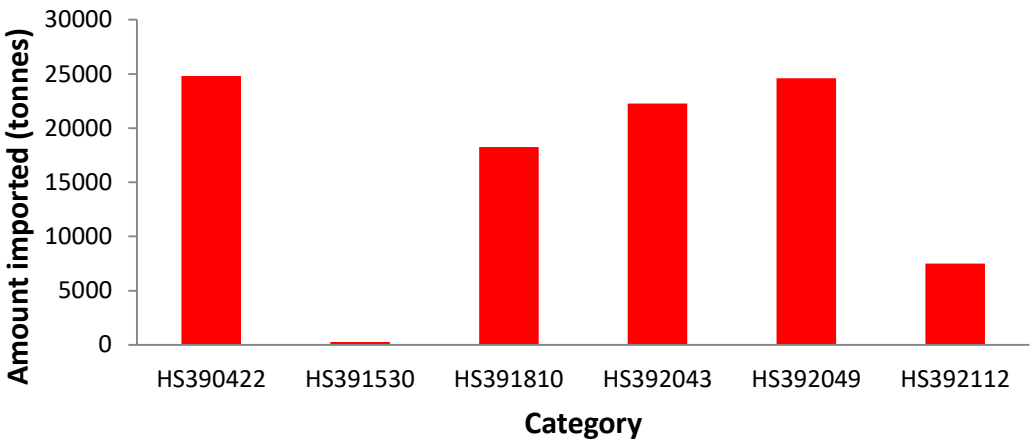

Figure 20. Amount of each HS category of imported PVC (2006 to 2018) that contains or likely contains plasticizers

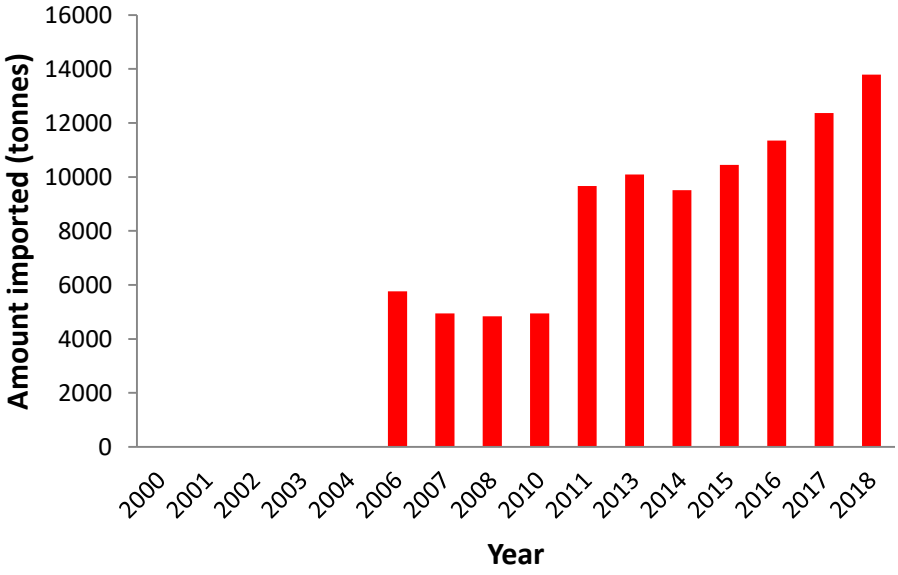

Figure 21. Trends of import of selected PVC (HS390422, HS391530, HS391810, HS392043, HS392049, HS392112, likely containing softeners/plasticizers) from 2006 to 2018.

C) Import of rubber potentially containing plasticisers and other additives

SCCPs and other CPs potentially containing SCCPs have also been used and are still being used in a wide range of rubber production as flame retardants and/or plasticizers. In the SC frame, SCCPs are exempted as additives in the production of transmission belts in the natural and synthetic rubber industry; also, spare parts of rubber conveyor belts in the mining and forestry industries. The Stockholm inventory guidance recommends an overall assessment of the use of SCCPs and other CPs containing >1% SCCPs in rubber production and rubber products, since companies might have difficulties to distinguish exempted and non-exempted uses in the rubber industry.[86]

The use of SCCPs and other flame retardants in rubber applications depends on the individual uses and the related safety and in particular, flammability standards. Applications where rubber compounds might be flame retarded with different SCCP content include, e.g., the following:

- Rubber conveyor belts
- Rubber transmission belts
- Rubber in sealants in housing
- Rubber applications in the transport sector (cars, busses, trains, airplanes)
- Rubber cables
- Industrial rubber rollers

SCCPs have also been used in rubber hose, industrial sheeting, and shoe soles with different SCCP content.

A wide range of rubber products are imported to Kuwait under different HS codes (Table 12). In addition to conveyor or transmission belts or belting (HS4010), rubber tubes, pipes and hoses, of vulcanised rubber (other than hard rubber) (HS4009); articles of apparel and clothing accessories (including gloves, mittens, and mitts); for all purposes, of vulcanised rubber (HS4015) and other articles of vulcanised rubber, other than hard rubber (HS4016) were imported between 2000 and 2017 in volumes of 5759 tonnes, 23,786 tonnes, 16,373 tonnes and 54,800 tonnes, respectively (Figure 22). Also, about 4115 tonnes of HS category 4004 “waste, parings, and scrap of rubber (other than hard rubber) and powders and granules obtained therefrom” were imported to Kuwait between 2000 to 2018 and might have contained some CPs. CPs were even found in granulates from rubber tyres at low concentration[89]. The imports of rubber which potentially contains CPs have increased since 2003 and since 2008 is around 10,000 t/year (Figure 23).

Table 12. HS codes of rubber imported to Kuwait. The bold marked categories containing plasticizer and possibly SCCPs

HS Code	Classification of rubber
4001	Natural rubber, balata, gutta-percha, guayule, chicle and similar gums; in primary forms or in plates, sheets or strip
4002	Synthetic rubber and factice derived from oils, in primary forms or in plates, sheets or strip; mixtures of heading no. 4001 and 4002, in primary forms or in plates, sheets or strip
4003	Reclaimed rubber in primary forms or in plates, sheets or strip
4004	**Waste, parings and scrap of rubber (other than hard rubber) and powders and granules obtained therefrom**
4005	Compounded rubber, unvulcanised, in primary forms or in plates, sheets or strip
4006	Unvulcanised rubber in other forms (e.g. rods, tubes and profile shapes) and articles
4007	**Vulcanised rubber thread and cord**
4008	**Plates, sheets, strip, rods and profile shapes, of vulcanised rubber other than hard rubber**

[89] Brandsma SH, Brits M, et al. (2019) Chlorinated Paraffins in Car Tires Recycled to Rubber Granulates and Playground Tiles. Environ Sci Technol.; 53(13), 7595–7603.

4009	**Tubes, pipes and hoses, of vulcanised rubber (other than hard rubber), with or without their fittings (e.g. joints, elbows, flanges)**
4010	**Conveyor or transmission belts or belting, of vulcanised rubber**
4011	New pneumatic tyres, of rubber
4012	Retreated or used pneumatic tyres of rubber; solid or cushion tyres, tyre treads and tyre flaps
4013	Inner tubes, of rubber
4014	Hygienic or pharmaceutical articles (including teats), of vulcanised rubber other than hard rubber, with or without fittings of hard rubber
4015	**Articles of apparel and clothing accessories (including gloves, mittens and mitts), for all purposes, of vulcanised rubber other than hard rubber**
4016	**Articles of vulcanised rubber other than hard rubber**
4017	Hard rubber (e.g. ebonite) in all forms, including waste and scrap; articles of hard rubber

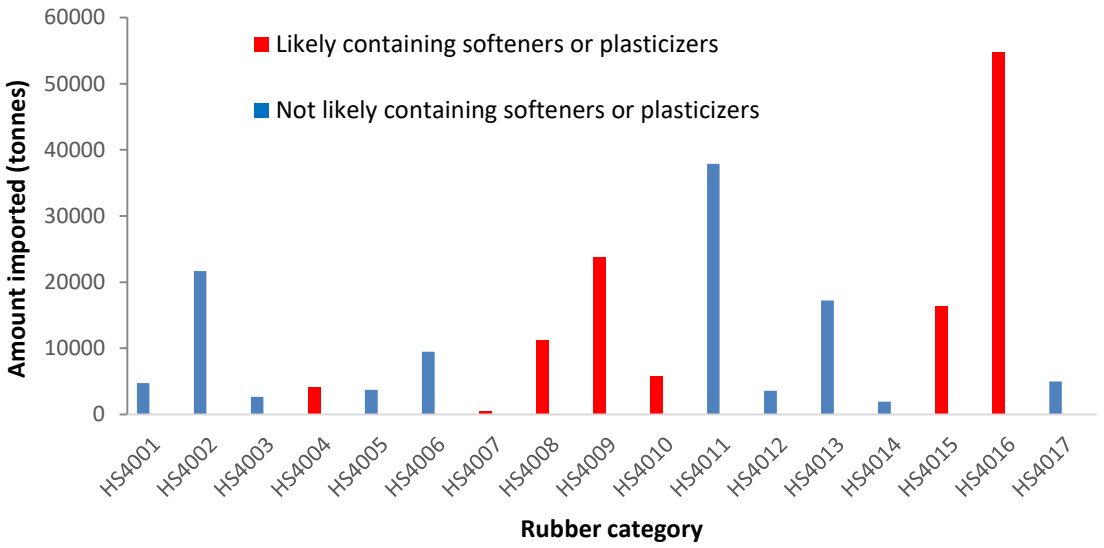

Figure 22. Amount of rubber in HS import categories into Kuwait that likely contains softeners or plasticizers potentially containing CPs (red) and rubber that likely does not contain CPs (blue) from 2000 to 2018.

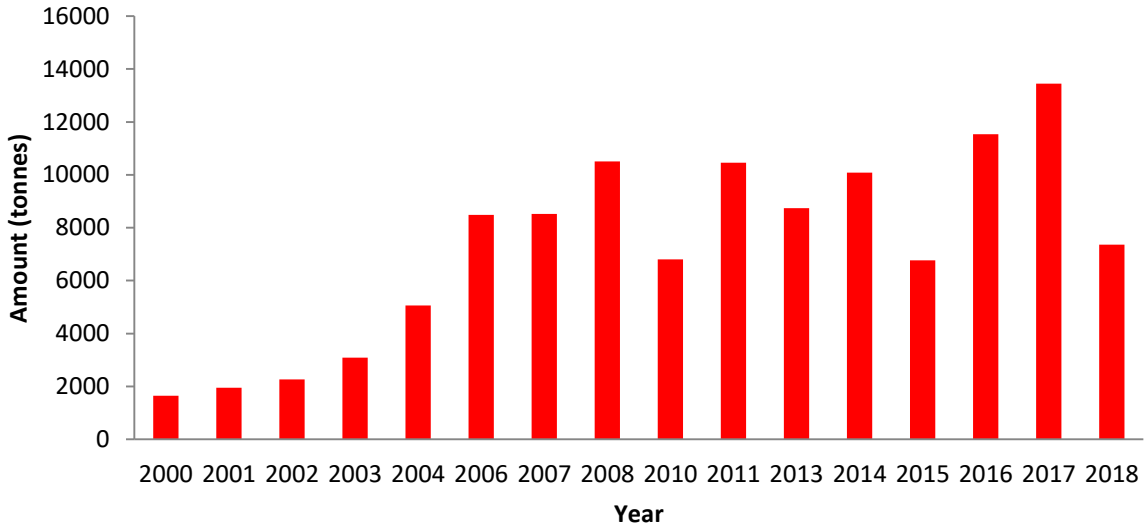

Figure 23. Trends in import of selected rubber product categories into Kuwait (2000−2018) that likely contain additives and possibly contain CPs such as SCCPs.

D) Import of chlorinated paraffins in paints and coatings

SCCPs or other CPs containing SCCPs are used as plasticizers and flame-retarding agents in paints and coatings. The paints are used mainly in industrial/specialized applications such as marine primer paints and fire-retardant paints, road marking paints, anti-corrosive coatings for metal surfaces, swimming pool coatings, and decorative paints for internal and external surfaces.

Waterproofing and fire-retardant paints are listed in the SC as exemptions for SCCP use.

The main types of paints that are likely to contain chlorinated paraffins are those based on chlorinated rubber, vinyl copolymers and acrylic-based coatings.[90] SCCPs may also be used in cross-linkable polyester systems for the production of long-term road markings.[91] Chlorinated rubber-based paints are typically used in aggressive environments such as marine or industrial applications or liquid manure pits. Vinyl copolymer-based paints are used mainly for exterior masonry.

While only waterproofing and fire-retardant paints are listed as exemptions, other manufacturers of paints might not be aware of this and use SCCPs or other CPs containing >1% SCCPs. Therefore, productions of all paints and coatings potentially using these CP mixtures should be assessed for the use of SCCPs and CPs containing >1% of SCCPs[86] (

Figure 24 and Figure **25**).

[90] ECHA (2008) Data on manufacture, import, export, uses and releases of alkanes, C10-13, chloro (SCCPs) as well as information on potential alternatives to its use. Technical report, European Chemicals Agency.
[91] RPA (Risk & Policy Analysts Limited) (2010) Evaluation of Possible Restrictions on Short Chain Chlorinated Paraffins (SCCPs). Final Report, Non-Confidential Version prepared for National Institute for Public Health and the Environment (RIVM) The Netherlands July 2010.

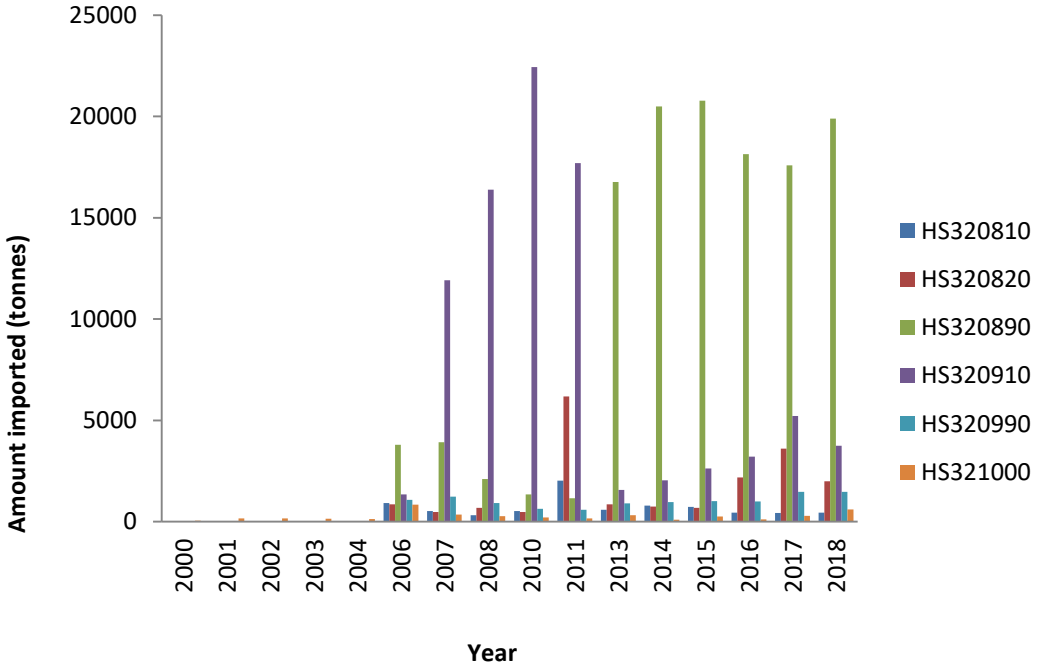

Figure 24. Time trend of import of paints and vanishes categories into Kuwait (2006-2018) that possibly contain CPs such as SCCPs as solvents and plasticizers.

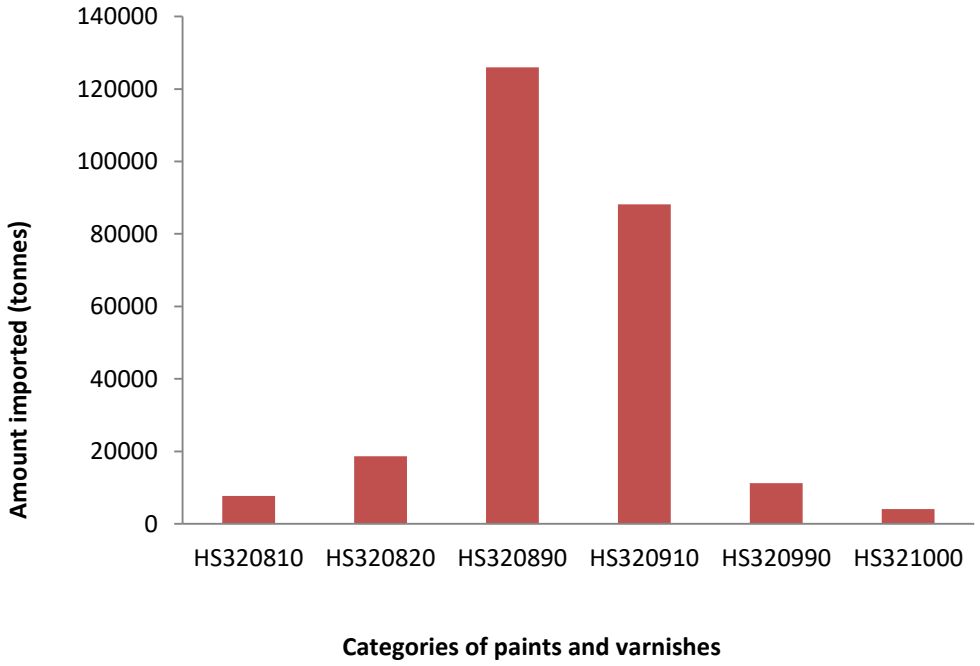

Figure 25. Import categories of paints and vanishes into Kuwait (2006−2018) that possibly contain CPs such as SCCPs as solvents and plasticizers.

E) Imports of chlorinated paraffins in other products

There are other products imported to Kuwait potentially containing SCCPs or other CPs with SCCPs above 1%. Some uses of SCCPs are in the production process and not in the products. This includes the use of SCCPs or CPs containing SCCPs in metal working fluids and the use as lubricants in a wide range of applications which can be a major use. Metal working fluids and lubricants are listed as exemptions in the Convention. There is also a specific exemption for use of SCCPs in the leather industry, in particular fatliquoring in leather.

Also adhesives and sealants used in the construction sector can contain SCCPs and adhesives are exempted for use. For these products, imports also need to be assessed.

Often, consumer products are made from flexible PVC containing a high percentage of plasticizers such as electrical cable sheathing, in plumbing, imitation leather, phonograph records, inflatable products, or outdoor decoration bulbs. These products are normally not imported under PVC HS categories, but in the consumer's product categories.

The European Union has created a rapid alert system for dangerous non-food products (RAPEX). RAPEX gives quick information on measures such as recall of products. A range of products were notified through the RAPEX system in the past years, because SCCP concentrations exceeded the regulatory limit of 1500 mg SCCP/kg. These included, for example, plastic toys, beauty cases, exercise mats, stickers for wall decoration, and cables (see Annex in the Stockholm Convention inventory guidance for SCCPs)[86].

2.3.6.4. Inventory of SCCPs in current use and stock

In this first NIP, the amount of SCCPs in current use could not be assessed. However, the imports of products possibly containing SCCPs or CPs contaminated with SCCPs were compiled giving a good idea, as to what product groups in use, are likely relevant for Kuwait (see section 2.3.6.3).

Many of these products have a long service life, like PVC products in construction or sealants and paints. For these products, the amounts of imports in the last 15 years have given an indication on the possible main categories of SCCP-containing products in use. However, the share of SCCP-contaminated products in the individual use categories swhould be clarified by practical monitoring.

Other products like metal working fluids and lubricants have a rather short service life of only a few days to weeks. Often, they are completely released into the environment or working environment. Also, here the individual use needs to be assessed by measurements to clarify if products contain SCCPs.

The types of products which have been found contaminated with SCCPs in the European and Japanese market, include the following (see Annex 1 Stockholm SCCP inventory guidance)[86]:

- Toys like plastic doll, toy doctor set (stethoscope), bouncy toy, stickers for children, rubber knife, toilet seat for children;
- Sports equipment: Beach ball, baseball glove, Fitness gloves, Abs trainer, Yoga mats, all-purpose mat;
- Artificial leather (PVC) wallet, handbags, mobile phone bag, brush case black, toiletry bag, wallet case for smartphones;

- Cables in motor vehicle sidelight, USB-cord, digital thermometer cable, extension lead, kettle cable, game controller (cable), electric kettle (cord), lighting chain (cord);
- Baking ovens and kitchen blenders;
- Other plastic/polymers like steering wheel cover, selfie stick, mobile phone case, rain cover for pushchair, cloche cover, garden equipment; and
- Further products (see Annex 1).

Such product categories and products are available in shops.

2.3.6.5. End-of-life management

Currently, there is no POPs destruction capacity in Kuwait. Therefore, the end-of-life management of these POPs-containing polymers need to be assessed and possibly modified.

Products which contain SCCPs are, to a large extent, disposed to landfills (e.g., consumer products and polymers in construction and demolition waste). Some SCCP-containing products might be recycled such as oils/lubricants, rubber, or PVC. In particular, these product categories need to be assessed, and detailed investigations of material and substance flows of CPs should be conducted.

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

2.3.7.1. General

Dichlorodiphenyltrichloroethane (DDT) was one of the most prominent POPs pesticides in the past and has been produced and used since 1939.

DDT is currently listed in Annex B to the SC with its production and/or use restricted to disease vector control purposes in accordance with related World Health Organization (WHO) recommendations and guidelines. Countries that are party to the Convention can produce and/or use DDT for disease vector control when locally safe, effective, and affordable alternatives are not available.

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. The impacts of DDT on the environment and human health were revealed and popularized in the book “Silent Spring” by Rachel Carson.[92]

In some countries, DDT is used in response to the development of resistance in malaria vectors against pyrethroid and carbamate insecticides. Available data on global production of DDT showed a 32% decline over the reporting period, from 5144 to 3491 tonnes of active ingredient p.a. Similarly, global use of DDT, for control of malaria and leishmaniasis, showed a 30% decline over the period 2001–2014, from 5388 tonnes p.a. to 3772 tonnes.[93]

[92] Carson, Rachel (1962). Silent spring. Boston : Houghton Mifflin ; Cambridge, Mass. : Riverside Press.
[93] van den Berg, H., Manuweera, G, Konradsen, F. (2017) Global trends in the production and use of DDT for control of malaria and other vector-borne diseases. Malar J 16, 401.

2.3.7.2. Import

DDT is banned in Kuwait and has not been imported since the last 20 years.

2.3.7.3. Use

There is no current use of DDT.

DDT has been used in the past and are still being detected in the air monitoring in Kuwait, although, at low levels (Figure 15).[94] No import data on pesticides are available prior to the year 1995 at the time DDT was used.

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

2.3.8.1. General

Per- and polyfluoroalkyl substances (PFASs) are a large group of more than 4500 fluorinated compounds[95], including oligomers and polymers, which consist of neutral and anionic, often surface-active compounds with high thermal, chemical, and biological stability and 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 are not readily biodegradable and therefore persistent in the environment (P), and many of them accumulate in living organisms (bio-accumulating, B) and have different levels and different types of toxicity (T). There is a lack of overall knowledge of PFAS. To prevent further pre-existing health and environmental hazards from building up and persisting for a long time, it is important to control and where necessary to eliminate the use of these substances[96]. Therefore, PFASs have been listed as an issue of concern under the Strategic Approach of International Chemical Management (SAICM). Recently, scientists have requested to treat all PFAS as a group.[97,98]

[94] Gevao B, Porcelli M, Rajagopalan S., et al. (2018). Spatial and temporal variations in the atmospheric concentrations of "Stockholm Convention" organochlorine pesticides in Kuwait. Sci. Total Environ, 622-623, 1621–1629

[95] OECD (2018) Towards a new comprehensive global database of Per- and Polyfluoroalkyl Substances

[96] Blum A, Balan SA, Scheringer M, Trier X, Goldenman G, Cousins IT, Diamond M, Fletcher T, Higgins C, Lindeman AE, Peaslee G, de Voogt P, Wang Z, Weber R (2015) The Madrid Statement on Poly- and Perfluoroalkyl Substances (PFASs). Environ Health Perspect 1235 A107–A111.

[97] Cousins I, DeWitt JC, Glüge J et al. (2020) Strategies for grouping per- and polyfluoroalkyl substances (PFAS) to protect human and environmental healthEnviron Sci Process Impacts 22, 1444, DOI: 10.1039/d0em00147c.

[98] Cousins I, DeWitt JC, Lohmann R, Glüge J., et al. (2020, August 17). The High Persistence of PFAS is Sufficient for their Management as a Chemical Class. https://doi.org/10.31224/osf.io/exszc.

Perfluorooctanesulfonate (PFOS) is one of the most relevant and toxic PFAS detected in wildlife and humans worldwide and has been associated with adverse health effects.[99,100,101] PFOS, its salts and PFOSF were listed in Annex B of the Convention in 2009 with a range of specific exemptions and acceptable purposes. The PFOS-related substances (precursors) are restricted through the listing of PFOSF, the basic material for their manufacture.[102]

In 2019, perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds have been listed in the SC in Annex A with a range of exemptions. Additionally, perfluorohexanesulfonic acid (PFHxS) has been assessed by the POPs Review Committee (POPRC) and has been recommended for listing.

In this NIP, only PFOS has been assessed, since PFOA has only been listed from 2017, and no guidance documents have been established as yet.

2.3.8.2. Inventory of PFOS in firefighting foams

PFOS was the major active ingredient in firefighting foams until 2009.The firefighting foams currently imported into Kuwait are not allowed to contain PFOS or PFOA.

2.3.8.3. Chromium plating and other plating

PFOS was and is still being used in the plating industry, and several countries have asked for exemption including the EU. In Kuwait, chrome plating industry exists. However, an assessment of the plating industries revealed that they are not using PFOS.

2.3.8.4. Synthetic carpets, textiles, leather, paper

PFOS-related substances have been used in large quantities as stain repellent for textiles, apparel, home furnishing and upholstery until 3M stopped sale in 2002.[103] In Kuwait, synthetic carpets (tufted carpets) are used as decorative floor coverings in private housing, hotels and offices. There might still be some synthetic carpets in use which have been produced before 2002; but, the major share of these carpets has likely been disposed to landfills.

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[99] Kallenborn R, et al. (2004) Perfluorinated alkylated substances (PFAS) in the Nordic environment. TemaNord 2004:552.

[100] Giesy, J. P.; Kannan, K. Global Distribution of Perfluorooctane Sulfonate in Wildlife. Environ. Sci. Technol. 2001, 35 (7), 1339–1342.

[101] Harada K, et al. (2004) The influence of time, sex and geographic factors on levels of perfluorooctane sulfonate and perfluorooctanoate in human serum over the last 25 years. J Occup Health, 46(2):141-147.

[102] UNEP (2017) Revised draft guidance for the inventory of perfluorooctane sulfonic acid and related chemicals listed under the Stockholm Convention. UNEP/POPS/COP.7/INF/26

[103] UNEP (2017) Revised draft guidance for the inventory of perfluorooctane sulfonic acid and related chemicals listed under the Stockholm Convention. UNEP/POPS/COP.7/INF/26

Synthetic carpets currently produced are treated with other shorter chain PFASs or do not contain PFAS. The amounts of carpet containing PFOS or PFOA or other PFASs could not be assessed in this first national PFOS/PFOA inventory.

