Gibraltar National Implementation Plan (NIP)

Report for Gibraltar Environmental Agency

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Executive summary

The Stockholm Convention is a global treaty to protect human health and the environment from Persistent Organic Pollutants (POPs). POPs are a group of chemicals which persist in the environment, may bioaccumulate in food and human tissues and are toxic. These chemicals also have the potential to be transported long distances and deposited far away from their place of release including in pristine environments such as the Arctic and the Antarctica. The Convention requires that Parties adopt and introduce measures to eliminate or reduce releases of POPs into the environment with aim of reducing human and wildlife exposure.

The Convention on POPs was adopted in May 2001 in Stockholm, Sweden, and entered into force on 17 May 2004. Under the original text of the Convention, 12 substances were listed in Annexes A, B and C, according to their mechanism of production and level of restriction. Over the last years, the Conference of the Parties (COP) agreed to amend the Stockholm Convention to list 11 new POPs in Annex A, B and C of the Convention. Following the last amendment in 2013, the Stockholm Convention currently covers 23 substances. These fall into three categories: pesticides (such as aldrin, chlordecone and lindane), industrial chemicals (such as penta-bromodiphenyl ether) and unintentionally produced by-products of combustion and industrial processes (such as polychlorinated biphenyls (PCBs), and dioxins and furans). Twenty of the intentionally produced chemicals are subject to a ban on production and use except where there are generic or specific exemptions.

Parties to the Convention are required to develop and endeavour to put into practice a National Implementation Plan (NIP) setting out how they will implement their obligations under the Convention. The NIP is subject to periodic updating and revision in response to the dynamic nature of the Convention: for example, in the identification and inclusion of additional POPs as the Convention obligations evolve over time.

This document is the first National Implementation Plan for Gibraltar. It has been developed by the Environmental Agency and the Department of Environment, with the co-operation of other relevant Government Departments and Agencies. The development of a NIP for the first time, is now timely in light of the recent addition of ten new substances to the Annexes of the Convention.

The establishment of inventories is one of the main phases in the development of NIPs. According to Article 5 of the Convention, action plans must include evaluations of current releases that are derived through the development and maintenance of source inventories and release estimates, taking into consideration the source categories addressed in Annex C. POPs inventories are useful tools to gather information, acquire a sound understanding of the national situation concerning these chemicals and form the basis for release reduction measures.

Emission estimates for the substances listed under Annex C of the Stockholm Convention presented in this document are based on the Gibraltar Environmental Agency report “Emissions of Persistent Organic Pollutants (POPs) in Gibraltar 1990 to 2011”. The emission inventories show a significant decline in emissions to all vectors for all pollutants, driven largely by the closure of the municipal waste incinerator in 2000, and the identification and removal of PCB containing equipment around 1997/98. The emission estimates for 2011 show the air vector to be dominant, with much of the emissions coming from the power generation sector (75% of all dioxins and furan emissions are linked to power stations), secondary sources include shipping, off-road machinery and road transport. Emissions to land and water are dominated by single sources, accidental fires and release of sewerage to sea respectively.

The Government of Gibraltar’s continuing goal is to protect human health and the environment from the risks posed by POPs and to reduce the total releases derived from anthropogenic sources of each of them. Over the past decade, the Government of Gibraltar has taken steps to identify, quantify and manage the major sources of unintentional releases of dioxins, PCBs PeCB and HCB listed in the Convention.

International and Gibraltar-specific data on the source activities and environmental releases of new POPs is scarce and associated release estimates are subject to high levels of uncertainty. Similarly, knowledge is not yet fully developed on the likely emissions of POPs contained in in-use items through to these entering the waste stream.

A new power station and wastewater treatment plant have been commissioned, and the process of tendering for a new waste treatment facility is ongoing. Although the level of emissions are not currently known, reductions in Gibraltar emissions can be expected as a result of using improved and more efficient technologies.

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1 Introduction

1.1 Purpose of National Implementation Plan

The Stockholm Convention on Persistent Organic Pollutants (POPs) entered into force on 17 May 2004. It is a global treaty signed by 178 States and regional economic integration organisations with the objective of protecting human health and the environment from persistent organic pollutants. The Convention web address may be found at: http://www.pops.int/.

Parties to the Convention are required to develop and endeavour to put into practice a National Implementation Plan (NIP) setting out how they will implement their obligations under the Convention.

The NIP is subject to periodic updating and revision in response to the dynamic nature of the Convention: for example, in the identification and inclusion of additional POPs as the Convention obligations evolve over time.

1.2 The Gibraltar National Implementation Plan

Under the auspices of the Stockholm Convention there is a requirement to produce a 'National Implementation Plans (NIP)' that details the key issues, policies and geography of a given Member State Party as set out under the requirements of the Convention. The NIP for Gibraltar has been developed by the Environmental Agency and the Department of Environment, with the co-operation of other relevant Government Departments and Agencies.

The development of a NIP for the first time, is now timely in light of the recent addition of ten new substances to the Annexes of the Convention. The development of a NIP must include a review of current relevant issues and development of an action plan that sets out issues identified a fixed set of time scale for action and document progress in the case of updates to a NIP.

The NIP is a dynamic document as it is to be reviewed periodically and updated to address new obligations under the Convention arising from amendments to the Convention or its annexes. A reviewed and updated version of the NIP will be transmitted to the Conference of the Parties within two years of the entry into force of the amendments.

The establishment of inventories is one of the main phases in the development of NIPs. According to Article 5 of the Convention, action plans must include evaluations of current releases that are derived through the development and maintenance of source inventories and release estimates, taking into consideration the source categories addressed in Annex C. POPs inventories are useful tools to gather information, acquire a sound understanding of the national situation concerning these chemicals and form the basis for release reduction measures. Updating and reviewing inventories on unintentionally produced POPs should therefore occur at regular intervals.

1.3 Persistent Organic Pollutants

The term "Persistent Organic Pollutants" (POPs) refers to a diverse group of chemicals which are toxic, persist in the environment, bioaccumulate in fatty tissues and biomagnify through the food chain. In addition, POPs have the potential to be transported long distances and deposited far from their place of release. Consequently, POPs are found in pristine environments such as the Arctic and Antarctic. POPs have been identified as priority chemicals for action for many years. The international community has therefore called for actions to reduce and eliminate their production, use and release, via the mechanism of the Stockholm Convention on POPs.

The Stockholm Convention currently focuses on reducing and eliminating environmental releases of 23 POPs, as listed in Table 1. The substances covered by the Convention include those originally listed, as well as further POPs added to the Convention in 2009, 2011 and 2013. Brief descriptions of each of the 22 POPs are provided at Annex 2.

Table 1 – The 23 POPS listed in the Stockholm Convention

Chemical	Pesticide	Industrial chemical	Unintentional by-product
Aldrin	×		
Chlordane	×		
Dieldrin	×		
Endrin	×		
Heptachlor	×		
Hexachlorobenzene (HCB)	×	×	×
Mirex	×		
Toxaphene	×		
Polychlorinated biphenyls (PCBs)		×	×
DDT	×		
Dioxins			×
Furans			×
Chlordecone*	×		
Hexabromobiphenyl (HBB)*		×	
Hexa- and hepta- bromodiphenyl ether*		×	
Alpha hexachlorocyclohexane*	×		×
Beta hexachlorocyclohexane*	×		×
Lindane	×		
Pentachlorobenzene (PeCB)*	×	×	×
Perfluorooctanesulphonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOS-F)*		×	
Tetra- and penta- bromodiphenyl ether*		×	
Endosulfan**	×		
Hexabromocyclododecane (HBCD)***		×	

* Listed in 2009
** Listed in 2011
*** Listed in in 2013

1.4 Provisions of the Stockholm Convention

The Stockholm Convention establishes a strong international framework for promoting global action on POPs, which are divided into three groups according to their mechanism of production and level of restriction.

Twenty of the intentionally produced chemicals are subject to a ban on production and use except where there are generic or specific exemptions. These are:

1. Aldrin
2. Poly-bromodiphenyl ether (hexa-, hepta-, tetra-, penta-)
3. Chlordane
4. Chlordecone
5. Dieldrin
6. Endosulfan
7. Endrin
8. Heptachloro- and hexabromocyclododecane (HBCD)
9. Hexabromobiphenyl
10. Hexachlorobenzene (HCB)
11. Alpha and beta hexachlorocyclohexane
12. Lindane (gamma hexachlorocyclohexane)
13. Mirex
14. Pentachlorobenzene
15. Perfluorooctanesulphonic acid (PFOS), its salts and perfluorooctane sulphonyl fluoride (PFOS-F)
16. Polychlorinated biphenyls (PCBs)
17. Toxaphene

In addition, the production and use of DDT is severely restricted.

Parties are required to take measures to reduce releases from the unintentional production of dioxins, PCBs, HCB and pentachlorobenzene (PeCB) with the goal of their continuing minimisation and, where feasible, ultimate elimination. The main tool for this is the development of source inventories and release estimates as well as plans for release reductions. The use of Best Available Techniques to limit releases of unintentionally produced POPs from the major sources, as categorised in the Convention, is also required.

There are special provisions for those Parties with regulatory assessment schemes to both review existing chemicals for POP characteristics and to take regulatory measures to prevent the development, production and marketing of new substances with POP characteristics.

The Convention also makes provision for the identification and safe management of stockpiles containing or consisting of POPs. Waste containing, consisting of or contaminated with POPs should be disposed of in such a way that the POP content is destroyed or irreversibly transformed. Where this does not represent the environmentally preferable option or where the POP content is low, waste shall be otherwise disposed of in an environmentally sound manner. Disposal operations that may lead to the recovery or re-use of POPs are forbidden.

The Convention recognises the particular needs of developing countries and specific provisions on technical assistance and financial resources and mechanisms are included in the general obligations.

1.5 Country Profile

Gibraltar is a peninsula situated at latitude 36º7’ North and longitude 5º21’ West at the southern tip of the Spanish mainland and the eastern end of the Strait which bears its name. It is clearly marked by its famous Rock, a mass of Lower Jurassic limestone running roughly north to south along the greater part of the peninsula which is approximately 6 kilometres long and 1.2 kilometres at its widest point. It rises

to a height of 426 metres and lies just 16 kilometres across the Straits from the north coast of Africa. The total area of the peninsula is approximately 6.5 square kilometres.

Gibraltar is a British territory and has a population of 30,001 (2012 population statistics), one of the highest population densities in the world. The territory has its own elected Government, which is responsible for all internal matters such as provision of municipal services, trade, health, education and housing.

Much of Gibraltar consists of rocky and dense matorral areas, called the Upper Rock Nature Reserve, which is a Special Protected Area (SPA) and a Special Area of Conservation (SAC), where any further development is prohibited. The remaining land has therefore been densely developed, and most of the population, commercial and leisure activities are concentrated on the lower western slopes of the Rock. Much of the city area is built on land reclaimed from the sea within the harbour. Gibraltar also receives an annual influx of some 10 million visitors, the vast majority being day-trippers from Spain. The Upper Rock Nature Reserve occupies 30.8% of Gibraltar's land mass (6.5 km^2). It is therefore particularly important for Gibraltar to strike a balance between the requirement for development and the preservation of the environment. The protection of the environment is a matter of prime concern.

Gibraltar is a popular port of call for cruise liners; with 187 cruise liners calling in 2011as well as for other vessels. It also has three marinas offering over four hundred berths for yachts. Gibraltar airport currently offers scheduled air services to the United Kingdom.

