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Feature Article

Scientific Applications for Marine Pollution Control and Emergency Response

The EPA is continuously working on improving marine pollution control to protect marine environments and safeguard ocean resources. This involves regularly upgrading marine pollution control systems and effectively monitoring and controlling pollution through the application of advanced tools such as satellite technology, unmanned aerial vehicles (UAVs), and computer modeling of dispersal patterns for oil and chemical pollutant spills. The EPA thus aims to both stop pollution at source and prevent illegal acts.

Legal Basis

The United Nations Convention on the Law of the Sea (UNCLOS) outlines the international responsibilities that each signatory party has toward marine environments as specified in the convention, with each party agreeing to cooperate over marine environmental protection either on a regional or global basis. Using the UNCLOS as a frame of reference, the EPA formulated the *Marine Pollution Control Act*, which was promulgated on 1 November 2000.

The work of marine environmental protection is heavily focused on pollution control and ecological conservation. Taiwan's *Marine Pollution Control Act* covers both pollution control and management, including marine pollution control management and emergency response. The act includes measures to prevent pollution incidents deriving from the transportation of oil, from marine engineering projects, and from land-based sources. The EPA employs a number of advanced tools to strengthen cooperation between public and private entities that conduct aerial and marine patrols aimed at preventing polluting activities at sea. Other technologies employed include the intermittent use of satellite remote monitoring and UAVs to facilitate inspections of pollution sources suspected of illegally discharging pollutants.

In This Issue

Some of the specific uses of advanced tools in marine pollution control and emergency response in 2014 are detailed as follows:

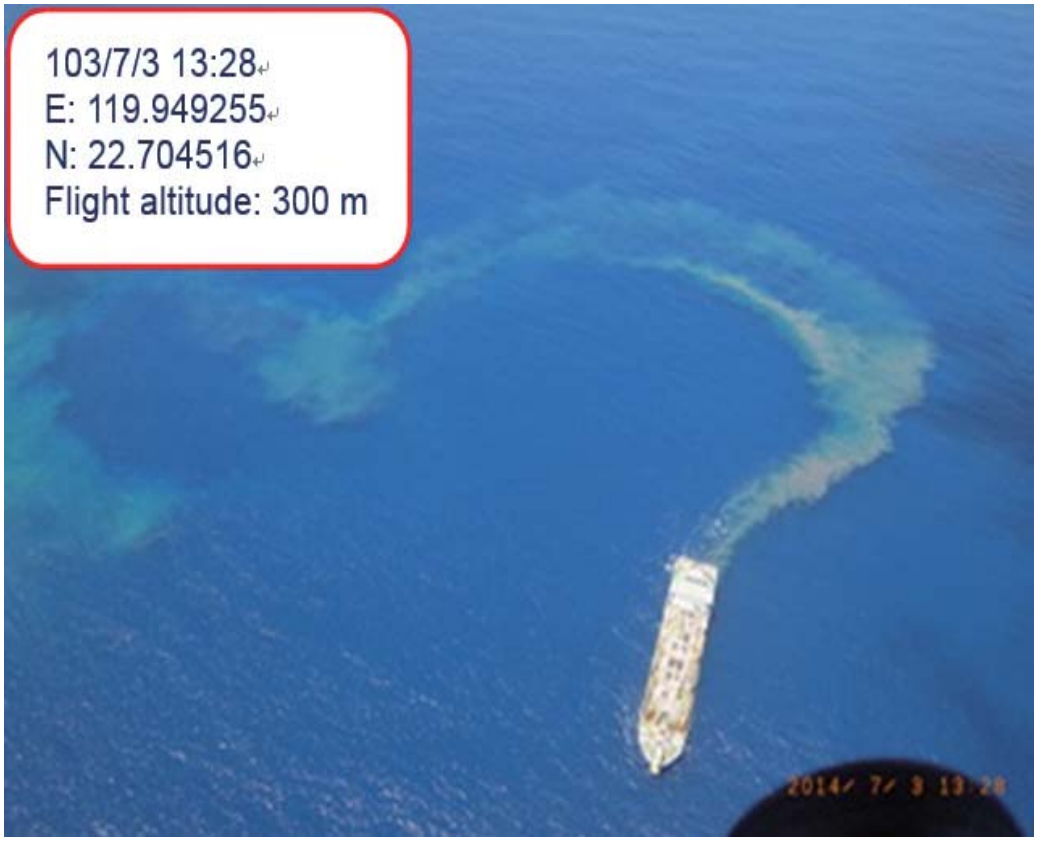
1. Use of Satellite Technology and UAVs to Enhance Marine Pollution Inspection and Emergency Response Capabilities

1) Satellite remote sensing and UAVs are intermittently used to monitor the main island of Taiwan and its surrounding marine territories. As one of the operations permitted under the *Marine Pollution Control Act*, aerial filming of vessels suspected of discharging oily water was conducted to quickly ascertain whether or not pollution had occurred. Vessels that were verified to have caused pollution were then dealt with by local government environmental protection bureaus and marine bureaus, the Coast Guard Administration, and the Maritime and Port Bureau of the Ministry of Transportation and Communications.

