# 臺灣「持久性有機污染物斯德哥爾摩公約國家實施計畫」

## 2024年執行成果年鑑

## The National Implementation Plan (NIP) of Taiwan under the Stockholm Convention on Persistent Organic Pollutants

2024 Implementation Results Yearbook



環境部化學物質管理署
Chemicals Administration
Ministry of Environment

# 臺灣「持久性有機污染物斯德哥爾摩公約國家實施計畫」

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# 01

第一章 Chapter 1

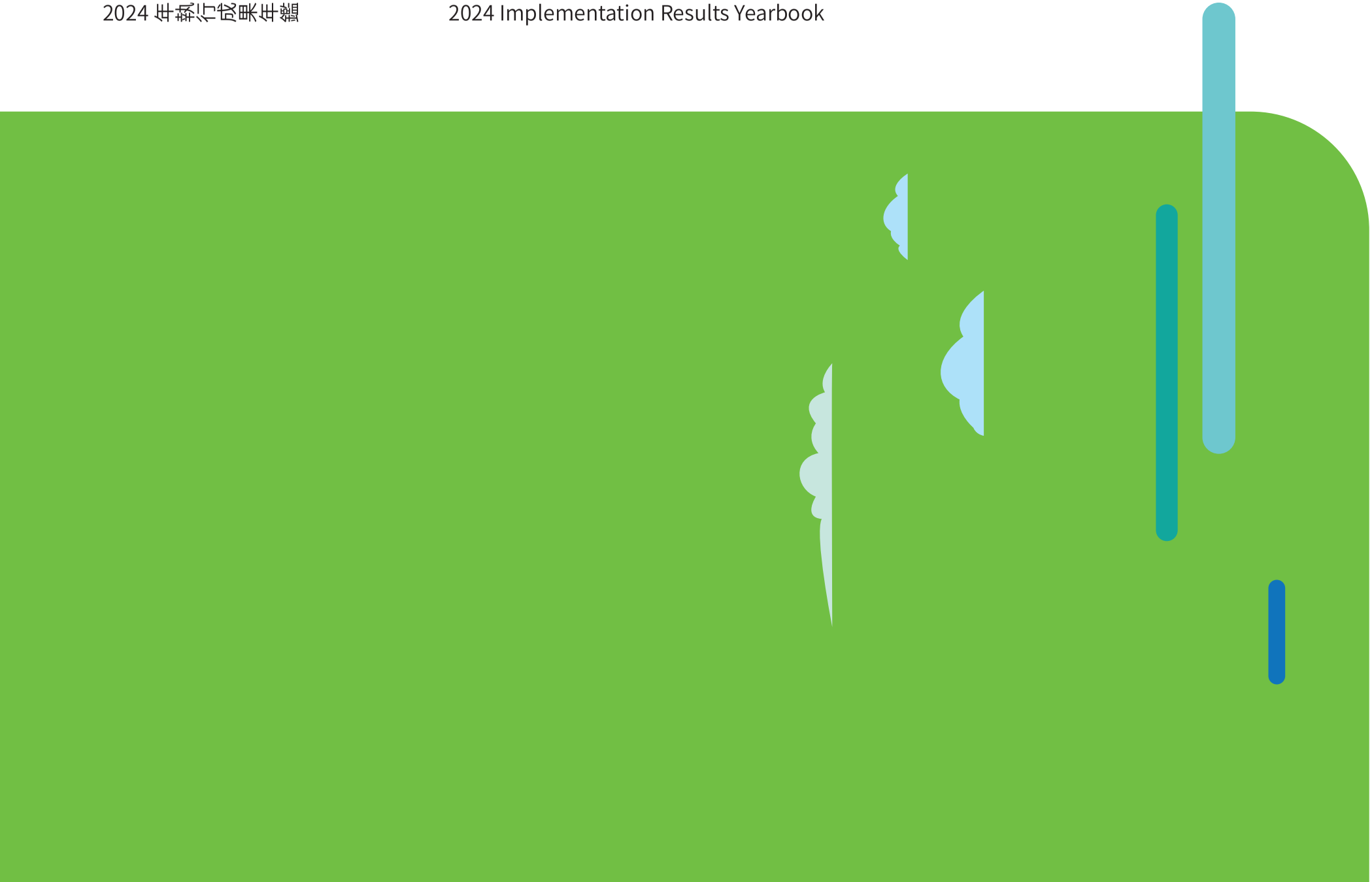
# 前言
# Introduction



# 臺灣「持久性有機污染物斯德哥爾摩公約國家實施計畫」2024年執行成果年鑑

# The National Implementation Plan (NIP) of Taiwan under the Stockholm Convention on Persistent Organic Pollutants

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第一章

# 前言

有鑑於持久性有機污染物 （Persistent Organic Pollutants, POPs）具有危害人體健康及環境的問題，聯合國環境規劃署 (United Nations Environment Programme, UNEP） 訂定全球性之持久性有機污染物斯德哥爾摩公約（Stockholm Convention on Persistent Organic Pollutants，以下簡稱公約）管制。依據公約第 7 條規定，締約方應制定實施計畫執行公約規範事項，我國並非公約之締約方，為彰顯我國 POPs 管制方向及積極作為，特制定我國「持久性有機污染物斯德哥爾摩公約國家實施計畫」（以下簡稱本實施計畫），並於西元（下同）2008 年 7 月 3 日核定，該實施計畫隨著公約管理趨勢滾動修訂，作為國內推動依據。

另依據公約第 15 條規定，締約方應向締約方大會報告其為執行公約各項規定而採取的措施，以及這些措施在實現公約目標方面的效力。為表達我國法規配套及執行成果，環境部每年彙整制定小組成員執行成效，希望藉本年鑑讓國人瞭解我國政府對於 POPs 管理之具體作為，並共同減低有毒物質之危害。



Chapter1

# Introduction

Persistent Organic Pollutants (POPs) are causing adverse effects to human health and the environment. In response, the Stockholm Convention is formally adopted to manage POPs by United Nations Environment Programme (UNEP). According to Article 7 of the Convention, Parties to the Convention are required to prepare a National Implementation Plans explaining how they are going to implement the obligations under the Convention and make efforts to put such a plan into operation. Although Taiwan is not a party to the Convention, to show our direction and active efforts in POPs control, Taiwan formulated the domestic “Stockholm Convention on Persistent Organic Pollutants National Implementation Plan” (National Implementation Plan, NIP) (approved on July 3, 2008) as the specific reference for domestic implementation, which continuously stays up to date with the latest development under the Convention.

In addition, according to Article 15 of the Convention, each Party shall report to the Conference of the Parties on the measures it has taken to implement the provisions of the Convention and on the effectiveness of such measures in meeting the objectives of the Convention. To demonstrate Taiwan’ s regulatory measures and implementation achievements, the Ministry of Environment (MOENV) compiles each year the performance of the NIP Task Force members. Through the publication of this yearbook, the government aims to inform the public of Taiwan’ s concrete actions in managing POPs and to promote joint efforts in reducing the hazards of toxic substances.