PFOS-treated textiles, furniture, and paper have shorter life cycle compared to carpets. The PFOS-treated textiles and papers that were produced before 2002 have largely reached their end of life and have been disposed in landfills and dumpsites where there is a risk of environmental release. Paper and textiles are partly recycled prolonging the service life. The total historic use of PFOS in these applications and the amount which has ended in landfills cannot be estimated in this first inventory.

2.3.8.5. Oil drilling

PFOS was used in oil drilling operations which was exempted until recently. Kuwait, as a major oil producing country most likely had used PFOS in oil drilling and oil storing activities in the past. The approximately detected 700 fires in oil wells, storage tanks, and refineries in Kuwait in 1991 during the Gulf War[104] were extinguished by privately contracted crews at a total cost of US$1.5 billion to Kuwait.[105] For these activities most likely or rather certainly, PFOS containing firefighting foams have been used in a large scale. These areas and the larger surrounding are likely contaminated by PFOS and other PFAS; and as such, environmental assessment in these areas should include PFOS/PFAS monitoring.

2.3.8.6. Sulfluramide insecticide against leaf cutting ants

The PFOS-related substance, sulfluramid, having for its acceptable purpose, the use as insecticide against leaf cutting ants is not registered and is not being used in Kuwait.

2.3.9. Assessment of releases of unintentional produced chemicals (Annex C)

2.3.9.1. General

Polychlorinated dibenz*o*-*p*-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), together with polychlorinated biphenyls (PCBs), hexachlorobenzene (HCB), pentachlorobenzene (PeCB), hexachlorobutadiene (HCBD), and polychlorinated naphthalenes (PCNs) are listed in Annex C of the SC as unintentionally-produced POPs (UPOPs) often also called “by-products”. PCBs, PCNs, HCB, and PeCB have also been industrially produced and used in several applications. PCDD/Fs were not produced commercially,[106,] and they have no known use.

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

Three releases are process-related and are the following:

[104] US EPA (1991) United States Gulf Environmental Technical Assistance from January 27 – July 31, 1991.. Report to Congress.

[105] Husain, T. (1995). Kuwaiti Oil Fires: Regional Environmental Perspectives. Oxford: BPC Wheatons Ltd. p. 68.

[106] With the exception of analytical standards.

- Chemical production processes – for example, 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; use of chlorine in industrial process like the production of magnesium or titanium oxide using elemental chlorine, pulp, and paper using elemental chlorine for chemical bleaching;
- 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.[107]

Meanwhile, the fourth, and probably by far the largest source, is related to historic formation and releases of PCDD/Fs and other UPOPs[108]:

- Reservoir sources, such as the following:
    - Historic landfills and dumps of PCDD/Fs and other UPOPs- containing wastes, stem largely from chlorine and organochlorine production. Historic inventories revealed that they have exceeded by far the documented releases from contemporary sources[108].
    - Also, soils and sediments - which have accumulated PCDD/Fs and other (U)POPs over the last 100 years from production and 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 relevant sources of food contamination (e.g., fishes, chicken/egg, grazing cattle, and milk and dairy products).[109]

2.3.9.2. Stockholm Convention's obligation with respect to 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,

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

[108] For an overview see 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. Also the UNEP toolkit chapter on contaminated sites http://toolkit.pops.int/Publish/Main/II_10_HotSpots.html

[109] 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://rdcu.be/bax79

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)).

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.

2.3.9.3. Inventory of PCDD/Fs and other unintentionally-produced POPs

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/)[110] was used in developing the inventory for PCDD/Fs.

In incineration and other thermal processes, PCDD/Fs and the other listed unintentional-POPs (PCBs, PCNs, HCBD, HCB, and PeCB) are formed together. The 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.[110] They are considered to constitute a sufficient basis for identifying and prioritizing sources of all such substances, as well as for devising applicable control measures for all Annex C POPs and for evaluating their efficacy. Therefore, the inventory of PCDD/Fs can be seen as representative for the other UPOPs for most

[110] UNEP (2013) 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.

processes. The sources where specific UPOPs are formed and are not covered by the PCDD/F inventory (e.g., production of specific pigments or specific pesticides and degradation products), are specifically mentioned and addressed.

For the UPOPs, in particular PCDD/Fs inventory, major source groups listed in the UNEP toolkit (waste incineration, metal industry, power generation, mineral production, transport, open burning, chemical and consumer goods, disposal, and hot spots (including the major source categories identified in Annex C of the SC)) were assessed for selecting appropriate emission factors and gathering the activity rates in Kuwait to calculate the PCDD/F release for 2018[111]. e total release from the majr source groups were 46.0 g TEQ/a for 2018 (Table 13).

The summary (Table 13) gives an overview of the releases from the source groups and release vectors. The individual release estimates for the different source groups are compiled in the following including selected emission factors and calculation.

Source Group Incineration

Four hospital waste incinerators were operated in Kuwait in 2018; while currently, only 3 are being operated. The total waste incinerated in 2018 was 7011 tonnes. The incinerators have air pollution control and are often operated 24 hours per day. However, they have at least weekly start-up and shut down. Therefore they are categorised in category 3 “Controlled combustion and good Air Pollution Control System (APCS)” with emission factors of 525 µg TEQ/tonne to air and 920 µg TEQ/tonne to residue and a total release of 3.68 g TEQ to air and 6.45 g TEQ to residues. Monitoring of one of the hospital waste incinerators has been started. As soon as robust monitoring results will be available, these data can be added for an update.

There is yet no municipal waste incineration in Kuwait. However, according to the Kuwait Authority For Partnership Projects (KAPP), there is a plan to build a municipal waste incinerator.[112] This will be considered after construction and start of operation.

Source Group Metal industry

Kuwait has a state-of-the-art steel production and has increased the steel production capacity from 500,000 tonnes (2010) to 1,150,000 tonnes (2016), and in 2018 to 1,300,000 tonnes[113]. Of this amount, 100,000 tonnes were scrap input, in particular end-of-life vehicles. For this scrap, the UNEP toolkit category Class 2 for iron and steel plants is considered with an emission factor of 3 µg TEQ/tonne to air and 15 µg TEQ/tonne to residues resulting in an emission of 0.3 g TEQ/year to air and 1.5 g TEQ/year to residues. For the remaining 1,200,000 tonnes of steel, the UNEP toolkit category Class 3 for iron and steel plants is considered with an emission factor of 0.1 µg

[111] For some sources only activity rates of 2017 or earlier were available and were used and indicated in the text.
[112] KAPP (2020) Municipal Solid Waste Treatment Facility – Kabd Location. http://www.kapp.gov.kw/en/Municipal-Solid-Waste-Treatment-Facility-%E2%80%93-Kabd-Location
[113] The production for 2020 increased to 2,510,950 t but was not considered in this inventory focusing on 2018.

TEQ/tonne to air and 0.1 µg TEQ/tonne to residues resulting in an emission of 0.12 g TEQ to air and 0.12 g TEQ to residues.

Therefore, the total release from metal industry is estimated at 0.295 g TEQ/yr to air and 1.04 g TEQ/yr to residue.

Source Group Power Generation

The main sources for power generation in Kuwait are oil and gas with an increasing amount of renewable energy in recent years. In 2017, 15,540,000 tonne oil equivalent and 18,487,000 tonne natural gas oil equivalent were used for power generation in Kuwait.[114] This translates to 650,628.7 Terajoule (TJ) and 774,013.7 TJ, respectively. Considering the emission factors from UNEP toolkit of 2.5 µg TEQ/TJ and 0.5 µg TEQ/TJ the emission to air s estimated to 1.63 g TEQ/yr and 0.387 g TEQ/yr, respectively.

Source Group Mineral Industry

Kuwait has three integrated cement plants. The production capacity increased from 2,200,000 tonnes in 2012 to 4,200,000 tonnes in 2016 and 5,049,000 tonnes in 2018. The kilns are dry kilns with the lowest emission factors (0.05 µg TEQ/tonne). The yearly emissions for 5,049,000 tonnes are therefore estimated at 0.25 g TEQ/yr.

Kuwait also has a lime production. The production volume was 100,000 tonnes. With a toolkit emission factor for good dust abatement (0.07 µg TEQ/tonne) the yearly emission is estimated at 0.007 g TEQ/yr.

The total brick production for 2018 was 150,500 tonnes. The classification was category 2 (0.02 µg TEQ/tonne) with an estimated PCDD/F emission of 0.003 g TEQ/yr.

The total glass production in Kuwait was 109,500 tonnes for 2018. No dust abatement, but induced/forced draft fan is used; therefore, the facility was categorised in category 1 (0.2 µg TEQ/tonne) with an estimated PCDD/F emission of 0.022 g TEQ/yr.

Source Group Transport

The gasoline consumption of Kuwait in 2018 was 71,460 barrels per day. The total consumption of gasoline per year was therefore 3,151,858 tonnes gasoline. Considering the UNEP emission factor for 4-stroke engines with unleaded gasoline with catalyst 0.001 µg TEQ/tonne, the total release was 0.0031 g TEQ/yr.

Source Group Open Burning

Most of the landfill sites have been closed for more than 20 years. These sites include Sulaibiyah, Kabed, Al-Qurain, Shuaiba, Jleeb Al Shuyoukh, West Yarmouk, Al Wafra among others. Only three landfills, namely Mina Abdullah, South of the Seventh Ring Road, and Al-Jahra are being

[114] International Energy Agency (2020) Total primary energy supply (TPES) by source, Kuwait 1990-2017, https://www.iea.org/countries/Kuwait

operated for municipal waste and industrial or mixed waste.[115] There are some fire events in particular in the summer time due to the high temperature (exceeding 50°C). The total amount of waste that has been disposed to landfills in 2018 was 2,735,458 tonnes. It was estimated by expert judgement, that over a year approximately 2% of waste is catching fire and burnt on the landfills, resulting in 54,709 tonnes burnt waste per year with a release of 16.4 g TEQ/yr to air and 0.55 g TEQ to land/residues and therefore, totalling 17 g TEQ/yr.

In addition, agricultural residues are also burnt after harvest or other wastes on farms in Kuwait. In total, approximately 1495 farms exist[116] and considering that an average farm is burning 500 kg waste/year, the total amount of agricultural waste burnt would be 750 tonnes/year with an emission of 0.023 g TEQ/yr to air and 0.008 TEQ/yr to land/residues.

Source Group Production and Use of Chemicals and Consumer Goods

Kuwait has a modern paper production with a production capacity of 55,000 tonnes/yr and tissues paper 14,000 tonnes/yr tissue. With an UNEP toolkit factor of 0.1 µg TEQ/tonne, the total emission to product can be estimated at 0.007 g TEQ/year.

Kuwait has chlorine (chloralkali) production since 1964. Today the company uses membrane technology which has a low UPOPs formation potential. The UNEP toolkit does not contain an emission factor for this technology. Analysis of releases from this facility might be conducted in the NIP implementation.

In this first UPOP inventory, individual imported chemicals containing PCDD/PCDFs could not be assessed; but however, will be evaluated during the implementation of the NIP.

From petroleum production and refining, there are 3 sources for PCDD/F release as follows: a) Flaring of gases; b) catalytic reforming; and c) coking.

In 2016, Kuwait had a natural gas production of 1,737 million standard cubic feet per day (MMSCFD) with 1.31% flaring which converts into 6690 TJ/yr with a total release of 0.002 g TEQ/yr.

Kuwait's nameplate refining capacity from its two refinery complexes, Mina al-Ahmadi and Mina Abdullah, was 736,000 b/d in 2018.[117] This translates to 35,879,558 tonnes oil/year (considering a density 0.84 kg/l). Considering the UNEP toolkit emission factor of 0.02 µg TEQ/tonne oil, the yearly emission to air is estimated at 0.72 g TEQ/year. In addition, PCDD/Fs are released in residues which could not be estimated in this first inventory, but however, will be requiring further assessment.

It should be mentioned that the Al Zour refinery is under construction and is expected to be completed by 2020, producing a nameplate capacity of 615,000 b/d.

Source Group Disposal

Waste also contains a certain concentration of PCDD/Fs. In 2018, the total amount of municipal waste disposed to landfills was 1,786,079 tonnes/year, agricultural waste disposed was 453,667 tonnes/year and 485,712 tonnes industrial waste which totalled to 2,735,458 tonnes in 2018. With

[115] State of Kuwait Central Statistical Bureau (2018) Annual Statistical Bulletin of Environment..
[116] FAO (2008) Irrigation in the Middle East region in figures – AQUASTAT Survey 2008.
[117] KISR (2019) 2019 Kuwait Energy Outlook – Sustaining Prosperity Through Strategic Energy Management.

a UNEP toolkit impact factor of 0.05 µg TEQ/tonne, the total amount of PCDD/F disposed to landfill in this waste would be estimated at 13.7 g TEQ/yr. The total release with water leachate from landfills would be estimated at 0.14 g TEQ/yr, which for Kuwait is likely lower, due to the low precipitation rate compared to countries with average precipitation.

Emission distribution of sources

The major share of sources for the 46.0 g TEQ release inventory in 2018 constituted the following. The highest emissions of PCDD/Fs resulted from open burning processes (17.0 g TEQ; 36.9% of total releases) with major contribution from fires on landfills (16.96 g TEQ; 36.9% of total release). The second largest source group was the disposal of waste where PCDD/Fs present in the waste were disposed to landfills (estimated at 13.7 g; 30.0% of total). Waste incineration was estimated to release 3.7 g TEQ to air and additionally 6.45 g TEQ to ashes and 10.1 g TEQ.in total (22.0% of total release). Power and heat generation was estimated to emit 2 g TEQ to air (4.4% of total releases), and metal industry was estimated to emit 1.3 g TEQ (3% of total) with 0.3 g TEQ to air and 1.04 g TEQ to residues. The PCDD/F releases from oil production stem mainly from the catalytic reforming process and were 0.72 g TEQ/yr (1.6 % of total releases) with a minor release from flaring (0.002 g TEQ). Other assessed sources were less than 1% of total.

In this first inventory, some sources like PCDD/F in imported chemicals and pesticides could not be assessed, but however, will be evaluated in the NIP implementation. Table 13 shows the PCDD/Fs releases for the inventory year 2018.

Table 13. Releases of PCDD/Fs from the main source groups to the release vectors in 2018[111]

Source Groups	Annual Releases (g TEQ/a)				
	Air	Water	Land	Product	Residue
Waste Incineration	3.681	0.000	0.000	0.000	6.450
Ferrous and Non-Ferrous Metal Prod.	0.420	0.000	0.000	0.000	1.620
Heat and Power Generation	2.014	0.000	0.000	0.000	0.000
Production of Mineral Products	0.286	0.000	0.000	0.001	0.000
Transportation	0.003	0.000	0.000	0.000	0.000
Open Burning Processes	16.435	0.000	0.555	0.000	0.000
Prod. of Chemicals & Consumer Goods	0.719	0.000	0.000	0.005	0.000
Miscellaneous	0.000	0.000	0.000	0.000	0.000
Disposal	0.000	0.137	0.000	0.000	13.677
Identification of Potential Hot-Spots					
Total	**23.558**	**0.137**	**0.555**	**0.006**	**21.748**
Grand Total			**46.00**		

The newly listed unintentional PCNs (05/2015) are formed, similarly to unintentional PCBs, HCB, and PeCB, as unintentional POPs together with PCDD/Fs in thermal processes.[118,119] Specific emission factors for PCNs for the thermal sources have not yet been established[118] and the WHO expert group has not assigned Toxic Equivalency Factors for PCNs, but has acknowledged that they possess dioxin-like activity.[120]

For unintentional PCNs, the inventory guidance mentions few processes where PCDD/F releases are not indicative of PCNs but, where specific assessment for PCNs and some other UPOPs are needed. These include unintentional PCNs in the production of chlorine, presence in industrial PCB mixtures, and in the production of chlorinated solvents and chlorinated paraffins.[1186] Kuwait has a production of elemental chlorine. Therefore, in this process, unintentional PCNs are likely formed at considerably higher levels than PCDD/Fs. For a detailed inventory, the residues from the chlorine production would need to be measured for UPOPs.

It needs to be stressed that while no chlorinated paraffins are produced in Kuwait, they are likely imported in products like PVC, rubber, paints, and industrial oils. By those imports also unintentional PCNs are likely imported to Kuwait.

HCBD is unintentionally formed in some specific organochlorine production such as organochlorine solvents (tetrachloroethene, tetrachloromethane, trichloroethane) and primary PVC production and some other organochlorine processes[121]. These processes were and are not present in Kuwait; and therefore, no major unintentional formation/release of HCBD is present in Kuwait. HCBD can also be formed in chlorine production and thermal processes, including refining processes in the aluminium and magnesium industry, secondary copper industry, incineration of high chlorine containing waste, and chorine production.[121] From these processes Kuwait only has elemental chlorine production. Thus, waste from the chlorine production is considered to contain some HCBD. At present, the chlorine production in Kuwait uses modern Membrane Cell Technology, which is considered to have a low level of UPOPs formation and release.

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

[119] Weber R, Iino F, Imagawa T, Takeuchi M, Sakurai T, Sadakata M (2001) Formation of PCDF, PCDD, PCB, and PCN in de novo synthesis from PAH: mechanistic aspects and correlation to fluidized bed incinerators. Chemosphere. 44(6), 1429-1438.

[120] Van den Berg et al. (2013) Review Polybrominated Dibenzo-p-Dioxins, Dibenzofurans, and Biphenyls: Inclusion in the Toxicity Equivalency Factor Concept for Dioxin-Like Compounds. toxicological sciences 133(2), 197–208 2013

[121] Secretariat of the Stockholm Convention (2017) Draft guidance on preparing inventories of hexachlorobutadiene (HCBD). UNEP/POPS/COP.8/INF/18.

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

This section compiles information on contaminated sites for individual POPs. The inventory of stocks and wastes for the individual POPs are included in the aforesaid individual POPs section.

2.3.10.1. Background

According to Article 6 (e) of the SC, (e) Endeavour to develop appropriate strategies for identifying sites contaminated by POPs.

Due to their high persistence, POPs remain long time in soils and sediments. For PCDD/Fs, the half-life in soils would be rather centuries.[122] For PFOS and PFOA no degradation in soils or ground water is known[96] and therefore pollution will last rather thousands of years. While the degradation of brominated POPs like PBDEs and HBCD is likely shorter due to the weaker carbon bromine bond and associated debromination over time.[123] Therefore the historic releases of POPs in a certain area in the last 50 to 100 years have resulted in POPs-contaminated sites. POPs can be released to soil, air, and water. POPs from contaminated soils are taken up by livestock and other biota and can result in exposure to humans.[124] Contaminated sites not only present a risk to human health but also to the environment. Therefore, POPs-contaminated sites should be identified, assessed and secured to reduce and eliminate human exposure and releases to the environment from these reservoirs.

The procedure of the inventory of POPs-contaminated sites comprises three tasks as follows:

- Identifying historical activities that could have caused contamination and identifying the potentially contaminated sites;
- Assessing these sites for the likely magnitude of the contamination and ranking by their exposure risk;
- Assessing the degree of contamination of the most significant sites by detailed analysis.

In this first NIP, mainly historic activities that could have caused contaminated sites have been identified. Initial soil sampling has been conducted at selected locations and analysis have started at selected sites (see 2.3.12.5). Nonetheless, for some areas, soils have been sampled for future analysis.

[122] Takasuga T, Takemoria H, Yamamoto T, Higashino K, Sasaki Y, Weber R (2020) Comprehensive monitoring of chlorinated aromatic and heteroaromatic pollutants at sites contaminated by chlorine production processes to inform policy making. Emerging Contaminants 6, 133-142.
[123] UNEP (2010) Debromination of brominated flame retardants. 6th POP Reviewing Committee meeting Geneva 11-15. October 2010 (UNEP/POPS/POPRC.6/INF/20)
[124] Weber R, Herold C, Hollert H, 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

2.3.10.2. POPs pesticides contaminated sites

POPs pesticide contaminated sites are generated during production, storage and use of pesticides.[125,126] In Kuwait, no pesticide production or storage sites exist which contain POPs. There are likely sites where POPs pesticides have been stored in the past. At such sites, soil could still contain elevated POPs pesticide levels. In addition, it is known from Australia and New Zealand[127] that sites where POPs pesticides were used at higher concentrations like sheep/goat dips might be contaminated. For Kuwait, this needs to be clarified. Initial monitoring of soil in farm areas have been conducted during the NIP development. In this first assessment particular high levels were not detected (see 2.3.12.5).

Overall, the low levels of POPs pesticide concentration in the atmosphere in Kuwait (see section 2.3.1.5)[94] indicated that POPs pesticide legacies are rather a minor issue in Kuwait.

2.3.10.3. PCBs-contaminated sites

PCB-contaminated sites are generated along the lifecycle of PCBs even in industrial countries.[128]

Therefore, former storage sites of transformers and maintenance sites of PCBs can be considered PCB-contaminated. Also, scrap yards, where metal scrap has been stored and managed, are frequently contaminated with PCBs. Sometimes, sites where PCB transformers have been operating can also be contaminated if the transformers were leaking.

Hence, areas where transformers have been operated for long time, sites where transformers were maintained, landfills where wastes from companies possessing PCB-containing equipment have been disposed, or sites where metal scrap is sorted and recycled should be assessed for PCB contamination.

2.3.10.4. POP-PBDEs, HBB and HBCD waste management and contaminated sites and hotspots

PBDE/POP-BFR-contaminated sites are particularly generated at the end of life in particular, due to open burning in the recycling of e-waste or cables.[129] Other potentially POP-BFR-containing materials like obsolete furniture, construction material, and mattresses are largely disposed to landfills. All the landfill/dumping sites and sites where these polymer fractions are disposed have open burning which results in releases of PBDEs and other POPs present in the waste and in the

[125] Toichuev RM, Victorovna L, Bakhtiyarovna ZG, et al. (2017) Assessment and review of organochlorine pesticide pollution in Kyrgyzstan. Environ Sci Pollut Res Int. 25, 31836-31847,
[126] Vijgen J, Abhilash PC, Li Y-F, et al. (2011) HCH as new Stockholm Convention POPs – a global perspective on the management of Lindane and its waste isomers. Env Sci Pollut Res. 18, 152-162.
[127] https://en.wikipedia.org/wiki/Sheep_dip
[128] Weber R, Herold C, Hollert H, Kamphues J, et al. (2018) Life cycle of PCBs and contamination of the environment and of food products from animal origin. Environ Sci Pollut Res Int. 25(17), 16325-16343.
[129] Shaw SD, Blum A, Weber R, et al. (2010) Halogenated Flame Retardants: Do the Fire Safety Benefits Justify the Risks? Rev. Environ. Health 25(4), 261-305

formation of UPOPs, including PCDD/Fs and brominated PBDD/Fs.[130] Over time, these sites and the surrounding soils can become contaminated with these POPs. During the NIP development samples were taken from soils in the vicinity of landfills.

2.3.10.5. PFOS-contaminated sites and hotspots

PFOS- (and PFOA)- contaminated sites are generated from production, use, waste water treatment, and disposal of PFOS and related compounds and related products.[131,132]

PFOS and PFOA are highly persistent, and no degradation is known in soil and groundwater. Therefore, the PFOS released in the last 50 years to soil, ground and surface water has likely been accumulated in these environmental matrices or has been further transported in the environment. Consequently, sites where PFOS has been released in the past can be considered potentially contaminated sites.

At KISR, a basic methodology for PFOS and PFOA analysis has been developed. An assessment of contaminated sites has not as yet been conducted. Therefore, in this first assessment, only potentially contaminated sites were compiled (2.3.10.5) which will need assessment in the future.

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

Due to the production, storage, and use of oil in Kuwait in the past 50 years, a high amount of PFOS containing firefighting foams have been used, in particular, between 1970s to about 2010. In addition, PFOA containing firefighting foam might also have been used.

A major potentially PFOS-contaminated site and several potential PFOS-contamination sites were identified. Of major concern are the approximately 700 fires in oil wells, storage tanks, and refineries in Kuwait during the Gulf War in 1991[133] which were extinguished by privately contracted crews.[134] For these activities, most likely or rather certainly, PFOS containing firefighting foams have been used in a large scale.

In addition, all training/drill areas at oil production sites and at oil storage sites as well as at the airport which has been operated before 2010 could have been contaminated with PFOS and possibly PFOA and other PFASs.

Similarly, areas where firefighting vehicles pipes were and are rinsed could have probably been contaminated to some extent.

PFOS-contaminated sites from oil drilling operations

PFOS was used in oil drilling operations, and this use has also been exempted until recently. Kuwait is a major oil producing country and most likely has used PFOS in the past with associated

[130] Gullett BK, Wyrzykowska B, Grandesso E, Touati A, Tabor DG, Ochoa GS (2010) PCDD/F, PBDD/F, and PBDE emissions from open burning of a residential waste dump Environ Sci Technol. 44(1):394-399.

[131] Oliaei F, Kriens D, Weber R*, Watson A. (2013) PFOS and PFC releases and associated pollution from a PFC production plant in Minnesota (USA). Environ Sci Pollut Res Int. 20, 1977-1992.

[132] Hu XC, Andrews DQ, Lindstrom AB, et al. (2016). Detection of Poly- and Perfluoroalkyl Substances (PFASs) in U.S. Drinking Water Linked to Industrial Sites, Military Fire Training Areas, and Wastewater Treatment Plants. Environmental science & technology letters, 3(10), 344–350.

[133] US EPA (1991) United States Gulf Environmental Technical Assistance from January 27 – July 31, 1991.. Report to Congress.

[134] Husain, T. (1995). Kuwaiti Oil Fires: Regional Environmental Perspectives. Oxford: BPC Wheatons Ltd. p. 68.

releases. Possible contamination can occur at the drilling sites and possibly, where waste from oil drilling is disposed. These areas should be assessed for PFOS and other PFASs.

PFOS-contaminated sites from the use in chrome plating industry

Until recently, PFOS was the major used mist suppressant in chrome plating, and chrome plating has still an exemption. Kuwait has chrome plating and therefore, PFOS has most likely been used and still perhaps being used. From other countries, it is known that PFOS and other PFAS contamination are detected at plating industries. In addition, the sludges from plating industries using PFOS contain high PFOS levels. Consequently, the sites where these sludges have been disposed can be considered PFOS-contaminated. Hence, assessment at the plating industries and the disposal sites should be done.

PFOS-contaminated sites from disposal of PFOS and related substances in consumables

In a wide range of consumer products, PFOS and related substances have been used during the last 50 years, including synthetic carpets, furniture, textiles and surface treated paper. Since the introduction of these contaminated products in Kuwait, they have been and are deposited and disposed to eleven landfill sites once they become waste. Most of these landfill sites have been closed, and only three are currently being operated. Leaching of PFOS, PFOA, and other PFASs from landfills has been documented in many countries. Since Kuwait has a low precipitation, the leaching and contamination are likely smaller. Further assessment of the groundwater situation at and around the landfills should be conducted.

2.3.10.6. PCDD/F- and UPOPs- contaminated sites and hotspots

PCDD/PCDF from reservoirs including contaminated sites and hotspots represent at the present time an important source of human exposure, often through food contamination.[135] The largest amounts of PCDD/Fs present are from historic releases of the chlorine and organochlorine industry, from the application of organochlorine pesticides, and their presence at contaminated sites, including landfills and deposits, but also in soils and sediments[136]

The UNEP Toolkit includes an indicative list of activities that might have resulted in the contamination of soils and sediments with PCDD/PCDFs and other unintentional POPs, including related deposits (http://toolkit.pops.int/Publish/Main/II_10_HotSpots.html).

