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Feature Article

Toxic Chemicals Management and POP Restrictions

To minimize the long-term harmful effects of persistent organic pollutants (POPs), in 2004 Taiwan began implementing a number of control measures, such as control at source, in accordance with the Stockholm Convention on Persistent Organic Pollutants. Taiwan has since kept up to date with all new announcements regarding the list of controlled substances maintained by the Stockholm Convention, in response to changing trends in the use of POPs. Taiwan also regularly assesses their use domestically and enforces restrictions in order to reduce the risks to human health and the environment.

The Stockholm Convention was adopted and opened for signature at a Conference of Plenipotentiaries convened by the United Nations Environment Programme on 22 and 23 May 2001, in Stockholm, Sweden. The convention came into effect on 17 May 2004, and Taiwan began to adopt strategies to control toxic substances in the same year. At present, there are 179 parties to the Stockholm Convention, 152 of which are signatory nations.

POPs are harmful to the environment and human health as they are toxic, bioaccumulative, persistent, and can be transported over large distances. The convention lays out a number of compulsory actions that signatory nations must adopt, including banning, restricting, reducing or eliminating the use and release of POPs.

23 POPs Currently Banned or Restricted Under the Stockholm Convention

The convention initially included 12 POPs. To determine whether or not there is a scientific basis for adding other chemicals with POP traits to the list, the convention stipulated ongoing screening of new and existing toxic substances according to its criteria, principles, and procedures.

In This Issue

After several meetings of the Persistent Organic Pollutants Review Committee and the Conference of the Parties to the Stockholm Convention, as of the end of 2014, 23 POPs were on the list of controlled POPs, as shown in the table below.

Taiwan Managing POPs at Source and Enforcing Controls Fully

Taiwan's regulations covering the management of chemical substances can be divided into three broad categories: 1) those that deal with managing the end use of the chemicals; 2) those that deal with managing the handling of toxic chemicals; and 3) those that regulate premises where such chemicals are handled or stored. The *Toxic Chemical Substances Control Act*（毒性化學物質管理法）aims to regulate the handling of all toxic chemical substances based on at-source management by competent authorities.

The management of POPs involves considerable scope, depth, and complexity. To effectively deal with environmental pollution hazards and increase the effectiveness of pollutant controls, the EPA continues to improve the environmental pollution control mechanisms it has in place. The EPA will also continue to monitor the environmental fates of such pollutants, strengthen risk management and enhance capacity building.

In 2004, the EPA drew up a Three-Year Environmental Protection Action Plan（環境保護施政三年行動計畫） in accordance with the *Basic Environmental Act*（環境基本法）and the National Environmental Protection Plan（國家環境保護計畫）. The three-year plan's cornerstones include environmental education, environmental harmony and preventative incentives. In a part of the action plan aiming at international participation, adherence to Stockholm Convention restrictions was included in the formulation of management strategies for POPs, in line with international practices:

1) Keeping track of Stockholm Convention developments and trends while modifying control measures

In response to new POP management strategies and ongoing additions to the convention's list of controlled substances – and with reference to the latest POP control measures adopted by developed nations – the EPA will continue to collect and analyze data on toxicity of POPs and their environmental fates and

Table: List of 23 controlled POPs POPs under the Stockholm Convention

Category	Chemical substances formed or released intentionally		Chemical substances formed and released unintentionally
	Annex A (substances to be eliminated)	Annex B (substances to be restricted)	Annex C (emissions to be reduced)
Listed substances	Aldrin, α-hexachlorocyclohexane, β-hexachlorocyclohexane, Chlordane, Chlordecone, Dieldrin, Endrin, Heptachlor, hexabromobiphenyl, hexabromodiphenyl ether, heptabromodiphenyl ether, hexachlorobenzene, Lindane, Mirex, pentachlorobenzene, polychlorinated biphenyls (PCB), tetrabromodiphenyl ether, pentabromodiphenyl ether, and Toxaphene	Dichlorodiphenyl-trichloroethane (DDT), perfluorooctane sulphonate (PFOS) and its salts and perfluorooctane sulfonic acid	Hexachloro-benzene (HCB), pentachloro-benzene (PeCB), polychlorinated biphenyls (PCB), polychlorinated dibenzo-p-dioxins, and dibenzofurans (PCDD/PCDF)