There are approximately 40 kilometres of roads in Gibraltar. The network currently connects to that of Spain by a single access road, which runs across the airport runway. The economy of Gibraltar has many unusual features most of which stem from its small size in terms of area and population. Gibraltar is not capable of sustaining any kind of agriculture due to its topographical features and size constraints. There are no commercial fishing fleets based in Gibraltar and there is no domestic industrial manufacturing activity

2 The legislative and policy framework on Persistent Organic Pollutants

Persistent Organic Pollutants represent a problem on global scale impacting human health and the environment. Owing to the long range transportation of POPs, a global approach is necessary to provide effective control of these substances. Consequently, action on POPs is delivered at the international, European and national levels.

In addition to the Stockholm Convention, Gibraltar has other commitments at the international and regional level. The full extent of these commitments is described in the sections below.

2.1 International agreements

2.1.1 UNECE Aarhus Protocol

The United Nations Economic Cooperation for Europe (UNECE) adopted a Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution (CLRTAP) on Persistent Organic Pollutants on 24 June 1998 in Aarhus, Denmark. Hence, this is known as the Aarhus Protocol. This protocol aimed to eliminate discharges, emissions and losses of 16 pesticides, industrial chemicals and by-products/contaminants. The Protocol bans or severely restricts the production and use of specified products and includes provisions for dealing with their wastes. Seven new substances were added to the Protocol in 2009, although these changes have not yet entered into force.

In its Long Term Strategy adopted, in December 2010, the Convention stated that the main focus of global action on POPs should be through the Stockholm Convention, with further changes to the POPs Protocol focusing on unintentionally released POPs and where it is agreed that the implementation of stricter measures in the UNECE region is needed. Further information may be found at:

http://www.unece.org/env/lrtap/pops_h1.html

2.1.2 The Stockholm Convention

The Stockholm Convention establishes an international framework for global action on POPs. The Convention has three Annexes, which are used for POPs which require different types of control and restriction. Each POP listed under the Convention is added to one or more of these Annexes:

1. Annex A – Elimination: substances listed under Annex A are subject to a ban on production and use except where there are generic or specific exemptions;
2. Annex B – Restriction: the production and use of the chemicals listed under Annex B is restricted to any applicable acceptable purposes and/or specific exemptions listed in the Annex.
3. Annex C – Unintentional production: substances listed under Annex C are unintentionally released from anthropogenic sources with the goal of continuing minimization and, where feasible, ultimate elimination.

2.1.3 The Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal is a global agreement which addresses the problems and challenges posed by the movement and management of hazardous wastes, including those consisting of, containing or contaminated with POPs. The Basel Convention uses a Prior Informed Consent (PIC) procedure to control transboundary movements of waste whereby hazardous waste cannot be shipped from one country to another without the consent of those countries involved, including countries of transit.

The Basel Convention was amended in 1995. The amendment prohibits the export of all hazardous waste from Parties that are members of the EU, OECD and Liechtenstein to all other Parties to the Convention. While the ban is not yet in force in its own right, it is implemented in the EU through the Waste Shipment Regulation.

This Convention was extended to Gibraltar on 11.4.2013. Legislation to implement the Convention is in Part IIB- Transfrontier Shipment of Waste, of the Public Health Act

2.1.4 The World Summit on Sustainable Development

The World Summit on Sustainable Development (WSSD), held in September 2002 in Johannesburg, agreed an Intergovernmental Plan of Implementation setting out what needs to be done to achieve global sustainable development. The plan of implementation included a number of chemicals related targets, including the implementation of existing chemicals conventions and the development of a Strategic Approach to International Chemicals Management (SAICM). SAICM is a global framework to improve chemicals management.

The International Conference on Chemicals Management held in February 2006 finalised and adopted the SAICM as a voluntary agreement supported by a high-level declaration. The agreement contains a toolkit of policies and activities aimed at raising the standards of chemicals management, particularly in developing countries. SAICM draws together international bodies with responsibility for chemicals management and supports and enhances the global treaties that cover chemicals and hazardous waste. Further details can be found at http://www.chem.unep.ch/saicm/.

2.2 European Union legislation

Gibraltar acceded to the European Economic Community at the same time as the United Kingdom, pursuant to Article 299(4) of the Treaty as one of "*the European territories for whose external relations a Member States is responsible*". The Member State United Kingdom is responsible for Gibraltar's external relations. Responsibility for implementing European Union obligations in Gibraltar rests with HM Government of Gibraltar. Given the absence of any agriculture and also manufacturing industries, almost all legislation on chemicals originates from the European Union.

The first European Community Implementation Plan (CIP) was developed in 2007[1]. It identified existing measures at EU level related to POPs, assessed their efficiency and sufficiency in meeting the

[1] http://ec.europa.eu/environment/pops/pdf/sec_2007_341.pdf

obligations of the Convention, identified needs for further Union level measures and established a plan for implementing further measures.

Following changes in the regulatory landscape, a review and update of the CIP has now been carried out. The reviewed and updated CIP will be referred to as the Union Implementation Plan (UIP).

The CIP includes a full list of relevant European Legislation. The key instruments are outlined below.

Regulation (EC) 850/2004 on POPs is directly applicable in Gibraltar and implements the most important obligations of both the Stockholm Convention and the UNECE POPs Protocol. It prohibits the production, use and marketing of the POPs listed in the Annexes of both instruments and contains provisions on stockpiles and wastes, which are stricter than those stipulated in the Stockholm Convention.

In 2010, a number of amendments of the EU Regulation, to implement the international agreement reached at the fourth Conference of the Parties (COP) to the Stockholm Convention in 2009, entered into force. The new chemicals added to the EU Regulation on POPs have already been subject to prohibition or severe restrictions in the EU. However, certain restrictions go further than previously was the case in order to comply with the new international commitments.

The new chemicals were: 4 types of polybromodiphenyl ether (PBDEs), alpha hexachlorocyclohexane, beta hexachlorocyclohexane, lindane perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride and pentachlorobenzene. The original POPs were mainly pesticides but some of the new substances have been widely used in consumer products, such as PFOS, which is used in metal plating, fire fighting foams and stain repellents.

At its fifth meeting in May 2011, the COP adopted an amendment to Annex A to the Stockholm Convention to list technical endosulfan and its related isomers with a specific exemption (decision SC-5/3). Pursuant to paragraph 4 of Article 21 of the Convention, the amendment was communicated by the depositary to all Parties on 27 October 2011.In

At its sixth meeting in May 2013, the COP adopted an amendment to Annex A by decision SC-6/13 to list hexabromocyclododecane in the annex. The amendment for the listing of hexabromocyclododecane (HBCD) to Annex A of the Stockholm Convention will enter into force on 26 November 2014

Council Directive 96/59/EC on the disposal of polychlorinated biphenyls and polychlorinated terphenyls aims at disposing PCBs and equipment containing PCBs as soon as possible, and for equipment with a capacity of 5 litres or more, before the end of 2010. There is an exception for transformers which can be used until the end of their useful life provided their PCB level is less than 500ppm. Until such time as they are decontaminated, taken out of service and/or disposed of, the maintenance of transformers containing PCBs may continue only if the objective is to ensure that the PCBs they contain comply with technical standards or specifications regarding dielectric quality and provided that the transformers are in good working order and do not leak. Directive 96/59/EC also sets requirements for the environmentally sound disposal of PCBs.

With regard to unintentionally produced POPs, several instruments have a direct or indirect impact on the reduction of releases of these substances. The main release control measures are set out in Directive 96/61/EC on Integrated Pollution Prevention and Control (IPPC). In 2010 the Directive on industrial emissions 2010/75/EU (IED) was adopted. The IED replaced the IPPC Directive and a number of other sectoral directives as of 7 January 2014, with the exception of the Large Combustion Plants Directive, which will be repealed with effect from 1 January 2016.

Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) inter alia provides provisions to ensure that industrial chemicals having POP characteristics are identified and prevented from being produced or imported in the EU. Although there are tonnage triggers for registration below which the data submitted to the authorities will not necessarily be sufficient for POP assessment within the REACH framework, the Regulation also has provisions to address substances of very high concern which exhibit the criteria of being persistent, bioaccumulative or toxic. These provisions apply regardless of tonnage. Furthermore, the European Chemicals Agency has a right to request further information from companies if it suspects that a substance might exhibit POP characteristics.

Regulation (EU) No 649/2012 has replaced Regulation (EC) No 689/2008 from1st March 2014. Both of these regulations are commonly known as the EU Prior Informed Consent (PIC) Regulation. This Regulation implements the Rotterdam Convention on the Prior Informed Consent Procedure (‘PIC

procedure') for certain hazardous chemicals and pesticides in international trade. It prohibits, in accordance with the provisions of the Stockholm Convention, the export from the European Union of POPs listed in Annexes A and B of the Convention.

Directive 2008/105/EC on Environmental Quality Standards (EQSD), also known as the Priority Substances Directive, sets out environmental quality standards relating to the presence in surface water of two groups of priority substances. The substances are selected on account of the risk they pose to, or via, the aquatic environment. Annex I of this Directive currently lists 33 substances, and 8 other pollutants, including POPs. The Directive places a requirement on member states to establish, for each River Basin District, an inventory of emissions, discharges and losses for substances listed under Annex I to the Directive. The aim of these inventories is to help provide an evidence base to inform policy decisions and plans to reduce these emissions, discharges and losses and thus help maintain, or achieve, compliance with the environmental quality standards.

2.3 National legislation

HM Government of Gibraltar is committed to the full and timely implementation of Gibraltar's EU obligations

2.3.1 Gibraltar Regulation on Persistent Organic Pollutants

In 2006 Community Regulation (EC) 850/2004 was transposed into Gibraltar national law, Environmental Protection (Disposal of Persistent Organic Pollutants) Regulations 2006 (LN. 2006/080). Following the addition of new substances to the Stockholm Convention at the last Conference of the Parties meetings, the Gibraltar POPs Regulations were amended in February 2013. The current legislation governing POPs in Gibraltar is the Environmental Protection (Disposal of Persistent Organic Pollutants) Regulations 2013 (LN. 2013/030).

The Regulations designate the Environmental Agency as the Competent Authority for the administrative tasks and enforcement agency for the EC POPs Regulation in Gibraltar.

2.3.2 Roles and responsibilities – Gibraltar

The Environmental Agency is the designated competent authority for the Environmental Protection (Disposal of Persistent Organic Pollutants) Regulations 2013; who report to the Department of the Environment and Climate Change, H.M. Government of Gibraltar.

3 Implementation of action on Persistent Organic Pollutants

This section considers the current situation regarding POPs in Gibraltar, outlining their production, use, release pathways and relevant regulatory controls. Where relevant, details of present stocks and marketing of the substances, and measures undertaken to meet compliance requirements is also provided. Details of POPs emissions are provided in Section 4.

3.1 Overview of regulatory control

The Stockholm Convention is implemented in Gibraltar by the Regulations LN. 2006/080. The Regulation contains provisions regarding production, placing on the market and use of chemicals, management of stockpiles and wastes and measures to reduce unintentional releases of POPs. Other chemical and environmental legislation complements the Regulation in implementing the requirements of the Stockholm Convention. In addition there are controls in place to reduce releases of unintentionally produced POPs and human exposure to these. These are outlined at the end of this section.