In Kuwait, during the NIP development, soil samples at some sites have been taken and will be analysed in the future.

[135] 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://rdcu.be/bax79

[136] 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.

Chlorine production site

Kuwait operates chlorine production since 1964, and the factory is still operating. At present, the company uses membrane technology which has a low PCDD/F formation potential. However, chlorine production in the 1960s to 1980s often used graphite electrodes with high release of all unintentional POPs, including PCDD/Fs.[137]

Formulation sites, storage sites, and application sites of PCDD/F containing pesticides

Historically, several pesticides contained high levels of PCDD/Fs and sites where these pesticides have been formulated, stored, and applied can be contaminated with PCDD/Fs.[136] Kuwait has rather a minor use of pesticides in the past. If former storage sites for pesticides were to be assessed (see section 2.3.10.2), PCDD/Fs should also be analysed.

Timber manufacturing and treatment sites

Sodium PCP and PCP contaminated with PCDD/Fs were used to treat wood up to the 1980s, sometimes in combination with lindane and DDT. Kuwait does not have logging, although it imports the wood. Normally, the imported wood is already treated depending on the required use. In effect, this is not considered relevant for Kuwait.

PCB-contaminated sites

The potentially PCB-contaminated sites can also be considered as potentially PCDF-contaminated due to the PCDF content of PCBs. Thus, the assessment of potentially PCB-contaminated sites should consider and monitor PCDF. The assessment of PCDD/F is in particular necessary if a transformer/capacitor fire were to occur which could involve PCBs.

Waste incinerators

In Kuwait, four (currently three) hospital waste incinerators are being operated. The emission of the incinerators is considered moderate to low. Also, the total amount of waste incinerated results in a relatively moderate emission. Therefore, no significant contamination of the surrounding is expected. Areas where the PCDD/F containing ashes of the incinerator are disposed can be considered contaminated.

Metal industries

The sites where metal smelters are or were operated can be impacted by the long-term releases of PCDD/Fs, other UPOPs, and heavy metals. Also, sites where cables and e-waste are smouldered for recovery of copper and metals can be considered hot spots being contaminated by PCDD/Fs, other UPOPs, PBDEs, and heavy metals.

[137] Takasuga T, et al. (2020) Comprehensive monitoring of chlorinated aromatic and heteroaromatic pollutants at sites contaminated by chlorine production processes to inform policy making. Emerging Contaminants 6, 133-142.

Dumps and disposal areas of PCDD/F-containing residues

Sites where PCDD/F- and other UPOPs- containing products or residues have been disposed of, can be considered contaminated with PCDD/Fs. However, PCDD/Fs are relatively immobile in landfills and dump sites as long as there are no organic co-deposits facilitating leaching or seepage water capable of mobilizing the contamination. The more water-soluble UPOPs (HCBD, PeCB) can be directly released to leachates in relevant amounts[138] and even impact drinking water.[139] Of possible relevance is also the remobilization of PCDD/Fs and other UPOPs containing deposits if such landfills or dumps are excavated due to remediation measures or for mining purposes.[140]

Kuwait does not have organochlorine industries with highly PCDD/F-contaminated residues. However, the chlorine production in particular in the 1960s to 1980s might have generated highly PCDD/F-contaminated residues. Further assessment is needed in this respect.

2.3.11. Future production, use, and releases of POPs – requirements for exemptions

2.3.11.1. 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.

Currently, Kuwait has not registered for any exemption for production and use of any of the exempted POPs.

2.3.11.2. Production, use, import, and export of Annexes A and B POPs

a) Production of Annexes A and B POPs

According to the assessment in the NIP update, Kuwait is not manufacturing any POPs.

b) Use of Annexes A and B POPs

In this first NIP and first POPs inventories, it could not be clarified if the most recently listed POPs with exemptions including SCCPs, decaBDE, or PFOA are currently used and if there is a need of continuing use. This assessment needs to be conducted in the NIP implementation (see action plan).

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[138] 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.

[139] Forter M (2016) Hexachlorobutadiene in the drinking water of the City of Basel (Switzerland), the Rhine and the chemical landfill „Feldreben" of BASF, Novartis and Syngenta. Conference proceeding; 13 IHPA Forum, November 03-06, 2015, Zaragoza, Spain.

[140] Torres JPM, Leite C, Krauss T, Weber R (2013) Landfill mining from a deposit of the chlorine/ organochlorine industry as source of dioxin contamination of animal feed and assessment of the responsible processes. Env Sci Pollut Res. 20, 1958-1965.

c) Continued use of POPs in certain articles

Articles containing POPs such as televisions containing PBDEs as flame retardants, insulation foam containing HBCD in buildings, SCCPs in PVC in construction or PFOS in synthetic carpets in use do not need to be immediately eliminated but can be further used. However, at end of life they need to be managed in an environmentally sound management (ESM).

2.3.11.3. Future release of POPs

The POPs in current use like PBDEs in electronics and vehicles or SCCPs in PVC or paints are released over time and can present a health risk, in particular, indoor. The monitoring of PBDE in house dust and dust in cars in Kuwait demonstrated the continuous release and exposure of humans.[141,142]

Also, PFOS/PFOA containing carpets are releasing POPs in the indoor environment with associated relevant exposure of humans.[143] However, there is yet no study on indoor levels of PFOS and PFOA in Kuwait.

Also, for SCCPs or other CPs for Kuwait, no analytical capacity for SCCPs and other CPs has yet been established, and no data are available. Nonetheless, a recent monitoring of house dust in South Africa revealed very high CP concentration in the 100 ppm range in all households with approximately 25% SCCP[144] indicating high release of SCCPs and CPs in indoor environment.

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

2.3.12.1. Background and overall Situation

Kuwait has a well-established POPs laboratory within the Stockholm Convention Regional Centre for West Asian Gulf Countries (SCRC Kuwait) at KISR. It has been more than 15 years that POPs monitoring has been conducted in Kuwait by experienced POPs researchers. Meanwhile, POPs monitoring has been established for several groups of POPs (OCPs, PCBs, PBDEs, and PCDD/Fs) in a wide range of matrices and have been published in many scientific articles and a book chapter (see Annex 2).

[141] Gevao B, Al-Bahloul M, Nabi Al-Ghadban A, Al-Omair A, Ali L, Zafar J, Helaleh M. (2006) House dust as a source of human exposure to polybrominated diphenyl ethers in Kuwait. Chemosphere, 64, 603-608

[142] Gevao B, Al-Shemmari F, Ali LN (2016) Polybrominated diphenyl ether levels in dust collected from cars in Kuwait: Implications for human exposure. Indoor and Built Environment. 25: 106-113.

[143] Wu Y, Romanak K, Bruton T, Blum A, Venier M. (2020) Per- and polyfluoroalkyl substances in paired dust and carpets from childcare centres. Chemosphere. 251, 126771.

[144] Brits M, de Boer J, Rohwer ER, De Vos J, Weiss JM, Brandsma SH. 2020 Short-, medium-, and long-chain chlorinated paraffins in South African indoor dust and cat hair. Chemosphere. 238, 124643.

Within the NIP development, further soil sampling has been conducted for initial screening of potentially POPs-contaminated sites. Some of the samples have been measured (see 2.3.12.5).

2.3.12.2. POPs monitoring in air in Kuwait and in the Middle East region

POPs concentration in air is used for effectiveness evaluation of the SC. Air monitoring has been conducted in Kuwait with active and with passive sampling in the environment and indoor. Studies covered the assessment of OCPs, PCBs, PCDD/Fs, and PBDEs.[145,146,147,148] There is not a particular time series for air monitoring which could show the time trend of POPs concentration. However, the POPs time trend instead has been analysed in sediment cores. The average ± SD (and range) of the ΣOC concentrations measured throughout the study period in decreasing order were urban, 505 ± 305 (range, 33–1352) pg m−3, remote, 204 ± 124 (4.5–556) pg m−3, and "industrial" 155 ± 103 (8.8–533) pg m−3.[145]

KISR, as SCRC Kuwait, also has established regional POPs monitoring activities.[149] The primary goal is to generate spatial and temporal atmospheric concentration data on POPs in the Middle Eastern environment. Fourteen monitoring stations with passive samplers were deployed in the Middle East in Kuwait (6), Lebanon (3 sites), Oman (2 sites), Saudi Arabia (1), and Turkey (2 sites). Sampling periods were between January 2018 and October 2018. The samplers were retrieved every 3 months. POPs groups monitored were PCDD/Fs, PCBs, PBDEs, and OCPs. The data are currently being compiled for publications in peer reviewed scientific journals.

In general, ambient air concentrations of "legacy" POPs are regulated by temperature controlled air-surface exchange; whereas, primary emissions regulate the concentrations of PCDD/Fs, which are unintentionally released into the environment from combustion sources.

2.3.12.3. Human milk study

The SCRC Kuwait in KISR (Dr. Hassan Alshemmari) is developing a POPs human milk study for Kuwait. Currently, capacity for the analysis of POPs in human milk is developed in KISR as a new monitoring matrix. POPs in human milk is used for effectiveness evaluation of the SC.

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[145] Gevao, B., Porcelli, M., Rajagopalan, S., Krishnan, D., Martinez-Guijarro, K., Alshemmari, H., Bahloul, M., & Zafar, J. (2018). Spatial and temporal variations in the atmospheric concentrations of "Stockholm Convention" organochlorine pesticides in Kuwait. The Science of the total environment, 622-623, 1621–1629.

[146] Gevao B, Ghadban AN, Porcelli M, Ali L, Rashdan A, Bahloul M, Matrouk K, Zafar J. (2013) Seasonal variations in the atmospheric concentrations of polybrominated diphenyl ethers in Kuwait. Sci. Total Environ., 454-455:534-541.

[147] Gevao, B., Porcelli, M., Rajagopalan, S., Krishnan, D., Martinez-Guijarro, K., Alshemmari, H., Bahloul, M., Zafar, J. (2017). Seasonal variations in the atmospheric concentrations of PCBs in Kuwait. Chemosphere, 189, 652–660.

[148] Martínez K, Ramadan A, Gevao B (2017) Atmospheric concentration of polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans (PCDD/Fs) and dioxin-like polychlorinated biphenyls (dl-PCBs) at Umm-Al-Aish oil field-Kuwait. Chemosphere 168 DOI: 10.1016/j.chemosphere.2016.10.036

[149] Gevao B., Martinez K., Alshemmari H., Krishnan D., Rajagopalan S., Bahloul M., Hajeyah M. (2020) Preliminary Assessment of the Spatial Variations in the Atmospheric Concentrations of Persistent Organic Pollutants in the West Asian Sub-Region. Progress Report Submitted to Kuwait Foundation For The Advancement Of Science.

2.3.12.4. POPs in food and feed

Food and feed collected in Kuwait have been analysed for PCDD/Fs and dl-PCBs, which are very problematic and bio-accumulative POPs for humans[150] and are orders above the WHO tolerable daily intake (TDI) in human milk worldwide. For the study, state-of-art screening with bio-assay and instrumental analysis was used for monitoring food. In total, 318 local and imported meat, milk, eggs, fish, and animal feed samples were analysed by cell-based reporter gene assay (Dioxin-Responsive Chemical Activated LUciferase gene eXpression (DR-CALUX)) for PCDD/Fs and dl-PCBs. The bioanalytical equivalents (BEQs) obtained by DR-CALUX bioassay were compared with the official maximum limits according to the European Commission (EC) regulations. The results showed that among suspected samples, one sample was confirmed to be non-compliant. The food sample above regulatory limit was of imported origin. A correlation coefficient of 0.98 between DR-CALUX and GC-HRMS was found. Moreover, the average daily intakes of PCDD/Fs and dl-PCBs for the Kuwaiti population were estimated showing that the dietary intake of the Kuwaiti population was below the WHO TDI.[150]

Also other POPs have been monitored for selected POPs content, in particular, in fish and sea food.[151] Additionally, PAHs listed as POPs in the United Nations Economic Commission for Europe (UNECE) protocol have been monitored in seafood and vegetable oils.[152,153]

2.3.12.5. POPs monitoring in soils, sediments and sludge

A wide range of POPs studies in sediments and soils have been conducted in Kuwait. This includes the measurement of sediment cores which allows the analysis of time trends[154,155,156] Also, the spatial assessment of POPs in sediments has been carried out which to some extent allows source appointment.[157] Also, transect studies on POPs in soils in urban and rural setting

[150] Husain A, Gevao B, Dashti B, Brouwer A, Behnisch P, Bahloul M, Al-Foudari M (2014) Screening for PCDD/Fs and dl-PCBs in local and imported food and feed products available across the State of Kuwait and assessment of dietary intake. Ecotoxicology and Environmental Safety, 2014, 100: 27-31.

[151] Bondi Gevao, Foday M. Jaward, Majed Al-Bahloul, Saif Uddin, Mirza U. Beg, Zafar J. (2011) Polybrominated diphenyl ethers in three commercially important fish from the northwestern Arabian Gulf: Occurrence, Concentration, and Profiles. Archives of Environmental Contamination and Toxicology, 60: 636-642.

[152] Beg MU., Gevao B., N. AL-Jandal, K. R. Beg, S. A. Butt, L. N. Ali, and M. Al-Hussaini. Polycyclic aromatic hydrocarbons in three varieties of fish from Kuwait. Polycyclic Aromatic Compounds, 2009, 29(2): 75-89.

[153] Alomirah H., S. Al-Zenki, A. Husain, W. Sawaya, N. Ahmed, B. Gevao, and K. Kannan. Benzo[a]pyrene and total polycyclic aromatic hydrocarbons (PAHs) levels in vegetable oils and fats do not reflect the occurrence of eight genotoxic PAHs. Food Additives and Contaminants Part A, 2010, 1-10.

[154] Gevao, B., Beg,M.U., Al-Ghadban, A.N., Al-Omai, A., Helaleh,M., Zafar, J., (2006). Spatial distribution of PBDEs in coastal marine sediments receiving industrial and municipal effluents in Kuwait. Chemosphere 62, 1078–1086.

[155] Gevao, B., Aba, A.A., Al-Ghadban, A.N. et al. (2012) Depositional History of Polychlorinated Biphenyls in a Dated Sediment Core from the Northwestern Arabian Gulf. Arch Environ Contam Toxicol 62, 549–556

[156] Gevao B, Bahloul M, Martínez K, Kannan K (2016) Depositional time trends of PCDD/PCDF in a dated sediment core from the Northern Arabian Gulf. Marine Pollution Bulletin 112(1) DOI: 10.1016/j.marpolbul.2016.08.019

[157] Gevao, B., Beg, M.U., Al-Omai, A., Helaleh, M., Zafar, J., (2006). Spatial distribution of polychlorinated biphenyls in coastal marine sediments receiving industrial effluents in Kuwait. Arch. Environ. Contam. Toxicol. 50 (2), 166–174.

have been conducted.[158] In addition to POPs, PAHs and heavy metals have also been measured within the same sampling.[159]

Additionally, within the NIP development, soils have been sampled at 3 locations (Abdali, Wafra, Amghara) and around landfill sites for assessing POPs contamination (Figure 26). Further samplings are planned at potentially PCB- and PFOS- contaminated sites (see action plan).

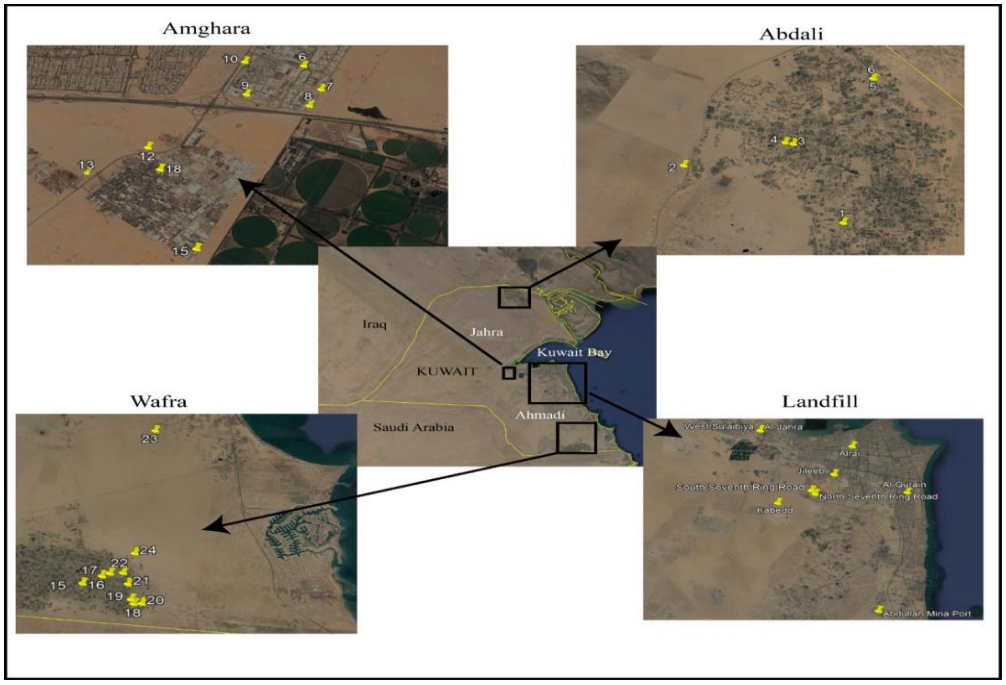

Figure 26. Soil monitoring sites sampled within the NIP development

The levels of POPs pesticides, selected unintentional POPs (HCB; PeCB), and PBDEs in soils around landfill sites in Kuwait are listed in Table 14 and Table 15. Overall, the levels were low and below regulatory limits of other countries. The HCB (344 pg/g) and PeCB (88 pg/g) concentrations near Kabedd landfill were higher compared to the other landfills (7−107 pg/g and 5−51 pg/g, respectively), indicating that, in the past, some landfill fires occurred with associated UPOPs release. Also PBDEs (mainly decaBDE) were detected around all landfills at levels between 10 to

[158] Gevao B, Ghadban AN, Uddin S, Jaward FM, Bahloul M, Zafar J. (2011) PBDEs in soils along a rural-urban-rural transect: Sources, concentration gradients, and profiles. Environmental Pollution, 159:3666-3672

[159] Lyons BP, Barber JL, Rumney HS, et al. (2015) Baseline survey of marine sediments collected from the State of Kuwait: PAHs, PCBs, brominated flame retardants and metal contamination. Mar Pollut Bull. 100(2), 629-636.

200 ng/g (Table 15); the levels are comparable to those at other landfills in industrial and developing countries.[160] From the POPs pesticides only the DDTs had partly levels above 1 ng/g (up to 14.3 ng/g) while other pesticides were all below 0.1 ng/g and often not detected (Table 14).

Table 14. Selected POPs in soils around the landfill sites in Kuwait

Landfill sites									
OCPs (pg/g)	South Seventh ring road	Abdullah Port	Al Jahra	North Seventh ring road	Jileabe Sheuaikh	Alrai	Kabedd	West Sulaibiya	Al Qurain
Pentachlorobenzene	51.2	< 5	36.2	22.0	< 5	< 5	88.2	< 5	< 5
Hexachlorobenzene	106.5	59.2	53.6	17.7	62.6	16.7	344.7	17.5	7.1
Alpha-HCH-	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Beta-HCH	< 5	< 5	< 5	< 5	< 5	< 5	36.9	< 5	< 5
Gamma-HCH	< 5	< 5	< 5	< 5	< 5	< 5	31.3	< 5	< 5
Heptachlor	< 5	7.97	< 5	< 5	< 5	< 5	33.8	< 5	< 5
Aldrin	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Heptachlor	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chlordane-trans	5.05	< 5	< 5	8.27	< 5	6.40	71.2	44.4	< 5
Endosulfan	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chlordane-cis	< 5	< 5	< 5	< 5	< 5	< 5	51.72	< 5	< 5
Nonachlor, trans-	< 5	< 5	< 5	< 5	< 5	< 5	< 5	26.30	< 5
Dieldrin	< 5	< 5	< 5	< 5	< 5	< 5	69.45	< 5	< 5
Endrin	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Nonachlor, cis-	5.22	4.77	< 5	4.54	5.36	4.99	47.86	19.46	3.53
DDD-p,p'	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
DDE-p,p'	474	1252	1503	117.9	153.5	205.3	1340	10224	0.44
DDE-o,p'	19.2	21.7	40.0	8.47	9.45	12.1	309.3	61.55	4.34
DDT-o,p'	31.6	< 5	< 5	18.3	< 5	< 5	< 5	< 5	< 5
DDT-p,p'	151.6	363.1	428.2	218.4	40	53.1	84.4	4022	22.6

Table 15. PBDEs in soils around the landfill sites in Kuwait

Landfill									
PBDE Congeners (pg/g)	South Seventh	Abdullah Port	Al Jahra	North Seventh	Jileabe Sheuaikh	Alrai	Kabedd	West Sulaibiya	Al Qurain

[160] Reviewed in Oloruntoba K et al. (2021) Polybrominated diphenyl ethers (PBDEs) concentrations in soil and plants around municipal dumpsites in Abuja Nigeria. Environmental Pollution in press.

	ring road			ring road					
BDE-47	1112	1155	2927	1705	1096	647	734	1691	3025
BDE-100	< 500	669	< 500	< 500	< 500	< 500	518	975	< 500
BDE-119	< 500	< 500	1526	676	< 500	< 500	< 500	< 500	< 500
BDE-99	< 500	2064	< 500	< 500	< 500	1104	1401	3558	5397
BDE-126	< 500	< 500	1097	< 500	< 500	< 500	< 500	< 500	< 500
BDE-154	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	1075
BDE-153	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	1260	< 1000
BDE-138	ND	ND	ND	ND	ND	ND	ND	ND	ND
BDE-183	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	1021
BDE-191	ND	ND	ND	ND	ND	ND	ND	ND	ND
BDE-197	< 1000	< 1000	1468	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
BDE-196	ND	ND	ND	ND	ND	ND	ND	ND	ND
BDE-206	< 2500	3644	< 2500	2811	< 2500	< 2500	< 2500	3634	3237
BDE-207	3048	3348	2912	3349	2876	3092	2903	3699	3029
BDE-209	56684	47620	197592	17250	11677	7374	7716	34066	15991

The agricultural areas did not contain relevant OCP levels (see Annex 3). All measured OCP concentration in Abdali soils were below 0.1 ng for the individual OCPs (see Annex 3 Table 41). Also for the Amghra site the OCP levels were below 0.1 ng/g with the exemption of the sum of DDT (see Annex 3 Table 39). The average DDT level was 0.9 ng/g, with a peak value of 7.2 ng/g, indicating that DDT has been used in the area before, but with overall low impact. Also, only one soil sample had HCB concentration above 1 ng/g (1.3 ng/g), while all others were below 0.2 ng/g and frequently below 0.1 ng/g. Also, in the Wafra area the OCP levels for DDT were measurable in most soils but below 0.2 ng/g. Other OCP levels were below 0.1 ng/g for agricultural and non-agricultural soil indicating low use of OCPs in the past (see Annex 3 Table 40).

2.3.12.6. Monitoring of plastic and microplastic pollution

Recently, regional centres are also entitled to assess and improve the plastic pollution situation.[161]

The objective of this study was to assess the microplastic pollution of Kuwaiti marine areas by examining the beach sediments, trawling the coastal areas and examining the stomach contents of local marine biota (4 types of fish and two types of clams). A total of 44 intertidal locations (from Kuwait-Saudi border to Khor Subiya) were sampled. Seawater trawls (40) were investigated to assess the microplastics (MPs) in seawater. Additionally, 87 biota stomach contents were also examined. The isolated plastics were characterized by Raman spectroscopy. The number of microplastics found in all of these samples was quite low. Apparently from these results, although

[161] UNEP (2019) Report on the activities of the Basel and Stockholm conventions regional centres.

Kuwait beaches are littered with discarded plastic, the microplastic levels are quite low in the sediment and in biota.

2.3.12.7. Gaps in POPs monitoring

Currently no PFOS/PFOA and related compounds, HBCD, and SCCPs have been measured in Kuwait. For PFAS, the first sampling has been conducted, and initial analytical capacity has been established.

Also, no POPs monitoring has yet been conducted in plastic and polymers in wastes, products, or recycling.

Currently, no human POPs data have also been generated. However, a human milk study on POPs is currently being undertaken.

2.3.13. Current level of information, information exchange, awareness, and education

2.3.13.1. General

Specific awareness and knowledge about chemicals management – inclusive of POPs – should be improved within the government, as well as in the general public.

2.3.13.2. Information and awareness raising in the West Asian Gulf regions – the SCRC Kuwait in KISR

As regional centres to the Stockholm Convention, the primary role for the Stockholm Convention Regional Centre for Capacity-building and the Transfer of Technology in West Asia is to assist parties in the West Asian Gulf regions to meet obligations under the convention, to promote the phase out of POPs and the environmentally sound management of wastes containing POPs in the West Asian Gulf regions. Parties currently served include Bahrain, Jordan, Kuwait, Lebanon, Oman, Qatar, Syrian Arab Republic, United Arab Emirates, and Yemen.

In the past years, SCRC Kuwait has carried out multiple projects or activities such as capacity building, information exchange, training, awareness raising, and technology transfer in the field of POPs management, which positively contribute to the implementation of SC in the West Asian Gulf regions (see Table 16 in section 2.3.15). Due to these projects, SCRC Kuwait, on the one hand, has accumulated a notable and rich experience on the implementation of the SC, management of regional projects, and POPs management. On the other hand, SCRC Kuwait has established a communication platform for developing parties in this region, which will benefit future operation of regional projects and information exchange.

For the coming years, the projects or activities are planned in the fields as follows: Firstly, conducting more national/regional projects to promote the reduction and phase out of POPs regionally; secondly, consolidating the existing platforms for information and experience exchange through projects or activities, which will strengthen the national capacity of POPs management in the West Asian Gulf regions; and thirdly, training or consulting service will continuously be provided for countries in need, which may bring more effective and targeted improvements in specific countries. Subsequently, the regional platforms for technical assistance and technology transfer will be further pushed to facilitate the application of BAT/BEP in the West Asian Gulf regions.

More awareness is needed in the region to achieve a POPs-free environment in the West Asian Gulf regions, with a wide range of challenges for stakeholders to understand and address POPs topics in the region.

2.3.13.3. Awareness of industries

Numerous industries do not have proper information on POPs due to a lack of awareness raising on POPs topics, in particular, of the recently listed industrial fluorinated and brominated POPs. Also, no information on the recently listed SCCPs have been communicated as yet. On the other hand, many industries, in particular multinational companies, are aware of global restricted substances which they are not allowed to use.

Within the NIP development, industries and associations were invited to the POPs inception and inventory development workshop and were provided with information on all listed POPs.

2.3.13.4. Awareness of farmers

In a recent study, the levels of knowledge, attitude, and practices of Kuwaiti farmers regarding the safe use of pesticides were assessed by a team from KISR.[162] A total of 250 farmers participated in this study through in-depth interviews and observations on-farm. The majority of the farmers acknowledged that pesticides were harmful to their health (71%) and the environment (65%). However, farmers' level of knowledge of pesticide safety is insufficient. Over 70% of the farmers did not read or follow pesticide label instructions, and 58% did not use any personal protective equipment (PPE) when handling pesticides. Educated farmers were significantly more likely to use PPE compared with famers with limited formal education ($2 = 9.89$, $p < 0.05$). Storage of pesticides within living areas was reported by 20% of farmers. When disposing of pesticide wastes, respondents adopted unsafe practices such as discarding, incinerating, or burying empty pesticide containers on-farm, or reusing the containers. Farmers also reported disposing leftover pesticide solution or old pesticide stocks on-farm or in the sewer. A significant number (82%) of the farmers reported at least one symptom of acute pesticide poisoning. Although farmers' knowledge of pesticide hazards was high, the reported safety measures were poor. The study concluded that comprehensive intervention measures to reduce the health and environmental risks of pesticides are needed, including pesticide safety training programs for farmers, stringent enforcement of pesticide laws, and promoting integrated pest management (IPM) and non-synthetic methods of pest control.[162]

2.3.13.5. Awareness of stakeholders of the food and feed sector

In 2011, a survey of PCDD/Fs and PCBs in imported food and feed was conducted by researchers from KISR in cooperation with international partners[150, 163] The results were published and

[162] Jallow MF, Awadh DG, Albaho MS, Devi VY, Thomas BM. Pesticide Knowledge and Safety Practices among Farm Workers in Kuwait: Results of a Survey. Int J Environ Res Public Health. 2017;14(4):340.