UNEP

Stockholm Convention on persistent organic pollutants (POPs)

# 02

第二章 Chapter 2

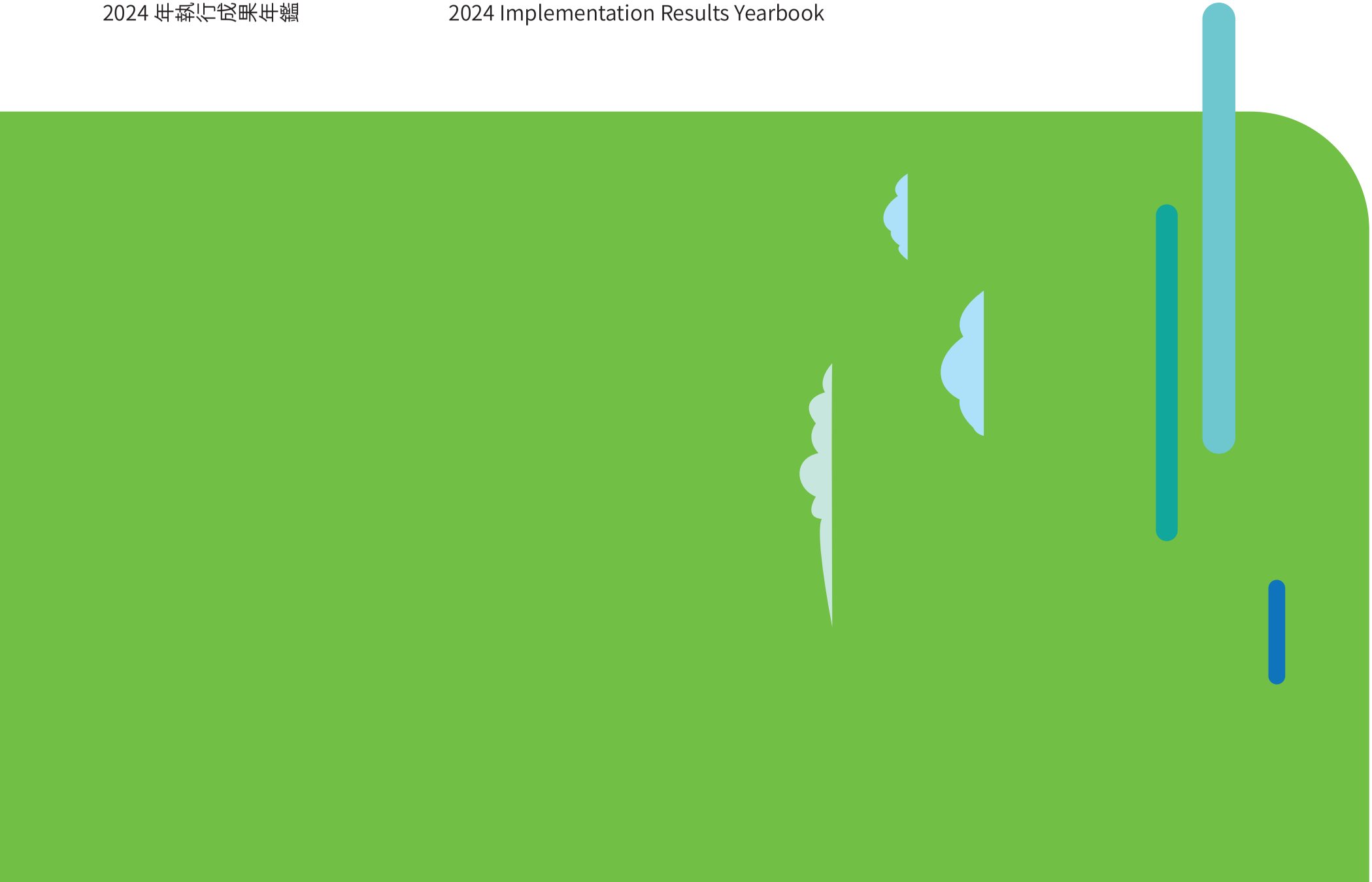
# 何謂持久性有機污染物
# What are POPs?



# 臺灣「持久性有機污染物斯德哥爾摩公約國家實施計畫」2024年執行成果年鑑

# The National Implementation Plan (NIP) of Taiwan under the Stockholm Convention on Persistent Organic Pollutants

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第二章

# 何謂持久性有機污染物

## 2.1 持久性有機污染物特性及危害

持久性有機污染物（POPs）是具有持久性、生物累積性、半揮發性及高毒性物質，一旦釋放到環境中，它們就會：

· 長期存在於環境中
· 透過長距離遷移，廣泛分佈在土壤、水和空氣等環境中
· 在人類及生物體中累積，最終對處於食物鏈頂端的生物會有較高濃度
· 對人類和野生動物具有毒性

持久性有機污染物的具體影響可能包括癌症、過敏反應、中樞和周圍神經系統受損、生殖障礙和免疫系統破壞。一些持久性有機污染物也被認為是內分泌干擾物，透過改變荷爾蒙系統，會損害暴露個體及其後代的生殖和免疫系統，還可能具有發育和致癌影響。



**POPs 具生物累積和生物濃縮性**

Chapter2

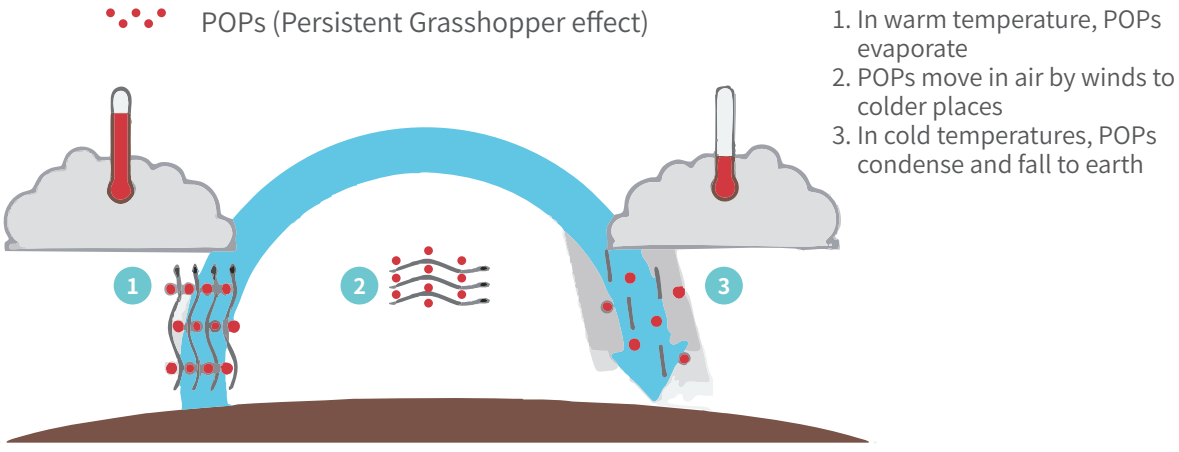
# What are POPs?

## 2.1 Characteristics and Hazards of POPs

POPs are organic chemical substances, that is, they are carbon-based. They possess a particular combination of physical and chemical properties such that, once released into the environment, they:

- remain intact for exceptionally long periods of time;
- become widely distributed throughout the environment as a result of natural processes involving soil, water and, most notably, air;
- accumulate in the living organisms including humans, and are found at higher concentrations at higher levels in the food chain; and
- are toxic to both humans and wildlife.