distribution. The EPA's *Toxic Chemical Substances Screening Principles*（篩選毒性化學物質作業原則）require that targeted substances are subject to a two-stage process of screening and consultation/ coordination. When results of screening indicate the substance in question is hazardous, the EPA will examine the possibility of listing it under the *Toxic Chemical Substances Control Act*, and, if necessary, banning or restricting its use to control it at source.

2) Promoting the dioxin and heavy metal pollution reduction plan to lower environmental load

The EPA has formulated the Environmental Dioxin and Heavy Metal Reduction Plan（環境有毒污染物戴奧辛及重金屬減量計畫）targeting air pollutant emissions from incinerators, smelters, and electric arc furnaces. The plan involves establishing a database and carrying out emissions reduction. Reduction and recycling of the waste – such as bottom ash and fly ash – produced by such operations is also being conducted in tandem with investigations into the specific properties of such waste. The EPA is working on formulating a promotion program on comprehensive management and proper treatment measures to improve the overall performance of emissions reduction.

3) Continuing to conduct surveys on environmental fates and enhance information exchange and public education

The EPA will continue to screen carefully for POPs and conduct surveys of their environmental fates in the atmosphere, soil, river sediments, fish, etc. The EPA has established a microanalysis laboratory that can analyze dioxins and certain POPs according to international standards. The EPA also closely examines international POP surveys, test results, and changes in restrictions. To address public concerns, the EPA will continuously compile the latest data and information on POPs, publish results of environmental background surveys, and enhance public education.

4) Strengthening communication and coordination between authorized agencies and establishing a crisis management mechanism

Proper management of POPs reduces their impact on human health and the environment. It has to be multi-faceted, involving at-source management, transportation management, and hazard and risk management. The EPA will continue to work closely with the Ministry of Health and Welfare and the Council of Agriculture to ensure that the interministerial mechanism is able to promptly and effectively deal with environmental pollution and food safety incidents.

On 3 July 2008, Taiwan began to carry out the National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants. Since then the plan has been revised in line with the dynamic nature of the Stockholm Convention. The government has also been implementing comprehensive pollution controls and restrictions throughout 19 different agencies, including those dealing with agriculture, health, the economy, labor, and finance. The government has also been monitoring and testing for POPs in the environment, livestock, poultry, and foods on the market to ensure that public health and the environment are fully safeguarded.

Chemical Substance Registration System Launched

In addition to the measures outlined above, in 2014 the EPA also did the following to enhance the management of toxic chemical substances:

1. Strengthened controls over endocrine disruptors by testing for 11 of them, including trichloroethylene, with a total of 5,785 samples tested.

2. Established Taiwan's Chemical Substances Registration System and formulated or amended a number of regulations. In accordance with the *Toxic Chemical Substances Control Act* amended on 11 December 2013, the Chemical Substances Registration System came into effect on 11 December 2014. In 2014, the EPA announced the additions of or amendments to six of the seven related regulations required by the act to formally launch the Chemical Substances Registration System.

3. Announced more toxic chemical substances to be listed and controlled: In response to the adding of hexabromocyclododecane (HBCD) onto the Stockholm Convention's control list of POPs, on 25 August 2014, the EPA announced that HBCD, and α-, β-, and γ- HBCD were to be listed as toxic chemicals, which brought the total number of controlled toxic chemical substances in Taiwan to 305. The controlled toxic chemicals are managed according to categories and quantities, as in developed nations. In addition to strengthening reporting on handling and release of toxic chemical substances, the EPA states that handlers of category 1, 2 and 3 toxic chemical substances must draw up hazard prevention and response plans, which shall be made available for

public viewing.

In 2015, the EPA will focus on rolling out registration for new chemical substances, reviewing currently controlled chemical substances and initiating the first stage of chemical substances registration.