[163] Hussain A, Dashti B, Gevao B, Al-Wadi M, Brouwer A, Behnisch P A (2011) First Surveillance Monitoring Results of Feed and Food Samples from Markets in Kuwait from International Origin for PCDD/PCDF/PCB-TEQ by DR CALUX. Organohalogen Compounds 73, 2100-2103

communicated nationally and internationally for the awareness of stakeholders in the food and feed sector, as well as for authorities responsible for food and feed.

2.3.13.6. Awareness of the public

Results of KISR activities and publications are also reaching the public. Also, activities of POPs workshops are communicated by mass media reaching the public. However, more specific awareness-raising activities in particular for POPs, such as PFOS, PFOA, PBDEs, and SCCPs in daily life should be developed for the public and to be communicated, as well.

2.3.14. 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

Development of the NIP according to Article 7, as well as reporting according to Article 15 is an obligation for Parties. The periodicity of the national reporting for the SC is every four years and in accordance with a format, as established by the COP at its first meeting (decision SC-1/22).

Thus far, Kuwait has not participated in any of the four reporting cycles. Although the 4th and current reporting cycle was due in August 2018, parties can still submit their Article 15 reports. Based on the information compiled for this first NIP, Kuwait plans to submit the national report for Article 15 reporting.

The major exchange of information on POPs-related issues with other Parties to the Convention is conducted by the SCRC Kuwait in KISR with other countries in the region. Moreover, the Centre conducts international collaboration on research of POPs, and researchers are visiting international conferences on POPs and environmental pollutants which are an excellent platform for information exchange. Researchers present their research outcomes from Kuwait and the region and discuss with leading scientists on these outcomes and on further ideas for studies and collaborations. Members from SCRC Kuwait in KISR have also participated in POP Review Committee meetings. Furthermore, members of the SCRC Kuwait participate in the yearly meetings of Basel and Stockholm regional centres for information exchange.

In addition, Kuwait participates regularly at COP meetings and exchanges information with other Parties and UN agencies.

2.3.15. Relevant activities of nongovernmental stakeholders

2.3.15.1. Activities of the Stockholm Convention Regional Centre West Asia in KISR

The major POPs activities in Kuwait are conducted and facilitated by the Stockholm Convention Regional Centre for West Asian Gulf Countries (SCRC Kuwait) in KISR. The Centre was developed based on recommendations of the Arab team on Multilateral Environmental Agreements (MEAs) for hazardous waste and chemicals at its fifteenth meeting held in Cairo 7−9 April 2004, which welcomed Kuwait's proposal for hosting a regional centre. UNEP's Regional West Asia office also supported KISR to bid for hosting the Centre due to its outstanding record in related technical capabilities and expertise. During the first Conference of the Parties (COP 1) of the SC held in Uruguay in 2005, Kuwait expressed its interest to host a regional POPs centre. The COP of the SC selected KISR, in its resolution SC-4/23, as Stockholm Convention Regional

Centre for West Asian Gulf countries for capacity-building and the transfer of technology to countries of West Asia in 2009.

In accordance with paragraph 4 Article 12 of the SC, regional and sub-regional centres should provide technical assistance and promote the transfer of technology to assist developing country Parties and Parties with economies in transition to fulfil their obligations under this Convention. The sixth meeting of the Conference of the Parties (COP6) to the SC, which was held from 28 April to 10 May 2013, underscores the important role to be played by the SC regional and sub-regional centres in delivering technical assistance at a regional level for the implementation of the technical assistance programme and facilitating technology transfer. Because of the circumstances and particular requirements, the developing countries especially need to strengthen their national capabilities for the management of chemicals and waste. The transfer of technology, support of POP monitoring and provision of financial and technical assistance and promotion of cooperation among the Parties have been identified as effective channels to strengthen national capabilities of developing countries. In recent years, the implementation of the SC and the POPs management in West Asian Gulf countries has achieved some improvements due to activities supported or triggered by the SCRC Kuwait; nevertheless, continued efforts are needed.

Hence, it is meaningful for SCRC Kuwait to establish various platforms (such as international/regional symposium, news website, newsletters, etc.) to facilitate the exchange of information and experiences, as well as the transfer of technology and facilities.

A wide range of POPs monitoring and capacity building projects have been conducted by the SCRC Kuwait hosted by KISR (Table 16).

Meanwhile, for the newly listed chemicals under the SC, in particular fluorinated POPs (PFOS, PFOA), brominated POPs (PBDEs, HBCD, HBB), and SCCPs, most developing West Asian Gulf countries are facing the problem of lack in information, such as on their production, usage, importation, existing legal framework and alternatives, etc. Besides that, lack of financial support and available technology is also a main problem that restricts developing countries to fulfil their obligation on newly listed chemicals under the convention. To promote the reduction or phase out process of newly listed chemicals in the West Asian Gulf region, it is important for SCRC Kuwait to conduct regional/sub-regional projects on information collection with the funding from international community. Based on the information, the challenges can be specifically identified which will facilitate the formulation of national/regional action plans.

Goals of the Centre: Since the establishment of SCRC Kuwait, it has been working according to the functions defined by SC. The SCRC-Kuwait has been carrying out training, information exchange, technology transfer, consultation services, and awareness raising, and publicity activities on the basis of the regional service network and platform established by itself. During the four-year period of the work plan, this main goal contains three aspects on the following:

- To improve the Centre’s operation capacity to strengthen the cooperation and coordination between the SCRC-Kuwait and the West Asian Gulf countries;
- To improve national capacity of countries in West Asia for convention compliance and environmental regulations enforcement through implementing projects and activities; and
- To promote the implementation of conventions, their resolutions, and strategic framework in countries of the West Asian Gulf region.

Objectives: The objectives can be summarized as follows:

- To promote the implementation of SC in the West Asian Gulf region;
- To strengthen the national capacity of countries in the West Asian Gulf region on reduction or phase out of POPs;
- To facilitate the Environmentally Sound Management (ESM) of newly listed POPs in the West Asian Gulf region;
- To promote technical assistance and technology transfer in chemical management, analysis and treatment of countries in the West Asian Gulf region;
- To promote information exchange and awareness raising in chemicals, particularly POPs management and management of POPs-containing waste in the region; and
- To strengthen synergy of chemical and hazardous waste management in the region.

Table 16. Activities of KISR for Stockholm Convention Regional Centre from 2004 to 2019

Date	Activities from 2004 to 2019
21-25. August 2004	Workshop on Environmental Impact Assessment using the Rapid Impact Assessment Matrix (RIAM).
10–14. May 2006	Training course on the “Cost assessment of Environmental Degradation”.
25-29 Nov. 2007	Workshop on Environmental Impact Assessment.
14-16 Dec. 2009	Stockholm Convention Regional Capacity Building Workshop on New POPs and the Process of Reviewing and Updating NIP
17-21 October 2010	The practical use of the Guidelines on Best Available Techniques and Best Environmental Practices (BAT and BEP) and Environmentally Sound Management (ESM) of POPs wastes and PCBs for West Asia.
5-7 December 2011	Regional Workshop for the Development of Ambient Air Monitoring Network of Persistent Organic Pollutants (POPs) in the West Asia Region.
26-28 March, 2012	Capacity Building Workshop on “The Development of the Ambient Air Monitoring Network of Persistent Organic Pollutants (POPs)”.
2013	Workshop on Persistent toxic contaminants in food and the environment: Sources, occurrence and their determination -
17–20 March 2015	Asia & Pacific Regional Workshop in Support for the Ratification and Effective Implementation of the Minamata Convention On Mercury & Regional Preparatory Meeting for the Basel, Rotterdam and Stockholm Conventions 2015 COPs, Jakarta, Indonesia. Dr. Abdul Nabi Al-Ghadban
4-15 May 2015	Meeting of the Conferences of the Parties to the Basel, Rotterdam and Stockholm conventions in Geneva, Switzerland. Dr. Abdul Nabi Al-Ghadban
19 to 23 October 2015	Eleventh meeting of the Persistent Organic Pollutants Review Committee (POPRC.11) Rome, Italy. Dr. Abdul Nabi Al-Ghadban
8-11 Feb. 2016	Consultancy Meeting related to updated POPs in Stockholm Convention

31 March 2016	Planning of a joint proposal on the analysis of persistent organic pollutants (POPs) in human blood in collaboration with Occupational Health Department in Ministry of Health (MoH).
10-15 March 2016	Seventh session of the Intergovernmental negotiating committee on mercury (INC- 7) Dead Sea, Jordan (Dr. Hassan Alshemmari)
31 Oct. to 02 November 2016	Annual Joint Meeting to Enhance Cooperation and Coordination between the Regional Centres under the Basel and Stockholm Conventions. (Dr. Abdul Nabi Al-Ghadban)
19 to 23 September 2016	Twelfth meeting of the Persistent Organic Pollutants Review Committee (POPRC.12) of the Stockholm Convention on POPs Rome, Italy, (Dr. Hassan Alshemmari, Dr. Bondi Gevao and Mr. Majed Al-Wadi
6-7 Dec. 2016	Visit of Dr. Rolph Payet, Executive Secretary of the Stockholm Convention
6-8 October 2019	Workshop Development of a National Implementation Plan for the Stockholm Convention on POPs for Kuwait – POPs Inventory development
Other activities developed over this period	
Approval of the Regional Project on POPs monitoring with the support of ROPME	
Preparation of a project on POPs in breast milk (Effectiveness indicator)	
Preparation of a project on management of electronic waste and its POPs emissions	
Research related to Hg contamination in the Kuwait environment (Minamata convention).	
Participation in inter-laboratory exercises: INTERCIND 2015 and 2016	
Approval and development of the NIP project for Kuwait in collaboration with EPA	

Activities and Strategies

The new work plan is focused on assisting regional members to build capacity (or strengthen their existing capacities) to monitor the levels of POPs in key core matrices suggested by the SC, and to continue establishing a long-term monitoring network in Kuwait and in West Asia. As such, the activities (Work Plan) were as follows:

1. Developed regional members' capacity building to determine the analytical capacity of countries in West Asia with the view to support and strengthen their capacity by technological transfer;
2. Organized a three-day workshop of representatives from regional partners to discuss regional POPs monitoring efforts and discussed their capacity building requirements for the implementation of the convention obligations;
3. Set up and initiated a long-term regionally based air monitoring network for POPs in West Asia;
4. Organized a training workshop on the sources, environmental behaviour, and toxicity of POPs and POPs in atmospheric samples;
5. Organized a laboratory-based training on analytical techniques for the determination of selected POPs of interest;
6. Compiled POPs inventories for Kuwait and supported the development of Kuwait's National Implementation Plan (NIP).

Meanwhile, the work plan constitutes activities that will be, as follows:

1. Continuing the improvement of a website on Centre activities and serve as a repository of technical information on the levels of POPs in various environmental matrices in West Asia;
2. Development of a long-term air monitoring network in Kuwait in accordance with the guidelines of the SC global monitoring plan.

Challenges. There are several challenges in the region which need to be addressed, such as the following:

- Lack of communication of information and experience relative to POPs management, Convention implementation, and BAT/BEP on national level in the region. Some Parties are not positively involved in relevant activities. Regional workshops and various kinds of methods will be conducted to communicate with Parties more frequently.
- Lack of available funds to implement more effective projects in the West Asian Gulf region. SCRC Kuwait plans to apply actively for international funding and multilateral and bilateral aid to allocate budget, such as industry fund, Global Environment Facility (GEF) fund, and cooperate with other governments.
- Lack of access to certain project application information. SCRC Kuwait plans to establish long-term and sustainable relationships or cooperation with relevant stakeholders through operating projects with high quality and timely review of news issued by international organizations and countries that may provide project opportunities.
- The situations in developing countries in the West Asian Gulf region are of great difference, including economic development, legislation, and languages, which would cause inconvenience and difficulties during implementation of activities. A series of activities relying on local experts of each country will be conducted and a convenient communication mechanism will be launched.
- Limited time to implement the projects listed in the work plan. More efforts will be put in by SCRC Kuwait to push this work plan and have it implemented successfully and timely.

2.3.15.2. Kuwait Chemical Society (KCS)

Kuwait Chemical Society's (KCS) interests include caring for chemists and chemistry affairs, introducing the impact of chemistry to the society, organizing and sponsoring communication with similar Arab and foreign organizations, as well as representing Kuwait to the international forums.

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

Kuwait has Resolution No.16 of 2017 on the Accreditation System for Environmental Laboratories in the State of Kuwait, which applies to all environmental laboratories belonging to public authorities, public and private research bodies, educational institutes, NGOs, and independent laboratories. It states that environmental laboratories applying for accreditation, or for its renewal, must obtain ISO/IEC 17025 (General requirements for the competence of testing and calibration laboratories). The competent authority (Centre for Analytical Laboratories at KEPA), after examining the accreditation requests, replies within 30 days from the application. The accreditation certificate issued by EPA, Kuwait is valid for 3 years, and is renewable if the conditions set out in this Resolution are met. EPA's concerned department can visit the

accrediting institution to verify the validity of the certificates and documents. Article 15 lists the cases in which a laboratory's accreditation certificate can be cancelled. This resolution is a basis for appropriate laboratory capacity and reliable results.

Environmental laboratories are divided into (i) national environmental laboratories; (i) independent commercial environmental laboratory; (iii) commercial environmental laboratory belonging to a third party; and (iv) internal environmental laboratory, i.e. belonging to a specific company to carry out analyses within it.

2.3.16.1. Technical capacity of KISR

The monitoring of POPs, air, water, soil, and human health monitoring should rely on qualitative standardized processes of data collection and analysis. The SCRC Kuwait's capabilities of the POPs facilities developed by KISR include three laboratory sections, namely, dioxins, sample preparation, and instrumentation. The main goal of these facilities is to support the work of the Regional Centre for POPs as well as to develop a mechanistic understanding of sources, atmospheric levels/behaviour, and human exposure to POPs. The laboratories are equipped with state-of-the-art instruments for the analysis of pollutants listed in the SC as well as emerging contaminants (see Table 17). POPs laboratories measure the levels of several organic contaminants, including polybrominated diphenyl ethers (PBDEs), PCBs, polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans (PCDD/Fs), polychlorinated naphthalenes (PCNs), and organochlorine pesticides (OCPs), in various environmental compartments.

The Environmental Pollution and Climate Program (EPCP) also support the sustainable management of Kuwait's environment by working with policy makers to ensure that the nation's industrial practices are at par with international standards. A critical focus area is that of POPs, for which KISR has been mandated to provide research and evidence to the SC to understand the incidence, accumulation, and impacts of POPs within Kuwait's environment and its population. Furthermore, under the SC, KISR has been selected as the Regional Centre for the analysis of POPs in the West-Asian region. This Regional Centre is housed at the EPCP and supported by a Government Initiative, for establishing the needed infrastructure (for example, the POPs Laboratory) and the skilled personnel, allowing KISR to fulfil the requirements for coordinating the POPs related activities in 12 countries in the West-Asian region.

The POP's analytical facilities developed by KISR include a Dioxins suite, a sample preparation room and a mass spectrometry laboratory. The laboratories are equipped with state-of-the-art instruments for the analysis of pollutants listed in the SC as well as emerging contaminants. Our group comprises four researchers, two professionals and two technicians. The main goal of these facilities is to support the work of the Regional Centre for POPs, as well as the KISR's research project related to POPs.

Professional staff: The Centre has gradually formed its advantage in research on management policy and technology, capacity building and information exchange in chemicals and waste, consisting of full-time staff with PhD or master's degrees, and part-time technical team formed by professors and experts. The POPs-related research groups in SCRC Kuwait include academicians, professors, associate professors and technical staff, most of them have 5−10 or even more years of research and consulting experience on waste management and POPs pollution control. With the unremitting efforts of all the staff, the global influence of the Centre is

increasingly growing. SCRC Kuwait has undertaken numerous international/national projects/activities and regional workshops on capacity building in the field of hazardous waste and other solid wastes, as well as chemicals, with focus on e-waste and POPs.

Peer reviewed publications of the centre are compiled in Annex 1.

Research projects on POPs conducted by the SCRC Kuwait at KISR:

- Preliminary assessment of the spatial variations in the atmospheric concentrations of persistent organic pollutants in the West Asia sub-region. Jointly funded by Kuwait Foundation for the Advancement of Sciences, Regional Organization for the Protection of the Marine Environment and Kuwait Institute for Scientific Research (USD 745,000)
- High Resolution Historical Records of Trace Metals and Organic Pollutants from Sediments and Coral Reefs in Kuwait. Kuwait Foundation for the Advancement of Sciences Grant (USD 943,000)
- Spatial and temporal Variations in the Atmospheric Concentrations of the Newly Listed Chemicals in the "Stockholm Convention on Persistent Organic Pollutants". (Project Leader) Kuwait Environmental Public Authority Grant (USD 408,730)
- Spatial and temporal distribution of POPs in coastal marine sediments in Kuwait. Kuwait Foundation for the Advancement of Sciences Grant (USD 371,000)
- Comprehensive Indoor and Outdoor Air Quality Assessment at the Early Production Facility – North Kuwait. Kuwait Oil Company Grant (USD 444,500)
- Determination of the Levels of Dioxins and Dioxin-Like Polychlorinated Biphenyls in Foodstuffs Marketed in the State of Kuwait: A Preliminary Study - Kuwait Foundation for the Advancement of Sciences Grant (USD 330,950)
- POPs in Kuwait's Atmosphere: Building the Capacity to Fulfil Data Requirements of the Stockholm Convention on POPs. Kuwait Environmental Public Authority Grant (USD 319,690)
- A Baseline Screening Survey of Human Pharmaceuticals in Wastewater Treatment Plants in Kuwait. Kuwait Foundation for the Advancement of Sciences Grant– (USD 286,000)
- Indoor Air Quality and Environmental Assessment Study for the New Corporate Oil Sector Complex. Kuwait Petroleum Company Grant (USD 159,810)
- Halogens in Homes and the Workplace: A Preliminary Survey of Brominated Flame Retardants in Indoor Air in Kuwait. KISR Grant (USD 52,150.00)
- Persistent Organic Pollutants in House Dust in Kuwait. Kuwait Institute for Scientific Research Grant (USD 70,000.00)
- Hair as a Biomonitoring Tool for POPs in Kuwait. KISR Grant (USD 15,260)

Table 17. List of the instruments available in POPs Laboratory of KISR

Instrumental analysis	
AutoSpec Premier HRGC/HRMS (Waters) (High resolution gas chromatography - High resolution mass spectrometry)	Dioxins, polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), pesticides, PAHs
7000C GC-MS/MS (Agilent) (Gas chromatography- tandem mass spectrometry)	Dioxins, polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), pesticides, PAHs

5977A GC-MS (Agilent) (Gas chromatography–mass spectrometry)	Polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), pesticides, PAHs
Shimadzu 2010 plus GC/MS	Pesticides, PAHs
Xevo TQS, UPLC-MS/MS (Waters) Ultra performance liquid chromatography - tandem mass spectrometer	Pharmaceutical and polar compounds in general
Sample preparation	
PowerPrep™ Multi-Column Sample Cleanup System (FMS)	
ASE-350, Accelerated Solvent Extraction (Dionex)	
PSE, Accelerated Solvent Extraction (Horizon Technologies)	
Pressurized Liquid Extraction (FMS)	
SPE-DEX, Extractor System (Horizon Technologies)	
Dry Vap concentrator system (Horizon Technologies)	
MultiVapor P6 (Buchi)	
4 Direct to vial concentrators (1 TURBOVAP and 3 Supervap from FMS)	
N-Vap (Organomation INC)	

2.3.17. Overview of technical infrastructure for POPs management and destruction

2.3.17.1. Waste management including POPs management and destruction capacity

While there are a range of waste management challenges (see section 2.1.5.4), Kuwait is currently further developing its waste management capacity and is in the process of developing a master plan for waste management in cooperation with a German institution (see section 2.1.4).

Currently, there is no dedicated facility for POPs destruction in Kuwait. There is a plan to build a municipal waste incinerator in Kuwait which likely would have the capacity to destroy some type of POPs waste.

In addition, Kuwait has three integrated cement plants. Such plants have the basic capacity to destroy POPs containing waste.[164,165] However, individual facilities need to be assessed for

[164] Yan, D., Peng, Z., Karstensen, K. H., Ding, Q., Wang, K., & Wang, Z. (2014). Destruction of DDT wastes in two preheater/precalciner cement kilns in China. The Science of the total environment, 476-477, 250–257. https://doi.org/10.1016/j.scitotenv.2014.01.009

[165] Waltisberg J, Weber R (2020) Disposal of waste-based fuels and raw materials in cement plants in Germany and Switzerland – What can be learned for global co-incineration practice and policy? Emerging Contaminants 6, 93-102. https://www.sciencedirect.com/science/article/pii/S2405665020300056

meeting the technological requirements and facilities would need to build the necessary management capacity. Moreover, competent authorities also need the capacity to supervise POPs destruction projects otherwise the treatment of POPs waste can result in greater environmental and human contamination.[165,166]

2.3.17.2. Capacity and infrastructure for contaminated sites assessment, securing, and remediation

Kuwait has sufficient laboratory capacity in KISR to investigate contaminated soils and sediments. Also, KISR has capacity for risk assessment of contaminated sites, and KISR has already conducted research in oil contaminated sites.[167,168] Therefore, the basic science knowledge on contaminated sites exists in KISR, and assessment of POPs contaminated sites could be conducted.

Within the NIP development process, soils have been gathered from different areas which might be contaminated with PCDD/Fs and possibly other POPs. Similarly, ground water sampling for the analysis of PFOS/PFOA and other PFAS is under preparation.

2.3.18. Identification and scale of impacted populations or environments, and social implications for workers and local communities

2.3.18.1. Background

Human exposure to POPs can be through air, water, soil, food, dermal contact, and occupational exposure. Studies on the initially listed 12 POPs had shown that in industrialized settings, more than 90% exposure of the general population to these compounds was through food.

Regarding the new industrial POPs, there is increasing evidence that other exposure routes may also be significant, for example inhalation and ingestion of dust containing PBDEs and other brominated flame retardants or PFOS in house dust from the home environment

Fluorinated POPs are water soluble, and therefore relevant exposure can take place from drinking water. Additionally, there is a particular risk of high exposure for workers dealing with POPs or POP-containing materials. Local communities living at and around POPs-contaminated sites can be particularly exposed to POPs which can have health and social implications.

[166] Weber R, Schlumpf M, Nakano T, Vijgen J (2015) The need for better management and control of POPs stockpiles Environ Sci Pollut Res Int. 22, 14385-14390 http://link.springer.com/article/10.1007/s11356-015-5162-7/fulltext.html

[167] Al-Sulaimi J., Viswanathan MN, Székely F (1993) Effect of oil pollution on fresh groundwater in Kuwait. Environmental Geology volume 22, 246–256.

[168] Yateem A (2013) Rhizoremediation of Oil-Contaminated Sites: A Perspective on the Gulf War Environmental Catastrophe on the State of Kuwait. Environ Sci Pollut Res Int ;20(1):100-7. doi: 10.1007/s11356-012-1182-8.

Basically, every citizen is exposed to POPs via food and indoor exposure, and therefore, impacted by POPs. The POP contamination level of humans can be determined by assessing levels in human milk or blood.

2.3.18.2. Impacted population

In Kuwait, no monitoring of POPs in humans has been conducted yet. However, currently, the frame of a human milk study has been established. Babies are exposed at elevated concentration from human milk. For PCBs and PCDD/Fs, the levels are in an order of magnitude and higher above the tolerable daily intake.[169] The many benefits of breastfeeding stressed by WHO[170] and scientists[171] overcompensate the negative impact by POPs.

Scavengers and informal sector are partly recycling waste on landfills in Kuwait. For such scavengers, exposure has been documented in other countries.[172]

2.3.18.3. Human exposure to POPs

PCDD/F and PCB exposure from food is mainly from products of animal origin. Local and imported meat, milk, eggs, fish, and animal feed samples have been monitored. Only a few samples were above the EU maximum limits. The average daily intakes of PCDD/Fs and dl-PCBs for the Kuwaiti population were estimated, showing that the major population in Kuwait was below the WHO tolerable daily intake (TDI). It is worthy to note that the European Food Safety Agency (EFSA) recently has reduced the TDI by a factor of 7[173] and comparing to this limit, a share of the population would be above the updated EFSA TDI.

PBDE and HBCD exposure in cars is linked to their use as flame retardants in electronic items and instrument panels, high-impact plastics, foam, and fabric of car seats. PBDEs in 19 randomly selected cars in use in Kuwait were measured to assess human non-dietary ingestion exposure from this exposure source. The concentrations of the total target PBDEs, Σ14PBDEs, ranged from 68 to 17,200 ng/g. BDE-209 was the dominant congener in all cars examined with concentrations ranging from 52 to 16,100 ng/g which, on average, accounted for 77% of the Σ14PBDEs measured. Using the measured concentrations, the estimated human non-dietary ingestion exposure based on median PBDE concentrations ranged from 0.034 ng/kg body weight (bw) per day for adults to 0.138 ng/kg bw per day for toddlers. The exposure estimate for drivers was the

[169] UNEP/WHO (2013) Results of the global survey on concentrations in human milk of persistent organic pollutants by the United Nations Environment Programme and the World Health Organization. UNEP/POPS/COP.6/INF/33
[170] WHO (2020) Health topic breast feeding (https://www.who.int/health-topics/breastfeeding#tab=tab_1)
[171] Mead NM (2008) Contaminants in Human Milk - Weighing the Risks against the Benefits of Breastfeeding. Environ. Health Perspect. 116 A 427-434 www.ncbi.nlm.nih.gov/pmc/articles/PMC2569122/pdf/ehp-116-a426.pdf
[172] Athanasiadou M, Cuadra SN, Marsh G, Bergman A, Jakobsson K. (2008) PBDEs and bioaccumulative hydroxylated PBDE metabolites in young humans from Managua, Nicaragua. Environ. Health Perspect. 116(3), 400-408.
[173] EFSA (2018) Risk for animal and human health related to the presence of dioxins and dioxin-like PCBs in feed and food. EFSA Journal 2018;16(11):5333, doi: 10.2903/j.efsa.2018.5333.

highest at 0.170 ng/kg bw per day. Due to the high temperature in Kuwait, chemicals in cars including PBDEs might lead to higher exposure compared to people in colder climate. In addition, the population is exposed to PBDEs indoor from dust as demonstrated for all measured house dust samples in Kuwait.[141] PBDEs were also detected in fish in the Kuwait market.[174] Therefore, there are multiple exposure pathways of the Kuwaiti population to PBDEs.