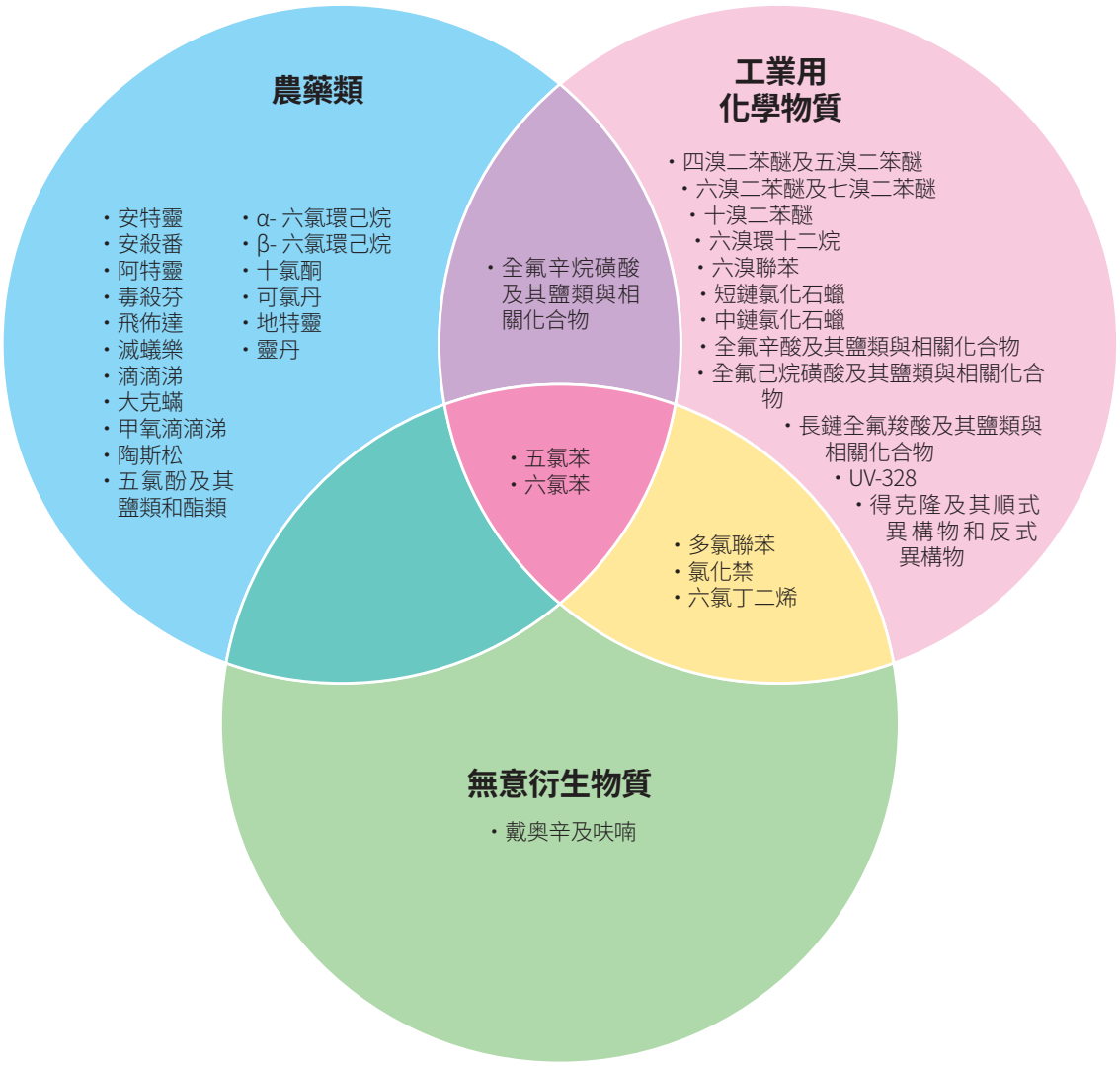
Specific effects of POPs can include cancer, allergies and hypersensitivity, damage to the central and peripheral nervous systems, reproductive disorders, and disruption of the immune system. Some POPs are also considered to be endocrine disrupters, which, by altering the hormonal system, can damage the reproductive and immune systems of exposed individuals as well as their offspring; they can also have developmental and carcinogenic effects.



## 2.2 「斯德哥爾摩公約」所列之持久性有機污染物

「斯德哥爾摩公約」是保護人類健康及環境，免受持久性有機污染物危害的國際公約，公約於 2001 年 5 月 22 日在瑞典斯德哥爾摩通過，並於 2004 年 5 月 17 日生效。

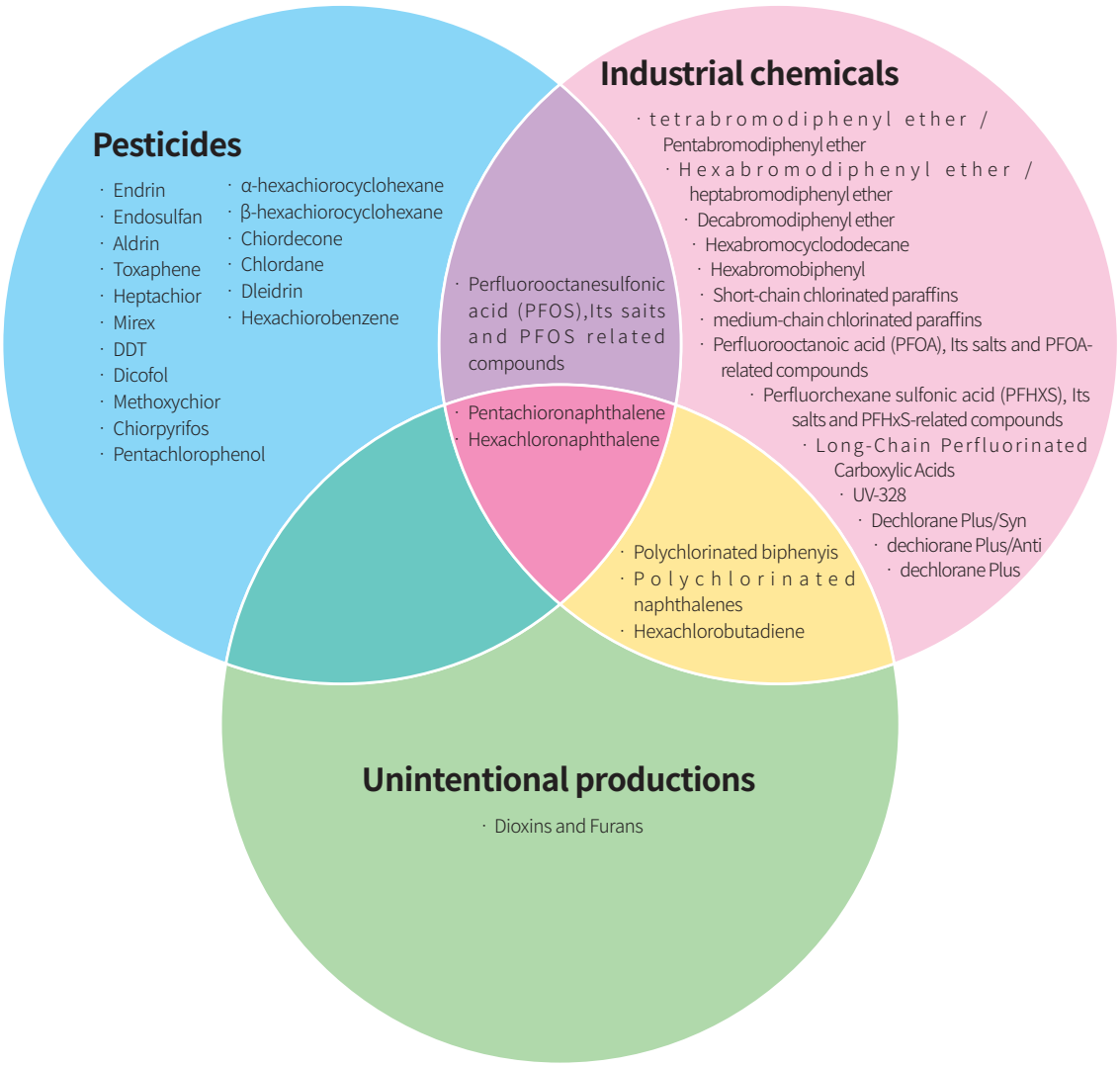
公約所列之持久性有機污染物分為農藥類、工業用化學物質及無意衍生物質，共計有 37 種。




「斯德哥爾摩公約」所列之 POPs 污染物

## 2.2 POPs listed in the Stockholm Convention

The Stockholm Convention is an international treaty to protect human health and the environment from POPs. It was adopted on 22 May 2001 in Stockholm, Sweden, and entered into force on 17 May 2004, and covers 37 chemicals. The 37 POPs can be placed in 3 categories, includes pesticides, industrial chemicals and unintentional POPs.