3.2 POPs regulated before 2009 ("existing POPs")

The term "existing POPs" covers the substances listed in the Stockholm Convention or the POP Protocol and regulated by the POP Regulation at EU level before 2009, i.e. before the new POP substances were listed in the Stockholm Convention or the POP Protocol in 2009 and 2011.

3.2.1 Pesticides

The Stockholm Convention originally listed the pesticides aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene and DDT. All have been banned in Gibraltar since 2008

3.2.2 Hexachlorobenzene (HCB)

Hexachlorobenzene is an industrial chemical as well as a pesticide and its use, including in imported articles is banned under Regulation (EC) 850/2004, which is implemented through the Regulations LN. 2006/080. The lack of an agricultural industry in Gibraltar and predominant use of fuel oil for energy generation mean that there are few sources of HCB. The key sources identified for Gibraltar are the use of an incinerator in the early part of the time-series, and shipping (assuming use of some waste oils as part of the fuels mix).

Measurements carried out between July 2009 to date show that concentrations of HCB in seawater samples were below 0.001 µg/L (see section 4.3.3).

3.2.3 Polychlorinated Biphenyls (PCBs)

Prior to the mid-1970s PCBs were used in both 'closed' (electrical equipment such as capacitors, capacitors, transistors and electrical switching gear) and 'open' applications such as sealants. Although the open use of PCBs ceased in the 1970s, it is possible that building sealants containing PCBs may still be present in older properties. A significant amount of PCBs found in the environment has arisen from past use of such products.

The manufacture of PCB containing equipment was banned in 1985. However, due to their high persistence and the residual bank of equipment still being used, emissions of PCBs have continued long after the ban was introduced. As required under Council Directive 96/59/EC on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (the PCB Directive), the Environmental Agency holds registers of all identifiable PCB holdings (including any transformer, capacitor or receptacle containing residual stocks) in Gibraltar.

3.2.4 Dioxins and furans

Emissions of dioxins and furans have declined significantly following measures taken to control industrial releases. Emission to air have declined by an order of magnitude since 1990. However, unintentional releases from costal shipping and sewage sludge and effluent dumping at sea such as small-scale fuel combustion, continue to present a challenge in achieving further reductions.

3.3 POPs regulated from 2009 ("new POPs")

The new POPs are the substances that were listed in the Stockholm Convention at the 4th, 5th and 6th Conference of the Parties (COP) to the Stockholm Convention held in May 2009, in April 2011 and May 2013 respectively. These chemicals were also included in the POP Protocol at the 27th and 28th meeting of the Executive Body of LRTAP Convention held in December 2009 and 2010, respectively.

Thus, the new POPs are chlordecone; hexabromocyclododecane (HBCD); alpha and beta hexachlorocyclohexane (HCH); endosulfan; lindane (gamma HCH); pentachlorobenzene (PeCB); perfluorooctanesulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOS-F); tetra-, penta-, hexa-, and hepta-BDE (Polybrominated diphenylethers, PBDEs).

3.3.1 Annex A pesticides

The pesticides listed in Annex A to the convention are: Chlordecone, alpha and beta hexachlorocyclohexane, lindane (gamma hexachlorocyclohexane) and endosulfan.

Measurements carried out between July 2009 to date show that concentrations of alpha and beta hexachlorocyclohexane, lindane and endosulfan in seawater samples were below 0.003 µg/L (see section 4.3.3).

3.3.1.1 Current production, marketing, use and control

These pesticides are not produced in Gibraltar and have been banned for many years. There has been an effective ban in Gibraltar since all pesticides were sourced mainly in the UK and to a lesser extent, in Spain.

EU legislation (particularly Council Directive 79/117/EEC) prohibited the placing on the market and use of plant protection products containing certain active substances which, even if applied in an approved manner, could give rise to harmful effects on human health or the environment.

Council Directive 79/117/EEC was repealed on 14 June 2011, since when the marketing of plant protection products in the EU has been governed by Regulation (EC) No 1107/2009. This prohibits the use of any active substances in plant protection products unless approved for that purpose.

The wider production, use, import and export of alpha and beta hexachlorcyclohexane and lindane has been banned under Regulation (EC) 850/2004.

Endosulfan is also classified as a priority hazardous substance under the Water Framework Directive 2000/60/EC which requires environmental quality standards to be set for concentrations in water and sediments.

3.3.1.2 Historical use and release pathways

Pesticides in Annex A have never been produced and may not have been used in Gibraltar prior to their ban. Releases of these substances to the environment are therefore unlikely.

Chlordecone

Chlordecone is a synthetic chlorinated compound, which was mainly used as an agricultural pesticide. It was first produced in 1951 and introduced commercially in 1958. Chlordecone was sold under the trade name ‘Kepone’.

Chlordecone may not have been used in Gibraltar given the absence of any agriculture industries prior to its ban in 1977. Releases of the substance to the environment are therefore unlikely.

Alpha and beta hexachlorocyclohexane (HCH)

Alpha and beta hexachlorocyclohexane (HCH) were previously important components of the pesticide Technical HCH. Lindane (99% by weight gamma HCH), which replaced Technical HCH, contains only trace amounts of alpha and beta HCH. As significant quantities of waste were generated in the production of lindane, this may have contained the alpha and beta HCH isomers.

Lindane (gamma hexachlorocyclohexane (HCH))

Lindane has been used globally as a broad-spectrum insecticide for seed and soil treatment, foliar applications, tree and wood treatment and against ectoparasites in both veterinary and human applications. The estimated world-wide use in 1990 was 8,400 tonnes. The production of lindane has decreased rapidly in recent years and it is now only produced in a few countries.

Lindane was used as an insecticidal product to treat timber. To a lesser degree, it was a constituent of specialist shampoos for the treatment of head lice. The use of Lindane was at its peak in the 1970s, after which its use declined until its ban in 2002.

The main release pathway in Gibraltar for lindane is emissions to air from historic lindane application, notably as a legacy of treated stockpiles of wood (e.g. used in construction, fencing etc.) with an estimated lifespan of 50 years. Estimates come with a high level of uncertainty, and have been based on emissions from the UK, as remaining stockpiles of treated wood are unknown in Gibraltar.

Endosulfan

Endosulfan is an insecticide which occurs as two isomers, alpha and beta endosulfan, both of which are biologically active. It has been used since the 1950s to control crop pests, tsetse flies and ectoparasites of cattle. It has also been used as a wood preservative. Several countries that used to produce endosulfan in Europe have stopped production.

Endosulfan is used as a broad spectrum insecticide to control a wide range of pests on a variety of crops including coffee, cotton, rice, sorghum and soy.

The main release pathways for endosulfan would be from past use to water and soil sediments. Endosulfan may also be present in trace amounts in agricultural products imported from other countries.

3.3.2 Annex A industrial chemicals

The industrial chemicals listed in Annex A are: Hexabromobiphenyl, polybrominated diphenyl ether (tetra, penta, hexa and hepta BDE) and hexabromocyclododecane (HBCD)

3.3.2.1 Current production, use, control and release pathways

These industrial chemicals have never been produced in Gibraltar.

Hexabromobiphenyl

Hexabromobiphenyl (HBB) was used as a flame retardant within a number of plastic applications, mainly in the 1970s. During production of plastic products containing HBB, the key emissions would have been to air and water, with further residual emissions to air from goods during use (e.g. due to abrasion resulting in dusts containing HBB). Emissions to air, land and water would therefore have occurred throughout the lifecycle of the product including after final disposal to landfill.

Plastic products treated with HBB are expected to have a lifespan ranging from 5 to 10 years. It is therefore unlikely that there have been any significant HBB emissions to the environment after 1990.

Polybrominated diphenyl ether (tetra, penta, hexa and hepta BDE)

The four POPs in this category are substances which have either been used as flame retardants or been present in commercial grade flame retardant products.

Council Directive 2003/11/EC restricts the marketing and use of certain dangerous substances and preparations (pentabromodiphenyl ether, octabromodiphenyl ether). Additional controls on the use and placing on the market of these substances are provided through the EU Chemicals Regulation (REACH, 1906/2007) and the EU Restriction of certain Hazardous Substances (ROHS) Directive (2011/65/EC). There is no legislation governing flame retardant in soft furnishings in Gibraltar but since practically all soft furnishings are imported from the EU, it is reasonable to assume that they would comply with any relevant directive/regulation.

Since 2007, the EU Waste Electrical and Electronic Equipment (WEEE) Regulation has regulated the disposal and recycling of electrical and electronic equipment containing tetra, penta, hexa and heptaBDE. This legislation is implemented in Gibraltar through the Environment (Waste) Regulations 2007 (LN. 2007/125).

3.3.2.2 Historical use and release pathways

Polybrominated diphenyl ether (tetra, penta, hexa and hepta BDE)

Tetra and pentaBDE are the two main polyBDE congeners found within commercial pentaBDE. The hexaBDE congener may also be found in low concentrations in commercial pentaBDE. Hexa and heptaBDE are congeners found within commercial octaBDE.

There is no legislation governing flame retardants in soft furnishings in Gibraltar. Practically all soft furnishings are imported from the EU therefore they would comply with any relevant European directive/regulation.

Commercial octaBDE had more limited applications than pentaBDE, as it was primarily used as an additive flame retardant in plastic housings for electrical goods. Commercial pentaBDE was used as an additive flame retardant in a number of plastic applications. It was also used in soft furnishings to meet strict UK fire resistance targets, but soft furnishings in Gibraltar are more likely to be imported from elsewhere in the EU, so this is likely to be a less significant source of octa-BDE than in the UK.

Although both commercial penta and octaBDE have been banned in the UK since 2003 and 2004 respectively, low levels of brominated chemicals could continue to be present in unlabelled recycled plastics. Both commercial penta and octaBDE were manufactured and used in the UK until 2000.

Emissions of tetra and pentaBDE from in-use items and in waste streams are estimated to be more significant than those arising from past manufacturing or use. This is because carpets, textiles, furnishings and other items which may have been treated with pentaBDE prior to the 2003 ban remain in use and will continue to enter waste streams for some time. It is estimated that tetra and pentaBDE may be emitted to air, land and water during use and following disposal of these goods.

In recent years, the main release pathways for hexa and heptaBDE are believed to have been emissions to air and land in the form of contaminated dusts arising from the disposal of products manufactured prior to the ban. It is reported that these substances are present in many articles still in use and that releases from this source will diminish over time as these items are removed from the stock of electrical goods.

3.3.3 Annex B substances

The only Annex B substances listed in 2009 were the industrial chemicals perfluorooctanesulphonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOS-F.

3.3.3.1 Current production, marketing, use and control

PFOS has never been produced or imported as such in Gibraltar. It was banned in under the terms of the Environmental Protection (Disposal of Persistent Organic Pollutants) Regulations 2013 (LN. 2013/030). However there are exemptions for its use in the chrome plating, semi-conductor and photographic industries. Exemptions for PFOS under the EU POPs Regulation are as follows:

1. until 26 August 2015, wetting agents for use in controlled electroplating systems;
2. photoresists or anti reflective coatings for photolithography processes;
3. photographic coatings applied to films, papers, or printing plates;
4. mist suppressants for non- decorative hard chromium (VI) plating in closed loop systems;
5. hydraulic fluids for aviation.

Exemptions for use of PFOS in fire fighting foams ceased in 2011.