The overall exposure from HBCD in polystyrene is considered low. However in particular, workers, cutting polystyrene insulation with hot wires are exposed to high levels[175]. In the deconstruction of buildings, the polystyrene is partly released to the environment. Chickens like to pick polystyrene and can accumulate HBCD in eggs with associated exposure.[176] Furthermore, polystyrene is a major contributor to marine litter, if not appropriately managed.

HBCD in textiles might have a higher exposure risk from fibres and related house dust ingestion. However as already said, it is not clear as to what extent HBCD has been used in textiles.

The exposure to SCCPs has not as yet been monitored. The exposure is complex and includes exposure from food such as fish, meat, milk products, and food oils. High SCCP levels are also present indoor such as house dust with related exposure. Furthermore, SCCPs are present in products like baking ovens, food blenders, toys, sport mats, cables, and other PVC, and rubber parts with related exposure.[83,177,178] All these exposure pathways contribute to various degrees to an overall high exposure to SCCPs.

The exposure to PFOS and PFOA has not as yet been monitored in Kuwait. Therefore, no information is available for this. However, from other countries it is known that exposure is frequently above the tolerable weekly intake (TWI) of EFSA where the EFSA CONTAM Panel established in 2018 was that of a TWI of 13 ng/kg body weight (bw) per week for PFOS and 6 ng/kg bw per week for PFOA. This was even further lowered in 2020 and now the TWI of EFSA for the sum of PFOS, PFOA, HFHxS and PFNA is 4.4 ng/kg body weight.[179] For the sum of these

[174] Gevao B, Jaward FM, et al. (2011) Polybrominated diphenyl ethers in three commercially important fish from the northwestern Arabian Gulf: Occurrence, Concentration, and Profiles. Arch. Environ. Contam. Toxicol. 60: 636-642.

[175] Zhang H, Kuo YY, Gerecke AC, Wang J. (2012) Co-release of hexabromocyclododecane (HBCD) and Nano- and microparticles from thermal cutting of polystyrene foams. Environ Sci Technol. 46(20), 10990-10996.

[176] Hiebl J, Vetter W (2007) Detection of hexabromocyclododecane and its metabolite pentabromocyclododecene in chicken egg and fish from the official food control. Journal of agricultural and food chemistry 55, 3319–3324.

[177] Gallistl C, Sprengel J, Vetter W. (2018). High levels of medium-chain chlorinated paraffins and polybrominated diphenyl ethers on the inside of several household baking oven doors. The Science of the total environment, 615, 1019–1027. https://doi.org/10.1016/j.scitotenv.2017.09.112

[178] Yuan B, Strid A et al. (2017) Chlorinated paraffins leaking from hand blenders can lead to significant human exposures. Environment International 109, 73-80.

[179] EFSA Panel on Contaminants in the Food Chain (2020) Risk to human health related to the presence of perfuoroalkyl substances in food. SCIENTIFIC OPINION ADOPTED: 9 July 2020 doi: 10.2903/j.efsa.2020.6223

compounds, exposure of a considerable proportion of the population exceeds the proposed TWI e.g. for US[181] and China[180] from drinking water alone.

The use of PFOS and other PFASs in firefighting foam is particularly problematic, as it involves direct release into the environment with associated ground and drinking water contamination.[181] PFOS and other PFAS are also released from landfills and dumpsites from PFOS/PFAS-containing waste.[182,183] PFOS, PFOA and other PFASs can cause extensive long-term problems in the environment by contaminating groundwater, drinking water and soil.[181,184] The assessment of the history of PFOS used in firefighting foam and in oil drilling in Kuwait is timely, relevant, and important both at the present time and in the future.

2.3.19. Details of any relevant system for the assessment and listing of new chemicals and assessment of chemicals already on the market

There are legal means to ban and prohibit POPs and most of SC POPs have already been banned in Kuwait (see Annexes 1 and 2). However, no system has yet been established to assess and determine new chemicals or currently used chemicals in the market as POPs.

In 1987, Kuwait implemented a national monitoring system for chemicals. It has a national committee on pesticides and ozone-depleting chemicals. This committee has been in service since 1990, and includes 16 concerned parties from Ministries and nongovernmental organizations (NGOs), as well as a secretariat that is associated with the Environment Public Authority . Kuwait has been planning executive legislation on chemicals management.

A particular assessment is conducted for pesticides, and Kuwait has transposed the Pesticides Act into national law, via “Law No. 21 of 2009 approving the Pesticides Act in the countries of the Cooperation Council for the Arab States of the Gulf.” The law on pesticide registration and circulation prohibited the import or manufacture of pesticides without prior permission from Kuwait PAAAFR. “High risk or extremely poisonous pesticides may not be registered unless proved that other alternatives which are less poisonous are not available. This is decided by the Joint Permanent Committee for the Organization of the Pesticide Manufacturing, Importation, and Usage.” Five samples of the finished pesticide product and one standard sample of the active

[180] Liu L, Qu Y, Huang J, Weber R (2020) - and polyluoroalkyl substances (PFASs) in Chinese drinking water: risk assessment and geographical distribution. Environ Sci Eur. 33, 6 https://doi.org/10.1186/s12302-020-00425-3.

[181]Hu XC, Andrews DQ, Lindstrom AB, et al. (2016) Detection of Poly- and Perfluoroalkyl Substances (PFASs) in U.S. Drinking Water Linked to Industrial Sites, Military Fire Training Areas, and Wastewater Treatment Plants. Environ Sci Technol Lett. 3(10):344-350.

[182]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.

[183]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.

[184]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.

substance(s) must be submitted. These samples will be subject to biological experiments and examination to determine their effectiveness on the targeted insect or pest, as well as to chemical analysis. However, no particular assessment for their persistent, bioaccumulative and toxic (PBT) properties is required.

There is no particular requirement for the assessment of chemicals used in industrial processes or chemicals in products for their PBT properties in Kuwait.

2.4. Implementation status

To document the NIP implementation including successes and gaps is one basis for updating of the NIP and to develop a reflected action plan and priorities. A NIPs lessons learned report with experiences, successes and gaps on NIP implementation has been compiled by UNEPs.[185]

The levels of implementation and compliance with the SC requirements for Kuwait are compiled in Table 18.

Table 18. Overview on NIP implementation status in Kuwait

Convention Article	Level of compliance	Comments
In ARTICLE 3 Measures to reduce or eliminate releases from intentional production and use	For POPs pesticides see ***Section 2.3.1.***	Pesticides are prohibited for import. No POPs pesticides are in use.
	For PCBs see ***Section 2.3.2.***	No PCB use has been discovered in Kuwait.
	For PBDEs see ***Section 2.3.3.***	Still PBDE containing equipment is in use.
	For HBCD see ***Section 2.3.4.***	HBCD in insulation is in use in buildings.
	For HCBD see Section 2.3.5	No HCBD use
	For SCCPs see **Section 2.3.6**	Likely use and release
	For DDT see ***Section 2.3.7***	DDT has been stopped more than 20 years ago.
	For PFOS see ***Section*** 2.3.8	PFOS are likely in use in older synthetic carpets.

[185] UNEP (2018) From NIPs to implementation: Lessons learned report. 31 December 2018. https://wedocs.unep.org/bitstream/handle/20.500.11822/27399/NIP-lessons-learned.pdf?sequence=1&isAllowed=y

Convention Article	Level of compliance	Comments
ARTICLE 4 Register of exemptions	Kuwait has not registered for any exemptions, as listed in SC Annexes.	SCCPs and PFOA have not been assessed yet for exemption need.
ARTICLE 5 Measures to reduce or eliminate releases from unintentional production	See **Section** 2.3.9***.***	Mainly PCDD/F are inventoried and addressed, but is considered an indicator for other UPOPs.
ARTICLE 6 Measures to reduce or eliminate releases from stockpiles and wastes and address contaminated site status	For the individual POPs see Sections 2.3.1. to 2.3.8 and Section 2.3.10	Soils from suspected POPs-contaminated sites will be identified and samples of the soils will be collected and analysed to ass the level of contamination and develop a plan for treatment and rehabilitation of the contaminated sites
ARTICLE 7 NIP and implementation plans	The current NIP is the first NIP of Kuwait.	
ARTICLE 8 Listing of chemicals in Annexes A, B and C	Kuwait has not submitted a proposal on the listing of new chemicals in Annexes A, B and C to the COP.	
ARTICLE 9 Information exchange	See ***Section*** 2.3.13	
ARTICLE 10 Public information, awareness and education	See S***ection 2.3.13***	
ARTICLE 11 Research, development and monitoring	See ***Sections 2.3.12 and 2.3.16***	More monitoring capacity is needed in particular for new industrial POPs
ARTICLE 12 Technical assistance	Kuwait hosts the SCRC Kuwait and gives technical assistance.	Kuwait plans to extend the regional support
ARTICLE 13 Financial resources and mechanisms	Kuwait is financing the SCRC Kuwait and related regional activities.	
ARTICLE 15 Reporting	Kuwait has not submitted Article 15 reports.	The fourth reporting will be prepared based on the current NIP update
ARTICLE 16 Effectiveness evaluation	Kuwait conducts the first human milk study and conducted air monitoring.	
ARTICLE 17 Non-compliance	As the procedures and institutional mechanisms for determining non-compliance have not yet been approved and developed, the	

Convention Article	Level of compliance	Comments
	compliance from countries cannot yet be verified.	
ARTICLE 19 Conference of the Parties	SC focal point of Kuwait has attended the Stockholm Convention COPs.	
ARTICLE 21 Amendments to the Convention	Kuwait has accepted all the Stockholm Convention amendments.	
ARTICLE 22 Adoption and amendment of annexes		
ARTICLE 24 Signature	Kuwait signed the SC 23/05/2001	
ARTICLE 25 Ratification, acceptance, approval or accession	Kuwait ratified the Convention on 12/06/2006.	
ARTICLE 26 Entry into force	The Stockholm Convention entered into force for Kuwait on 10/09/2006.	

3. Strategy and action plan elements of the national implementation plan

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's obligations and other additional objectives set by the country.

3.1. Policy Statement

The Government of Kuwait is determined to safeguard its environment, population, and future generations from exposure to hazardous chemicals including Persistent Organic Pollutants;

Mindful that Persistent Organic Pollutants (POPs) possess toxic properties, resist degradation, bio-accumulate, and move in the environment through air, water and migratory species across international boundaries;

Conscious of the need for actions and activities to protect human health and the environment through effective and tangible measures reducing and/or eliminating emissions and discharges of persistent organic pollutants.

The Kuwait Environment Public Authority formally endorses this first National Implementation Plan (NIP) and commits itself to undertake the activities set forth in this plan, in coordination with relevant stakeholders, and meet its obligations under the Stockholm Convention within its existing national conditions and capabilities.

Kuwait is aware that POPs are only a part of the sound chemical management and hazardous waste management challenge. Therefore, the Environment Public Authority is aiming at linking and harmonizing the different activities on overall chemical management (SAICM synergy) and hazardous waste management (POPs, mercury, ozone depleting substances, plastics) and where appropriate, also chemical related measures for climate change mitigation and biodiversity.

Kuwait has also adopted the 2030 Agenda for Sustainable Development and related goals. Sound management of chemicals and wastes is central to achieving the three dimensions of sustainable development (namely social, economic, and environment) and the SDGs. It is also critical to ensuring food security and clean water and land, secure human health particularly for women and men reproductive health, for children and vulnerable populations. The SDGs have many links to chemicals and waste management with a specific target under SDG 12 on Sustainable Consumption and Production. Sound management of chemicals and waste also impacts on SDG 3 (Good Health and Well-Being) and SDG 6 (Clean Water and Sanitation). Goal 12 is aimed at achieving, by 2020, the environmentally sound management of chemicals and all wastes throughout their life cycle and significantly reduce their release to air, water, and soil. Goal 3, on the other hand, targets to reduce substantially by 2030, the number of deaths and illnesses from hazardous chemicals and air, water, soil pollution and contamination.

The overall objective of the sound management of POPs and hazardous chemicals, is to strengthen the national capacity and capability to deliver a comprehensive assessment of the threats posed by chemicals, reduce and where possible, eliminate the exposure of the populations and the environment, to POPs and hazardous chemicals. Appropriate actions, activities, and strategies prepared in the NIP will then be implemented to reduce and ultimately eliminate POPs from the environment, as envisaged under the Convention. The NIP takes into account the

existing work and assessments and forms an integral part of the national integrated chemicals and hazardous wastes management activities. It also takes due account of the aims of the national sustainable development agenda in matters relative to social, economic, and environmental policies and actions, in order to maximize their overall benefits. This will avoid “reinventing the wheel” and thus will link the NIP to related national chemicals and waste management initiatives where appropriate, to ensure maximum efficiency and reduce duplication of effort.

3.2. Implementation strategy

3.2.1. Inter-ministerial and stakeholder coordination considering national priorities

At the governmental level, all relevant ministries will be involved in the NIP implementation, by which each ministry will have different responsibilities with respect to its function. This inter-ministerial coordinating mechanism is considered vital in addressing chemicals and waste management issues (including POPs). Chemicals and waste and their management are important to the national development plan of Kuwait Vision 2035[186].

The NIP has some complementary activities which can contribute and enrich the national development plan of Kuwait Vision 2035. For example, the current Kuwait Vision 2035 does not explicitly mention the life cycle management of hazardous chemicals or the waste hierarchy for the recovery of resources from waste and the related circular economy approach. Here, the NIP can positively enrich the Kuwait Vision 2035 in particular when appropriately mainstreamed with the National Waste Management Strategy, currently developed for Kuwait.

Chemicals and waste and their management are important for a range of SDGs of the 2030 Sustainable Development Agenda, in particular SDG 12 on sustainable production and consumption. Chemical and waste management also significantly contribute to the implementation of the SDGs in particular for the following:

- Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture
- Goal 3: Ensure healthy lives and promote well-being 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).

[186] Kuwait National Development Plan - A consolidated approach towards a prosperous and sustainable future https://www.mofa.gov.kw/en/kuwait-state/kuwait-vision-2035/; https://newkuwaitsummit.com/kndp.

- 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.[187]
- 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).

At the governmental level, all relevant ministries will be involved in the NIP implementation by which each ministry will have different responsibilities with respect to its function. Inter-ministerial coordinating mechanism is considered vital in addressing chemicals and waste management issues (including POPs). This inter-ministerial coordination group would address relevant chemical issues, related waste and circular economy, and related SDG topics. 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 will be assigned, including those involved in activities that influence chemical safety such as the private sector, industry, labour, science, and public interest groups.

For this likewise, 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 often not used effectively in policymaking; and policymakers do not always effectively inform scientists about their needs for scientific knowledge. The Kuwait Foundation for the Advancement of Sciences (KFAS) is keen in galvanizing its role as a major catalyst in development and capacity building in research and technology in accordance with the State of Kuwait Development Plan. The new strategic plan is aimed at accelerating the establishment of a “National Research Council” to identify national priorities of the State of Kuwait with respect to scientific research and funding of research. With a further step, the increased scientific capacity should be used for science policy advice. In effect,

[187]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. Environmental Sciences Europe DOI:10.1186/s12302-018-0139-z

KFAS in cooperation with KISR could develop a strategy for the improvement of science-policy interface with respect to chemicals and wastes. This 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 will have to be in place. This should consider three levels such as the following:

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

2. Management level: support legislative work, 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 sound management of chemicals and waste. An international guidance has been developed to support financing of chemicals management in this respect.[188] Extended Producer Responsibility (EPR)[189] and Polluter Pays Principle (PPP) are approaches supporting sustainable financing of chemical and waste management.

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

Appropriate actions are proposed in the action plans.

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 harmonised implementation. Kuwait has ratified and is a signatory to the Basel Convention and other international conventions and agreements and is also aware that efforts should to be made for a harmonized implementation.

Moreover, the Strategic Approach to International Chemicals Management (SAICM; www.saicm.org/) is aimed at an overall management of chemicals and has POPs-related emerging policy issues and issues of concern.[190] Here, the implementation of the SC can and should facilitate the implementation of SAICM and vice versa. The government seeks 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. Currently, Kuwait has limited waste destruction capacity, and therefore, is currently disposing most of the chemicals, products, and materials imported to the country at the end of their useful life. Only a minor fraction of the materials is recycled. The leaching of POPs and other

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

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

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

chemicals from landfills and dumps into ground- and surface water and related impact to the environment and biota emphasises 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.

Furthermore, international efforts in protecting the ozone layer (Montreal Protocol/Vienna Convention on ozone depleting substances (ODS)) address partly the same waste categories containing POPs, such as air conditioners in cars or HBCD containing extruded polystyrene (XPS) normally containing 8% hydrofluorocarbon (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 PBDEs/HBCD 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 like POPs containing electric and electronic equipment (EEE), furniture, synthetic carpets, textiles, or paper. The related waste and other waste like car shredder residues, POPs containing waste wood or waste oils are challenges for recycling and circular economy. Such bulk wastes containing POPs, POPs-like chemicals or other hazardous chemicals have entered Kuwait in thousands of tonnes over the last three decades and are currently largely disposed in landfills. This highlights that another waste management, extended producer/importer responsibility, and import policy are 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 at addressing POPs in connection with sustainable development and consumption and production efforts (SDG 12). Chemicals and waste and their management are important for the national development plan of Kuwait Vision 2035[186] and should be mainstreamed into the national development plan (see 3.2.1) which does not have yet a detailed strategy for resource recovery from wastes or a strategy toward a (more) circular economy. This is however needed, if Kuwait aims to achieve sustainable development. It is at this juncture that the NIP can support the national development plan of Kuwait Vision 2035 by facilitating a more circular economy by phasing out POPs.

The contamination of several potential recycling flows by POPs revealed the negative impact and threat for a (more) circular economy and resource recovery important for resource conservation and sustainable development[191]. This includes, e.g., treated wood or polymer fractions such as WEEE plastic or PVC and BFR containing polymer fractions of end-of-life vehicles and

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

construction and demolition wastes. Also, rubber and 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 needs to be considered.

Several POPs have exemptions for continued use, and often, the exemptions include continued use 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 chemicals[192] and chemicals of concern[193] (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 promoting recycling and reuse, and therefore, supporting circular economy and sustainable consumption and production (SCP).

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

3.3. Action plans, including respective activities and strategies

It is worth noting that the suggested time frames in the individual action plans are tentative. Likewise, the listed stakeholders are merely an initial list which can be amended when appropriate.

3.3.1. Activity: Institutional and regulatory strengthening measures

The lifecycle management of chemicals is a cross cutting issue in a country for different ministries. The need to move to a circular economy results in an urgent need to better control and regulate the use and in particular, recycling of products and waste categories containing POPs and other hazardous chemicals.

While Kuwait has developed a regulatory frame for chemicals (see section 2.2.3), there is limited comprehensive and streamlined legislation for chemicals management and waste management in the life cycle. There are for example, no defined limits as to what levels waste is considered hazardous waste and when it is to be destroyed, and there are no limits defined at what POPs concentration a product such as recycled plastic or rubber can be sold in the market. The Basel and Stockholm Conventions have established low POPs content. Also, several POPs, such as SCCPs, PFOS, or PFOA have not as yet been regulated in Kuwait.

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

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

Furthermore, other ratified chemical Conventions should be considered, in particular, Rotterdam and Basel Conventions. Moreover, the Strategic Approach on International Chemical Management (SAICM) is aimed at an overall management of chemicals and has POPs-related emerging policy issues and issues of concern. At this point, the implementation of the SC can facilitate the implementation of SAICM and vice versa. A successful implementation of the SC in Kuwait would therefore attempt an integrated approach with SAICM and Basel Convention and integration of some related provisions into the current institutional and regulatory framework for managing chemicals in the life cycle in the country. One important tool for governments to facilitate 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 Globally Harmonized System of Classification and Labelling of Chemicals (GHS). The trade bloc for Gulf countries, including Kuwait, confers with the countries in alliance on a draft regulation that sets out provisions for safety data sheets, labelling, and classification based upon the fifth edition of the GHS. This will also be an important step to raise enterprise, workers' and public awareness of chemical risks. However, it consideration should be taken in 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.

The POPs action plan is aimed at improving the existing institutional and regulatory framework in Kuwait and at further facilitating chemical and waste management, in particular, for POPs-containing waste.

Table 19 illustrates the institutional and regulatory measures embodied in the action plan.

Table 19. Action plan institutional and regulatory strengthening measures

Objectives	Activities	Performance indicators	Time frame	Implementer
Cooperation between institutions				
Coordinated activities of the different institutions in the administration and monitor chemical and waste management including implementation of the SC NIP, GHS, SAICM and other activities	Establish or update an interministerial and multi stakeholder committee to coordinate the overall management of chemicals and chemicals in products including implementation of NIP	Identified gaps for the coordination of chemicals and chemicals in products and how to address gaps (report) Established committee	2 years	EPA, KISR MoJ, MoCI, PAI, MoH, MoSAL
To assess and possibly update responsibilities of ministries and other authorities for the life cycle management of POPs and other hazardous chemicals (SAICM synergy) and wastes (Basel synergy)	Assess responsibilities and capacity of institutions for life cycle management of POPs and other hazardous chemicals and wastes and related gaps and needs assessment. Addressing gaps and improvement of the frame for life cycle management of POPs and other hazardous chemicals and waste. Capacity building of institutions for life cycle management of POPs, chemicals and waste	Gaps assessment report and suggestions for improvement Improved legal frame Trainings and workshops	3 years	EPA, KISR MoJ, MoCI, PAI, MoH, MoSAL. Customs,
Legal and policy framework				
Restricting or prohibit import of Annex A & B chemicals not yet listed	Evaluate the need for any exemption Develop regulatory framework to restrict or prohibit for POPs not yet listed in Kuwait	Evaluation report Restriction regulation	3 years	EPA, KISR MoJ, MoCI, PAI,

Objectives	Activities	Performance indicators	Time frame	Implementer
Limit values for POPs in products, waste, and recycling which guarantee safe material cycles	Assessment of POPs limits in waste and products Selection of appropriate limit values and development of regulations	Review report		EPA, KISR MoJ; MoCI, PAI,
Established regulatory frame for the management of SCCPs and CPs containing SCCPs	Inclusion of SCCPs in list of banned or restricted substances	SCCPs listed as restricted substance	1 years	EPA, KISR MoJ, MoCI, PAI
	Development of regulatory frameworks for SCCPs and CPs containing SCCPs and related products and wastes containing these POPs	Overview of international regulations compiled	2 years	
Established regulatory frame for the management of POP-BFRs (PBDEs, HBCD, HBB) and related articles and waste categories	Inclusion of PBDEs, PBB and HBCD in list of banned or restricted substances	PBDE, PBB and HBCD restricted	1 years	EPA, KISR MoJ, MoCI
	Assessment of regulatory frameworks for POP-BFRs and related products and wastes containing these POPs	Overview of international regulations compiled	2 years	
	Development of regulatory frame for EEE/WEEE and related PBDE management	Regulatory frames for EEE/WEEE developed	2 years	EPA, KISR MoJ, MoCI, PAI,
	Development of a regulatory frame for vehicles management[194] (importation, end of life management).	Regulatory frames for vehicles developed	2 years	
	Development of a regulatory frame for HBCD in insulation.	Regulatory frame for HBCD insulation foams developed	2 years	
Establishing policy and regulatory framework for management of PFOS and related substances and other PFAS (SAICM synergy)	Assessment of regulatory frameworks of other countries for controlling PFOS and related substances and other PFAS.	Assessment report and draft regulation	5 years	KISR, EPA, MoJ, MoCI, Customs
	Amending existing laws, or develop new laws related to the control and management of PFOS and other PFAS. Banning or restricting PFOS, PFOA, and possibly other PFASs	Law and policy in place	3 years	
	Custom control and improvement of the traceability of PFOS and other PFAS in imports (including chemicals in products).	Customs trained	3 years	
	Implementation of extended producer/user responsibility for management of PFOS, PFOA and other PFAS containing products throughout product life cycle (including disposal).	EPR in place - Industrial use - Consumer products (e.g. carpets, textiles): take back of end-of-life products and ESM.	3 years	
Establish legal framework for reduction and minimisation of unintentional POPs	Undertake law and policy assessment on PCDD/F/UPOPs and relevant co-pollutants. Amend existing laws, or develop new laws where needed, related to the management of	Policy and legal framework for reduction and minimization of UPOPs and other pollution release established	5 years	EPA, KISR MoJ, MoCI, PAI,

[194] see e.g. EU ELV directive

Objectives	Activities	Performance indicators	Time frame	Implementer
	UPOPs within an integrated pollution prevention and control approach. Regulatory limits of unintentional POPs in chemicals including pesticides Regulatory limits of unintentional POPs in food and feed			
Inform and capacitate institutions and stakeholders on regulations and on enforcement and compliance of regulations on POPs and other hazardous chemicals (SAICM synergy)	Development of information materials on regulatory requirements for the respective POPs tailored for institutions and industrial and other stakeholders. Information and education on regulatory issues for stakeholder groups for individual POPs	Information materials Workshops organised and stakeholders reached (documentation)	5 years	EPA, KISR, MoJ, MoCI, PAI,

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

In Kuwait, there is no intentional production of POPs chemicals. However, there are likely several POPs in use, including PBDEs in articles such as TVs or HBCD in insulation foams in buildings or PFOS in articles such as synthetic carpets. Furthermore, recently listed POPs such as short-chain chlorinated paraffins (SCCPs) and DecaBDE have a range of exemptions. These new listed POPs have not yet been assessed for Kuwait in the current NIP update, and are not yet prohibited (see section 3.3.1).They are likely used in some processes and are certainly present and used in articles and products. Article 3 of the Convention summarises activities that must be put in-place to reduce and eliminate releases from intentional production. These activities include legal and administrative measures. This action plan presented in Table 20 identifies measures to reduce or eliminate releases from intentional use of POPs.

Table 20. Measures to reduce or eliminate releases from intentional use

Objectives	Activities	Performance indicators	Time frame	Implementer
Assessment of current use of POPs and reducing and eliminating releases and use of POPs	Update inventory of Annexes A and B chemicals imported and used in Kuwait, in particular the recent listed SCCP, decaBDE, PFOA, and the soon to be listed PFHxS	Detailed inventory of SCCPs, PFOA Chemicals currently in use	5 years	EPA KISR MoCI, PAI, Custom
	Analyse pattern of usage of POPs in use and in particular POPs in products in use and in import (PFOA, SCCPs, PBDEs)	Use pattern and products and processes of POPs in current use identified and controlled (monitoring and control report)		
	Control and reduce use and release			
	Phase out of current new use of identified POPs and substitution (PFOA; SCCPs) and control waste management of other POPs in long-term use (PBDEs, HBCD, PFOS).	Substitution by more green and sustainable chemicals and non-chemical alternatives		
Restricting or prohibiting import of Annexes A and B chemicals	Please see Table 19			

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

There has not been any previous production of the listed POP pesticides in Kuwait.

Furthermore, there are no POPs pesticides stocks in Kuwait.

Nevertheless, there are imports and use of pesticides in agriculture and indoor. Thus, there might be import of counterfeit pesticides to Kuwait, which in other countries was up to 25% of pesticides used. Such counterfeit and illegal pesticide imports could include POPs pesticides such as PFOS precursors or DDT still produced as well as highly hazardous pesticides (HHPs). Considering the synergy with SAICM, the control and restriction of HHPs should be considered.

Pesticides can contain unintentional POPs, such as e.g. PCDD/Fs and HCB.[195,196]

Furthermore it need to be stressed that indoor risks of pesticide uses are significantly linked to hazards of the family members even for pesticides which are not considered HHPs.[197] The cancer rates of children for leukaemia and brain tumours are higher in households using indoor pesticides[198] (in particular for insecticides which are for example, used for mosquitos, ticks in pets, ants, and cockroaches).