**POPs listed in the Stockholm Convention**

# 03

第三章 Chapter 3

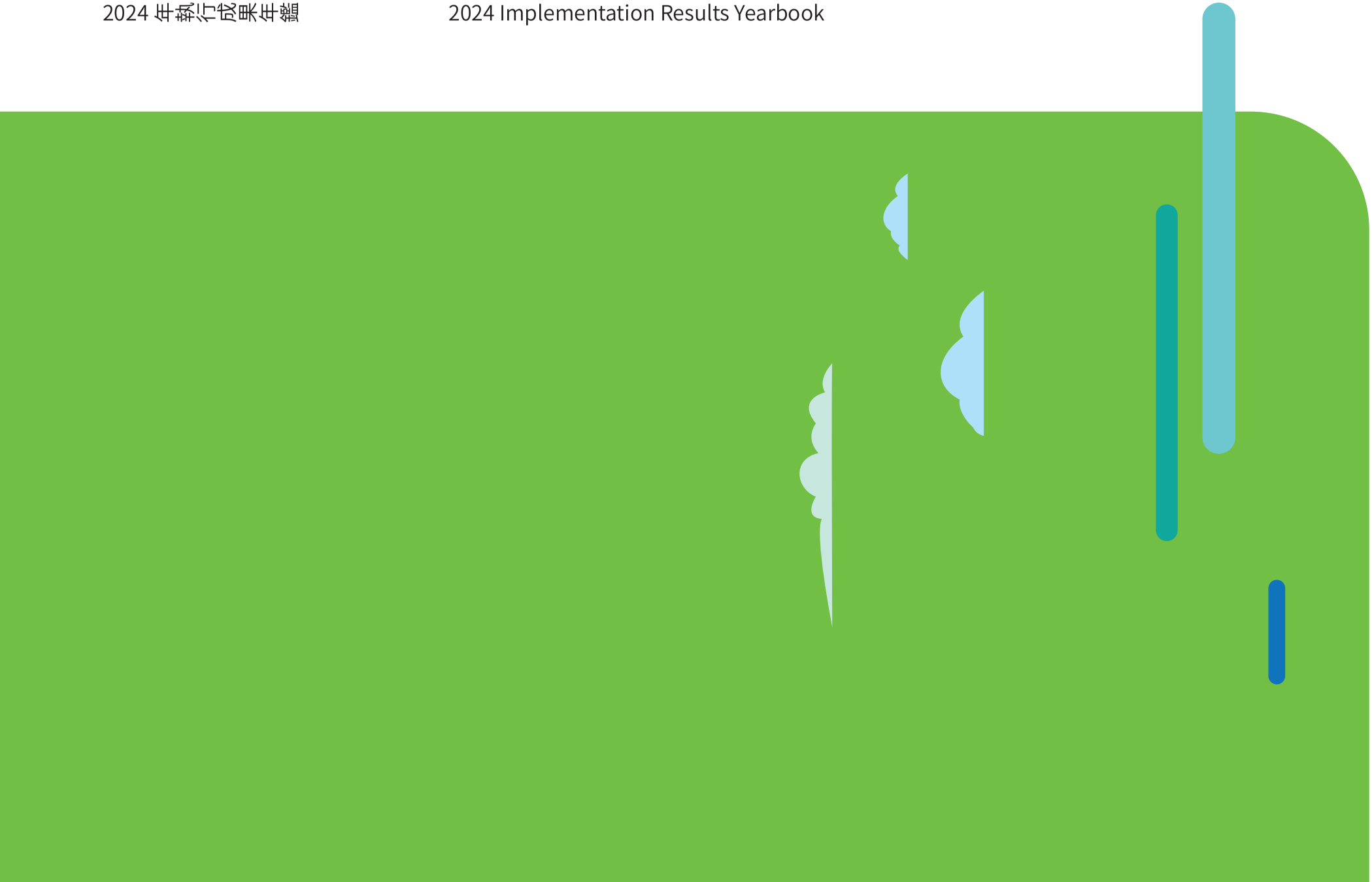
# 臺灣如何管理持久性有機污染物
# How does Taiwan Manage POPs?



# 臺灣「持久性有機污染物斯德哥爾摩公約國家實施計畫」2024年執行成果年鑑

# The National Implementation Plan (NIP) of Taiwan under the Stockholm Convention on Persistent Organic Pollutants

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第三章

# 臺灣如何管理持久性有機污染物

我國係依據「持久性有機污染物斯德哥爾摩公約國家實施計畫」（NIP），並由環境部、農業部、衛生福利部、經濟部、財政部關務署、勞動部職業安全衛生署、海洋委員會海洋保育署協力合作，管理持久性有機污染物。

我國針對公約所列之 POPs，係以「毒性及關注化學物質管理法」、「農藥管理法」及「環境用藥管理法」進行製造、輸入及使用等運作管理及管制評估，並已採取源頭減量、清潔生產及管末控制技術等措施與發布相關固定污染源排放標準，以減少因工業生產過程或焚化爐燃燒造成之戴奧辛及呋喃無意排放。

為能掌握環境中 POPs 流布狀況，保障國人的環境品質和健康，我國針對國內大氣、水體、底泥、土壤、飲用水、生物體等介質之含量或濃度進行調查或監測，並滾動式納入公約關注物質進行調查，及開發相關採樣及檢測方法。

我國也進行市售食品 POPs 含量調查，嚴格訂定農藥殘留容許量標準，執行膳食調查及評估，以全面了解國人健康狀況。透過制定市售商品標準進行抽樣檢驗，減少商品使用有害物質，降低消費者的暴露風險。同時，加強民眾教育宣導，提升環境保護意識。



Chapter3

# How does Taiwan Manage POPs?



According to the NIP of Taiwan, POPs management responsibilities are allocated among various competent authorities, such as Ministry of Environment (MOENV), Ministry of Agriculture (MOA), Ministry of Health and Welfare (MOHW), Ministry of Economic Affairs (MOEA), Ministry of Finance, Ministry of Labor (MOL) and Ocean A¬airs Council (OAC).

Taiwan has implemented operational management and regulatory assessment of the manufacture, import, and use of POPs through the Toxic and Concerned Chemical Substances Control Act, the Pesticide Management Act, and the Environmental Agents Control Act. Measures such as source reduction, cleaner production, and end-of-pipe control technologies have been adopted, along with relevant emission standards for stationary pollution sources, to reduce the unintentional release of dioxins and furans from industrial processes or incineration.

To understand the distribution of POPs and safeguard environmental quality and public health, Taiwan has conducted surveys and monitoring of POPs concentrations in air, water, sediments, soil, drinking water, and biota. In addition, substances of concern under the Convention are included in the surveys on a rolling basis, along with the development of relevant sampling and analytical methods.

Taiwan has also surveyed POP levels in commercial food products, established strict maximum residue limits (MRLs) for pesticides, and carried out dietary assessments to gain a comprehensive understanding of public health conditions. By setting standards for commercial products and conducting inspections, the use of hazardous substances in goods is reduced, thereby lowering consumer exposure risks. At the same time, public education and outreach have been strengthened to raise environmental awareness.