3.3.3.2 Emission sources and release pathways

PFOS is both intentionally produced and an unintended degradation product of related anthropogenic chemicals. PFOS was manufactured by the 3M Company in Europe as a surfactant for a range of applications until 2001. It is understood that some small scale manufacture of PFOS might have continued outside Europe after 3M ceased production.

The current use of PFOS includes metal plating activities in the chrome industry, the use of small quantities in semi-conductor manufacture and limited applications in the photographic industry.

In the past PFOS has also been used as a surfactant in a number of fire fighting foams. Previous use of PFOS was dominated by the domestic market, particularly as a stain repellent in furniture and other furnishing items. These items which are still being used are likely to remain a source of PFOS emissions for an extended period.

The main environmental release pathways are believed to be to water, where concerns have been raised about further de novo formation of PFOS within waste water treatment works. When the proposed waste water treatment plant is operating, a monitoring programme to should be run to collect data and eventually to provide emission estimates.

3.3.3.3 Stockpiles, compliance activity and alternatives

The Gibraltar Fire and Rescue Service does not hold stocks of PFOS-containing fire fighting foams

3.3.4 Annex A and C substance

The only substances added to Annexes A and C in 2009 was the pesticide, industrial chemical and unintentional by-product Pentachlorobenzene (PeCB)

3.3.4.1 Production, marketing, use and control

Pentachlorobenzene (PeCB) was never produced in Gibraltar and has no current commercial uses. It is present as a contaminant in the pesticide Quintozene. Following a review[2], Quintozene was not approved for use as an active substance under Council Directive 91/414/EEC and quintozene-containing products already on the market were withdrawn on 27 June 2001 with existing stocks to be

[2] http://ec.europa.eu/food/fs/sfp/ph_ps/pro/eva/existing/list1-19_en.pdf

exhausted by 27 June 2002. From 28 June 2002 it has been illegal to market, use or store pesticide products containing Quintozene.

Directive 91/414/EEC had been transposed into Environmental Liability Regulations 2008 (LN. 2008/100)

3.3.4.2 Historical use and release pathways

In the past PeCB was present in the following as:

1. an elastomer in PCB di-electric fluids
2. a contaminant of HCE (hexachloroethane) de-gassing agents used in aluminium manufacture
3. a contaminant of the pesticide Quintozene
4. a contaminant of the pesticide PCP (pentachlorophenol)
5. a contaminant of tetrachloroethene (also known as perchloroethylene or PERC) used in dry cleaning
6. a by-product of the production of carbon tetrachloride
7. Pentachlorobenzene is also produced as an unintentional by-product in combustion processes, in the following diffuse activities:
8. uncontrolled combustion of waste
9. accidental fires
10. incineration of hazardous and clinical wastes
11. combustion of solid fuels – principally coal in domestic grates trace residues from emissions of waste water treatment works

Emissions of pentachlorobenzene (PeCB) in Gibraltar from a wide range of sources have been estimated for the period 1990 to 2011 (see section 4.1.4). Emissions in the 90s were dominated by the municipal waste incinerator and dielectric equipment and use of PCB containing fluids. The significance of these industrial sources has declined since 1997/98 for dielectric and 2000 for the incinerator, leading to more recent emission estimates being dominated by diffuse sources.

3.4 Controls on unintentionally produced POPs

3.4.1 Current legislation on unintentionally produced POPs

The legislation on unintentionally produced POPs is delivered through a combination of action at the national, European Union and international level. Control measures via legislation and abatement technologies have led to a significant reduction in dioxin, PCB and PeCB emissions. These measures include a combination of pollution control equipment or substitute process technologies. For major industrial sources these measures are listed in this next section. Full details of existing Community legislation are available in the Community Implementation Plan[3].

3.4.2 Control on industrial processes

Unintentionally produced persistent organic pollutants, including dioxins and dioxin-like PCBs, are covered under several instruments in Community legislation that have an impact, either directly or indirectly, on the reduction of releases of these substances. The main release control measures were set out in the Integrated Pollution Prevention and Control Directive (Directive 2008/1/EC) The Industrial Emissions Directive (2010/75/EU) brings together Directive 2008/1/EC (the 'IPPC Directive') and six other directives in a single directive on industrial emissions.

This Directive covers industrial activities with a major pollution potential, defined in Annex I to the Directive (energy industries, production and processing of metals, mineral industry, chemical industry, waste management, rearing of animals, etc.).

[3] http://ec.europa.eu/environment/pops/index_en.htm

The Directive contains special provisions for the following installations:

1. combustion plants (≥ 50 MW);
2. waste incineration or co-incineration plants;
3. certain installations and activities using organic solvents;
4. installations producing titanium dioxide.

As from 28.2.2013 Large Combustion Plants Act 2003 (LN. 2003/18) has been revoked by Pollution Prevention and Control Regulations 2013 (LN. 2013/042), transposing Directive 2010/75/EU.

3.4.3 Other key legislation for dioxins, PCBs and HCB

Part 3, Article 1.3 of the Pollution Prevention and Control Regulations 2013 (LN. 2013/042) establishes an emission limit value for waste incineration of 0.1 ng I-TEQ[4]/Nm[3] for dioxins and furans over a sampling period of 6 to 8 hours.

3.5 Controls on diffuse sources

As result of tighter regulation on industrial sources, diffuse sources of dioxin, PCB, HCB and PeCB releases make the most significant contribution to emissions and may require further consideration. Open burning of waste is not allowed and is controlled by the Waste Provisions of the Public Health Act, specifically Part V A of the public Health Act Section 192 and the Environment (Waste) Regulations 2007 (LN. 2007/125).

3.6 Occupational exposure to dioxins, PCBs and HCB

Health and Safety legislation lays down a series of requirements on employers which will apply to situations at work where exposure to polychlorinated biphenyls (PCBs) and dioxins may occur. The EU Directive 96/82/EC, more commonly known as the “Seveso II Directive” is implemented in Gibraltar through the Public Health Act and the Environmental Agency is the competent authority. The Environmental Agency is the designated competent authority for the Environmental Protection (Disposal of Persistent Organic Pollutants) Regulations 2013; who report to the Department of the Environment and Climate Change, H.M. Government of Gibraltar.

3.7 Food legislation on dioxins and dioxin-like polychlorinated biphenyls

Regulation (EC) 1881/2006 on setting maximum levels for certain contaminants in food as amended by Regulation (EC) 1259/2011 establishes maximum acceptable levels for dioxins, dioxin-like PCBs and non dioxin-like PCBs in food. Limits are set in meat, liver (including fish liver), fish, marine oils, milk and dairy products, hen eggs and egg products, animal fats, vegetable oil and foods for infants and young children. Regulation 252/2012 sets conditions to ensure that samples are representative and that analysis is carried out to an acceptable standard. Recommendation 2011/516 establishes separate action levels for dioxins and dioxin-like PCBs at which an investigation should be considered, if possible to identify and eliminate any significant local sources.

Gibraltar does not have a programme of monitoring POPs in food. The possibility of food analysis is currently under consideration.

4 Evaluation of the current releases of the POPs

This section considers the current releases of the POPs to the environment, data on emission trends in different environmental vectors (where available). It also outlines measures that are in place to control emissions of unintentionally produced POPs and to what extent these have assisted in reducing emissions from regulated sources.

[4] TEQ is a scheme used to provide the measurement of toxicity for dioxins.

4.1 Emission estimates for Annex C POPs — Source inventories in Gibraltar (1990-2011)

Emission estimates for the substances listed under Annex C of the Stockholm Convention presented in this section are based on the Gibraltar Environmental Agency report "Emissions of Persistent Organic Pollutants (POPs) in Gibraltar 1990 to 2011"[5]. Additional information can be found there.

The reporting guidelines for developing and submitting emission estimates require to develop an inventory with five vectors in order to be fully compliant with the Convention. These five vectors are:

1. Air
2. Water
3. Land (assumed to be releases to land in an uncontrolled fashion)
4. Residue (assumed to be releases to land in a controlled fashion)
5. Product

Gibraltar does not make use of any landfill sites within the territory. On this basis there will be no emissions for any of the Annex C substances to the 'residue' vector. As regards the 'Product' vector, this typically constitutes two key sources. Firstly, ash and slag residues from combustion processes may be recycled into cement, concrete or road aggregates. Secondly POPs may be present in pesticides: however, in the Gibraltar inventory this is disaggregated to air, land, and water and not counted under 'product' in order to avoid double counting. Gibraltar does not have a cement and concrete industry or make use of pesticides within agriculture. While road repairs and road building are likely to happen in a more limited fashion the use of recycled ash and slag from combustion of fuels is considered likely to be negligible. On this basis no emissions to the 'Product' vector are reported for the Annex C substances.

4.1.1 Dioxins and Furans (PCDD/F)

PCDD/Fs have been shown to possess a number of toxicological properties. The major concern is centred on their possible role in immunological and reproductive effects. The main sources of PCDD/Fs are thermal processes, but they can also be released to the environment from some chemical processes.

PCDD/Fs can arise from any thermal process where chlorine is present. For example, coal and other solid fuels contain trace amounts of chlorine compounds which can under certain combustion conditions result in PCDD/F formation. In addition PCDD/Fs can be present in the feedstock material, or chlorinated impurities may be introduced into the feedstock of some thermal processes. The amount of chlorine required for PCDD/F formation may be small and consequently many processes have the potential to emit these pollutants. PCDD/Fs can also be emitted from the chemical production and use of polychlorinated aromatic pesticides and herbicides, although this is not a relevant source for Gibraltar.

The estimated multi-vector emissions for PCDD/F are shown in Table 2 and Figure 1 – Dioxin emissions as a time-series 1990-2011 (air vector)Figure 1. Historically the key source for emissions of dioxins and furans to air was the municipal waste incinerator which closed in 2000. Figure 1 shows how in 1990 the incinerator dominated 95% of all dioxin and furan emissions to air. Since its closure the key sources within the air inventory are related to fuel combustion with the power generation sector now the most significant source for Gibraltar.
Secondary sources include shipping (fuel use), a new clinical waste incinerator which opened in 2009, and accidental fires which are also the key source for emissions to land. For the water vector the disposal of sewerage waste at sea will be the sole source to water. Due to the hydrophobic nature of dioxins and furans, they tend to be concentrated within the sewage sludge fraction with effluent concentrations typically very low or negligible.

Total release of dioxins and furans within Gibraltar have fallen from 3.6 g I-TEQ/y to 0.3 g I-TEQ/y in 2011 for air, with broadly stable emissions for land and water at approximately 0.01 and 0.1 g I-TEQ per annum. Emissions to air from combustion in energy production are the dominant source of dioxins and furans. It is anticipated that the impact of this source will improve significantly with the operation of the

[5] Gibraltar Environmental Agency (2013) "Emissions of Persistent Organic Pollutants (POPs) in Gibraltar 1990 to 2011"

new power station facility at North Mole, as the current power stations at Waterport and the Southern District are nearing the end of their operational life.