The overall objective of the NIP Strategy and Action Plan is to ensure a substitution and safe use of pesticides for environmental and human health in Kuwait. The strategy which can be applied is the following:

1. Consider the use of integrated pest management (IPM) and organic farming and non-chemical solutions
2. Use of environmentally safe pesticides
3. Responsible and safe use of potential hazardous pesticides
4. Banning the use of highly hazardous pesticides (SAICM synergy)
5. Education and awareness of the hazards associated with pesticide use in agriculture and indoor.

Increasing awareness and information dissemination

The general awareness on the nature and use of pesticides can be improved in Kuwait. Information about pesticides should be translated into different messages that target farmers and also the consumers for indoor use of pesticides. A website could be established for the risk in indoor use similar to United States Environmental Protection Agency (US EPA)[199]. Another is that a general website could be established to provide general information on all pesticides used in Kuwait, their use and risks to human and the environment, as well as on alternatives to pesticides.

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[195] Holt E, Weber R, Stevenson G, Gaus C (2010) Polychlorinated Dibenzo-p-Dioxins and Dibenzofurans (PCDD/Fs) Impurities in Pesticides: A Neglected Source of Contemporary Relevance. Environ. Sci. Technol 44, 5409–5415.

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

[197] Sarwar M (2016) Indoor risks of pesticide uses are significantly linked to hazards of the family members https://doi.org/10.1080/2331205X.2016.1155373

[198] Chen, M., Chang, C. H., Tao, L., & Lu, C. (2015). Residential Exposure to Pesticide During Childhood and Childhood Cancers: A Meta-Analysis. Pediatrics, 136(4), 719–729. https://doi.org/10.1542/peds.2015-0006

[199] https://www.epa.gov/indoor-air-quality-iaq/pesticides-impact-indoor-air-quality#Health_Effects

Table 21 presents the action plan on the import, export, use, stockpiles and wastes of POPs pesticides and other hazardous pesticides.

Table 21. Action plan import and export, use, stockpiles, and wastes of POPs pesticides (Annex A) and highly hazardous pesticides (HHPs)

Objective	Activities	Indicator	Implementer	Time frame
Control and stop counterfeit and substandard pesticide imports to avoid any POPs and HHPs in Kuwait	Organise training for selected stakeholders and implement certification for pesticide trade and organise with permitting department that only certificated companies can obtain a permit	Participants obtained certificates and are actively involved in pesticide management	KISR, EPA, PAAFR Customs	2 years
Establish analysis and monitoring of counterfeit and substandard pesticide import	Improve the monitoring of counterfeit and substandard pesticides considering also unintentionally POPs in pesticide products	Laboratory data on pesticide monitoring including unintentional POPs screening Market survey of illegal and counterfeit pesticide use	KISR, EPA, PAAFR Customs	2 years
Control and reduction of indoor pesticide use and awareness on health effects	Compilation of information on health effects of indoor pesticide use and awareness platform Assessment of illegal use of PFOS precursors in ant and cockroach bites Assessment of risk and health effects of other indoor pesticide use	Website with information on risk of indoor use of pesticides (also in Arabic) Market survey of illegal and counterfeit pesticide use Health risk assessment report	KISR, EPA, PAAFR MoH	2 years
The action plan for POP pesticide contaminated sites is integrated in the general action plan on POPs contaminated sites (Table 29), which is presented in the latter pages..				

3.3.4. Activity: Import and export, use, identification, labelling, removal, storage, and disposal of PCBs, PCNs, and SCCPs containing wastes (Annex A, Parts I and II Chemicals)

PCBs and PCNs have been used in the same closed applications (capacitors and transformers) and open applications (sealants, adhesives, cables, PVC paints and other paints).[200] PCNs have been used mainly in the 1930s to 1960s and overall in much lower amount compared to PCBs; and thus are less relevant and can be managed within the frame of PCB management plus unintentional POPs management (see section 3.3.9).

SCCPs have substituted PCBs and PCNs in a wide range of open applications (e.g., paints, coatings, sealants, plastic additive/flame retardant, rubber, lubricants, metal working fluids).[200] SCCPs have been listed with a range of exemptions.

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

According to the inventory findings, Kuwait does not have PCB-containing transformers or capacitors in use. Therefore, no activity of inventory and management of PCB equipment is needed.

Consequently, the major activities on PCBs, PCNs, and in particular, SCCPs can be concentrated on the use in open applications where SCCPs have been and are being used in large volumes (PVC, cables, certain rubber products, metal working fluids, and oil/lubricants, paints and adhesives/sealants). PCBs and PCNs have been used in the past in these applications (the 1930s to the 1980s). Moreover, PCNs and PCBs are unintentional contaminants in SCCPs/CPs, sometimes above that of low POPs content.[200]

The action plan is aimed at understanding and phasing out the current use of SCCPs, and use of better alternatives, as well as establishing a life cycle management of products and waste containing SCCPs. The remaining former use of PCBs/PCNs and the unintentional PCBs/PCNs should also be monitored within this assessment.

Table 22 highlights import and export, use, identification, labelling, removal, storage, and disposal of SCCPs, PCBs and PCNs as defined in the action plan.

Table 22. Action Plan import and export, use, identification, labelling, removal, storage and disposal of SCCPs, PCBs and PCNs

Objective/aim	Activity	Indicators	Time frame	Implementer
For the regulatory frame please see action plan in Table 19				
Development of an inventory of SCCPs and PCB/PCN in open applications	Assessment of the current and past use of SCCPs and CPs containing SCCPs in open applications (e.g., sealants, paints, rubber, plastic additive, metal working fluids, lubricants). Within this assessment, past use of PCBs/PCNs and in the country. Where relevant, developing inventory of PCBs/PCNs and SCCPs in open applications.	Inventory of SCCPs in current use open applications	3 years	EPA, KISR, MoIC; MoEW Private sector (PVC, plastic, rubber paint, lubricant; PVC) Oil importing companies
	Inventory of recycling cycles possibly affected by SCCPs (PVC, cables, rubber, waste oil)	Monitoring/inventory report	3 years	
	Developing and regularly updating a database for SCCPs. PCB/PCN and HBCD in open applications in buildings/constructions	Database of POPs in buildings	3 years	EPA, KISR MoHA; MoPW
Life cycle management (import, handling, storage, transport and disposal) of SCCP and PCBs/PCNs containing products and contaminated wastes	Assessment of import of SCCPs and CPs containing SCCPs and products containing SCCPs.	Monitoring report	3 years	EPA, KISR;MoEW; Customs, Waste management and recycling sector
	Assessing the current situation and improvement needs of waste management of SCCP and PCB/PCN containing wastes (PVC, cables, rubber, waste oil, C&DW)	Assessment report	1 year	
	Assessment and monitoring of recycling of waste fractions containing SCCPs, PCBs/PCNs (PVC, cables, other plastic, rubber, oil, C&DW).	Authorities and staff trained	2 year	
	Stop the use of SCCPs and CPs containing SCCPs or PCB/PCN above the low POP content.	Phase out of equipment by 2025. Documented management and export	6 years	

Objective/aim	Activity	Indicators	Time frame	Implementer
	Environmentally sound management and disposal of PCB/PCN containing equipment and waste	Disposal of equipment by 2027	9 years	
Assessment and promotion of sustainable alternatives used for SCCPs in the relevant applications	Compilation of information on alternatives of SCCPs in open applications and assessment of alternatives used	Reports (compiling available information from e.g. POPRC)	2 years	EPA, KISR, MoIC; MoH
	Education on alternatives to SCCPs in the relevant applications	Trainings conducted (numbers of participants)	3 years	
	Promotion of the most sustainable alternatives in (former) open applications of PCBs/PCNs and SCCPs	Selected alternatives (e.g. ecolabel)	5 years	
Activities for PCB/PCN and SCCP contaminated sites are integrated in the action plan on POPs contaminated sites (Table 29), which is presented in the latter pages.				

3.3.5. Activity: Import and export, use, stockpiles, and wastes of PBDEs, HBCD, and HBB (Annex A, Part I Chemicals)

PBDEs have been imported in EEE, in vehicles, polymers in construction and possibly other goods. Therefore, they are present in stocks at consumer levels or as wastes (see Section 2.3.3).

The action plan is focused on setting actions, measures, and implementation, by which will lead to managing and controlling PBDE-containing products. For managing PBDEs, the life cycle management (import, export, use, recycling, destruction) of PBDE-containing articles/products and waste needs to be developed, in particular, for EEE/WEEE and end-of-life vehicles (ELVs). In addition, HBCD and to a less extent, PBDEs are used in insulation of buildings (EPS/XPS, polyurethane, and possibly other polymers).

For the three material and waste flows – WEEE, ELVs, and construction and demolition waste (C&DW) − also, resource recovery and recycling need to be developed and optimised for promoting the circular economy and the waste management hierarchy. At the same time, pollutants such as PBDEs, and other POPs and hazardous substances need to be phased out of the recycling.[201]

[201] Stockholm Convention (2017) Guidance on best available techniques and best environmental practices for the recycling and disposal of articles containing polybrominated diphenyl ethers (PBDEs) listed under the Stockholm Convention on Persistent Organic Pollutants; Draft 2017

PBDEs might also be partly included in polyurethane or textiles from imported furniture, in particular, from North America or the United Kingdom where in particular, flammability standards exist.[202,203,204]

Table 23 shows elimination and management of hazardous substances as embodied in the action plan, to include timelines, responsible authorities, and stakeholders.

Table 23. Action plan elimination and management of POP-BFRs (PBDEs, HBCD and HBB[205]) including timelines, responsible authorities and stakeholders

Objectives	Activities/tasks	Performance indicators	Time Frame	Implementer
For the regulatory frame please see action plan in Table 19				
Updated and refined inventory of PBDEs and HBCD in articles and wastes including monitoring	Update PBDE inventories considering DecaBDE (and other update if necessary)	Updated inventory report	2 years	KISR, EPA Selected stakeholder Consultants
	Develop a dynamic MFA/SFA inventory for POPs/PBT (and resources) in EEE/WEEE, vehicles, and polymers in construction.	Dynamic substance flow analysis (SFA) of POP-BFR containing products and waste (report)	3 years	
Sound Life Cycle Management of PBDE and HBCD containing product and waste categories (EEE/WEEE, end of life vehicle, insulation foam) and integrate in the larger frame of plastic/polymer management	Compilation of information of management for POP-BFR containing products and waste including fate of other pollutants.	Report	2 years	KISR, EPA MoCI, PAI,
	Assessment of management, recycling and destruction option of waste categories containing POP-BFR (WEEE; ELV, insulation foam, furniture).	Assessment report	2 years	
	Compile information on safe handling of POP-BFR polymers in EEE, ELV, and insulation foam etc. and use available guidelines or develop national guidance for the management of waste and resources.	Report and selected guideline or developed guidance	2 years	
	Development of sound management of POP-BFR containing plastic and other polymer in EEE/WEEE within the frame of hazardous substance management in EEE	EEE plastic and PBDE management is addressed within WEEE management	3 years	
	Development of sound management of plastic and other polymers in ELVs	ESM of plastic and polymers within ELV management established (report)	5 years	

[202] Shaw SD, Blum A, Weber R, et al. (2010) Halogenated Flame Retardants: Do the Fire Safety Benefits Justify the Risks? Rev. Environ. Health 25(4), 261-305.
[203] Charbonnet J, Weber R, Blum A (2020) Furniture, building insulation and electronics: Benefit and risk. Emerging Contaminants, DOI: 10.1016/j.emcon.2020.05.002
[204] McKenna ST, Birtles R, Dickens K, et al. (2018) Flame retardants in UK furniture increase smoke toxicity more than they reduce fire growth rate. Chemosphere. 196:429-439.
[205] 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.

Objectives	Activities/tasks	Performance indicators	Time Frame	Implementer
	Development of sound management of POP-BFR containing plastic and other polymer in buildings and construction considering other POPs (SCCPs, PCBs) and hazardous substance management in buildings and construction.	ESM of plastic/polymer from construction and demolition waste (report)	3 years	
	Identify destruction and energy recovery options for POP-BFR containing waste. Develop phase out/destruction options for identified POP-BFR sources.	Phase out/destruction options identified. Phase out/destruction options programmes in place	5 years	
Assessing and selecting the most sustainable alternatives to POP-BFRs in used/exempted applications	Compilation of information considering available UN and other reports Education and capacity building on alternatives assessment. Selection of the most sustainable alternative chemicals and non- chemical solutions in the different applications. Phase in of sustainable alternative chemicals and non-chemical alternatives.	Most sustainable alternatives to POP-BFRs (HBCD and DecaBDE) in used/exempted applications are assessed and selected	3 years	KISR EPA MoIC
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 and other hazardous chemicals in the life cycle of EEE, vehicles, buildings, textiles and other impacted product categories. Collect or develop 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 and marine litter and on SCP. Awareness raising campaigns to reduce/eliminate open burning of EEE/WEEE and ELV polymer scrap by the informal sector	Compiled awareness raising materials. Awareness raising workshops and dissemination of information (number of stakeholders reached)	5 years	KISR EPA MoIC
Building 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 Capacity building for implementation of the regulatory frames for managing WEEE, ELVs and other impacted wastes Training/education of customs authorities on control of import of WEEE, ELVs and other potentially impacted products.	Policy and regulatory needs assessment (report) Training materials developed	3 years	KISR EPA MoIC Private sector

Objectives	Activities/tasks	Performance indicators	Time Frame	Implementer
		Procedures on inspections and maintenance of stockpiles and waste developed.		
	Development of education and training materials for life cycle management of POP-BFRs and other hazardous substances (considering already available materials) in EEE, vehicles, buildings, furniture, textiles for relevant sectors Capacity building of life cycle management for POP-BFRs 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.	Education and training materials for life cycle management of POP-BFRs Capacity building and training activities conducted (number of workshops and participants)		
The action plan for POP-BFRs (PBDEs and HBCD) monitoring is included in Table 34 and for contaminated sites is integrated in the general action plan on POPs-contaminated sites in Table 29				

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

DDT has not been used for long in Kuwait, and is banned. Since the use is prohibited, no export or registration has ever been recorded. The inventory review did not find any pesticide/DDT stocks in the country. Conclusively, no storage sites with associated releases exist.

Table 24. Action plan Import, export, use, stockpiles, and wastes of DDT (Annex B Chemical)

Objectives	Activities	Performance indicators	Time Frame	Implementers
Further assessing and controlling illegal imports of pesticides.	Further assessment of illegal import activities including counterfeit pesticides Training of custom to control imports of illegal pesticides	Report on the import Training on illegal pesticide import included in general training for customs	3 years	KISR, EPA MoH; Customs

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 report, PFOS, PFOA, and related substances are not manufactured in Kuwait. However, PFOS and related substances have entered Kuwait in chemicals and mixtures used by industries.

PFOS and PFOA have been used in firefighting foams, which have been used in the past with generation of potentially contaminated sites and groundwater. Also, PFOS has been used in oil drilling operations; although, the extent of historic use in Kuwait is unknown. Also, plating industry has likely used PFOS in the past.

In addition, PFOS, PFOA, and other PFAS have entered Kuwait in consumer products and articles. PFOS and PFOA are likely present in synthetic carpets (tufted carpets), treated furniture and textiles from where these substances result in human exposure and are released into the environment. The disposal to landfills has always been and still is the main waste disposal in Kuwait.

Currently, analytical capacity is under development in KISR.

The main issues to be considered in the action plan are the assessment of current used PFOA in industry and products and contaminated sites and groundwater. Also, the identification, management, safe handling and treatment of waste potentially containing PFOS or PFOA are a problem for stakeholders in Kuwait (enforcement authorities, waste management and recycling industry) and ought to be addressed.

PFOS, PFOA, and related compounds have been substituted mainly by other per- and polyfluorinated substances (PFAS). PFAS are an issue of concern under SAICM. To promote the synergy of the SC and SAICM, the action plan is extended to considering other PFAS when appropriate (Table 25).

Table 25. Action plan for measures to reduce or eliminate PFOS, PFOA, and control other PFAS (SAICM synergy) including timelines, responsible authorities and stakeholders, and associated cost

Objectives	Activities/tasks	Performance indicator	Time frame	Implementer
For the regulatory frame please see action plan in Table 19				
Updating and refining inventory of PFOS/PFOA and other PFASs containing products, stockpiles and waste (SAICM synergy)	Refining inventory of PFOS, PFOA, and other PFAS in firefighting foams Refining of inventory of PFOS, PFOA, and other PFAS in consumer products Refining of inventory of stocks and waste of PFOS, PFOA, and other PFAS (including landfills) Refining inventory of historic use and release of PFOS and PFAS (see contaminated site action plan)	Updated inventory with robust data and list of data gaps	5 years	KISR, EPA
Life cycle management of PFOS/PFOA and other PFASs containing products, stockpiles and waste (SAICM synergy)	Compilation of information of management situation of PFOS and PFAS containing products in the country	Report	5 years	KISR, EPA, MoCI, PAI, firefighters, plating industry, textile importers, retailers, Private sector
	Assessment of management and destruction option of PFOS, PFOA, and other PFAS containing stocks and wastes	Management and destruction options assessed (report)		
	Policy and strategy for control and management of PFOS and other PFAScontaining products and wastes	Strategy incorporated in National Chemical and Waste Management Plan		
	Environmentally safe storage of PFOS, PFOA, and other PFAS containing materials	PFOS, PFOA and PFASs containing waste stored		
	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		

Objectives	Activities/tasks	Performance indicator	Time frame	Implementer
Assessing PFOS alternatives in use/exempted uses and substituting PFOS by the most sustainable chemical and non-chemical solution	Compilation of information on alternatives to PFOS, PFOA and related substances (considering available information of POPRC).	Information materials developed (report) and disseminated.	5 years	KISR, KEPA, MoCI, PAI,
	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 PFAS and establishing approach for information exchange	Development of education and awareness materials for stakeholder groups (considering already available materials) and translation of selected materials into Arabic	Education material selected/modified and selected materials translated into Arabic	3 years	KISR, EPA, MoCI, PAI,
	Inform and educate stakeholders including users (e.g. fire fighters; plating industry), importers of products (textile, furniture) policy makers and public on the environmental and health impact, ESM and on alternatives of PFOS, PFOA, and related compounds.	Number of workshops, online seminar (number of participants)		
	Training/education of custom and other authorities on PFOS, PFOA (and other POPs and other hazardous substances) in products.	Number of trained personnel		
The action plan for monitoring PFOS/PFOA and related compound is included in Table 34 and the action plan on contaminated sites is integrated in the general action plan on contaminated sites in Table 29				

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

Article 4 of the SC on POPs requires the establishment of a POPs register for the purposes of identifying parties that have specific exemptions listed in Annexes 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 (DDT, HBCD, lindane, decaBDE, SCCPs, PCP, PFOS, PFOA, and recycling of PBDEs-2009). For most of these listed POPs, no exemptions are needed. However, for some of the recently listed POPs, alternatives might be needed (e.g., PFOA or SCCPs). To decide if an exemption is needed, an informed decision needs to be made considering available alternative chemicals and non-chemical solutions. Such an assessment can be made by appropriate research institutions, in particular KISR, and the industries using the chemicals. If after such a science-based assessment an exemption is needed, then, the Secretariat of the SC/COP would be informed, and the exemptionis registered. Hence, in this action plan, an activity is included to establish an appropriate systematic methodology for assessment of exemption to appropriately meet the obligations under Article 4 in the future.

Table 26. Action Plan: Register for specific exemptions and continuing need for exemptions (Art. 4)

Objectives	Activities	Performance indicators	Time Frame	Implementer
To establish an informed evaluation and registration process for exemptions	Organize stakeholder consultation to establish criteria for assessment and selection of exemptions for chemicals listed under Annexes A or B	Stakeholder consultation held and outcomes documented	3 years	KISR, EPA, MoCI, PAI,, MoH, related industry, other stakeholders, NGOs
	Assess if exemptions are needed for DecaBDE, SCCPs, PFOA, and future listed PFHxS	Country assessment of current listed POPs with exemptions (report)		
Listing and periodic assessment of the POPs in case the aforesaid assessment concluded that an exemption for a POPs is needed	Inform BRS Secretariat / COP on the exemption needed after thorough assessment of the need and the alternative options	Notification submitted and exemption listed	As need arise	KISR, EPA, MoCI, PAI, MoH, affected industries, other affected stakeholders, NGOs
	Periodic review to assess the need for continued exemptions and alternatives and stop exemption and use more sustainable alternatives as soon as feasible	Review report		

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

PCDD/Fs are released from different industries and from open burning on landfills. The preliminary inventory for PCDD/F and UPOPs requires refining and further monitoring of individual facilities. Moreover, the inventory has to be regularly updated.

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

BAT/BEP (Best Available Technique and Best Environmental Practice)

In Kuwait, only a few facilities listed in Annex C of the SC have been discovered as PCDD/F sources such as medical waste incinerators, iron-smelters, cement kilns, power plants and chlorine-production.

Within this first UPOPs inventory, the technology level of the individual facilities and if they are BAT could not be assessed. BAT/BEP with respect to PCDD/F control and reduction, is described

in the “Guidelines on BAT and provisional guidance on BEP” developed within the SC[206]. Comprehensive BAT Reference documents (BREFs)[207] for large-scale industries have been developed by the European Commission (EC) within and as a base to the Integrated Pollution Prevention and Control process of the EU. These documents could be used in Environmental Impact Assessment (EIA) and permit procedures also in Kuwait.

The substitution of PVC considers the substitution principle of Article 5c of the Convention reducing UPOPs releases from medical waste incinerators. The reduction of PVC additionally brings the benefit of reduced phthalate and other softener use and exposure to patients.[208] Efforts can also be combined with reduction of mercury use in hospitals as synergy to the Minamata Convention.[209] For medical waste incineration and non-incineration technologies are available.

Synergies in national monitoring, inventory making, and Pollutant Release and Transfer Register (PRTR)[210]

Kuwait has an ongoing eMISK Industry Overview project assessing and controlling industrial emissions.[211] This project will establish a national program for the implementation of a permanent and comprehensive environmental inventory (survey) of industrial facilities in Kuwait. This will be done through developing a comprehensive electronic database of industrial facilities in Kuwait and the use of geographical information systems (GIS) and global positioning system (GPS), as well as by providing tools and software necessary to implement this project at the Environmental Monitoring Information System of Kuwait (eMISK) and the concerned departments within EPA and the relevant authorities and institutions concerned with the industry in the State of Kuwait. Moreover, a pilot project will be implemented for real-time continuous monitoring of pollutants emitted from the stacks of some industrial facilities, which will be automatically linked online with eMISK at EPA. This pilot project can be used in the future as a model for the continuous online monitoring and the automatic online linking of all industrial facilities in Kuwait with eMISK at EPA. It can be expanded in the future to establish a comprehensive national inventory which would include an electronic database and GIS maps of all types and forms of emissions to the Kuwaiti environmental media (water, air, and soil) from different activities, including industrial, residential, commercial, transportation, and the power and electricity generation sector.[211]

Within this project, Kuwait is considering to establish a PRTR. It should be assessed where efforts could be harmonised, and if PCDD/Fs and UPOPs could be integrated in these monitoring activities and in a future PRTR.

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[206] Stockholm Convention (2009) “Guidelines on best available techniques and provisional guidance on best environmental practices” http://chm.pops.int/Programmes/BAT/BEP/Guidelines/tabid/187/language/en-US/Default.aspx

[207] BAT Reference (BREF) documents download page: http://eippcb.jrc.es/reference/

[208] http://www.env-health.org/IMG/pdf/PVC_in_hospitals.pdf; http://www.accessmedicalsupply.com/content/preventing_harm_from_noharm.org/europe/issues/toxins/pvc_phthalates_avoiding_pvc_in_hospitals.pdf./alternatives.php

[209] http://www.gefmedwaste.org/

[210] https://prtr.unitar.org/site/home

[211] http://www.emisk.org/emisk/ProjectOverview.aspx?prj=2

Figure 27 presents the plan of industrial emission monitoring in Kuwait within eMISK. Table 27, on the other hand shows the action plan for reduction and elimination of dioxins/UPOPs.

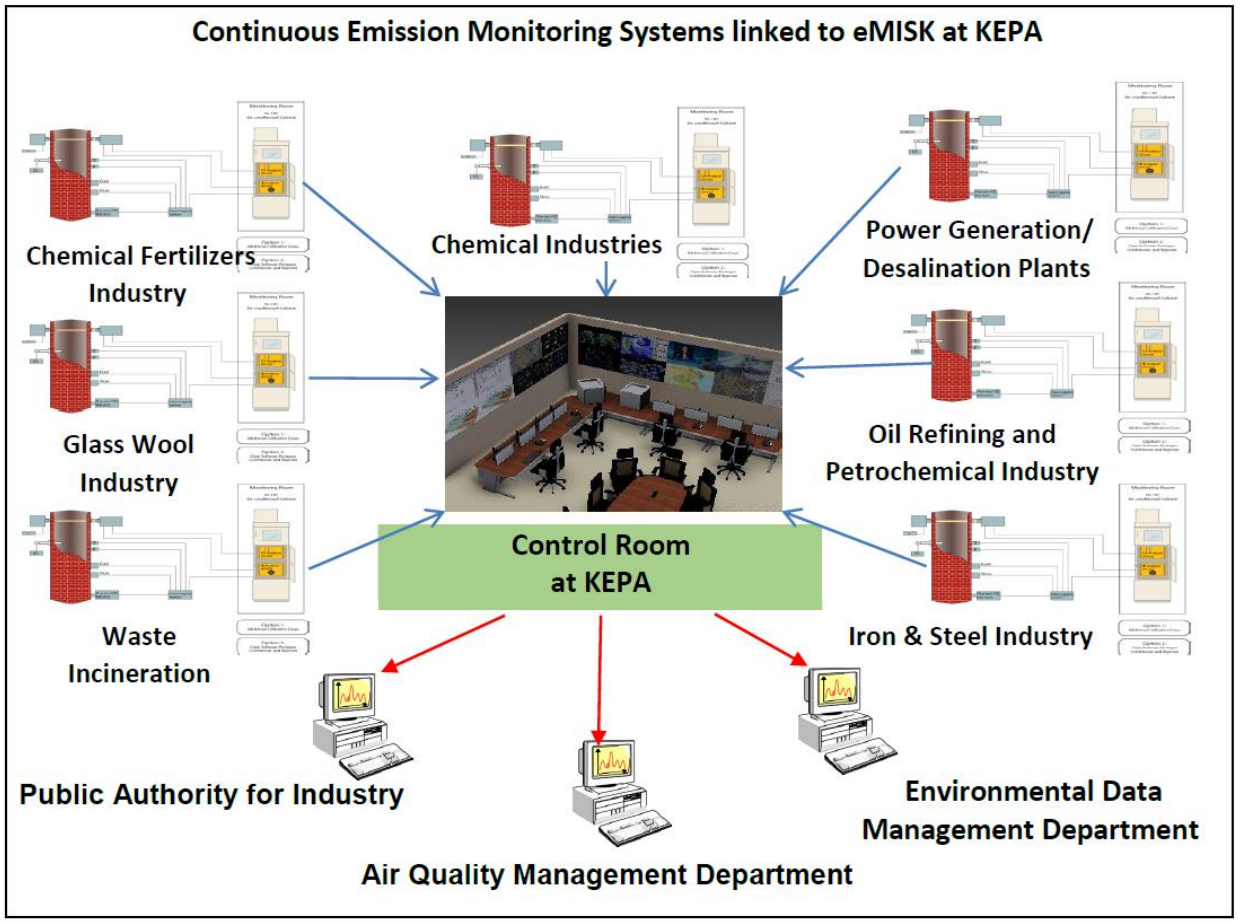

Figure 27. Plan of industrial continuous emission monitoring system in Kuwait within eMISK Industry Overview project at EPA [211]

Table 27. Action plan for reduction and elimination of dioxins/UPOPs

Objectives	Activities	Performance indicators	Time frame	Implementer
For the regulatory frame please see action plan in Table 19				
Refining and regular updated inventory for PCDD/F and possibly other listed UPOPs with data management and harmonization with related release inventories.	Regularly update of the UPOP inventory and reporting as appropriate Quantify other co-pollutants (e.g. PAHs; carbon black)	Dioxin/UPOP inventory refined/updated Other co-pollutants (e.g. PAHs; carbon black) quantified	4 years	KISR, EPA
	Development of a mechanism ensuring appropriate storage and management of data Development of an integrated database of pollutant releases (e.g. Dioxin/UPOPs, GHG; mercury, particulate matter, carbon black)	Database of pollutant releases developed	2 years	KISR
	Assessment and possibly development of a Pollutants Releases and Transfer Register (PRTR)[212]	PRTR approach assessed (report) Decision on the use or not use	3 years	
Implementation of Best Available Technology and Best Environmental Practice				
Policy frame for BAT/BEP for priority emission sources	Develop Policy and possibly legislative base for BAT/BEP requirements for facilities listed in Annex II and III.	Permits based on BAT/BEP	5 years	KISR, EPA, MoCI, PAI, MoJ
Adoption of BAT/BEP and Integrated Pollution Prevention and Control (IPPC) for the Annex II and III sources	Assessment of BAT/BEP options for UPOPs and other pollutants (mercury, PM, GHG) reduction Implementation of BAT/BEP.	BEP measures introduced	3 years	KISR, EPA, MoI
The action plan for Dioxin/UPOPs contaminated sites is integrated in the general action plan on POPs contaminated sites in Section in 3.3.11 and monitoring of UPOPs in section 2.3.12				

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 can cause serious threat to human health and the environment. This calls for their safe, efficient, and environmentally sound management. Activities geared toward 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

[212] (PRTR; http://www.unitar.org/cwm/prtr/).

waste are subsequently outlined and are in the action plans for the aforemantionedindividual POPs.