2) In 2014, the EPA conducted a total of 18 days of aerial monitoring of ships involved in waste dumping, oil discharging or construction projects at sea. On 3 July 2014, the EPA caught a cruise ship dumping waste outside of the designated marine dumping area at Yongan Port（永安港）. The EPA fined the ship's operator NT$300,000 in accordance with Articles 20 and 51 of the *Marine Pollution Control Act.*

3) On 10 October 2014, the marine research ship Research Vessel Ocean Researcher 5（RV OR5, 海研 5 號）sank in waters 2.1 nautical miles off the east coast of Huxi Township（湖西鄉）, Penghu County（澎湖縣）. To get a fuller picture of the ensuing oil spill problem, the EPA examined a total of 37 images of the sea surrounding the spot where the RV OR5 sank, taken almost daily at 10 a.m. between 12 October and 28 November by the FORMOSAT-2 satellite of National Central University. The images were a valuable aid to the EPA and other emergency response units in the task of locating and responding to the oil slicks.

4) The EPA conducted 18 days of aerial monitoring of oil transportation undertaken by China Petroleum Corp. from buoy moorings. No abnormalities were discovered.



Aerial photo of cruise ship dumping waste outside of Yongan Port Marine Dumping Area

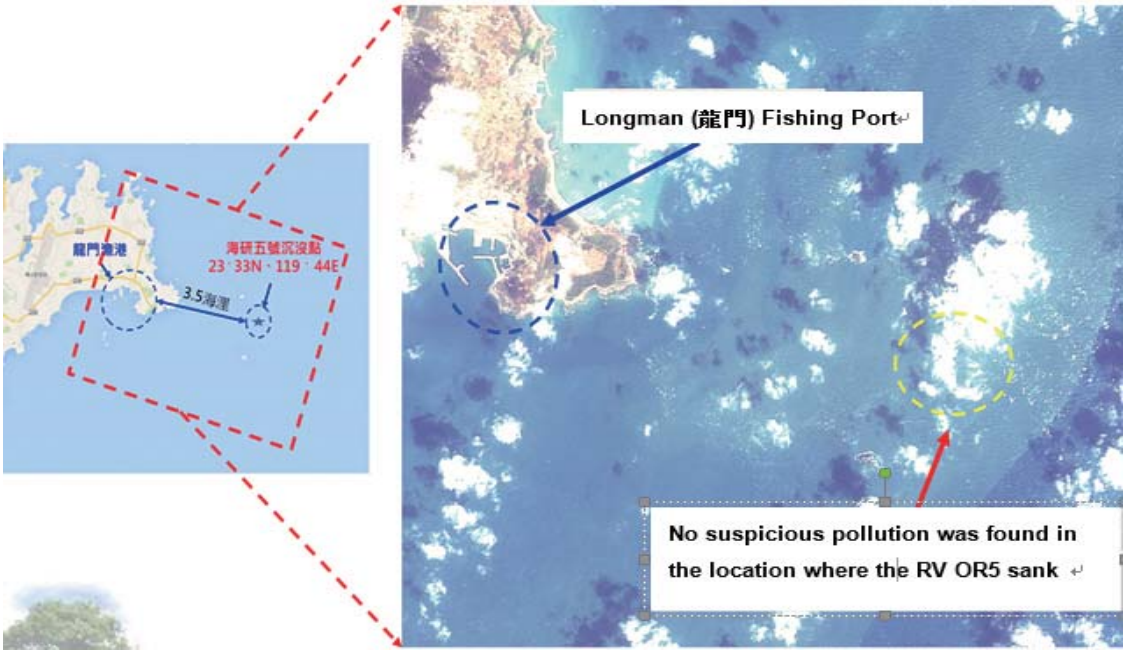
2. Improving Computer Modeling Accuracy for Marine Oil and Chemical Spills to Enhance Emergency Response Strategy Planning

1) The EPA is employing the computer modeling software OilMap and ChemMap to simulate possible dispersal patterns for marine oil and chemical spills. Used in combination with Central Weather Bureau data and flow distributions calculated using HydroMap hydrodynamic modeling software, the EPA is able to predict the scope of impact of marine oil and chemical pollution incidents. The EPA has also adapted oil radar technology from land-based monitoring vehicles to improve its marine oil and chemical spill monitoring capacity and assist in emergency response planning and dispatching of equipment. The more effective the initial response, the less impact the pollution has on nearby coastal environments.