# 04

第四章 Chapter 4

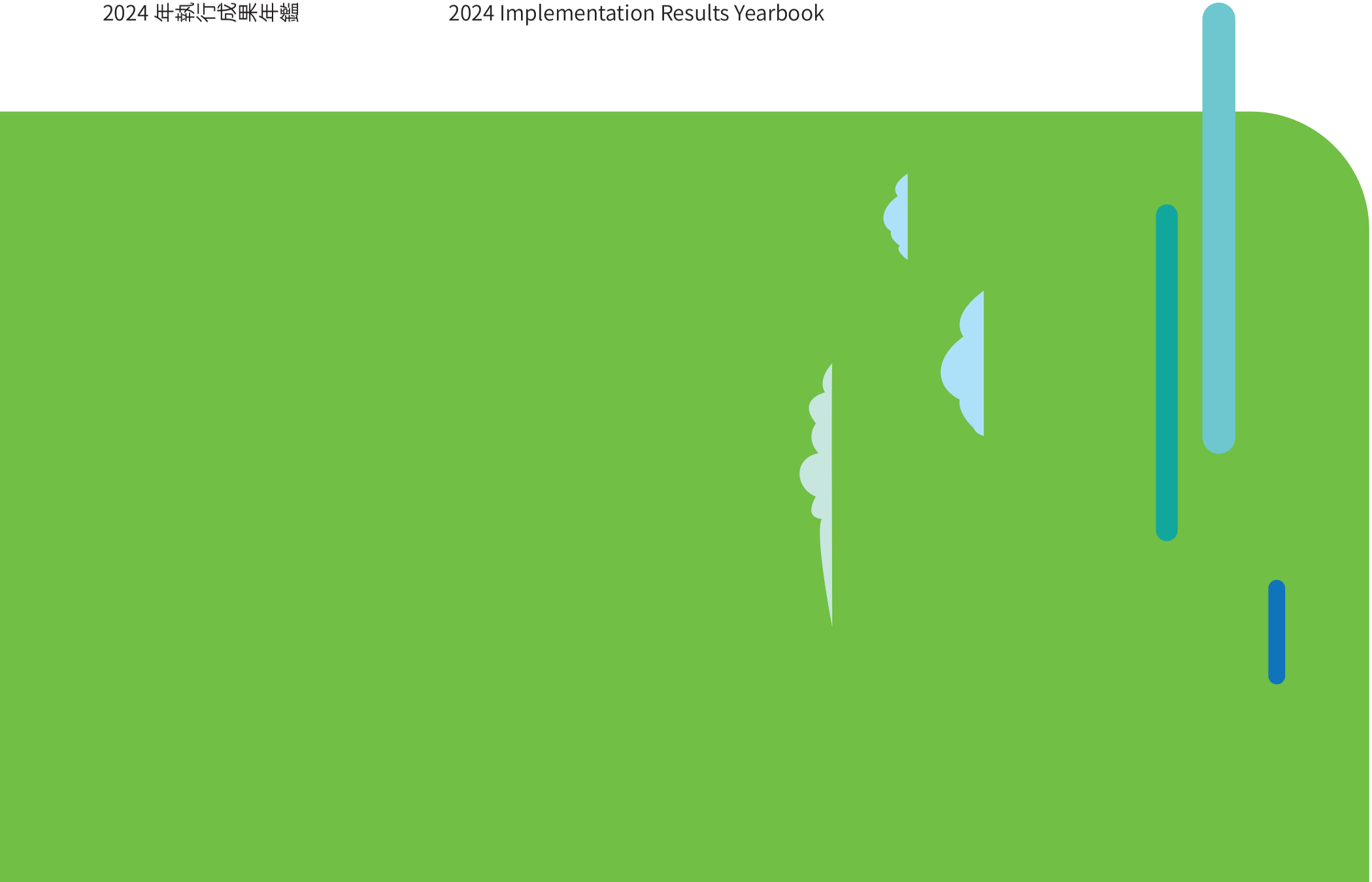
# 持久性有機污染物在臺灣環境之概況
# Status of POPs in the Environment of Taiwan



# 臺灣「持久性有機污染物斯德哥爾摩公約國家實施計畫」2024年執行成果年鑑

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第四章

# 持久性有機污染物在臺灣環境之概況

我國持續調查環境中 POPs 污染流布情形，包括環境底泥、土壤、水體、飲用水和空氣等。

## 4.1 有機氯農藥

由於農藥已禁用多年，近年河川底泥、環境土壤、環境水體、地下水等之有機氯農藥調查結果，顯示國內環境濃度極低，且皆符合國內相關標準。

飲用水水質之靈丹及安殺番，亦皆符合飲用水水質標準。

## 4.2 工業用化學物質

我國針對環境底泥、放流水、飲用水、土壤、環境水體進行調查。對於河川底泥中工業用化學物質，如六溴環十二烷、多氯聯苯和六氯 -1,3 丁二烯，其在國內河川底泥中的濃度極低或呈下降趨勢；針對全氟化合物、多溴二苯醚、六溴聯苯、短鏈氯化石蠟和得克隆等，仍持續監測其在河川底泥濃度趨勢，以確定趨勢。

土壤中工業用化學 POPs 物質均遠低於國外調查數據或國內標準。國內淨水場水質部分，近年多氯聯苯及 2024 年 PFOA、PFOS 及 PFHxS 檢測結果，均符合我國飲用水水質標準，且均未檢出六氯 -1,3 丁二烯、得克隆及 UV-328。

Chapter4

# Status of POPs in the Environment of Taiwan

Taiwan authority has kept investigating POPs concentration in environment, including sediment, soil, water body, drinking water and ambient air.

## 4.1 Organochlorine pesticides

Due to the long-term ban on organochlorine pesticides, recent investigations of their concentrations in river sediments, soils, surface water, and groundwater indicate that environmental levels are very low and fully comply with relevant domestic standards.

Concentrations of lindane and aldrin in drinking water are also in compliance with the national drinking water quality standards.

## 4.2 Industrial chemicals

Taiwan has conducted investigations of sediments, effluents, drinking water, soils, and surface waters. For industrial chemicals such as hexabromocyclododecane (HBCDD), polychlorinated biphenyls (PCBs), and hexachlorobutadiene (HCBD), their concentrations in domestic river sediments are extremely low or decreasing. Monitoring of perfluorinated compounds (PFCs), polybrominated diphenyl ethers (PBDEs), hexabromobiphenyl, short-chain chlorinated paraffins (SCCPs), and Dechlorane Plus (DP) is ongoing to track their concentration trends in river sediments.

Concentrations of industrial POPs in soils are far below either international survey data or domestic standards. Regarding water quality in drinking water treatment plants, recent monitoring results for PCBs and, in 2024, for PFOA, PFOS, and PFHxS all complied with Taiwan’s drinking water quality standards. In addition, HCBD, DP, and UV-328 were not detected.

## 我國工業用化學物質 POPs 環境調查狀況

| 環境介質 /POPs 物質名稱 | 河川底泥 | 事業放流水 | 飲用水 | 土壤 | 水體 |
|---|---|---|---|---|---|
| 六溴聯苯 | ● | | | ● | |
| 多溴二苯醚 | ● | ● | ● | ● | ● |
| 多氯聯苯 | ● | ● | | ● | ● |
| 全氟辛烷磺酸 | ● | ● | ● | ● | ● |
| 六氯 1,3 丁二烯 | ● | ● | | ● | |
| 全氟辛酸 | ● | ● | ● | ● | ● |
| 全氟己烷磺酸 | ● | ● | ● | ● | ● |
| 氯化萘 | | | | ● | |
| 五氯酚 | | ● | | ● | ● |
| 短鏈氯化石蠟 | ● | | | ● | |
| 六溴環十二烷 | ● | ● | | ● | |
| 得克隆 | ● | ● | | | |
| UV-328 | | ● | | | |