In Kuwait, no PCB or pesticides waste exist. However, 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). The situation of stockpiles of PFOS and related compounds (PFOS precursors) and of stockpiles of articles containing PFOS (carpets and possibly others) is unclear. Also, the SC has recently listed PFOA. The Persistent Organic Pollutants Review Committee (POPRC) has evaluated perfluorohexanesulfonic acid (PFHxS) as POPs, and SAICM has recognized all perfluorinated alkylated substances (PFAS) as an issue of concern. All wastes contaminated with PFASs (treated synthetic carpets, impregnated paper, textiles, and furniture) will need to be managed and possibly destroyed in the future.

Furthermore, SCCPs have been listed in 2017 and are still being used at volumes of 165,000 tonnes per year in a wide range of applications (e.g., lubricants, metal working fluids, PVC, rubber, textiles). By this current and in the past POPs use, further POPs stockpiles are/were generated which will need to be managed in the future.

Wastes containing these POPs and other PBT chemicals need to be managed and eventually destroyed to prevent their accumulation in the environment. Activities for the management of POPs-containing specific waste are listed in the individual action plans and would be considered/linked to the activities listed in this generic action plan for POPs stockpiles.

In the current inventory, it was revealed that currently, Kuwait does not have a POPs destruction capacity (see section 2.3.17). However, Kuwait has several cement kilns which might have the ability to destroy POPs-containing waste in an environmentally sound manner (ESM). In addition, Kuwait is possibly constructing a waste incinerator[213] whichmay have the ability to destroy POPs-containing waste fractions.

The overall goal is to develop and implement activities to manage the stockpiles/wastes and reduce releases from stockpiles and waste in accordance with internationally accepted guidelines and practises for handling, storage, transportation, and disposal thereof, considering the SC BAT/BEP guidance documents and the Basel Convention technical guidelines.

The management of the POPs should be linked and integrated with the current ongoing development of the waste management plan of Kuwait[214] (**Table 28**).

Table 28. Action plan to reduce releases from stockpiles and wastes (Article 6)

[213] KAPP (2020) Municipal Solid Waste Treatment Facility – Kabd Location. http://www.kapp.gov.kw/en/Municipal-Solid-Waste-Treatment-Facility-%E2%80%93-Kabd-Location

[214] Fraunhofer UMSICHT Institute (2020) A waste management plan for the Emirate of Kuwait. https://www.umsicht-suro.fraunhofer.de/en/departments/recycling-managament/emiskwaste.html

Objectives	Activities	Indicators	Time Frame	Implementer
Please note: The management of the stockpiles of the individual POPs (PFOS, PBDEs, HBCD, SCCPs) is included in the action plans of the aforementioned individual POPs.				
Identification of options and limitations for the destruction and management of POPs and hazardous chemicals in the country and the current and future capacity needs and options	Evaluation of destruction of POPs-containing waste in cement kiln or the planned waste incinerator[215] Evaluation of the option and limitation of other ESM measures for POPs-containing wastes	Documentation on destruction capacity Documentation of other ESM options in the country	3 years	EPA, MoCI, PAI, KISR Private sector
Developing measures for safe handling, separation and sound disposal of stockpiles of chemical and articles in use and appropriately recovering resources and energy to move to more circular economy.	Developing manuals for safe handling and disposal. Establishing collection scheme for POPs containing articles. Establishing appropriate separation, recycling and energy recovery schemes for POPs-containing waste fractions	Manuals for safe handling, transport and disposal Collections scheme for POPs containing products and wastes (report). Separation schemes for waste fractions like plastic, e-waste, ELVs, waste wood or waste oils (report).	5 Years	EPA, MoCI, PAI, KISR Private sector
Destruction, disposal or export of POPs wastes in an ESM	Destruction of POPs-containing waste and other hazardous chemicals containing waste in an ESM Possibly disposal of selected POPs containing waste fraction with low leaching risk Export of POPs waste which cannot be treated or disposed in Kuwait	POPs and other hazardous chemical waste managed in ESM and destroyed or disposed (report)	5 years	EPA, MoCI, PAI, KISR Private sector

3.3.11. Activity: Identification of contaminated sites (Annexes A, B, C Chemicals) and where feasible, remediation in an environmentally sound manner

General

To date, there has been no intergovernmental policy instrument that addresses the identification and remediation of contaminated sites. Countries that have ratified the SC (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 SC stipulates that any remediation attempts must be carried out in an environmentally sound manner (Article 6 SC).

The individual POPs inventories have shown that all POPs groups have conceivably resulted in some contaminated sites. The details are compiled in section 2.3.10. Since PFOS, PFOA, and

[215] KAPP (2020) Kabd Municipal Solid Waste Project. http://www.kapp.gov.kw/en/Municipal-Solid-Waste-Treatment-Facility-%E2%80%93-Kabd-Location

related compounds are the first relatively water soluble POPs, the contamination of ground water and potentially drinking water must be considered as a relevant exposure pathway to these POPs,[216] in addition to exposure to PFOS-contaminated soils.[217]

The activities for the identification and assessment of POPs-contaminated sites could be harmonised with other activities of Kuwait to assess and remediate contaminated sites and hotspots (Table 29).

Table 29. Action plan for identification of contaminated sites (Annexes A, B, and C chemicals) and securing and remediation in an environmentally sound manner

Objectives	Activities	Performance indicators	Time Frame	Implementer
Establishment of regulatory frame for POPs contaminated sites.	Developing/updating legislation to set criteria for determining contaminated sites for relevant POPs.	Draft regulation developed on contaminated sites.	5 years	EPA, MoCI, PAI, KISR MoEW (for sites contaminated with PCBs from equipment) Private sector
	Development of legislation on liability related to contamination and cleanup procedures. (Polluter Pays Principle (PPP))	Legislation on liability for contamination and cleanup	3 years	
	Establishing guidelines for soil and groundwater assessment and limits	Guidelines	5 years	
Methodology to identify, assess and prioritize sites contaminated with Annex A, B and C chemicals	Developing methodology to identify, assess, and prioritize POPs contaminated sites considering available guidance documents[218]	General procedures for investigations developed (report)	3 years	EPA, MoCI, PAI, KISR MoEW (for sites contaminated with PCBs from equipment) Private sector
	Establishing methodology for ground water and soil assessment	Methodology (guidance)	3 years	
	Developing list of potential contaminated sites (see individual POPs below)	List compiled (considering individual POP groups)	2 years	
	(Preliminary) prioritization of POPs-contaminated sites	List of priority sites	2 years	
	Participating in or following the UNEP working group on POPs-contaminated sites	Expert nominated for contact/ participation UNEP BAT/BEP group	1 years	EPA, MoCI, PAI, KISR Private sector
Secure POPs contaminated sites, and where feasible conduct remediation of contaminated sites	Standard procedures for registering and securing contaminated sites	Procedures for securing contaminated sites identified and isolated.	10 years	EPA, MoCI, PAI, KISR MoEW (for sites contaminated with
	Identifying potential remediation technologies available. Developing	Compilation and selection of available environmentally		

[216] Hu et al. (2016) Detection of Poly- and Perfluoroalkyl Substances (PFASs) in U.S. Drinking Water Linked to Industrial Sites, Military Fire Training Areas, and Wastewater Treatment Plants. Environ Sci Technol Lett. 3, 344-350.

[217] Brambilla G et al. (2015) Pathways and factors for food safety and food security at PFOS contaminated sites within a problem based learning approach. Chemosphere 129, 192-202.

[218] 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	Performance indicators	Time Frame	Implementer
	strategies for the environmentally sound management of POPs-contaminated sites	sound remediation methods (report in Arabic and English) Guideline on clean up procedures (Arabic and English)		PCBs from equipment) Private sector
	Training and upgrading skills of personnel in the assessment, securing and remediation of POPs contaminated sites	Training of stuff on contaminated sites; number of contaminated site expert in governmental institution		
Identification and securing of POPs pesticides contaminated sites	Identification and assessment of potentially pesticide contaminated sites (former storage, use, and disposal of pesticides) Securing of sites and possibly remediation of sites as appropriate	Inventory report of potentially contaminated sites	3 years	EPA, MoCI, PAI, KISR Private sector
Identification, assessment, securing and possibly remediation of PCB contaminated sites	Identification and assessment of potentially PCB contaminated sites (former storage, use and disposal of PCB equipment) Securing of sites and possibly remediation of sites as appropriate	Potential PCB contaminated sites are assessed, ranked for priority and secured (report)	5 years	EPA, MoCI, MoEW, PAI, KISR Private sector
Identification, assessment, securing and possibly remediation of POP-BFR contaminated sites.[219]	Developing method for risk assessment of sites where WEEE, ELV, or other POP-BFR containing waste have been treated. Assessment and securing and possibly remediation of contaminated sites	Method for risk assessment developed Sites secured and remediation measures identified	5 years	EPA, MoCI, PAI, KISR Private sector Informal sector
Identification, assessment, management, of potentially PFOS and PFOA contaminated sites and securing /remediation needs	Use of Stockholm and other guidelines for identification and assessment of PFOS/PFAS-contaminated sites Ranking of potentially contaminated sites and initial assessment and prioritisation of sites (risks) for further assessment Analytical confirmation of POPs contamination for the identified locations (according to prioritisation list) Take measures to secure the contaminated sites to stop human exposure	Guidelines on identification developed Workshops conducted, staff trained Priority sites determined Pollution assessed (data) Sites secured and exposure stopped	3 years	EPA, MoCI, PAI, MoO MoPW; KISR Fire fighters Airport Private sector

[219]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	Performance indicators	Time Frame	Implementer
	Identification of cleanup measures and potential cleanup where needed.	Strategies for addressing sites developed		
Assessment, management, database of potentially PCDD/Fs and other UPOPs contaminated sites and securing /remediation needs	Use of guidelines [220] for defining, identification, and assessment of UPOPs-contaminated sites	Contaminated site criteria defined and assessment approach documented (report)	3 years	EPA, MoCI, PAI, MoO MoPW; KISR Private sector (metal industry) Operators of incinerators
	Monitoring of contamination for identified sites (based on prioritisation) Taking measures to secure contaminated sites to stop human exposure Identification of cleanup measures and initiate cleanup activities considering the prioritisation.	Priority sites determined Pollution assessed Sites secured Priority sites cleaned	5 years	

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 the national, regional and international scale. Referring to Articles 9 and 10 of the SC, the Parties provide the access to information to the community and constantly update the information.

The information exchange between the Parties of the SC is performed via the National Focal Points and with the support of the Secretariat of the SC.

Furthermore, a key player to the regional information exchange are the regional centres. KISR hosts the Stockholm Convention Regional Centre for West Asian Gulf countries, and therefore, plays a key role in information exchange for POPs in the region. Additionally, KISR/SCRC Kuwait has an important role for information exchange and capacity building in the country; since, the largest knowledge on POPs and access to new information on POPs is in KISR. In effect, KISR had also a key role in the development of the NIP.

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 the environment, including information of involved socio-economic costs. In addition, information on inventory of POPs and management of POPs have been generated during the development of the NIP in KISR and should be further promoted considering that this is a continuing process.

[220] 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

Recently, regional centres are also entitled to assess and improve the plastic pollution situation.[221] KISR already has established research on microplastics, and initial results on the research project "Assessment of the microplastic pollution of Kuwait's marine environment" were communicated to the Basel, Rotterdam, and Stockholm (BRS) Conventions Secretariat.[221]

Furthermore, considering the synergy with SAICM, the regional centres can address SAICM's emerging policy issues and issues of concern. KISR has already established research on nanotechnology and nanomaterials which is an emerging policy issue and needs an assessment of the risks and the sound management of manufactured nanomaterials.[222] Also, KISR has started to measure and address PFASs, which is a cross-cutting topic of POPs and the related SAICM issue of concern.

Information exchange and stakeholder involvement are activities to be elaborated for the implementation of the NIP (Table 30). The development of a comprehensive strategic information exchange and communication plan will be the one step to take in order to achieve successful implementation of the NIP and control POPs in the Gulf region. This activity is also closely linked to the action plan on awareness raising in the subsequent Section 3.3.13.

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. Besides, close information exchange between and among governmental entities, industry, and research institutions is crucial. A national activity for institutional information exchange will be developed through workshops to ensure full stakeholder engagement.

Table 30. Action plan for facilitating information exchange and stakeholder participation

Objectives	Activities	Performance indicator	Time frame	Implementer
Information acquisition on POPs from international sources	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	KISR, EPA, BRS Secretariat; MoI
Information exchange in the region	Update of the work plan of the Regional Stockholm Convention Centre including promotion of information dissemination on new listed POPs and possibly SAICM issues and plastic management in the region. Governmental support and promotion of the Regional Stockholm Convention Centre to increase the work plan portfolio to all new	Updated workplan for regional centre	4 years and Continuous	KISR, EPA, MoI Regional stakeholders

[221] UNEP (2019) Report on the activities of the Basel and Stockholm conventions regional centres.
[222] http://www.saicm.org/Implementation/EmergingPolicyIssues/Nanotechnology/tabid/5475/Default.aspx

	listed POPs and possibly to SAICM's emerging policy issues and issues of concern and management of plastic and capacity-building related concerns. Promoting the information exchange and capacity building on POPs in the region with relevant counterparts and stakeholders in the partner countries. Facilitating the information exchange with other Stockholm/ Basel Regional Centres to promote global information exchange Participate in international conferences related to POPs (International Symposium on Halogenated Persistent Organic Pollutants series)	Appropriate budget for implementing the workplan Regional workshops and online seminars Regional monitoring data generated and communicated Meetings with regional centres attended KISR researchers participate in intern. conference; related presentations and poster		
Access of information and documents for national stakeholders	Establishing mechanism and possibly website that key documents, information and news on POPs and hazardous chemicals can be found by stakeholders. Evaluation on the Stockholm Convention's documents and deciding if any document should be translated into Arabic Possibly translate selected documents into Arabic	Key documents and information accessible to stakeholders	3 years	KISR, EPA, MoI, MoCI, PAI, MoH, MoE, MoHE, Other National Stakeholders
Improved information exchange on national level between stakeholders	Facilitating the dialogue between industry, research and policy makers Establishing or improving dialogue between science community and policy makers for improved science-policy dialogue.	Stakeholder mapping Stakeholder workshop	3 years	KISR, EPA, MoI, MoCI, PAI,, MoH, MoE, MoHE Other National Stakeholders

3.3.13. Activity: Public/stakeholder awareness, information, and education (Article 10)

Article 10 of the SC on 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 are made available to the public and other stakeholders, and that the information is kept up to date. 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 in related industries.

The successful implementation of the SC 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 and informed on the nature of POPs, other hazardous chemicals (SAICM synergy) 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 products and 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 contribute in their respective roles.

The awareness activities shouldl be linked to general awareness activities on chemical safety, awareness programmes on public health, and on green economic development, as well as awareness programs on sustainable consumption and production (SDG12) − all aimed at broad awareness raising strategies for sustainable development.

Some best practice case for awareness raising (and other NIP implementation) has been compiled in UNEPs "NIPs lessons learned report".[223] This includes the national approach on using films for awareness in Switzerland (Films for the Earth)[224]. More than 500 featured films on sustainability and environmental topics including some POPs related films such as "Story of Stuff"[225] or "Silent Snow"[226] (on contamination of the Arctic by the global use of POPs) have been compiled and are communicated by festivals, the website (https://filmsfortheearth.org/en), DVDs for free and video on demand. Also recent films on PFOS/PFOA pollution or internet journalism on PFAS pollution.[227] Tailor made information materials should be compiled or developed for stakeholders.

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 31).

Table 31. Action plan for public awareness, information, and education activities

Objectives	Activities	Performance indicators	Time Frame	Implementer
General Awareness on POPs and on POPs-related SAICM issues and general hazardous chemicals as appropriate (For specific awareness activities for individual POPs,	Compilation of available state of the 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.	3 years	KISR, EPA, MoE; MoHE; Selected industries
	Adopt education and training materials on new listed POPs tailor made for target groups (policy makers, industry, public, curricula) considering available materials and translate selected materials into Arabic also considering needs of Gulf countries	Arabic education and training materials on new listed POPs tailored to target groups	5 years	

[223] UNEP (2018) From NIPs to implementation: Lessons learned report. 31 December 2018. https://wedocs.unep.org/bitstream/handle/20.500.11822/27399/NIP-lessons-learned.pdf?sequence=1&isAllowed=y
[224] Films for the Earth https://filmsfortheearth.org/en
[225] Story of stuff films www.storyofstuff.org ; https://www.storyofstuff.org/movies/story-of-stuff/
[226] http://www.silentsnow.org
[227] https://en.wikipedia.org/wiki/Dark_Waters_(2019_film); https://theintercept.com/collections/bad-chemistry/; https://thedevilweknow.com/

Objectives	Activities	Performance indicators	Time Frame	Implementer
see the respective action plans of individual POPs and coordinate where appropriate)	Implementing trainings and programmes for teachers and lecturers about toxicology, environment, and ecology issues related to POPs and hazardous chemicals and green/sustainable alternatives	Trainings and workshops conducted (number participants)	3 years	KISR, EPA, MoE; MoHE; Customs
	Providing training and guidance for stakeholder groups that are directly exposed, treating equipment and waste containing POPs (see individual POPs action plans)	Training and guidance for stakeholder groups that are directly exposed, treating equipment and waste containing POP (see individual POPs action plans) provided	3 years	
	Implementing communication activities, raising 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 in Kuwait and Gulf countries.	Number communication activities and number of stakeholders reached	Continuously	
	Implementing the activities to raising awareness and training for inspectors; customs, environmental police, on the contents related to POPs management	Trainings and workshops conducted	3 years	
	Integrating POPs and hazardous chemicals in the environmental education syllabus of basic and secondary schools	Updated syllabus of basic and secondary schools	3 years	
Raising awareness on POPs and alternatives to POPs and introduction of green and sustainable chemistry approach	Compilation of information materials available on alternatives to POPs and Green and Sustainable Chemistry	Materials compiled (place on POPs website)	1 year	KISR, EPA, MoHE
	Develop education modules on Green and Sustainable Chemistry and Life Cycle Assessment (LCA) of chemicals for curricula at the University	Modules for curricula developed and used in University	3 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 Annexes 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 (GMP) for the SC. As main matrices selected for assessment of the effectiveness of the implementation, human milk and air have been chosen by the Convention. This evaluation shall be conducted on the basis of available scientific, environmental, technical and economic information, including national reports.

KISR has conducted a wide range of POP monitoring studies in air, water, and sediments in Kuwait (see section 2.3.12). By this, KISR has generated baseline POPs data for initial POPs (PCBs, POP pesticides, and PBDEs) which can be used for effectiveness evaluation in the future. For some new listed POPs (PFOS, PFOA, SCCPs), such data need to be generated.

KISR can conduct intermittent sampling and analysis of POPs in combustion sources to monitor the reduction of the unintentional release of POPs following installation of best available techniques in waste incinerators, power plants and other combustion sources.

KISR is also promoting regional POPs air monitoring in the Gulf region which can generate regional baseline data for effectiveness evaluation.

Presently, KISR is preparing the first human milk study in Kuwait. Hence, Kuwait would be said to be contributory to the full extent generation of data for effectiveness evaluation (Table 32).

Table 32. Action plan for effectiveness evaluation (Article 16)

Objectives	Activities	Performance indicator	Time frame	Implementer
Generating data on POPs in human milk (or human blood)	Monitoring study of POPs in human milk in Kuwait based on the WHO protocol (ongoing)	Updated data on POPs in human milk with WHO laboratory (pooled sample).	2 years	KISR, MoH
	Repeating human milk study after 5 or 10 years	Time trend of POPs in human milk generated	5 years	KISR, MoH
Generate POPs in air data in Kuwait and the Gulf region	Continuous air monitoring in Kuwait and selected Gulf countries	Time trend of POPs in air generated	5 years	KISR, KEPA, Selected Gulf countries
Generate POPs emission data from industrial facilities Kuwait and the Gulf region	Intermittent measurements of POPs in emission sources (like; incinerators, power plants and open burning of wastes) in Kuwait and selected Gulf countries	Monitoring reduction of emissions from combustion sources	3 years	KISR, KEPA, Selected Gulf countries
Evaluating the effectiveness of the implementation of the Convention by other approach	Developing further national performance evaluation criteria. Assessment of the implementation and progress performance	Criteria Developed. Assessment report	1 year 3 years	KISR, EPA,

3.3.15. Activity: Reporting (Article 15)

According to Article 15 (here paraphrased): 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 SC 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 Annexes A and B, as well as a list of states from/to which it has imported/exported each of such substances. Article 15 reports provide a substantial input to the effectiveness evaluation of the Convention (Article 16), and are submitted every four years.

To date, Kuwait has not as yet submitted a report under Article 15. However, with the development of this first NIP, Kuwait plans to submit the Article 15 report (Table 33).

This Action Plan is aims at collecting/collating the information relevant to the provisions of the Convention for filling the Article 15 reporting format for submission to the BRS Secretariat and the COP.

Table 33. Action plan for reporting under Article 15 of the Stockholm Convention

Objectives	Activities	Performance indicator	Time frame	Implementer
Setting up mechanism for article 15 reporting	Developing a mechanism for complying with the reporting requirements by submission of the required online report template within the given deadlines	Mechanism developed		KISR, EPA
	Setting up responsibilities for data compilation and filling the reporting form	Form filled	1 year (for 4th reporting cycle)	
Complying with article 15 reporting	Compilation of information for reporting (updated inventory and other information) Submission of report to the secretariat (website)	Reporting submitted deadlines met	6 months (4th reporting; then 4 year cycles)	Stockholm Focal Point

3.3.16. Activity: Research, development, and monitoring (Article 11)

Article 11 of the SC mandates parties to undertake appropriate research, development, monitoring, and cooperation pertaining to POPs. Kuwait has a well-established POPs laboratory in KISR (see section 2.3.16.1), which at the same time is also the regional centre for the Gulf region and is conducting regional monitoring (see 2.3.12.2). As a result, the analytical capacity should be used for capacity building and should be extended to other relevant POPs not yet established in KISR. While for all initially listed POPs and for the listed brominated POPs upon which the analysis has been developed, there are some gaps for the analytical capacity for some new listed POPs. For PFOS and PFOA, some initial activities have been conducted; then again, no robust analysis has yet been developed. For PCNs, HCBD, and in particular for SCCPs, the analysis has not been developed yet.

While there has been a wide range of environmental monitoring, no structured monitoring of POPs-contaminated sites has been conducted. Yet still, POPs have not been monitored in products and in recycling in Kuwait. Considering that the world, including Kuwait, has to move to a more circular economy[228], the POPs contamination of products and related waste and recycling

[228] Gulseven G, Mostert J (2017) Application of Circular Economy for Sustainable Resource Management in Kuwait International Journal of Social Ecology and Sustainable Development (IJSESD), 8(3), 87-99.

flow, (in particular PBDEs, SCCPs, PFOS/PFOA) becomes even more relevant in the future and should be investigated.

Other research areas

Another relevant research area are assessments of alternatives to POPs, considering the wide range of exemptions of POPs use. Taking into account the large amount of POPs-like chemicals identified in current use[229] and bearing in mind the synergies with SAICM's emerging policy issues and issues of concern, a wider frame of research and monitoring capacity is imperative to address these hazardous chemicals and 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 delivered various 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 being used effectively in policymaking; and policymakers do not always effectively inform scientists about their needs for scientific knowledge. It is at this juncture that 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 them in a way that the information can be used for policy making.

Kuwait, with its regional Stockholm Centre, has a particular responsibility in the conduct of activities of monitoring and research on POPs in the Gulf region (Table 34). This section therefore has identified various activities in addressing the research, development, monitoring, and science-policy needs.