Figure 1 – Dioxin emissions as a time-series 1990-2011 (air vector)

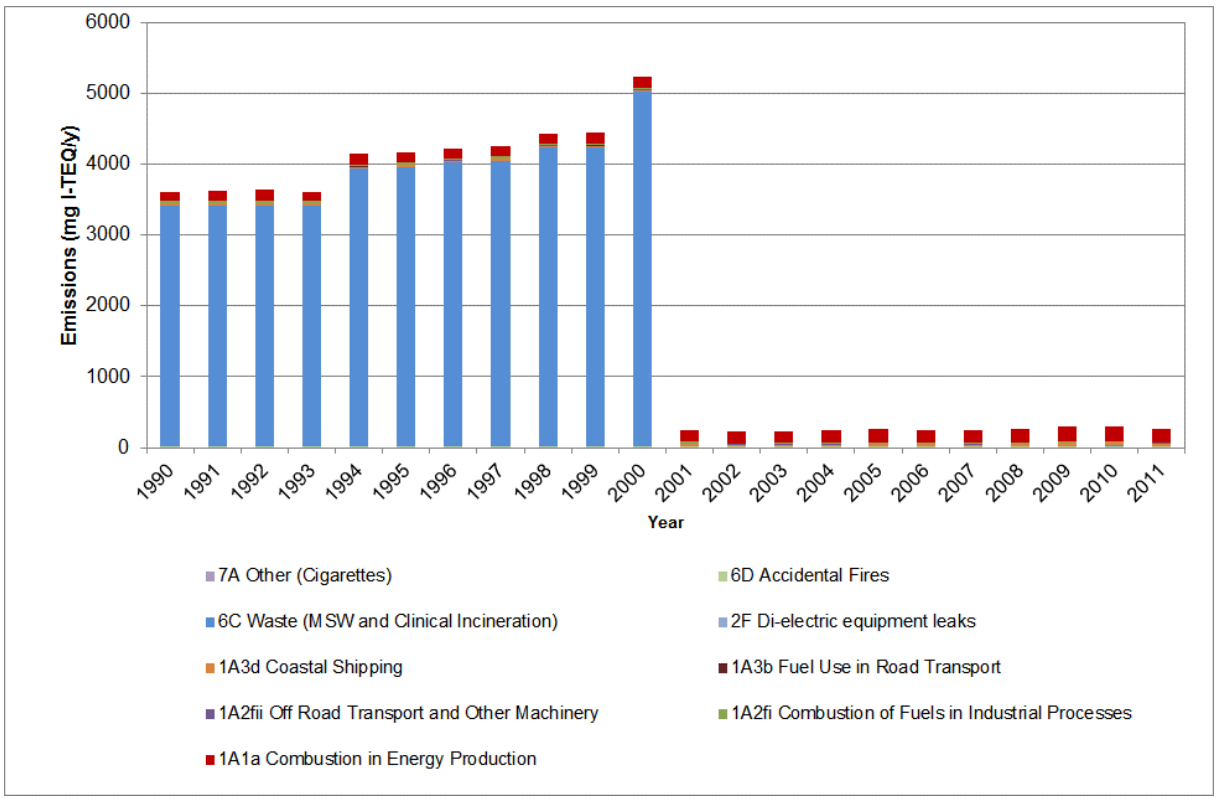


Table 2 – Dioxin and Furan emissions to all vectors for Gibraltar 1990-2011

1. Air

NFR	Description	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
1A1a	Combustion in Energy Production	mg I-TEQ/y	135	143	158	183	176	186	196	205	209	198
1A2fi	Combustion of Fuels in Industrial Processes	mg I-TEQ/y	26	26	27	20	20	15	11	8	4	2
1A2fii	Off Road Transport and Other Machinery	mg I-TEQ/y	6	6	6	6	6	6	6	6	6	6
1A3b	Fuel Use in Road Transport	mg I-TEQ/y	5	2	1	1	1	1	1	1	1	1
1A3d	Coastal Shipping	mg I-TEQ/y	22	25	30	28	33	31	41	46	42	42
2F	Di-electric equipment leaks	mg I-TEQ/y	1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
6C	Waste (MSW and Clinical Incineration)	mg I-TEQ/y	3403	3943	4999	0	0	0	0	14	29	6
6D	Accidental Fires	mg I-TEQ/y	17	18	17	17	16	10	12	11	12	12
7A	Other (Cigarettes)	mg I-TEQ/y	0.01	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.003
	Total Emissions	mg I-TEQ/y	**3615**	**4163**	**5239**	**255**	**252**	**248**	**267**	**291**	**303**	**268**

2. Land

NFR	Description	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
2F	Di-electric equipment leaks	mg I-TEQ/y	7	6	1	1	1	1	1	1	1	1
6D	Accidental Fires	mg I-TEQ/y	17	17	16	16	16	10	12	10	12	12
	Total Emissions	mg I-TEQ/y	**23**	**23**	**17**	**17**	**16**	**10**	**13**	**11**	**12**	**13**

3. Water

NFR	Description	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
6B	**Total Emissions** (Sewage sludge and effluent dumping at sea)	mg I-TEQ/y	**85**	**75**	**75**	**79**	**80**	**81**	**81**	**81**	**81**	**82**

4.1.2 PolyChlorinated Biphenyls (PCBs)

PCBs are synthetic organic compounds that have mainly been used in electrical equipment as dielectric insulating media.

PCBs have been linked with effects such as reduced male fertility and long-term behavioural and learning impairment. They are classified as probably carcinogenic to humans. Certain PCBs have been assessed as having dioxin-like effects. PCBs are extremely persistent in the environment and possess the ability to concentrate up the food chain. These compounds are highly insoluble in water but accumulate in body fat. Present human exposure is probably dominated by the accumulation through the food chain of the PCBs present in environmental reservoirs such as soils and sediments as a result of previous releases to the environment.

A large source of PCBs in many countries is leakage from old electrical equipment (eg. capacitors and transformers) containing dielectric fluids (which in turn contain PCBs), and from the destruction of such equipment. A survey of power generation and supply professionals in March 2001 found that all of the large electrical equipment in Gibraltar had been replaced by PCB free units in the late 1990s. We have assumed that this took effect between 1997 and 1998, which has led to a large drop in the emissions from this source across these years. Emissions have not fallen to zero because there are likely to be undetected PCBs in some smaller appliances. No emissions from the destruction and disposal of this equipment have been included because all electrical waste from Gibraltar is exported.

For the early part of the time series, emissions from electrical equipment have been calculated based on the EU average amount of PCB present per GWh of electricity generated in 1987, assumptions based on the amount of old equipment still in use each year, and what proportion of the fluid contained is emitted to the atmosphere. In 1998, emissions are assumed to be 20% of the total in 1997, and to

continue to decline from this point as old equipment is replaced. The remaining emissions are from the power station (as there are trace emissions arising from fuel combustion) and waste incineration.

Emission estimates for Gibraltar to all vectors for PCBs are summarised in Table 3 and Figure 2. The dominant source in this case relates to the use of PCBs within the heat transfer fluids for dielectric equipment such as transformers and capacitors. The removal of these articles from use accounts for the large decrease in emissions between 1997 and 1998 shown in Figure 2.

The emissions do not drop to zero for this source as we make the assumption that a small quantity of stock is likely to remain unidentified and in use. One particular issue for PCB dielectric equipment is the idea of 'back filling'. This is the replacement of or 'topping up' of heat transfer fluid without properly decontaminating the fill reservoir. In this case where PCBs have been used historically the dielectric equipment can remain contaminated and continue to emit all be it at a reduced level.

Emissions to land are also dominated by leakage from dielectric equipment while emissions to water have a single source relating to the disposal of sewage to sea. The nature of POPs means that they tend to be hydrophobic and will bind to organic matter in this case the sewage sludge. PCB concentrations within the liquid effluent are likely to be lower.

Table 3 – PCBs emissions to all vectors for Gibraltar 1990-2011

1. Air

NFR	Description	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
1A1a	Combustion in Energy Production	g/y	31	33	37	42	41	43	45	48	49	46
1A2fi	Combustion of Fuels in Industrial Processes	g/y	6	6	6	5	5	3	3	2	1	1
2F	Di-electric equipment leaks	g/y	11180	9413	1643	1383	1336	1291	1247	1205	1164	1125
6C	Waste (MSW and Clinical Incineration)	g/y	66	51	65	0	0	0	0	0	0	0
6D	Accidental Fires	g/y	21	22	21	21	20	12	15	13	15	15
	Total Emissions	**g/y**	**11304**	**9525**	**1772**	**1451**	**1402**	**1350**	**1311**	**1268**	**1229**	**1187**

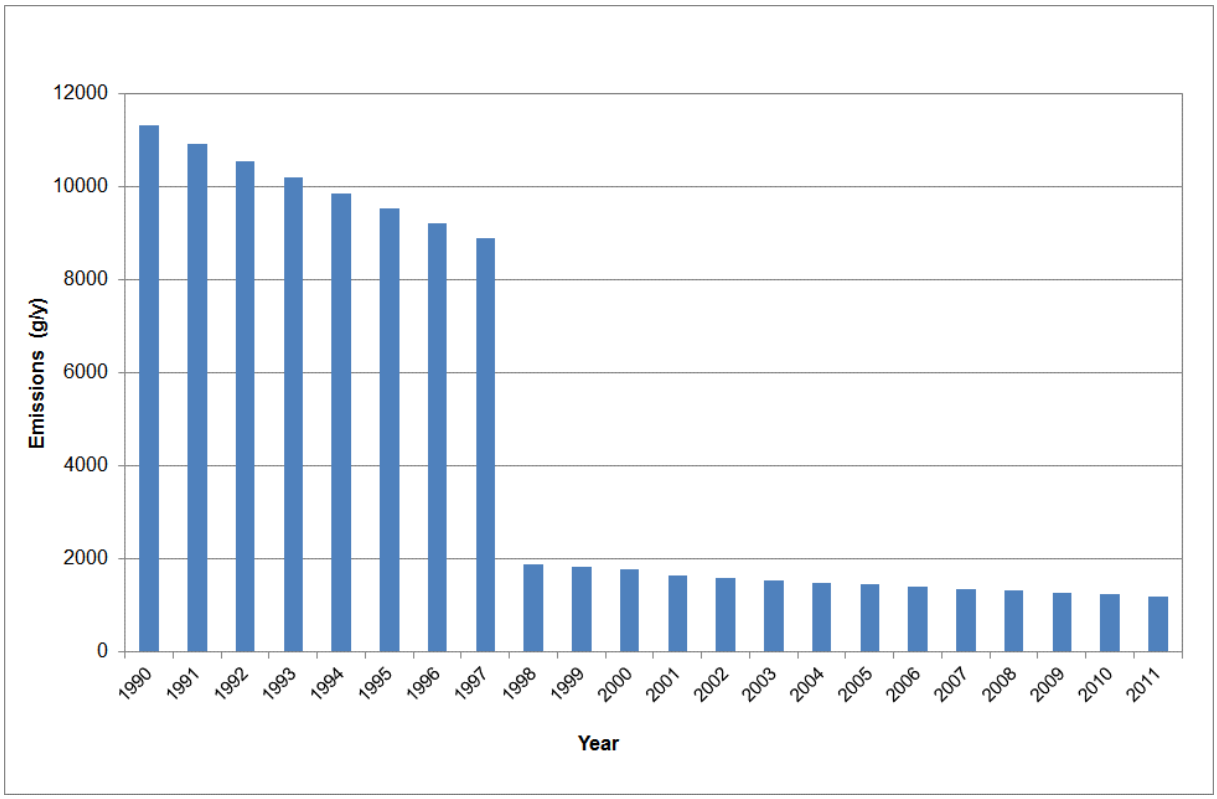
2. Land

NFR	Description	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
2F	**Total Emissions** (Di-electric equipment leaks)	**g/y**	**81988**	**69026**	**12048**	**10143**	**9800**	**9469**	**9148**	**8839**	**8540**	**8251**

3. Water

NFR	Description	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
6B	**Total Emissions** (Sewage sludge and effluent dumping at sea)	**g/y**	**374**	**330**	**328**	**349**	**350**	**355**	**355**	**357**	**357**	**361**

Figure 2 – PCBs emissions as a time-series 1990-2011 (air vector)



4.1.3 Hexachlorobenzene (HCB)

Hexachlorobenzene has previously been used as a pesticide particularly for use as a seed treatment. It is also still found as a contaminant of 'in-use' pesticides particularly the pesticides chlorothalonil and chlorthal dimethyl. Alongside commercial use hexachlorobenzene also has a number of unintentional sources, resulting in its listing in Annex C to the Stockholm Convention. The key unintentional sources are typically incomplete combustion of solid fuels, particularly coal. It is also a pollutant linked to the emissions to air and air pollution control residues for incinerators, particularly clinical and hazardous waste incineration. It is also linked to shipping fuels where waste oils can be used with heavy marine fuels to help make fuel costs more economically viable.