There are increasing international concerns as to the potential public health and environmental hazards posed by toxic chemical substances. Scientific and technological advances are showing ever more clearly the toxic chemical substances' environmental fates and potential harm to bioorganisms. The EPA will keep a close watch over developments and trends in international toxic chemicals management and will assess POP controls in the most rigorous and scientific way possible in order to reduce handling risks and safeguard public health and the environment.

Director Shaw-Ying Yuan of the Department of Environmental Sanitation and Toxic Substance Management of the EPA (far right) shares Taiwan's experiences on control of POPs in a side event at the Stockholm Convention COP 6

Air

Additional Air Quality Monitoring Stations Required for $PM_{2.5}$ in Special Industrial Parks

To strengthen controls over fine particulate matters ($PM_{2.5}$) and protect public health, the EPA has decided to enforce monitoring in four special industrial parks by requiring $PM_{2.5}$ to be added to the list of air quality monitoring items. Among these four special industrial parks, three of them have had their monitoring facility installation plans approved by local environmental bureaus. Monitoring is expected to begin in May 2015 at the earliest.

$PM_{2.5}$ controls have become a major international issue due to the serious impact of fine particulate matters on human health. In 2012, the EPA formulated $PM_{2.5}$ air quality standards and a series of measures to strengthen control over pollution sources. The EPA also made air quality monitoring requirements for special industrial parks more rigorous by adding $PM_{2.5}$ to the list of air quality monitoring items, demonstrating the EPA's determination to enforce $PM_{2.5}$ controls across the board.

The special industrial parks currently required to enhance air quality monitoring include the Sixth Naphtha Cracking Plant of Formosa Plastics (台塑六輕工業區), Linhai Industrial Park (臨海工業區), Linyuan Industrial Park (林園工業區), and Southern Taiwan Science Park (南部科學園區). The air quality monitoring facility installation plans of Linyuan Industrial Park, Southern Taiwan Science Park, and the Sixth Naphtha Cracking Plant of Formosa Plastics have been reviewed and approved by local environmental protection bureaus of the relevant jurisdictions. The monitoring for $PM_{2.5}$ at these sites is expected to start in mid-May, early June and late November 2015, respectively.

Air pollutant emissions from special industrial parks are quite often high-volume and of complex composition. Only through creating a dense network of monitoring stations that frequently monitor a complete range of pollutants is it possible to accurately assess the impact that emissions from special industrial parks have on air quality, and thus safeguard public health. In addition to monitoring for $PM_{2.5}$, the stations also monitor for precursors of sulfur oxides, nitrogen oxides, and volatile organic compounds (VOCs). The data accumulated from these monitoring stations will also be useful in the future for air quality modeling that can be applied to assessing and strengthening controls over pollution sources and for formulating policies that aim to constantly improve Taiwan's air quality.

The items that the EPA has designated for monitoring by the monitoring stations at the special industrial parks include PM_{10}, $PM_{2.5}$, SO_2, NO, NO_2, CO, O_3, total hydrocarbons (THC), 54 ozone precursors, 52 harmful air pollutants, methanol, ethanol, 7 heavy metals, 8 acid/alkaline gases, 6 malodorous pollutants such as sulfides and dioxins.

In response to the high public expectations concerning air quality monitoring stations in special industrial parks, the EPA requires certain special industrial parks to establish at least one air quality monitoring station in each city, town, village or district where it is located and on which it borders, plus another four air quality monitoring stations in suitable places. The targeted industries are involved in metal smelting, oil refining, petrochemical raw materials, paper pulp, cement, coking, and power generation from coal, oil or natural gas.

Other special industrial parks not mentioned above should also establish at least four air quality monitoring stations in suitable places. These special industrial parks have over 25% of their total land occupied by special industries including industries of pesticide raw materials, resins, plastics, rubber, petrochemical intermediate materials, acid/alkaline materials, semi-conductors, and optoelectronic materials and components.