Table 34. Action plan for research, development and monitoring (Article 11)

Objectives	Activities	Performance indicator	Time frame	Implementers
Establishing improved and operative science-policy interface and contributing to decision making	Assessment of current science-policy interface in decision-making: gaps and improvement needs	Gap assessment of science-policy interface (report)	1 year	KISR, EPA, MoCI, PAI,
	Establishment/improvement of science-policy interface for chemicals and waste/resources for assessing the impact of POPs and hazardous chemicals to the SDGs and indicators, to ecosystem services and other policy drivers	Compilation of impact of hazardous chemicals to SDGs and related indicators Science-policy assessment report on chemicals and waste/resources	3 years	
Developed further analytical capacity for relevant POPs	Assessment on analytical capacity need (see individual POPs action plans subsequently shown)	Needs assessment (NIP; report)	2 years	KISR, EPA International partners
	Developing further laboratory capacity for new listed POPs considered relevant for	Staff trained Methodology developed	5 years	

[229] Scheringer M et al. (2012) How many persistent organic pollutants should we expect? Atmos. Poll. Res. 3, 383–391 doi: 10.5094/APR.2012.044

Objectives	Activities	Performance indicator	Time frame	Implementers
	the country (SCCPs, PFOA, PFOS, PFHxS)	Laboratories accredited for relevant parameters		
	Identifying cooperation partners for POPs and PBT research on international level	International cooperation established	2 years	
Established monitoring of SCCPs and other CPs and major product categories, waste and recycling monitored	Monitoring and analysis of SCCPs in major exempted uses (PVC, cables, rubber, paints, and consumer goods such as toys and sports mats)	SCCP data in major uses and updated inventory	3 years	KISR, EPA, industrial stakeholders
	Monitoring of occupational and consumer exposure	Monitoring data of potentially exposed staff	5 years	KISR, EPA, MoH, MoSAL, industrial stakeholders
	Monitoring of SCCP in human milk, food, house dust	Monitoring data	3 years	
Established monitoring of POP-BFRs and pollutants in the technosphere and other priority areas	Monitoring of major product categories, wastes and 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).	Monitoring data of POP-BFRs and pollutants in the technosphere and in priority areas (report)	5 years	KISR, EPA, industrial stakeholders, international stakeholders
Establishing monitoring of PFOS and other PFAS in priority areas	Establishing monitoring capacity for PFOS, PFOA and other PFASs in KISR laboratory	PFAS monitoring is established and accredited	2 years	KISR, EPA
	Monitoring of drinking water supplies, ground water and irrigation water and related food in Kuwait and possibly the Gulf region Monitoring biota and soil samples for PFOS especially in vicinity of suspected contaminated sites (contaminated site action plan). Improvement of inventory by monitoring approach where knowledge gaps exist. Monitoring of chemicals and chemicals in products/articles suspected to contain PFOS and its related substances.	PFOS/PFOA/PFASs water data on priority areas such as major drinking water reservoirs Data on biota and soils	5 years	
Monitoring of PCDD/F and other UPOPs and relevant pollutants from Annex C, Parts II and III sources and food and feed	Assessment of monitoring needs for PCDD/Fs and other UPOPs from priority sources. Emission monitoring of Annex C, Parts II and III priority sources releasing PCDD/F and other UPOPs. Monitoring of chemicals and chemicals known to potentially contain PCDD/F and other UPOPs. Monitor priority food samples for PCDD/Fs/UPOPs in Kuwait and region	Report on monitoring recommendations Long term or short term monitoring data from industry from Annex C, Parts II and III sources Data on UPOPs in chemicals Data on food and feed	3 years	KISR, EPA, MoCI, PAI, MoH, Industries PAAFR
Established mechanism for quality assurance and	Establishing effective quality assurance and quality control system including accreditation	Protocol for ensuring QA/QC in place;	2 years	KISR, EPA, KOWSMD

Objectives	Activities	Performance indicator	Time frame	Implementers
control of monitoring data		Procedure for data evaluation developed		
Research on alternatives to POPs and Green and Sustainable Chemistry	Compilation of information on alternatives to POPs and research on alternatives	Research project into alternatives to POPs	5 years	KISR, EPA, MoCI, PAI, KCS University Private sector
	Developing research into Green and Sustainable Chemistry (G&SC))	Workshops on G&SC Research project on G&SC	5 years	

3.3.17. Activity: Technical and financial assistance (Articles 12 and 13)

The ability of the country to fulfil its obligations under the POPs Convention depends partly on the provision of adequate financial and technical assistance. Kuwait has financial resources for implementation of the SC. Furthermore, Kuwait is financing the SC regional centre and related capacity building and regional monitoring by the Centre. At the same time, this is also a technical assistance for the region (Table 35).

The following actions are suggested 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 POPs' overall objectives.

Table 35. Action plan for technical and financial assistance (Articles 12 and 13)

Objectives	Activities	Key performance indicator	Time frame	Implementer
Details on financing the NIP implementation established and approved in governmental budget	Assessing detailed financial needs for implementing the Stockholm Convention activities. Approval of budgets for projects supporting the NIP implementation	Report on financial need assessment for individual activities Number of proposals prepared, accepted and conducted	1 years	KISR; EPA, MoF
Providing appropriate budget for the Stockholm Convention Regional Centre in KISR	Assessing financial needs for continuing POPs monitoring, establishing new POPs analysis, POPs management and capacity building.	Study evaluating and documenting financial needs. Approved budget	3 years	KISR; EPA, MoF
Assessment of the needs of the Gulf countries	Survey of the needs of the Gulf countries which can be supported by the centre	Needs assessment report	1 years	KISR
Providing budget for regional POPs capacity building and monitoring	Assessing financial needs for regional activities and concluding on budget	Study evaluating and documenting financial needs. Approved budget.	1 years	KISR; EPA, MoF
Needed technical assistance for the region for POP monitoring and other technical needs.	Conducting regional monitoring activities. Conducting other technical assistance required in the region.	Regional monitoring conducted (data & report)	5 years	KISR, EPA

3.4. Priorities, regulatory development, and capacity building

As priority areas for the implementation of the SC, the following areas have been discovered during the inventory development process and the NIP development. The order of the listed priority areas does not mean there is prioritisation between the areas.

The activities in the different action plans are linked to these high priority areas, and implementation will contribute to these priority areas and to the SDGs to different degrees.

3.4.1. Regulatory development, strengthened coordination, and implementation

The appropriate regulatory frame is the basis for the management of chemicals and waste. For the new industrial POPs (PFOS, PFOA, POP-BFRs, SCCPs), the regulatory frame for the life cycle management of POPs and in particular, POPs in products need to be developed in Kuwait and the Gulf region. In addition to the banning or restriction of these POPs, likewise the limit values in waste, recycling, and products need to be defined that the large related material flows (e.g., WEEE plastic, ELVs, PVC, rubber, waste oils, and textiles) can be managed in a circular economy controlling POPs. Such limits in products and waste require also measurement standards.

For some of the POPs, such as PFOS, PFOA, PCDD/Fs, and dl-PCBs, tolerable intake values are partly exceeded globally. Limit values for major exposure pathways, such as food and for PFOS/PFOA, also drinking water are needed and have been developed in a range of countries. Existing legislation regulating chemical management has to be updated and amended. Major regulatory needs are detailed for POPs in the respective action plan.

Several of the listed priorities demand the support and cooperation of different ministries, institutions, and stakeholders, such as industries. The strengthening of cooperation between and among the different ministries, institutions and other stakeholders is one important factor for an effective implementation of the SC's NIP, as well as the coordination of activities, such as those relating to waste and chemical management. The best approach is a coordination committee in which different ministries and other stakeholders are participating. In addition, ministries need institutional strengthening for chemical and waste management for the development of effective legislation and regulation and the implementation of the regulatory framework and the action plans.

The activity contributes to SDGs 3, 4, 8, 9, 11, 12, and 16.

3.4.2. Capacity building, education, information, and awareness raising (Regional Centre)

A major task for the SC constitutes capacity building, education, and awareness raising. The regional centres play a crucial role in this respect.

In Kuwait, mainly for the new industrial POPs groups (PFOS/PFOA and related substances, POP-BFRs and SCCPs), education and awareness raising activities are needed. In the region, other countries might still have problems with PCBs and pesticide stocks. The information needed for an assessment is supplied in the action plan.

The education and awareness should include industries, authorities, research community, and the public.

The awareness on POPs should be integrated in a general awareness portfolio on hazardous chemicals and related risks and health impacts. Since some of the new industrial POPs are present in consumer products (electronics, vehicles, synthetic carpets, flame-retarded or surface-treated textiles, furniture, mattresses, etc.), the establishment of awareness raising materials and awareness communication is ideal to create and enhance awareness of consumers and industries producing these consumer products (SDG12).

This also should include awareness and education on waste management and recycling/circular economy and the fate of POPs for relevant stakeholders.

The activity contributes to SDGs 1, 2, 3, 5, 8, 9, and 12, and 16.

3.4.3. Monitoring of POPs, effectiveness evaluation, and initiating research and collaborations (Regional Centre)

One priority for the implementation of the Convention in Kuwait is the monitoring of POPs for the generation of robust POPs data for the Gulf region. Strategic POPs monitoring, such as in human milk and air are also needed for the effectiveness evaluation of the SC. Kuwait has conducted a range of monitoring studies on the initial POPs and is currently preparing the first human milk study. This monitoring efforts necessitate an extension on recently listed POPs such as PFOS, PFOA, and SCCPs. It is also at this point thatthe human exposure to POPs in Kuwait and the region calls for an assessment and comparison to for example, tolerable daily intake established by the European Food Safety Authority (EFSA) or minimal risk levels (MRLs) developed by the Agency for Toxic Substances and Disease Registry (ATSDR). Similarly, the monitoring of POPs in products, waste, and recycling is needed to guide the development of a more circular economy with minimum risks.

The activity contributes to SDGs 3, 4, 5, 6, 8, 11, 12, 14, and 16.

3.4.4. Management of POPs stockpiles (PBDEs, HBCD, PFOS, PFOA, SCCPs)

The management of existing POPs stockpiles is considered a priority to protect human health and the environment, as well as promote circular economy.

While no PCB and POPs-pesticide stocks exist, new industrial POPs have entered the country (PBDEs, HBCD, PFOS) and are likely still entering the country (e.g., SCCPs and PFOA).

Large stocks of POP-BFR-containing wastes are present in Kuwait in plastics and polymers of EEE/WEEE, end-of-life vehicles, insulation in construction, and possibly other uses, like furniture and textiles.

PFOS, PFOA, and related compounds are contained in stocks in products such as synthetic carpets, textiles, furniture, and medical devices. These water-soluble PFASs are a threat to ground water, drinking water, and soil. The use has to be stopped, and stocks have to be appropriately managed.

Additionally, these material and waste fractions are largely plastics and polymers and are sources for marine litter and associated pollution. Hence, their management can be linked to the overall management of plastic and polymers.

The activity contributes to SDGs 3, 12, 14, and 15.

3.4.5. Substitution of POPs and selection of green and sustainable alternatives to promote circular economy

Some of the new listed POPs, such as SCCPs, PFOA, and DecaBDE are likely still being used in Kuwait in products (PVC, other plastic, textiles, rubber) or in processes (e.g., lubricants, metal working oils, fatliquoring). In addition, a wide range of POPs-like substances are in use even in industrial countries. Recently, major European countries are considering to restrict and regulate PFASs as a group[230]. For that reason, the science community has suggested to limit the use of PFASs only for essential uses.[231] When substituting POPs or phasing out groups of POPs-like chemicals, an assessment of these chemicals and substitution with non-regrettable substitutes is required, considering green and sustainable chemistry or non-chemical alternatives.[232] For this process, adequate capacity must be provided.

In addition, the substitution of highly persistent and water-soluble PFOS, PFOA, and other PFAS (SAICM synergy) contributes to enhancing water security, which is essential to Kuwait and the water-scarce Gulf region.

Considering another synergy to SAICM, in addition to POPs pesticides, highly hazardous pesticides (HHPs) and other pesticides with serious health threats, such as endocrine disruption[233] or cancer[234,235] need to be substituted by more sustainable alternatives. Similarly, other EDCs[236] (SAICM emerging issue) used as chemicals in products with exposure risk should be substituted.

The activity contributes to SDGs 3, 4, 6, 8, 9, 12, 14, and 16. The use of green and sustainable chemicals also contributes to SDGs 2, 14, and 15.

3.4.6. Contaminated sites assessment and management

The assessment and inventory in this updated NIP revealed that for POPs groups (pesticides, PCBs/PCNs, dioxin/UPOPs, PFOS and PBDEs), a range of sites are possibly or likely contaminated. Contaminated sites negatively impact several SDGs including 3, 6, 11, 14, and 15. Currently, there are no systematic assessments of POPs-contaminated sites in Kuwait or the Gulf region. Therefore, it is of high priority to initiate a structured assessment, mapping, and securing of POPs-contaminated sites. This is particularly obligatory for sites with potential contamination

[230] ECHA (2020) https://echa.europa.eu/-/five-european-states-call-for-evidence-on-broad-pfas-restriction
[231] Cousins IT et al. (2019) The concept of essential use for determining when uses of PFASs can be phased out Environ. Sci.: Processes Impacts, 21, 1803-1815.
[232] Fantke P, Weber R, Scheringer M (2015) From incremental to fundamental substitution in chemical alternatives assessment. Sustainable Chemistry and Pharmacy 1, 1-8.
[233] Kassotis et al. (2020) Endocrine-disrupting chemicals: economic, regulatory, and policy implications. The Lancet Diabetes & Endocrinology 8(8), 719-730,
[234] Pluth TB, Zanini LAG, Battisti IDE (2019). Pesticide exposure and cancer: an integrative literature review. Saúde em Debate, 43(122), 906-924. Epub November 25, 2019.https://doi.org/10.1590/0103-1104201912220
[235] Sarwar M (2016) Indoor risks of pesticide uses are significantly linked to hazards of the family members, Cogent Medicine, 3:1, DOI: 10.1080/2331205X.2016.1155373
[236] UNEP (2017) Overview Report I: Worldwide initiatives to identify endocrine disrupting chemicals (EDCs) and potential EDCs. Prepared by: The International Panel on Chemical Pollution (IPCP).

of ground and drinking water with PFOS/PFOA or sites, where food-producing animals are grazing/feeding.

The activity contributes to SDGs 3, 6, 11, 14, and 15.

3.5. Time frame for the implementation strategy and action plans

The individual action plans and activities developed and compiled in Section 3.3 contain individual time frames 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). The suggested time frame is tentative and can be adjusted, as appropriate. Also, the listed implementers and stakeholders can be amended, as appropriate. The project implementation and budget should be harmonised and linked to the waste management plan under development and other national plans, as appropriate.

3.6. Resource requirements

The resource requirements for the implementation of the individual action plans and for the overall implementation of the NIP will be estimated during detailed development of individual projects and for instance, the yearly budget of the regional centre and the development of regional activities.

Annex 1: Hazardous pesticides prohibited from circulation

A list of banned and restricted pesticides based on the Ministry of Health's Decision No. 95/1995 and its annexes.

Table 36. Banned POPs pesticides and other banned pesticides in Kuwait

N0.	Common Name*	Manufacturer Commercial Name*	Group
1	**Aldrin**	**Aglutox،Agrodin Aldrex**	**Organo chlorine**
2	**HCH; BHC**	**Bencide Hexachlor; Benzex**	**Organo chlorine**
n3	**Camphechlor**	**Toxaphen, Alltox, Anatox**	**Organo chlorine**
4	Carbofuran	Furdan, Yaltox, Curaterr	Carbamates
5	Carbofenothin	Nephocarp, Lethox, Dagdip	Organo phosphate
6	**Chlordane**	**Chlordox**	**Organo chlorie**
7	**DDT**	**Diditan, Dicophane, Didical**	**Organo chlorine**
8	Demeton	Solverex, Disytox, Systemox	Organo phosphate
9	Dichlorvos	Novan, Vapona, Benfos	Organo phosphate
10	**Dieldrin**	**Alvit, Antex, Eldrinol**	**Organo chlorine**
11	Dimethoate	Dimeto, Vitex, Dimethogen	Organo phosphate
12	**Endosulfan**	**Endosan, Beosit, Cyclodan**	**Organo chlorine**
13	Ethylinedibramide	EDB, Edabrom, Celimde	inorganic
14	**Heptachlor**	**Drinox, Heptagran, Velsical**	**Organo chlorine**
15	**Lindane**	**Lindex, Lintox, Lindatox**	**Organo chlorine**
16	**Mirex**	**Decane, Dechlorane**	**Organo chlorine**
17	Monocrotophos	Nuvacron, Monoror, Monofos	Organo phosphate
18	Parathion	Parathene, Paratox, Paraspray	Organo phosphate
19	Phorate	Granutox, Timet, Rampart	Organo phosphate
20	Chlorothalonil	Bravo 72% SC	Iso-Phenyl nitril
21	Sumislex 50% W.P	Procynidon 50%	Dicarboximide
22	Methyl bromide	Methyl bromide	Metalic organic
23	Degesch phostoxin Detia gas – EX – P	Aluminium phosphide	Phosphor Gas
24	Diazimone 60% EC	Diazinon 60% Basudin 60%	Organo phosphate
25	Chlorpyrifos	Dursoban 60% 4TC Chlorpyrifos	Organo phosphate

*POPs are marked in bold

Table 37. Banned acaricides including some POPs in Kuwait

N0.	Common Name*	Manufacturer Commercial Name*	Group
1	Azinophos-Methyl	Azinos, Contion, Guthion	Organo phosphate
2	Carbophenothion	Acarithion, Nephocarp	Organo phosphate
3	Chlordimeform	Acron, Bermat	Formamidine
4	Demeton	Solvirex, Systox, Demetox	Organo phosphate
5	**Endosulfan**	**Beosit, Hildan, Cyclodan**	**Organo chloride**
6	Methamidophos	Chevron, Hamidop, Tamaron	Organo phosphate
7	Omethoate	Lemak, Folimat	Organo phosphate
8	Phosphamidon	Dimecron, Aphidon, Dicron	Organo phosphate
9	Sulfotop	Tinotepp, Dithione, Sulfatep	Organo phosphate
10	Chlorobenzilate	Acaraben, Akar, Benzilan	Organo chloride
11	Propergite 57%	Ommite	Organo phosphate
12	**Dicofol**	**Kelthane**	**T**

*POPs are marked in bold

Annex 2: Chemicals subject to control of public authority of industry

Table 38. List of chemicals subject to control of public authority of industry

A- Paint categories		
No.	**HS code**	
1	32090000	Water paints of all kinds
2	32070000	Base paints of all kinds
3	32070000	Glossy paints of all kinds
4	32080000	Oil paints of all kinds
5	32060000	Paints used for road signs
6	32060000	Plastic paints for roads
7	32060000	Aluminum paints
8	32140000	Insulation pastes and cracks filling
9	32080000	Materials used to dilute paints
10	38249050	Materials used to increase thickness of paints
11	32080000	Foundation materials diluted with water
12	32080000	Varnish
13	32080000	Water spray paints
14	32090000	Wood paints
15	32090000	Base wood paints
16	32140000 32080000	Cars paint and paste
17	32140000	Oil based protection materials for wood decors
18	32140000	Paints protection material from algae as a result of exposure to water and moisture
19	32080000	Manufactured paints used in sports and factory floors
20	32080000	Marines paints used in ships and yachts
B- Oil categories		
1	27100000	Motor and brake oil
2	27100000	Manufactured hydraulic oils
3	27100000	Grease
4	27100000	Electrical insulation oil
5	27100000	Concrete liquefaction oil
6	27100000	Cold lubricating oil
7	27100000	Rust and corrosion protection oil
8	27100000	Diesel engine oil
9	27100000	Brake fluid
10	27100000	Manual transmission oil
11	27100000	Automatic transmission oil
C- Building materials		
1	25230000	Concrete
2	25230000	Gypsum
3	32140000	Adhesive of ceramic and tiles

Annex 3: Results from POPs monitoring in soils during NIP development

Table 39. OCPs and HCB/PeCB levels in soils in Amghra (2020)

	Locations in Amghra													
OCPs (pg/g)	1	2	3	4	5	6	7	8	9	10	12	13	15	18
HCB	65.0	1298	38.0	ND	127	40.5	27.2	10.5	14.7	134	38.0	172	19.6	110
HCH-a	14.5	17.2	14.8	15.1	14.5	ND	ND	ND	ND	ND	ND	ND	ND	ND
HCH-b	21.7	23.4	21.6	ND	24.8	22.9	ND	ND	ND	ND	ND	ND	ND	ND
HCH-G	17.7	19.4	17.8	ND	19.2	17.4	ND	ND	ND	ND	ND	ND	ND	ND
HCH-d	10.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	ND	ND	40.0	ND	40.0	ND	ND	14.7	ND	14.8	14.8	14.8	ND	15.1
Aldrin	5.65	146	ND	ND	ND	5.74	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	30.5	55.8	ND	ND	ND	29.7	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	13.7	ND	ND	ND	13.7	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane-oxy	ND	40.9	40.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane-trans	30.8	50.0	32.8	ND	45.7	31.7	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane-cis	17.8	36.6	19.4	ND	29.4	18.4	ND	ND	ND	12.23	ND	6.25	ND	13.04
Endosulfan	46.2	59.1	49.8	ND	93.7	44.5	ND	ND	ND	ND	ND	ND	ND	ND
Nonachlor-trans	10.0	18.3	ND	ND	23.2	12.0	5.12	3.62	2.34	16.0	2.21	7.19	2.21	11.9
Nonachlor-cis	7.35	10.3	7.73	ND	11.3	7.41	ND	ND	ND	ND	ND	ND	ND	ND
DDE-o,p'	45.4	68.2	47.6	ND	66.1	47.2	9.55	7.65	12.7	209	19.4	16.7	8.48	16.6
DDE-p,p'	57.4	674	73.1	ND	817	133	83.3	37.6	120.7	5095	492	134	24.4	149
DDD-o,p'	74.0	99.8	73.7	ND	78.2	72.4	2.00	2.18	3.44	139.8	6.53	5.46	ND	22.9
DDD-p,p'	14.0	33.0	9.51	ND	36.6	13.1	24.7	20.7	23.7	203	25.3	26.9	20.4	39.2
DDT-o,p'	16.5	15.4	10.4	ND	13.2	15.5	66.8	54.5	65.8	181	60.0	57.6	ND	62.5
DDT-p,p'	58.8	131	58.0	0.00	191	64.6	98.1	57.9	74.9	1444	89.1	69.3	0.00	111.2

Table 40. OCPs and HCB/PeCB levels in agricultural and non-agricultural soils in Wafra (2020)

OCP (pg/g)	**Wafra (N- Non Agricultural; A- Agricultural)**									
	15-N	16-N	17-A	18-N	19-N	20-A	21-A	22-N	23-N	24-A
Hexachlorobenzene	7.44	4.94	< 5	< 5	< 5	4.43	< 5	8.02	< 5	136.07
Pentachlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HCH-alpha	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HCH-beta	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HCH-gamma	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HCH-delta	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	14.78	< 5	< 5	< 5	< 5	< 5	14.78	< 5	14.88	< 5
Aldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor exo	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane oxy	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor endo	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane-trans	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane-cis	< 5	< 5	6.10	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Nonachlor-cis	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nonachlor-trans	< 5	4.00	16.5	2.08	< 5	2.78	3.60	3.38	< 5	3.28
DDE-p,p'	< 5	22.0	119	13.0	14.6	23.1	22.3	13.9	14.6	21.8
DDD-o,p'	< 5	1.33	15.4	4.14	< 5	1.08	2.72	1.41	2.96	1.26
DDD-p,p'	17.6	18.5	22.1	17.7	17.9	18.5	18.0	17.6	19.4	18.4
DDE-o,p'	7.13	7.42	9.03	7.16	7.44	7.71	7.63	7.33	7.09	7.85
DDT-o,p'	53.7	53.6	< 5	< 5	< 5	56.2	53.2	53.3	58.8	54.1
DDT-p,p'	< 5	< 5	< 5	< 5	48.7	49.3	47.4	47.3	49.5	51.3

Table 41. OCPs and HCB/PeCB levels in soils in Abdali (2020)

Compound (pg/g)	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6
Hexachlorobenzene	34.7	30.7	42.7	29.8	47.7	30.7
β-HCH	33.9	31.7	30.9	318	31.1	29.8
ɤ-HCH	29.6	27.8	27.9	ND	27.3	27.2
Aldrin	41.3	44.0	42.2	42.0	33.2	28.3
Dieldrin	19.4	18.6	ND	19.9	11.7	ND
Nonachlor-cis	44.4	44.5	44.4	44.3	45.0	45.0
Chlordane-Trans	55.6	55.2	55.2	54.75	55.61	54.78
Endosulfan-α	10.6	11.95	9.8	9.81	10.2	11.6
Chlordane-cis	39.2	ND	39.5	38.7	39.70	38.9
DDE-o,p’	59.0	58.9	58.8	58.49	58.90	58.56
DDE-p.p’	69.8	65.7	67.9	65.9	51.1	43.2
DDD-p,p’	6.27	5.61	5.64	5.47	4.66	3.53

Annex 4: Relevant peer-reviewed publications on POPs from SCRC Kuwait

1. Gevao, B., Porcelli, M., Rajagopalan, S., Krishnan, D., Martinez-Guijarro, K., Alshemmari, H., Bahloul, M., & Zafar, J. (2018). Spatial and temporal variations in the atmospheric concentrations of "Stockholm Convention" organochlorine pesticides in Kuwait. The Science of the total environment, 622-623, 1621–1629.
2. Gevao, B., Porcelli, M., Rajagopalan, S., Krishnan, D., Martinez-Guijarro, K., Alshemmari, H., Bahloul, M., & Zafar, J. (2017). Seasonal variations in the atmospheric concentrations of polychlorinated biphenyls in Kuwait. Chemosphere, 189, 652–660.
3. Martínez K, Ramadan A, Gevao B (2017) Atmospheric concentration of polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans (PCDD/Fs) and dioxin-like polychlorinated biphenyls (dl-PCBs) at Umm-Al-Aish oil field-Kuwait. Chemosphere 168 DOI: 10.1016/j.chemosphere.2016.10.036
4. Bondi Gevao, Fatema Al-Shemmari and Lulwa N. Ali. (2016) Polybrominated diphenyl ether levels in dust collected from cars in Kuwait: Implications for human exposure. Indoor and Built Environment., 25, 106-113.
5. Gevao B, Bahloul M, Martínez K, Kannan K (2016) Depositional time trends of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans in a dated sediment core from the Northern Arabian Gulf. Marine Pollution Bulletin 112(1) DOI: 10.1016/j.marpolbul.2016.08.019
6. Adnan Husain, Bondi Gevao, Basma Dashti, Abraham Brouwer, Peter Behnisch, Majed Bahloul, Mohamad Al-Foudari. Screening for PCDD/Fs and dl-PCBs in local and imported food and feed products available across the State of Kuwait and assessment of dietary intake. Ecotoxicology and Environmental Safety, 2014, 100: 27-31.
7. Bondi Gevao, Edward A. Boyle, Abdul Aziz Aba, Gonzalo G. Carrasco, Abdul Nabi Ghadban, Dalal Al-Shamroukh, Hassan AlShemmari and Majed Bahloul Polybrominated diphenyl ether concentrations in sediments from the Northern Arabian Gulf: Spatial and temporal trends. Science of the Total Environment, 2014, 491-492:148-153.
8. Bondi Gevao, Abdul Nabi Ghadban, Massimiliano Porcelli, Lulwa Ali, Amal Rashdan, Majed Bahloul, Khalid Matrouk and Jamal Zafar. Seasonal variations in the atmospheric concentrations of polybrominated diphenyl ethers in Kuwait. Science of the Total Environment, 2013, 454-455:534-541.
9. Bondi Gevao, Abdul Nabi Ghadban, Majed Bahloul, Saif Uddin and Jamal Zafar. Phthalates in indoor dust in Kuwait: implications for non-dietary human exposure. Indoor Air, 2013, 23:126-133.
10. Bondi Gevao, Abdul Aziz Aba, Abdul Nabi Ghadban, and Saif Uddin. Depositional history of polychlorinated biphenyls in a dated sediment core from the Northwestern Arabian Gulf. Archives of Environmental Contamination and Toxicology 2012, 62(4):549-556
11. Bondi Gevao, Abdul Nabi Ghadban, Saif Uddin, Foday M. Jaward, Majed Bahloul, and Jamal Zafar. PBDEs in soils along a rural-urban-rural transect: Sources, concentration gradients, and profiles. Environmental Pollution, 2011, 159:3666-3672
12. Bondi Gevao, Foday M. Jaward, Matthew MacLeod, and Kevin C. Jones.Diurnal fluctuations in polybrominated diphenyl ethers concentrations during and after a severe dust storm episode in Kuwait City, Kuwait. Environmental Science and Technology, 2010, 44: 8114-8120
13. Bondi Gevao, Foday M. Jaward, Majed Al-Bahloul, Saif Uddin, Mirza U. Beg and Jamal Zafar. Polybrominated diphenyl ethers in three commercially important fish from the northwestern

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