# Status of Environmental Monitoring of Industrial POPs in Taiwan

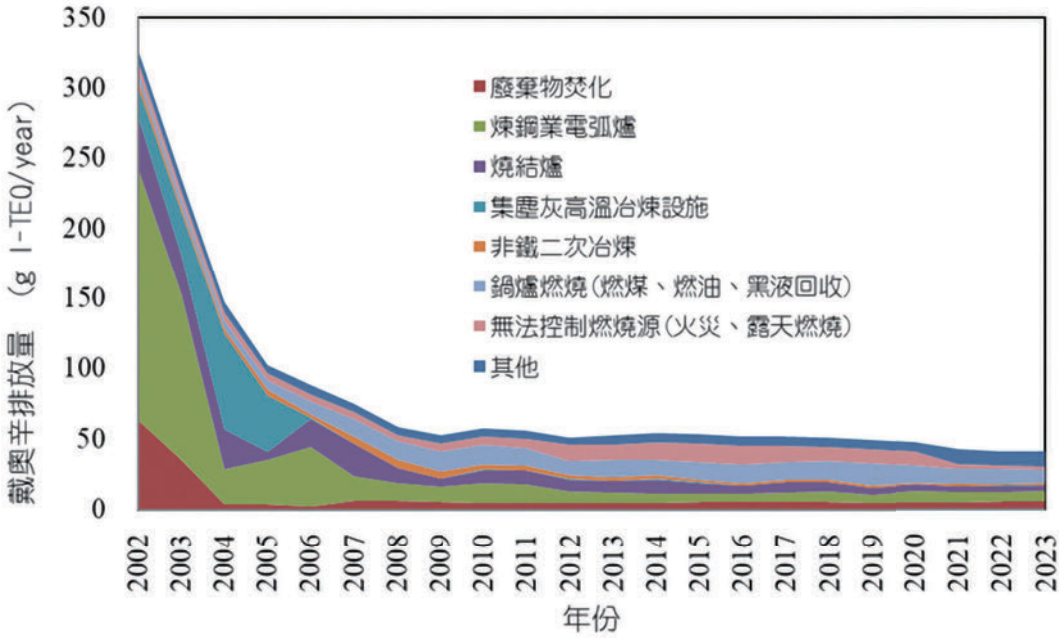
| Environmental media /POPs | river sediment | effluent | drinking water | soil | water body |
|---|---|---|---|---|---|
| Hexabromobiphenyl | ● | | | ● | |
| PBDEs | ● | ● | ● | ● | ● |
| PCBs | ● | ● | | ● | ● |
| Perfluorooctane sulfonic acid (PFOS) | ● | ● | ● | ● | ● |
| Hexachlorobutadiene | ● | ● | | ● | |
| Perfluorooctanoic acid (PFOA) | ● | ● | ● | ● | ● |
| Perfluorohexane sulfonic acid (PFHxS) | ● | ● | ● | ● | ● |
| Polychlorinated naphthalenes (PCNs) | | | | ● | |
| Pentachlorophenol (PCP) | | ● | | ● | ● |
| Short-chain chlorinated paraffins (SCCPs) | ● | | | ● | |
| Hexabromocyclododecane (HBCDD) | ● | ● | | ● | |
| Dechlorane Plus (DP) | ● | ● | | | |
| UV-328 | | ● | | | |

## 4.3 無意衍生物質（戴奧辛及呋喃）

我國每年監測大氣中戴奧辛及呋喃濃度，2006-2024 年戴奧辛平均濃度為 0.014～0.051 pg I-TEQ/$m^3$，較 2002 年、2003 年監測平均濃度 0.089 pg I-TEQ/$m^3$ 明顯降低。歷年監測值皆遠低於日本環境戴奧辛空氣品質標準 0.6 pg WHO-TEQ/$m^3$

國內戴奧辛及呋喃大氣排放量，隨著中小型焚化爐、煉鋼業電弧爐、鋼鐵業燒結工場、既存電弧爐第二階段之排放標準及燒結爐第二階段排放標準陸續生效，至 2023 年排放入大氣之戴奧辛總量已降至 41.33 g I-TEQ，整體減量率較 2002 年（327.5 g I-TEQ）減量達 87%。

此外，國內近年調查土壤、地下水及飲用水中戴奧辛及呋喃濃度亦皆符合國內環境相關標準。



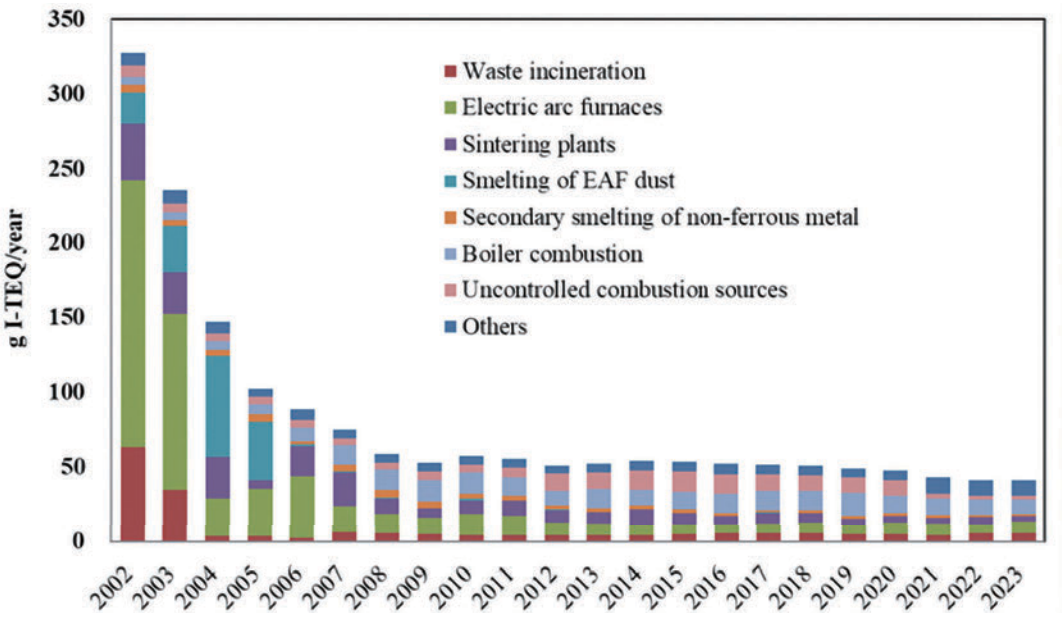

**2002~2023 年戴奧辛排放量逐年下降**

## 4.3 Unintentional POPs (Dioxins and Furans)

Taiwan conducts annual monitoring of atmospheric dioxins and furans. From 2006 to 2024, average concentrations were 0.014–0.051 pg I-TEQ/$m^3$, well below the 0.089 pg I-TEQ/$m^3$ recorded in 2002–2003, and consistently far under Japan' s air quality standard of 0.6 pg WHO-TEQ/$m^3$.

Emissions decreased 87% between 2002 and 2023, from 327.5 g I-TEQ to 41.33 g I-TEQ, owing to effective standards for small and medium waste incinerators, electric arc furnaces, and sintering plants in the steel industry.

Recent surveys also confirmed that dioxin and furan levels in soil, groundwater, and drinking water comply with domestic standards.




**Dioxin emissions declined annually from 2002 to 2023**

## 4.4 國人持久性有機污染物之膳食暴露評估

衛福部近年執行國人持久性有機污染物之食品調查及膳食暴露評估，以戴奧辛、呋喃及戴奧辛類多氯聯苯之推估為例，2013~2020 年各地區成人之終生平均日暴露劑量為 0.108~0.433 pg WHO-$TEQ_{PCDD/F+PCB}$/kg BW/day，符合世界衛生組織之每日容許劑量（TDI）1~4 pg WHO-$TEQ_{PCDD/F+PCB}$/kg BW/day。此外，國人經由飲食攝入多氯聯苯、多溴二苯醚、全氟化合物、六溴聯苯、六溴環十二烷、短鏈氯化石蠟及得克隆，均屬可接受之風險，不會引起健康上的問題。

建議國人採取適量飲食及飲食多樣化，減少攝取脂肪含量高的動物食品、多吃蔬果、選擇健康烹調方式與環保包裝，以有效降低飲食中的持久性有機污染物之暴露。

## 4.4 Taiwanese dietary exposure assessment of POPs

In recent years, Taiwan MOHW has conducted food surveys and dietary exposure assessments of POPs in the Taiwanese population. Taking dioxins, furans, and dioxin-like PCBs as examples, the estimated lifetime average daily exposure dose for adults across regions during 2013~2020 was 0.108–0.433 pg WHO-$TEQ_{PCDD/F+PCB}$/kg BW/day, which complies with the World Health Organization's tolerable daily intake (TDI) of 1~4 pg WHO-$TEQ_{PCDD/F+PCB}$/kg BW/day. In addition, dietary intake of PCBs, PBDEs, perfluorinated compounds, hexabromobiphenyl, HBCDD, SCCPs, and DP among the population poses acceptable risks and is not expected to cause health problems.