General Policy

EPA Minister Wei Visits Taoyuan City's Mayor Cheng to Discuss Environmental Issues

To deepen and support the environmental protection work of local governments, on 6 February 2015, EPA Minister Kuo-Yen Wei (魏國彥) paid a visit to Mayor Wen-Tsan Cheng (鄭文燦) of Taoyuan City (桃園市). A number of environmental issues, such as autonomous regulations on low-carbon, air pollution controls, river purification, water resources, soil, coastal clean-ups, and the Environmental Science and Technology Park were discussed in depth. EPA Minister Wei lauded Mayor Cheng for his efforts and expressed the hope that future cooperation between central and local governments would facilitate continuing progress in protecting the environment.

As Minister Wei pointed out, Taoyuan City has a good record of working closely with the central government on environmental tasks, such as the conservation of the Guanyin algal reef and wastewater treatment projects. Regarding river purification brought up by Mayor Cheng, Minister Wei promised to raise the issue with the Ministry of Economic Affairs' Industrial Development Bureau and

seek its assistance in solving the persistent problem of industrial waste water polluting Taoyuan's rivers. For the third stage of soil remediation and regeneration in Taoyuan City, Minister Wei again promised to assist Taoyuan in carrying out graded control measures to effectively solve the soil contamination problem at its root.

In addition to bringing up the aforementioned environmental problems, Mayor Cheng also heartily thanked the central government for its support. Mayor Cheng particularly referred to the coastal clean-up as an especially tough task. He said that Taoyuan City will produce a white paper on coastal conservation within the next two years that will include a full report on coastal development and controls. Mayor Cheng also said that as Taoyuan City is a major center of industry, the administration would continue to work on regulations governing Taoyuan's *Autonomous Regulations on Low-carbon* and on developing low-carbon solutions.

EPA Minister Kuo-Yen Wei（魏國彥, *left*） *visits Taoyuan City Mayor Wen-Tsan Cheng*（鄭文燦）*to discuss environmental issues*

Environmental Education

Film on Taiwan's Eco-Campus Program Available Online

The EPA has recently completed the production of *Eco-Campus*, an educational film to promote Taiwan's Eco-Campus program and its certification application procedures to school authorities and the general public. Through this program, the EPA is assisting schools to raise environmental awareness, build capacity to take action and improve environmental courses. It would like to see environmental education grow from school curricula to active participation in international EcoCampus certification programs. The EPA is encouraging schools and the public to view or download the film by the same name, *Eco-Campus*, to witness and appreciate the green miracle that Taiwan's Eco-Campuses are creating.

At the end of 2014 the world-renowned environmentalist Dr. Jane Goodall was interviewed as a part of the EPA's film, *Eco-Campus*. She had high praise for Taiwan's promotion of environmental education, particularly the Eco-Campus program, and spoke about how she has been visiting the nation since 1996 and has witnessed first-hand the great progress that it has made in the field of

environmental education. She noted the significant number of schools that had joined the Eco-Campus program, and commended their efforts in ecological conservation and sustainable development education as truly inspiring.

In fact, Taiwan has long been actively participating in global environmental affairs. The EPA's enthusiastic promotion of the Taiwan-USA Eco-Campus Partnership Program in recent years is one example. Through the documentary *Eco-Campus* , the EPA presents successful examples of school partnerships that other interested institutions can follow. The film also gives details on applying for international EcoCampus certification.

The Eco-Schools program, from which the EcoCampus certification scheme evolved, was formally launched in 1994 by the Foundation for Environmental Education (FEE). The scheme is currently administered in over 40,000 schools in more than 60 nations where its certificates are recognized. To gain a certificate from the FEE, a school must implement seven common practices. Then successful applicants will be issued a green flag by the FEE to show that they are accredited eco-schools.

The Taiwan-USA Eco-Campus Partnership Program accreditation is somewhat different from the Eco-Schools program. The Taiwan-USA Eco-Campus program distinguishes Eco-Campuses into the three grades of Bronze, Silver and the highest honor, Green. As of January 2015, four schools in Taiwan have received the Eco-Campus certification: Sacred Heart High School for Girls （聖心女中）and Jian-An Elementary School（建安國小）in New Taipei City（新北市）, both certified as Green Eco-Campuses; Hu-Shan Elementary School in Tainan City（臺南市虎山國小）, certified as a Silver Eco-Campus; and Jinhu Junior High School in Kinmen County（金門縣金湖國中）, certified as a Bronze Eco-Campus.