The lack of an agricultural industry in Gibraltar and predominant use of fuel oil for energy generation mean that there are few sources of HCB. The key sources identified for Gibraltar are the use of an incinerator in the early part of the time-series, and shipping (assuming use of some waste oils as part of the fuels mix). The absence of agricultural use in Gibraltar means that emissions to land are negligible and are so not reported here. Table 4 shows the time-series for HCB.

Table 4 – HCB emissions to all vectors for Gibraltar 1990-2011

1. Air

NFR	Description	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
1A3d	Coastal Shipping	g/y	1	1	1	1	2	1	2	2	2	2
6C	Waste (MSW and Clinical Incineration)	g/y	8	10	12	0	0	0	0	0	0	0
	Total Emissions	**g/y**	**9**	**11**	**13**	**1**	**2**	**1**	**2**	**2**	**2**	**2**

2. Water

NFR	Description	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
6B	**Total Emissions** (Sewage sludge and effluent dumping at sea)	**g/y**	**19**	**16**	**16**	**17**	**17**	**18**	**18**	**18**	**18**	**18**

The total emission of HCB to all vectors in 2011 was 20 g. Comparison of per capita emissions of HCB in Gibraltar, the UK and Spain were 0.1, 0.5 and 6.6 mg per person per annum respectively. The much lower HCB emissions for Gibraltar reflect the absence of an agricultural industry and no use of solid fuels such as coal and wood.

4.1.4 Pentachlorobenzene (PeCB)

Pentachlorobenzene is a poly-chlorinated aromatic compound from the same family of chemicals as hexachlorobenzene, which has been the subject of extensive study. It was the only new substance to be added to both Annex A and Annex C of the convention in 2009.

Pentachlorobenzene is no longer used commercially but historically has a wide array of applications which include:

1. As a pesticide and contaminant in other pesticides such as Quintozine
2. Industrial chemical in metal working, particularly aluminium industries.
3. By-product of solvent manufacture including PERC (Perchloroethylene) used in dry cleaning
4. Used in PCB mixtures for di-electric equipment

It is also an unintentional POP linked principally to uncontrolled combustion of fuels. As with hexachlorobenzene this primarily relates to sold fuels such as coal. There are also emissions from incineration particularly clinical and hazardous waste incineration. Public exposure to pentachlorobenzene is likely to occur mainly through the food chain and cycling of sediments. PeCB within sewage sludges is the key source for emissions to water in the Gibraltar inventory.

Emission estimates for pentachlorobenzene are displayed in Table 5 and Figure 3. Pentachlorobenzene has a more diverse set of sources than other POP pollutants found within Annex C of the Stockholm Convention. It is produced as a result of combustion processes, although like hexachlorobenzene this relates particularly to the combustion of solid fuels like coal and wood, noting that Gibraltar uses fuel oil. It has also been used alongside PCBs in dielectric equipment as part of the mixture of chemicals used for heat transfer fluids. It is also found as a trace contaminant in certain pesticides, particularly Quintozine.

A number of potential sources for pentachlorobenzene such as pesticides and combustion of solid fuels are not relevant for Gibraltar. The key dominant sources for air emissions in the early part of the time series displayed in Figure 3 is the municipal waste incinerator. Emissions also arise from the use of PCB containing fluids as a dielectric. These two sources dominant the emissions profile, with significant reductions in emissions around 1997/98 for dielectric fluids and 2000 for the incinerator.

A secondary source is accidental house and vehicle fires, in which plastics (particularly PVC containing plastics) are destroyed. This is a minor source for air and land within the inventory. The sole source for pentachlorobenzene to water is the disposal of sewage to sea. Pentachlorobenzene tends to be slightly more soluble than the other POPs (Log Kow is between 4.8 – 5.18) and so can be present in liquid effluents at detectable concentrations. However concentrations overall for sewage sludge released to sea are likely to be low, and emissions of POPs to water are likely to be dominated by PCBs rather than HCB or PeCB.

Figure 3 – PeCBs emissions as a time-series 1990-2011 (air vector)

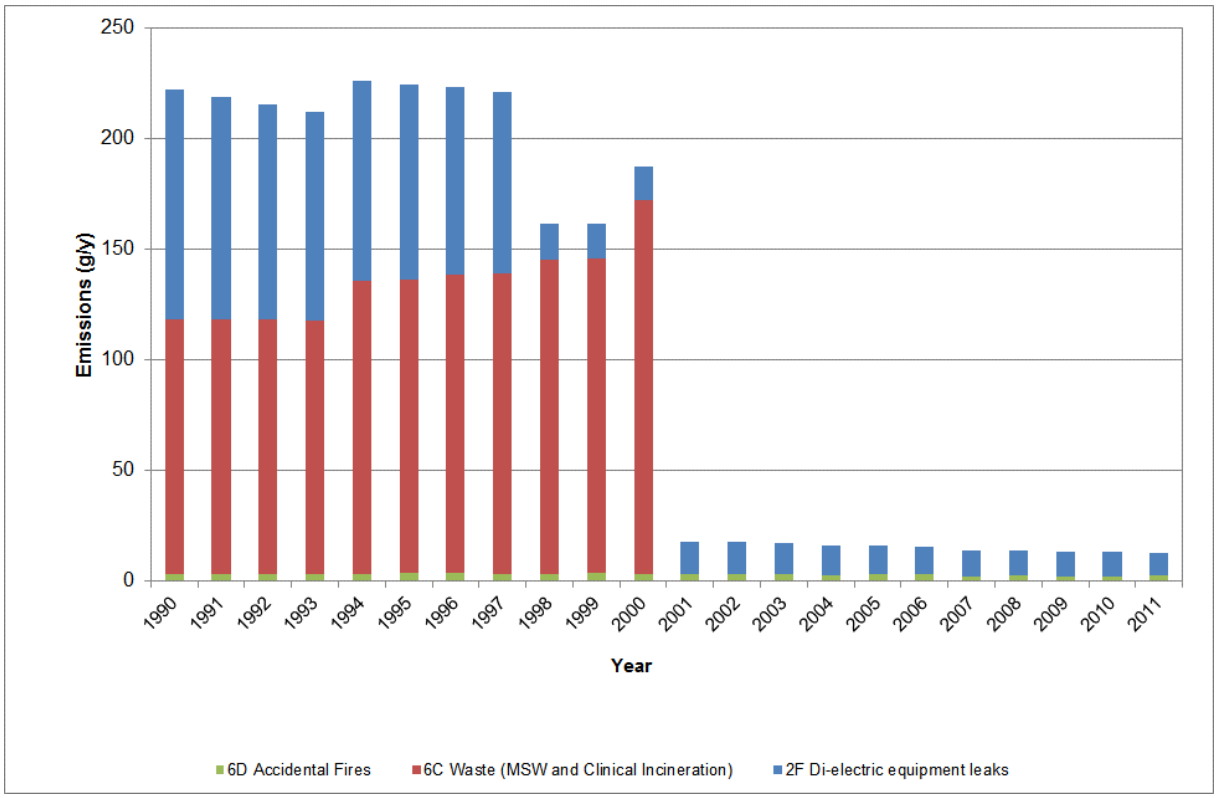


Table 5 – PeCB emissions to all vectors for Gibraltar 1990-2011

1. Air

NFR	Description	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
2F	Di-electric equipment leaks	g/y	104	88	15	13	12	12	12	11	11	10
6C	Waste (MSW and Clinical Incineration)	g/y	115	133	169	0	0	0	0	0	0	0
6D	Accidental Fires	g/y	3	4	3	3	3	2	2	2	2	3
	Total Emissions	**g/y**	**223**	**224**	**187**	**16**	**16**	**14**	**14**	**13**	**13**	**13**

2. Land

NFR	Description	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
2F	Di-electric equipment leaks	g/y	765	644	112	95	91	88	85	82	80	77
6D	Accidental Fires	g/y	39	40	38	38	37	23	28	24	27	28
	Total Emissions	**g/y**	**804**	**684**	**151**	**133**	**128**	**111**	**113**	**107**	**106**	**105**

3. Water

NFR	Description	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
6B	Sewage sludge and effluent dumping at sea **Total Emissions**	**g/y**	**0.6**	**0.5**	**0.5**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**

4.2 Emission estimates for Annex A and B POPs

All 'new POPs' added to Annexes A and B of the Stockholm Convention since 2009 had either already been banned and/or had their use restricted under other reporting protocols, in particular the UNECE's Convention on Long-range Transboundary Air Pollution (CLRTAP). International and Gibraltar-specific data on the source activities and environmental releases of these new POPs is scarce and associated

release estimates are subject to high levels of uncertainty. No estimates have been made for the other substances listed in the Stockholm Convention as they have not been used in Gibraltar or emissions are otherwise considered to be negligible.