It is recommended that the public adopt balanced and varied diets, reduce consumption of high-fat animal products, increase intake of fruits and vegetables, choose healthier cooking methods, and use environmentally friendly packaging to effectively reduce dietary exposure to POPs.

# 05

第五章 Chapter 5

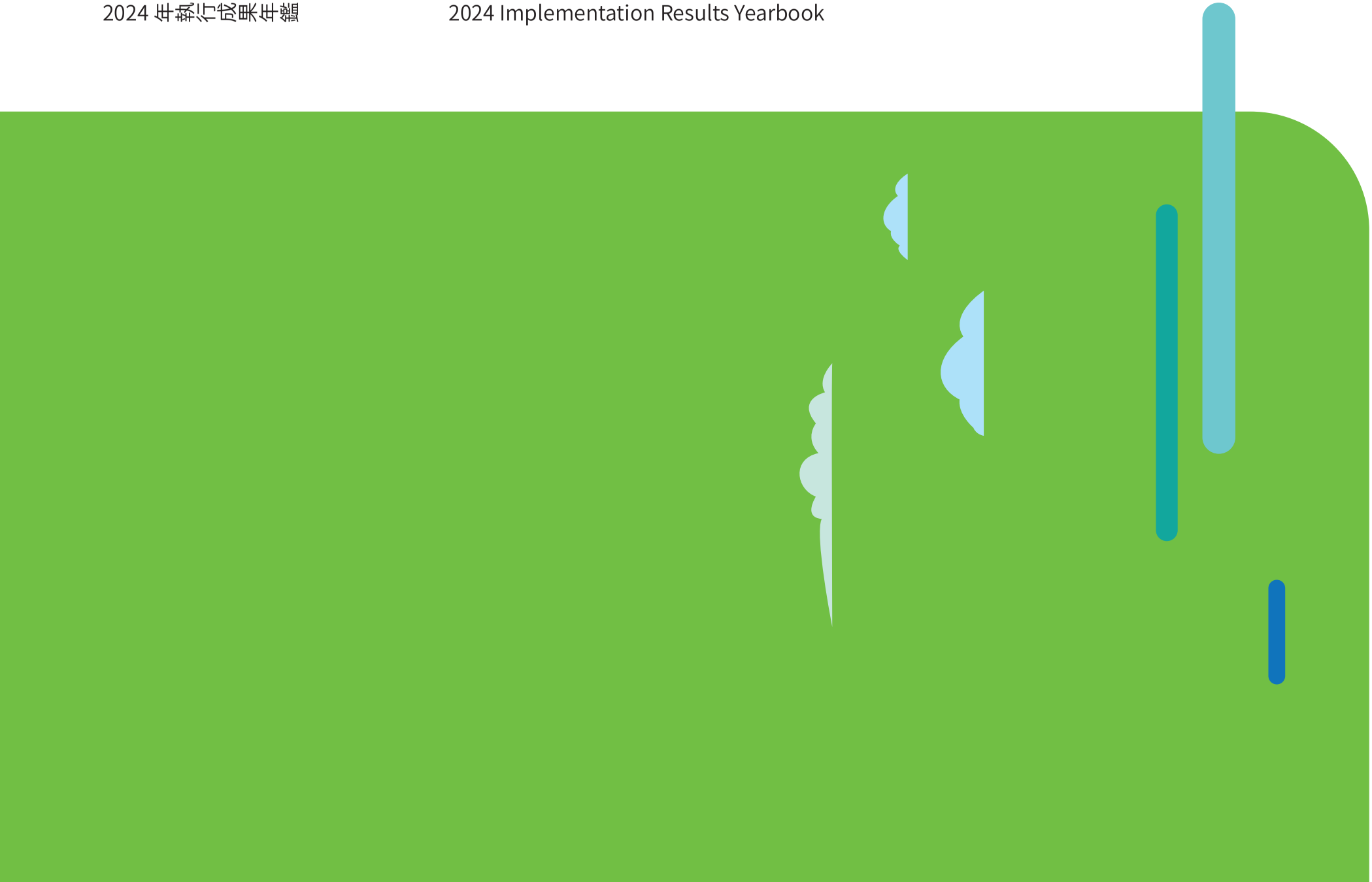
# 教育宣導
# Educational promotion



# 臺灣「持久性有機污染物斯德哥爾摩公約國家實施計畫」2024年執行成果年鑑

# The National Implementation Plan (NIP) of Taiwan under the Stockholm Convention on Persistent Organic Pollutants

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第五章

# 教育宣導

教育宣導可讓全民瞭解人與環境之關係，以及生態保育、環境保護與永續發展之重要性，我國相關部門機關透過建置資訊網站、出版手冊、宣導品等方式，促使民眾瞭解 POPs 公約及其持久性有機污染物，以及瞭解國內管制現況。

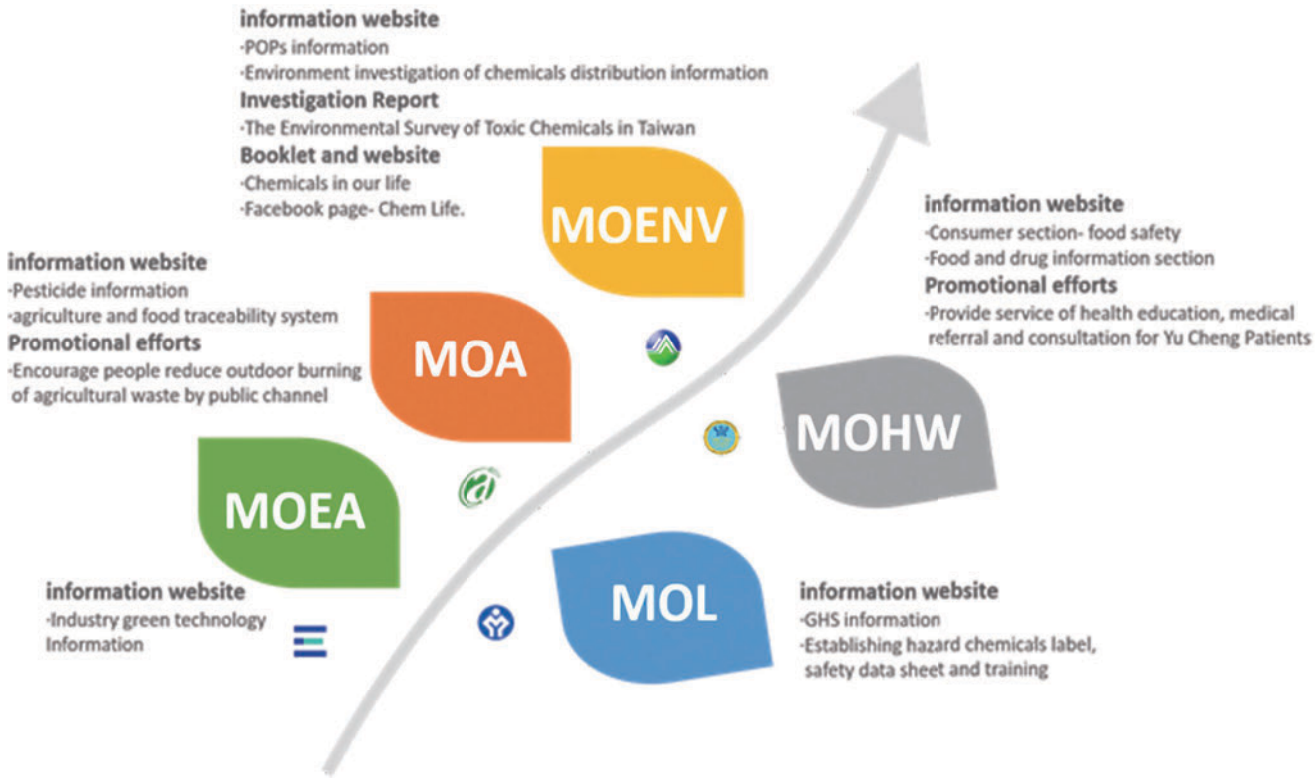



**我國教育宣導作為**

Chapter5

# Educational promotion

Educational campaigns help the public understand the relationship between humans and the environment, as well as the importance of ecological conservation, environmental protection, and sustainable development. In Taiwan, relevant authorities have promoted awareness of the POPs Convention and persistent organic pollutants, as well as the current domestic control measures, through the establishment of information websites, publication of manuals, and distribution of promotional materials.