EPA documentary on Taiwan's Eco-Campus Program available online at https://youtu.be/iTAfcHAEVfU

Waste

Restrictions on Mercury and Cadmium Content of Batteries to Be Tightened from 2016

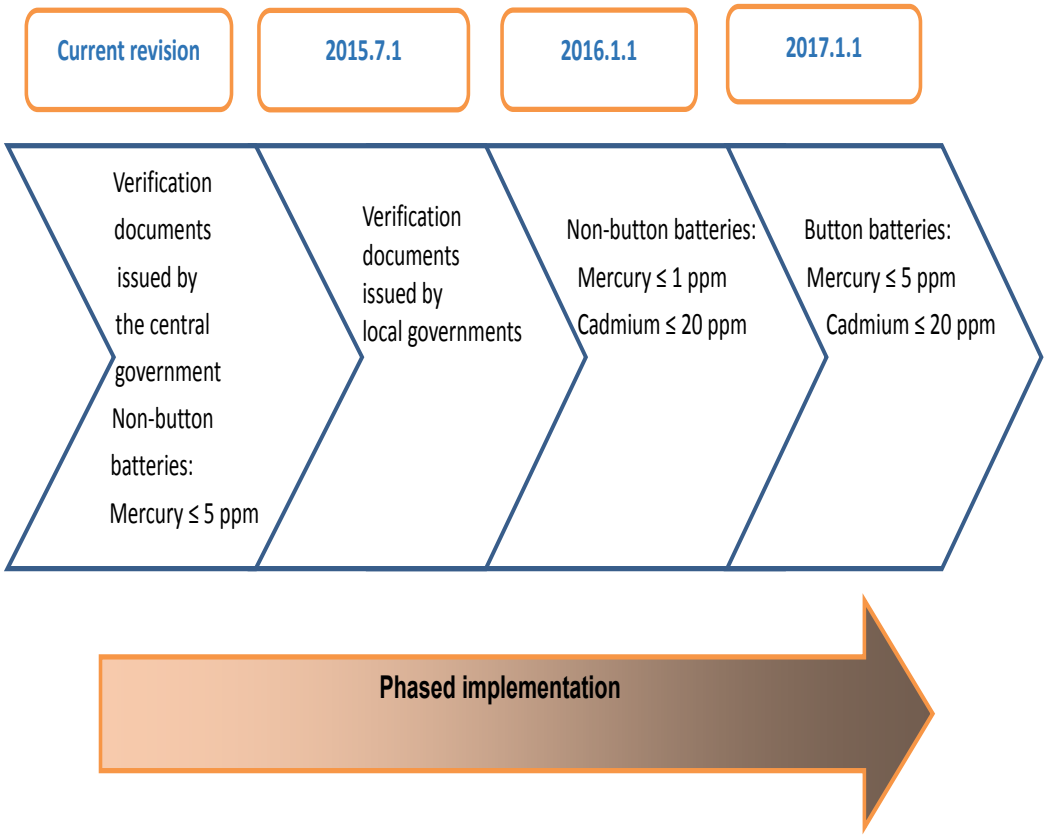
The EPA has announced revisions to the *Restrictions on the Manufacture, Import, and Sale of Dry Cell Batteries*（限制乾電池製造、輸入及販賣）. Starting from 1 January 2016, the maximum permitted mercury content of non-button batteries will be 1 ppm and the maximum for cadmium content will be 20 ppm. In addition, from 1 January 2017, new restrictions will be imposed on button batteries with the maximum permitted mercury content set at 5 ppm and the maximum cadmium content set at 20 ppm.