4.2.1 Lindane (γ-HCH)

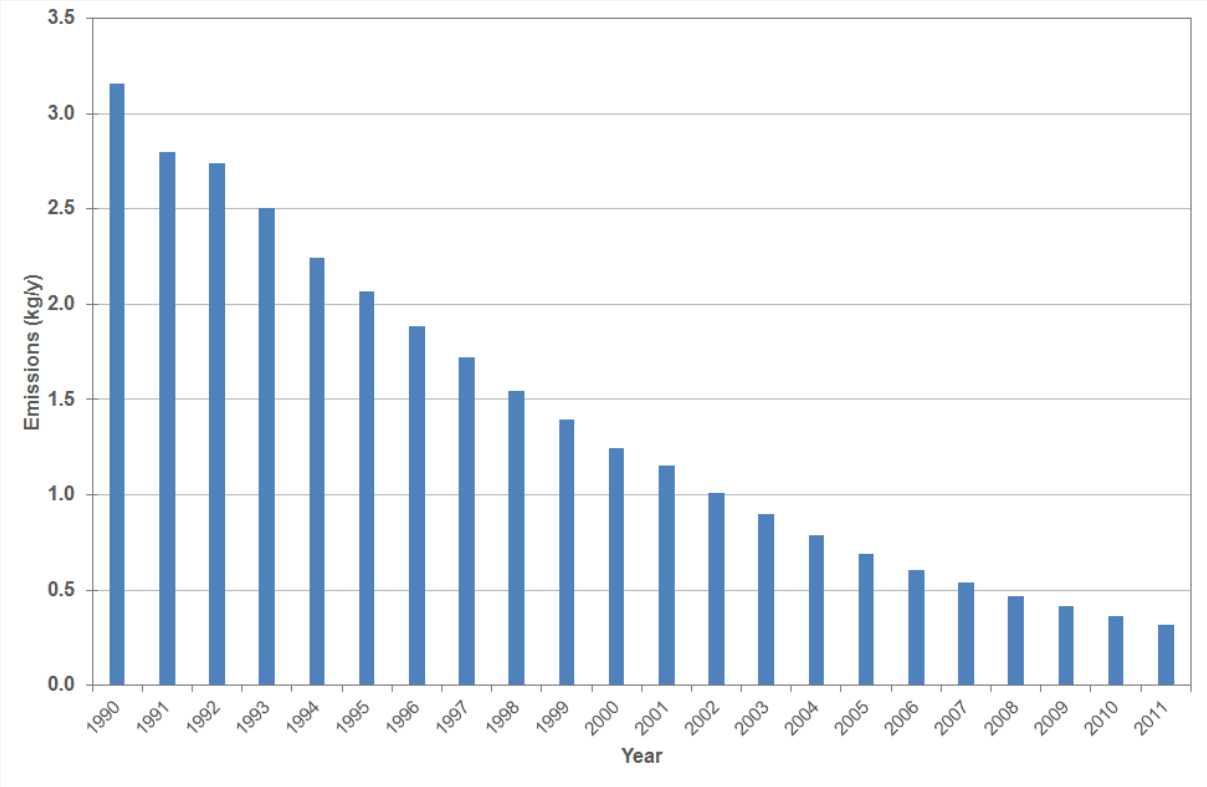
Lindane is applied as an insecticide, fungicide and used as a wood preservation treatment. Lindane is used in the agriculture, domestic and veterinary sectors, and was used in Gibraltar until 1990. Emissions since then arise from wood which has previously been treated.

The emission from this source is uncertain as the treated wood stock in Gibraltar is unknown, and the emission factors are also uncertain. The estimates shown in Table 6 and Figure 4 have been based on per capita emissions from the UK.

Table 6 – Lindane emissions to air for Gibraltar 1990-2011

NFR	Description	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
2F	Previously treated wood	**kg/y**	**3.2**	**2.1**	**1.2**	**0.7**	**0.6**	**0.5**	**0.5**	**0.4**	**0.4**	**0.3**

Figure 4 – Lindane emissions to air for Gibraltar



4.2.2 Polybrominated diphenyl ethers (PBDE)

There are 209 possible congeners of polybrominated diphenyl ethers (PBDEs). Concern about potential risks to human health and the environment has centred on the potential toxicity, persistence and the tendency for bioaccumulation of some brominated diphenyl ethers.

Since the 1960s, PBDEs have been added as flame-retardants. They are used in a variety of materials, including thermoplastics (e.g. high-impact polystyrene) that are used in electrical equipment, computer circuit boards, casings, upholstery, furnishings; interiors in cars, buses, trucks and aeroplanes, rugs, drapery and building materials.

The annual EU production of polybrominated diphenyl ethers has been estimated to be 7,600 tonnes per year. Production of the three commercial mixtures (penta-, octa- and deca-dibrominated diphenyl) has virtually ceased in the EU. The commercial penta and octa brands were banned in the EU in 2004 and added to annex A of the Stockholm Convention in 2009.

The possible routes of release of PBDEs vary from production to the disposal of the materials for which they are used, including recycled plastics. There is limited information concerning the releases and it is difficult to attempt to estimate an emission inventory without any measurements of releases from sources or potential sources. Information is not easily accessible, particularly as PBDEs are a material used in such a wide variety of industries.

Since neither the production nor the disposal of these substances takes place in Gibraltar, emissions are assumed to arise only from the lifetime of the products in which they are used.

The estimate of emissions in Gibraltar was based on per capita emissions from the UK, reduced by a factor of 0.1 since there are no production or disposal emissions here. The UK estimate, however, is highly uncertain. This is because very little UK specific information is available, so estimates have been based on the scaling of EU level data. The time series of emissions is presented in Table 7. It would be useful to investigate emissions of PBDEs further in the next iteration of the emissions inventory.

Table 7 – PBDE emissions to air for Gibraltar 1990-2011

Description	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
PDBEs all sources	**kg/y**	**0.5**	**0.4**	**0.4**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.2**

4.3 Monitoring

4.3.1 Monitoring of POPs in air

Gibraltar has an air monitoring network. The Gibraltar Air Monitoring Programme's primary objectives are:

1. To provide the public with rapid and reliable information on urban air quality.
2. To monitor compliance with European Directives and local statutory instruments.
3. To assist in developing new policies.

The Gibraltar Air Quality Monitoring Programme covers:-

1. Arsenic
2. Benzene
3. Cadmium
4. Carbon Monoxide
5. Lead
6. Nickel
7. Nitrogen Dioxide (NO2)
8. Ozone
9. Particulate Matter (PM10 and PM2.5)
10. Polycyclic Aromatic Hydrocarbons (PAH)
11. Sulphur Dioxide

PAHs are included within Annex III of the UNECE protocol on POPs. They are the only family of chemicals specified in the UNECE protocol which are not included within the U-POPs of the Stockholm Convention. Therefore emission estimates are not required under the Stockholm Convention. Emission estimates to air of PAHs covered under the UNECE Protocol can be found in the Environmental Agency's report "Emissions of Persistent Organic Pollutants (POPs) in Gibraltar 1990 to 2011".

POPs in the Stockholm Convention are not currently covered in the monitoring programme.

4.3.2 Monitoring of POPs in food

Gibraltar does not have an ongoing programme of monitoring POPs in food. The possibility of implementing such a programme is currently under consideration.

4.3.3 Monitoring of POPs in the marine environment

The Department of the Environment undertake monitoring for some POPs in the marine environment. Monitoring and sampling of Gibraltar's coastal waters is carried out in compliance with the Water Framework Directive (WFD) and Marine Strategy Framework Directive (MSFD). The programme is carried out on a monthly basis by the department's technical officers. The programme consists of collecting water samples from specific monitoring sites which then undergo laboratory analysis in the UK. Additionally, a number of in-situ measurements are taken at each site. Water quality parameters that are monitored include physico-chemical quality elements, chemical elements and biological quality elements (e.g. phytoplankton) some of which are monitored on a quarterly basis. POPs are monitored every quarter in each of the departments sampling sites. The results for these substances are consistent with every set of sampling carried out in every site. The results are as follows:

1. Endosulfan ≤0.003 µg/L
2. Hexachlorobenzene ≤0.001 µg/L
3. Alpha hexachlorocyclohexane ≤0.003 µg/L
4. Beta hexachlorocyclohexane ≤0.003 µg/L
5. Lindane (gamma hexachlorocyclohexane) ≤0.003 µg/L
6. Pentachlorobenzene ≤0.001 µg/L

Environmental quality standards for surface water bodies are laid down in Part A of Annex I of Directive 2008/105/EC (Priority Substances Directive), as follows:

Table 8 – Environmental quality standards for surface water bodies

Name of substance	Maximum allowable concentration (MAC-EQS) – Other surface waters (µg/L)
Endosulfan	0.004
Hexachlorobenzene	0.05
Hexachlorocyclohexane	0.02
Pentachlorobenzene	0.0007

The measured levels comply with the standards set out in Table 9.

5 Control strategies and measures

5.1 Introduction

This chapter sets out planned measures to further reduce emissions of POPs from Gibraltar.

The Government of Gibraltar's continuing goal is to protect human health and the environment from the risks posed by POPs and to reduce the total releases derived from anthropogenic sources of each of them. Over the past decade, the Government of Gibraltar has taken steps to identify, quantify and manage the major sources of unintentional releases of dioxins, PCBs PeCB and HCB listed in the Stockholm Convention.

Data on emissions of the new POPs is limited. Additionally, there are gaps in knowledge of potential sources and emissions from previous legacy applications for the new POPs. Similarly, knowledge is not yet fully developed on the likely emissions of POPs contained in in-use items through to these entering the waste stream. Current evidence suggests that the most pressing task is to improve knowledge in these areas, with priority being given to lindane, polybrominated diphenyl ethers (PBDE) and PFOS.

5.2 Emission from consumer products and domestic activity

POPs emissions to the environment are regulated for certain consumer appliances and goods. For example, the disposal of waste generated from electronic equipment containing flame retardant is regulated whereas items such as fabrics and furniture containing polybrominated diphenyl ethers

(PDBEs) or PFOS from consumer products are not. These remain a potential source of POPs emissions to the environment. Many potential sources are not present in Gibraltar. Preliminary emissions estimates for Gibraltar have been made based on UK data for relevant sources.

5.3 Emissions from unintentional production

Multi-media source inventories were produced in 2013 to identify the key sources of dioxin, PCB, HCB and PeCB emissions to air, water and land. The emission inventories show a significant decline in emissions to all vectors for all pollutants, driven largely by the closure of the municipal waste incinerator in 2000, and the identification and removal of PCB containing equipment around 1997/98. The emission estimates for 2011 show the air vector to be dominant, with much of the emissions coming from the power generation sector (75% of all dioxins and furan emissions are linked to power stations), secondary sources include shipping, off-road machinery and road transport. Emissions to land and water are dominated by single sources, accidental fires and release of sewerage to sea respectively.

A new power station and wastewater treatment plant have been commissioned, and the process of tendering for a new waste treatment facility is ongoing. Although the level of emissions are not currently known, reductions in Gibraltar emissions can be expected as a result of using improved and more efficient technologies.

New Power Station

Gibraltar has commissioned Bouygues Energies & Services to replace the peninsula's three aged, diesel-fired power stations, with a single, state-of-the-art power station by 2017.The new power plant will comprise 6 MAN engines of 14.5 MW each, representing a total rated capacity of 87 MW, sufficient to cover projected electricity demand growth up to 2030.

Importantly, this initiative represents a shift away from a diesel-fuelled past, towards a power generation paradigm that is significantly cleaner. The new power plant will be gas-fired, based on imported liquid natural gas (LNG).

New Wastewater treatment plant

Gibraltar has commissioned JV Northumbrian Services Limited and Modern Water Services Limited to develop a new carbonaceous Wastewater Treatment Plant (WWTP) incorporating sludge dewatering and odour control; to be constructed to meet the water effluent requirements of the EU Waste Water Treatment Directive (91/271/EEC).

New Waste Treatment Facility

The Waste Treatment Facility ("WTF") is currently in its advanced tender stages, it will comprise of at least the following components (as per the requirements of H.M. Government of Gibraltar's tender specifications):

- A waste reception, sorting and storing facility for specific and separate waste-streams;
- A materials recovery facility;
- A waste treatment plant (only approved technologies stated in this document will be considered);

1. And a facility capable of:

- Generating electricity and/or
- Producing potable water and/or
- Producing biodiesel and/or
- Producing syngas; and
- Disposing of ad-hoc waste (including saline sewage sludge).

6 Reduction or elimination of releases from stockpiles and wastes

Article 6 of the Stockholm Convention requires that appropriate strategies should be developed to identify stockpiles and wastes consisting of or containing or contaminated with POP substances. Stockpiles identified by these strategies should be managed in a safe, efficient and environmentally

sound manner. There are no such stockpiles in Gibraltar, and so no further discussion of this provision is required.