**Public Education Initiatives in Taiwan**

# 06

第六章 Chapter 6

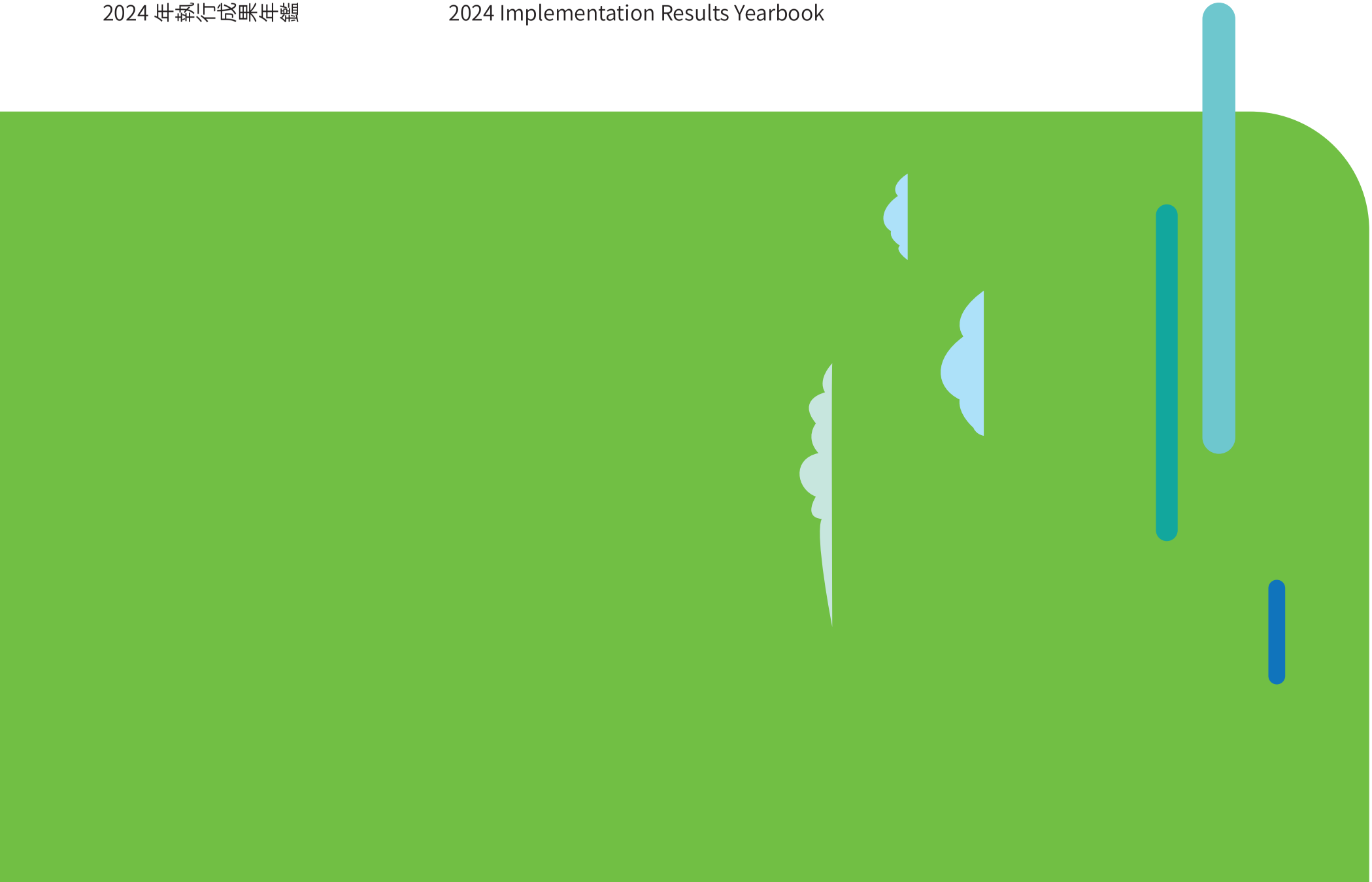
# 結語
# Conclusion



# 臺灣「持久性有機污染物斯德哥爾摩公約國家實施計畫」2024年執行成果年鑑

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第六章

# 結語

隨著國民所得提高，國人環境保護意識逐年增加，對環境品質的要求亦日益殷切。為保護國人健康並使人們之居住環境免於遭受持久性有機污染物之危害，我國將持續關注 POPs 公約最新發展，持續透過跨部會協力合作並與國際同步推動持久性有機污染物的源頭管制、排放削減、控制與替代技術研發及推廣應用，持續進行環境流布調查，審慎評估新增列管物質，加強民眾教育及宣導溝通，及進行國際合作交流等事項，逐步消除或降低環境中持久性有機污染物之排放，與全球共同致力於沒有持久性有機污染物之未來。

Chapter6

# Conclusion

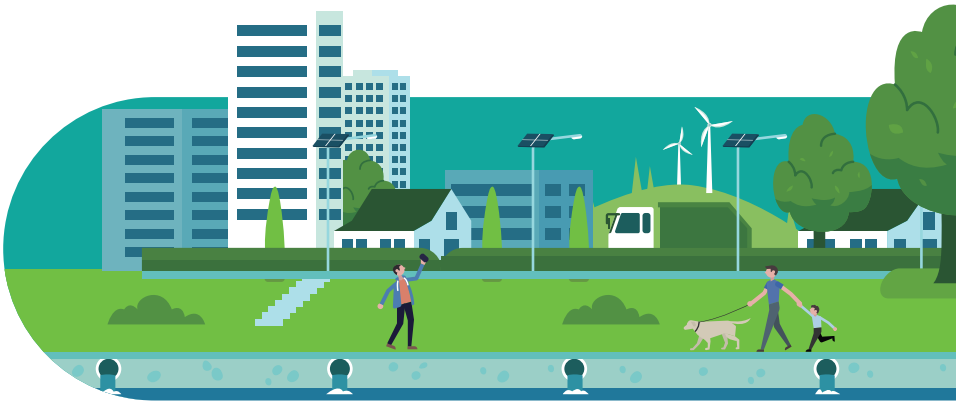
The public awareness on environment is gradually elevating. To protect public health and environmental quality, Taiwan authority follows the trends of Stockholm Convention to accomplish POPs management of cooperation among the departments. On the other hand, Taiwan authority also progressively reduces the release of POPs to the environment, by a variety of methods, like source control, emission elimination, development and implementation of alternative techniques, public propaganda and international cooperation. These efforts aim to build a better future in collaboration with global partners.

# 臺灣「持久性有機污染物斯德哥爾摩公約國家實施計畫」

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環境部化學物質管理署
Chemicals Administration
Ministry of Environment