The mercury and cadmium in dry batteries have the potential to cause serious pollution and harm organisms if leaked into the environment. If these heavy metals enter the human body they may accumulate and damage organs. To reduce the risk of such substances from batteries affecting the environment and public health, and also in response to international trends concerning extended producer responsibility, the EPA began restricting the heavy metal content of dry batteries in 2006, in accordance with Article 21 of the *Waste Disposal Act*（廢棄物清理法）.

The responsibility is on manufacturers and importers to determine the heavy metal content of any dry batteries that they wish to manufacture or import, and then obtain heavy metal content verification documents from the government. The control of the heavy metal content of dry batteries at source is aimed at reducing heavy metal pollution from spent battery incineration. It is also intended to reduce the heavy metal content in materials recovered and recycled from spent batteries, thus facilitating the recycling and reuse of such materials.

After closely examining the trends in dry battery controls in Europe and United Nations Environment Programme publications, the EPA announced amendments to the *Restrictions on the Manufacture, Import, and Sale of Dry Cell Batteries*（限制乾電池製造、輸入及販賣）. The mercury content maximum values for cylindrical zinc-carbon batteries and alkaline batteries have been lowered from 5 ppm to 1 ppm, and a maximum value for cadmium of 20 ppm has been added. Three types of button battery – alkaline manganese dioxide, mercury oxide, and silver oxide – will henceforth also be subject to controls, with a maximum mercury content of 5 ppm and a cadmium maximum of 20 ppm being set for them. These amendments align Taiwan's regulations with the latest EU standards, and will help prevent the use of high-mercury and high-cadmium dry batteries in Taiwan.

The EPA also reminds all manufacturers and importers of dry batteries that starting from 1 July 2015, they need to have the necessary verification applications submitted to their local government environmental protection bureaus, rather than the EPA, for review.



Restrictions on heavy metals in batteries to be tightened

Recycling

Revenue from Recycling of Household Appliances Tops NT$1.3 Billion in 2014

EPA statistics show that the total materials recycled from waste household appliances amounted to more than 80,000 metric tons last year, creating revenue of NT$1.3 billion. In this respect, the waste electrical appliances can be deemed an urban mine. The EPA therefore urged the general public to recycle household appliances for the sake of carbon reduction and the sustainable use of resources.

The EPA points out that the proper recycling and processing of waste household appliances not only reduces carbon emissions and resource consumption, but also creates huge economic value. A national tally of waste electrical appliances, including TV sets, refrigerators, washing machines, air conditioners and fans, shows that in 2014 more than 2,620,000 units totalling more than 100,000 metric tons were recycled. From that, about 80,000 tons of materials can be reused, worth a value of NT$1.3 billion.

The EPA reminds the general public not to dispose of waste electrical appliances carelessly. The EPA provides three channels for recycling:

1. When purchasing new TV sets, refrigerators, washing machines and air conditioners, give the old ones to the vendors for free recycling and ask for a receipt, which can be used for a prize draw when registered online.

2. When not purchasing new appliances, the public can dial the EPA's resource recycling hotline at 0800-085717 or log onto the EPA's resource recycling website at http://recycle.epa.gov.tw to inquire about or obtain the contact information for recycling organizations.

3. Contact the local sanitation team to set up a time and place to put out waste electrical appliances for recycling.

Under the concepts of extended producer responsibility and sustainable materials management, recycling of waste household appliances can become a lucrative urban mine. Through urban mining, the EPA expects to achieve the goals of resource reuse, recycling and zero waste, thereby making contributions to energy saving and carbon reduction.

Toxic Substance

Management Regulations for Toxic Chemical Incident Response Vehicles Announced

The EPA and the Ministry of Transportation and Communications jointly announced the *Management Regulations Governing Toxic Chemical Incident Response Vehicles*（毒性化學物質災害事故應變車輛管理辦法）, aimed at reducing the impact of toxic chemical incidents and safeguarding public health. The regulations stipulate that when a toxic chemical incident occurs, emergency response vehicles may have the right of way to the scene of the incident. The prerequisite for this is that the emergency response vehicles must be formally stationed in accordance with regulations.