7 Other obligations of the Stockholm Convention

The Stockholm Convention requires that Parties adopt and implement measures aimed at reducing or eliminating the release of POPs into the environment. This section sets out a range of other obligations listed in the Convention and highlights the steps being taken by the Gibraltar Government to implement them.

7.1 Information exchange, awareness and education

Article 10 includes obligations for Parties to facilitate 'Public information, awareness and education' on POPs. Specifically, it requires that "each Party shall, within its capabilities promote and facilitate *inter alia* "training of workers, scientists and educators, policy and decision makers".

Making information about the environment publicly available is essential in achieving sustainable development. By providing access to environmental information the public is able to take decisions in the full knowledge of the likely environmental implications and to participate more effectively in decision-making processes that affect the environment. Openness also promotes transparent decision-making and greater public accountability of how authorities undertake their duties and responsibilities in Gibraltar.

Since 1992, the public has had a statutory right of access to environmental information held by public authorities and certain other bodies. This stems from the European Community Directive 90/313/EEC on the freedom of access to information on the environment. In 2003, the 1990 Directive was replaced by EC Directive 2003/4/EC on public access to environmental information, which takes account of advances in technology, reflects international developments in access rights and also learns from the experience of the earlier regime. These provisions have been transposed into Gibraltar law by the Freedom of Access to Information on the Environment Regulations 2005

7.2 Research, development and monitoring

Article 11 requires that Parties facilitate and encourage research, development and monitoring of POPs on their sources, releases, transport levels and trends and effects in humans and environment and support international obligations aimed at research, data collection and monitoring.

Gibraltar Environmental Agency has supported monitoring for different pollutants over the years including some POPs (see Section 4.3 Monitoring). The air monitoring programme includes PAHs which are listed under the UNECE Protocol but it does not currently cover any of the POPs in the Stockholm Convention.

7.3 Reporting obligations under the Stockholm Convention

Under Article 15 Parties are required to report periodically on the measures taken and on their effectiveness in meeting the objectives of the Convention.

Reporting will include:

(a) data on the total quantities of production, import and export of the chemicals listed in Annexes A and B

(b) a list of countries from which it has imported and exported each of these

This is not relevant to Gibraltar as those chemicals are not produced, imported or exported.

Article 12 of the EU POPs Regulation requires the submission of annual and triennial reports to the EU Commission since 2007 outlining the progress made towards meeting the objectives of the Convention. Gibraltar has not carried out such reporting to date.

7.4 Other obligations

The following obligations are not relevant to Gibraltar.

1. New and emerging issues: Article 8 of the Stockholm Convention sets out process and criteria by which new POPs are processed, assessed and listed in the Annexes of the Convention. The UK Government will continue to respond to new and emerging issues addressing both requirements under the Stockholm Convention and the UNECE POPs Protocol.

2. Provision of technical assistance: Article 12 requires Parties to recognise that rendering timely and appropriate technical assistance in response to requests from developing country Parties and Parties with economies in transition is essential to the successful implementation of the Convention. Provision of technical assistance includes taking into account the particular needs of developing countries and countries with economies in transition to develop and strengthen their capacity to implement their obligations under the Convention.

1. Effectiveness evaluation: Article 16 requires that Parties in accordance to their technical and financial capabilities and using existing monitoring programmes and mechanisms (where possible) co-operate on a regional basis, when appropriate and contribute to a global monitoring programme for the Convention.

Appendices

Appendix 1 – Glossary and Abbreviations

Appendix 2 – Description of individual POPs

Appendix 1 – Glossary and Abbreviations

Anthropogenic	Caused or influenced by human activity
BAT	Best Available Techniques
BFR	Brominated Flame Retardants
Biologically active	A material is considered bioactive if it has interaction with or effect on any cell tissue in the human body
Congener	A congener is any single, well-defined chemical compound within a closely related group. A PCB congener is a well-defined chemical compound in the PCB category. The name of a congener is associated with the total number of chlorine substituents and the position of each chlorine
CLRTAP	Convention on Long-Range Transboundary Air Pollution
COP	Conference of the Parties
DDT	The chemical name for DDT is 1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane. The term DDT generally refers to para-DDT. However, the compound's structure permits several different isomeric forms including ortho para-DDT and meta para-DDT.
De novo	Synthesis of a compound from simple molecules under certain favourable conditions
Dioxin-like PCBs	PCB congener which has the same toxic action as to the most toxic dioxin congener (2,3,7,8-tetrachlorodibenzo-p-dioxin). Each dioxin-like PCB is assigned a TEF value to reflect its potency as a toxic agent
E-PRTR	European Pollutant Release and Transfer Register, which is based on Regulation (EC) No 166/2006 implementing the obligations of the UN-ECE PRTR Protocol signed in May 2003 by 36 countries and the European Community.
HCB	Hexachlorobenzene
HCE	Hexachloroethane
HCH	Hexachlorocyclohexane
IPPC	Integrated Pollution Prevention and Control – integrated approach to controlling pollution from industrial sources across the European Union
Isomer	An isomer is a chemical species with the same number and types of atoms as another chemical species, but possessing different properties. There are structural isomers, geometric isomers, optical isomers and stereoisomers.
I-TEQ	International – Toxic Equivalent Quotient is the Nato (1989) based system of toxic equivalents used to present a quantity of dioxin and furan congeners as a single value based on the relative toxicity of all congeners to the most harmful congener – TCDD.
LRTAP	Long-Range Transboundary Air Pollution
mg/m3	milligrams per cubic metre
ng	nanogram (10^{-9} g)

ng/l	nanogram per litre
OECD	Organisation for Economic Co-operation and Development
PAH	Polycyclic aromatic hydrocarbons
PBDEs	Polybrominated diphenylethers
PCB	Polychlorinated biphenyl
PCDD	Polychlorinated dibenzo-p-dioxins (also known as 'dioxins')
PCCD/F	Mixture of congeners of PCDD and PCDF (referred to collectively as 'dioxins')
PCDF	Polychlorinated dibenzofurans (also known as furans)
PCP	Pentachlorophenol
PeCB	Pentachlorobenzene
PERC	Perchloroethylene
PFOS	Perfluorooctane sulfonate
PFOS-F	Perfluorooctane sulfonic fluoride
PIC	Prior Informed Consent
POPs	Persistent Organic Pollutants
PRTR	Pollutant Release and Transfer Registers
SAICM	Strategic Approach to International Chemical Management
TEF	Toxic equivalency factor
TEQ	Toxic equivalent quotient
Toxicity	Harmfulness to living organisms. The capacity of a substance to cause toxic effects to organisms or their progeny
UNECE	United Nations Economic Commission for Europe

Appendix 2 – Description of individual POPs

Aldrin	A pesticide applied to soils to control termites, grasshoppers, corn rootworm, and other insect pests.
Chlordane	This is used extensively to control termites and as a broad-spectrum insecticide on a range of agricultural crops.
Chlordecone	This is a synthetic chlorinated compound, which was mainly used as an agricultural pesticide. It was first produced in 1951 and introduced commercially in 1958.
DDT (1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane)	DDT was widely used during World War II to protect soldiers and civilians from malaria, typhus, and other diseases spread by insects. It continues to be applied against mosquitoes in several countries to control malaria.
Dieldrin	This is used principally to control termites and textile pests, dieldrin has also been used to control insect-borne diseases and insects living in agricultural soils.
Dioxins	The term “Dioxins” in this context is an abbreviation for polychlorinated dibenzo-p-dioxins (PCDDs). Dioxins are an unintentional byproduct of many combustion processes in which chlorine and oxygen is present, particularly where combustion conditions are not closely controlled. The term “Dioxins” is often used as an umbrella term for polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs).
Endosulfan	This is an insecticide that has been used since the 1950s to control crop pests, tsetse flies and ectoparasites of cattle and as a wood preservative. As a broad-spectrum insecticide, endosulfan is currently used to control a wide range of pests on a variety of crops including coffee, cotton, rice, sorghum and soy.
Endrin	This is an insecticide which is sprayed on the leaves of crops such as cotton and grains. It is also used to control mice, voles and other rodents.
Furans	The term “Furans” in this context is an abbreviation for polychlorinated dibenzofurans (PCDFs). Furans are unintentionally produced compounds from many of the processes that produce dioxins, and were also produced during the manufacture of PCBs. Furans are often included by implication in the term “dioxins “
Hexabromobiphenyl	This is an industrial chemical that has been used as a flame retardant, mainly in the 1970s. It is no longer produced or used in most countries.
Hexabromo-cyclododecane (HBCD)	This is a brominated flame retardant. The HBCD commercial mixture is composed of three main isomers denoted as alpha (α-HBCD), beta (β-HBCD) and gamma (γ-HBCD) with traces of others.
Hexabromo diphenyl ether and Heptabromo diphenyl ether	These are the main components of commercial octabromodiphenyl ether which has been used as a flame retardant.
Tetrabromodiphenyl ether and pentabromodiphenyl ether	These are the main components of commercial pentabromodiphenyl ether which has been used as a flame retardant.

Heptachlor	This is primarily employed to control soil insects and termites, heptachlor has also been used more widely to control cotton insects, grasshoppers, other crop pests, and malaria-carrying mosquitoes.
Hexachlorobenzene (HCB)	This was first introduced in 1945 to treat seeds, HCB was primarily used as a fungicide. It was widely used to control wheat bunt. It is also a by-product of certain industrial chemicals and exists as an impurity in several pesticide formulations. HCB emissions may also arise from combustion sources.
Hexachloro-cyclohexane (alpha and beta)	These are still produced as a by-product of lindane, although the intentional use of alpha-and beta- HCH as an insecticide was phased out many years ago.
Lindane (gamma hexachloro cyclohexane)	Lindane is the common name for the gamma isomer of hexachlorocyclohexane (gamma- HCH). Lindane has been used as a broad-spectrum insecticide for seed and soil treatment, foliar applications, tree and wood treatment and against ectoparasites in both veterinary and human applications.
Mirex	This insecticide is applied mainly to combat fire ants and other types of ants and termites. It has also been used as a fire retardant in plastics, rubber, and electrical goods
Pentachlorobenzene (PeCB)	PeCB was used in PCB products, in dyestuff carriers, as a fungicide, a flame retardant and as a chemical intermediate e.g. previously for the production of quintozene. PeCB might still be used as an intermediate. PeCB is also produced unintentionally during combustion, thermal and industrial processes. It also present as impurities in products such as solvents or pesticides.
Perfluoroctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOS-F)	PFOS is both intentionally produced and an unintended degradation product of related anthropogenic chemicals. The current intentional use of PFOS is widespread and includes: electric and electronic parts, fire fighting foam, photo imaging, hydraulic fluids and textiles.
Polychlorinated Biphenyls (PCBs)	These compounds were used in industry as heat exchange fluids, in electric transformers and capacitors, and as additives in paint, carbonless copy paper, sealants and plastics. They can also be formed unintentionally as by-products in some chemical and combustion processes. It is now known that some PCBs exhibit similar biological activity to dioxins and these compounds are therefore referred to as dioxin-like PCBs.
Toxaphene	This insecticide, also called camphechlor, is applied to cotton, cereal grains, fruits, nuts, and vegetables. It has also been used to control ticks and mites in livestock.

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