To allow emergency response personnel for a toxic chemical incident to rush to the scene to carry out their duties, the EPA amended Article 24-1 of the *Toxic Chemical Substances Control Act*（毒性化學物質管理法）on 11 December 2013. The amendment lifted some traffic restrictions on emergency response vehicles. For example, when responding on duty, an emergency response vehicle is not subject to speed limits; nor must it heed any traffic signs, markings or signals when it has its flashing lights and sirens turned on. In response to the amendment, the EPA jointly announced the *Management Regulations Governing*

Toxic Chemical Incident Response Vehicles with the Ministry of Transportation and Communications on 11 February 2015.

The newly announced management regulations specify the identification marks, color recognition, basic equipment and usage, registration and license extension requirements of emergency response vehicles, as well as criteria for drivers. The motor vehicle supervision authorities are responsible for license plating issuance, duty management and supervision, and changing or cancellation of registration. The new regulations are intended to reduce the damage of toxic chemical incidents and safeguard the health of people involved.

Environmental Education

Taiwan's Beauty Revealed in Booklet *Beauty of Taiwan: Love for the Environment*

The Taiwan environmental organization Conservation Mothers Foundation（環保媽媽環境保護基金會） developed an environmental education plan and has won an EPA bid. The plan entails the publishing of a booklet of photos taken over the course of many years during environmental surveys done around Taiwan. Essays on the environment and ecosystem have been selected to accompany the photos, all of which have been compiled into a booklet with the title *Beauty of Taiwan: Love for the Environment*（臺灣美好環境之愛）.

After the *Environmental Education Act*（環境教育法）was promulgated in 2011, environmental education activities quickly took off. The EPA has since established a trove of environmental education projects and has openly sought the participation of citizens' groups and experts in the hope of adding vitality and diversity to environmental education, and giving it deeper roots to develop thoroughly.

In 2014, the EPA openly sought environmental education material production projects from the public. The Conservation Mothers Foundation was inspired by the documentary film *Beyond Beauty: Taiwan from Above*（看見台灣）, which brought Taiwan's environment to the attention of the public. The foundation therefore proposed to select some of the

The booklet entitled Beauty of Taiwan: Love for the Environment（臺灣美好環境之愛）

heart-stirring photos their members had taken through their work over the year. The images were originally published on the organization's website and Facebook account on a daily basis, along with short texts on various environmental topics. A booklet compiling the best selection of these photos with text was also proposed. The proposal obtained approval from the EPA and work on it started in mid-July 2014.

The photos in the booklet were taken during environmental surveys the Conservation Mothers Foundation started conducting in 2009, with the support of the EPA, to promote tidiness of the environment. By uploading photos of messy sites onto the EPA's EcoLife website and ranking the tidiness of each township, the survey has received wide approval and has led to significant improvement in living environments over the last six years. On their trips deep into rural areas, the members of the foundation were moved by the diverse cultures, lifestyles and ecosystems, and recorded them with their cameras.

The booklet includes 210 accompanying texts covering a wide range of topics such as marine ecology, biodiversity, air, water, wastes, reduction at source, green consumption, endocrine disruptors, food safety, renewable energy, climate change, agriculture, green buildings, green economy, forests, soil, and eco-tourism. Not only does the booklet visually show the environmental issues that Taiwan faces, it raises environmental awareness through the accompanying essays.

Climate Change

2014 National Greenhouse Gas Inventory Report Published

Taiwan has taken proactive steps to adhere to the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol agreements by publishing the 2014 National Greenhouse Gas Inventory Report, which helps the public and the world better understand Taiwan's greenhouse gas emissions. The report can be viewed and downloaded from the following web page: http://unfccc.saveoursky.org.tw/2014nir/.

A nation's Annual National Greenhouse Gas Inventory Report is one of the primary documents used to assess its compliance with greenhouse gas emissions agreements set out by the UNFCCC and the Kyoto Protocol. The protocol states that developed nations (Annex 1 nations) must calculate and compile their national greenhouse gas inventory every year and publish it in the form of an Annual National Inventory Report. Developing nations (Non-Annex 1 nations) are also encouraged to take the same approach.

Taiwan's total greenhouse gas emissions increased from 136,681 kilotons of carbon dioxide equivalents (excluding carbon dioxide removal) in 1990 to 270,682 kilotons of carbon dioxide equivalents in 2012 (excluding carbon dioxide removal) in 2012, with emissions increased by 98.04% at an average annual growth rate of 31.6%. However, the total emissions in 2012 were lower than that of the previous year by 2.03%. In addition, although net emissions increased from 117,849 kilotons of carbon dioxide equivalents (excluding carbon dioxide removal) in 1990 to 251,533 kilotons (excluding carbon dioxide removal) in 2012, the emissions in 2012 were lower than the previous year by 21.9%.

Among all the emissions, the main sources of carbon dioxide are the energy sector, the industrial manufacturing sector and the waste treatment sector. Meanwhile, the main sources of methane are the agricultural sector, the waste treatment sector, the energy sector and the industrial manufacturing sector. In 2012, the energy sector accounted for 93.49%, the industrial manufacturing sector for 6.49% and the waste sector for 0.01% of carbon dioxide emissions. The carbon dioxide emissions in 2012 compared with emissions in the previous year decreased by 1.84%, mainly because of emission reductions of 1.88% in the energy sector, 1.06% in the manufacturing sector and 49.53% in the waste sector.

The Taiwan government referred to the guidelines of the Intergovernmental Panel on Climate Change (IPCC) for calculating national greenhouse gas inventories and calculated Taiwan's emissions by examining inventories calculated by various government departments. These included the historical annual national greenhouse gas inventories produced by the Ministry of Economic Affairs' Bureau of Energy and Industrial Development Bureau, and the Council of Agriculture.

To compile the annual report, each agency's statistics have undergone internal reviews as well as review by the National Greenhouse Gas Emissions Inventory Committee. Once the statistics were examined and confirmed, each of the agencies involved was asked to write a section of the report based on the statistics. The final report was then compiled by the EPA and further reviewed by external experts to ensure accuracy and consistency. In keeping with the Kyoto Protocol's recommendations on the structure of national inventory reports, the report is composed of 11 sections and eight chapters. The report explains the scope of national greenhouse gas inventory statistics and gives an overview of the current state and possible future trends of greenhouse gas emissions in Taiwan. It also provides descriptions of the different greenhouse gas emission sources and greenhouse gas sinks examined by each agency along with the data, statistical methodologies used and results obtained by each agency. The report also projects future emission trends for each agency.

2014 National Greenhouse Gas Inventory Report

News Brief

Draft of Operating Principles for Greenhouse Gas Analysis and Auditing Organizations Formulated

On 17 February 2014, the EPA announced the *Guidelines for Greenhouse Gas Analysis and Auditing Organization Management*（溫室氣體檢驗測定及查驗機構管理辦法）. To strengthen the auditing regulations as stipulated in Article 32 of the guidelines, the EPA specifically formulated a draft of the *Operating Principles for Greenhouse Gas Analysis and Auditing Organizations*（溫室氣體認證機構及查驗機構稽查作業原則草案） which is to be followed by the central competent authorities.

According to the EPA, the main contents of the operating principles include: the procedures and focus of auditing, the methods of and items for implementation, the principles on the judgment of non-compliance, and so on. In addition, the EPA also mapped out the establishment of a Technical Team for the Greenhouse Gas Analysis and Auditing Organizations（溫室氣體認證機構與查驗機構技術小組）and specified its functions.

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Publisher
Kuo-Yen Wei, Minister

Editor-in-Chief
Tsung Yung Liu

Executive Editors
Yu-Ling Yang; Li-Kuo Hsiao; Shao-Wen Chang; Jason Hoy

Translator
Peter Morehead

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For inquiries or subscriptions to the printed version, please contact:

Environmental Policy Monthly
Environmental Protection Administration
Office of Sustainable Development

83, Sec. 1, Jhonghua Rd.,
Taipei 100, R.O.C. (Taiwan)
tel: 886-2-2311-7722, ext. 2203
fax: 886-2-2311-5486
e-mail: umail@epa.gov.tw

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