2) Modeling of marine oil spill dispersal patterns – In 2014 the EPA carried out 71 marine oil spill dispersal pattern modeling simulations. The simulations were done over the course of 12 cases, including: four incidents requiring emergency response, one sandbox model simulation, one response drill, and six hypothetical scenarios. Fifty-eight model simulations were conducted for the RV OR5 sinking incident to ascertain whether or not the oil spilling from the wreckage would have an impact upon the nearby coastline. The EPA was also able to incorporate weather data into the computer models, thus making daily adjustments to the predicted dispersal patterns of the oil pollution. The results of the pollution dispersal simulation were then immediately passed on to local government environmental protection bureaus and other relevant units so that they could adopt appropriate emergency response measures and dispatch equipment to where it was most needed.

3) On-site monitoring of marine oil pollution using vehicle-mounted radar monitoring: By positioning vehicle-mounted radars to monitor along the coast, the EPA is able to gauge the scope of marine oil spill dispersal within three to eight kilometers off the coast. When combined with data on wind speed, wind direction, ocean currents, wave height and other meteorological data, the radar data can enhance the accuracy of oil pollution dispersal simulations. In 2014, the EPA continued assisting local government environmental protection bureaus to conduct marine pollution emergency response drills that take account of different topographic and geological traits of Taiwan's coasts. The EPA also conducted eight days of monitoring of locations that have a history of oil spills, or that have been assessed to be at high risk of having one.

4) Modeling of marine chemical pollution dispersal: After consulting the International Maritime Organization's list of high-risk chemical substances



Images taken by the FORMOSAT-2 satellite on 12 October 2014 were used for monitoring the site where the RV OR5 sank

and the Ministry of Finance's statistics on the economic value of all high-risk chemicals imported into or exported from Taiwan in 2014, the EPA selected 12 chemicals for marine dispersal simulations. Each of the 12 chemicals (dimethylbenzene, acrylonitrile, ethylene glycol, chlorine, sodium hydroxide, butane, nitric acid, ethyl acetate, ammonium nitrate, ethylene, urea, and 2-butoxyethanol) was run through 13 ChemMap or HydroMap marine dispersal simulations. Then, based on the simulation outcomes, principles and contingency options were formulated for four main incident management tasks – namely, on-site response, command and assessment, disaster relief, and clean-up and restoration – to serve as references for future marine chemical spill incidents.

Future Approaches

The EPA intends to continue employing advanced tools such as UAVs and satellite remote sensing to conduct monitoring, in addition to analyzing existing data on Taiwan's climate and ocean currents, in order to fine tune computer simulations of marine oil and chemical spill dispersal patterns. More accurate dispersal pattern models will allow the EPA to effectively respond to such emergencies and will assist in strategic decision-making during such incidents.

Projected oil spill dispersal for 12 October 2014 in the sea surrounding the RV OR5 wreckage site

Environmental Education

Cherish the Earth and Consume with Care to Celebrate World Environment Day

To echo the United Nations Environment Programme's 2015 World Environment Day event, on 30 May 2015 EPA Minister Kuo-Yen Wei（魏國彥）, the Magistrate of Yilan County （宣蘭縣） Tsung-Hsien Lin（林聰賢）, and legislators Chiu-chin Tien（田秋堇） and Ou-Po Chen （陳歐珀）arrived together at Neicheng Community（內城社區）in Yilan County to participate in the Cherish the Earth and Living a Green Life in Yilan event. As a part of the activities they all left a handprint symbolizing their pledge to "Cherish the Earth and Consume with Care." Minister Wei took the opportunity to urge the public to think carefully about their consumption choices and to manage resources appropriately so that our resources can be used sustainably.

Minister Wei pointed out at the event that the UN's theme for 2015 World Environment Day was "Seven Billion Dreams, One Planet, Consume with Care." He said that we only have one Earth but humankind is using resources excessively. He hoped that everyone could think a little more about their consumption choices to avoid creating more trash. He also said that natural resources such as water and air should be cherished more.

During the event Minister Wei, Magistrate Lin, and local residents who participated in the event walked along the mountain path around the 100-year old canal to gain a greater understanding of how the residents of Neicheng Community protect resources and engage in traditional farming. The participants were also treated to a traditional meal prepared by local grandmothers to give them a taste of village culture.

Taiwan is currently going through its worst drought in nearly a decade: twelve counties and cities have declared varying degrees of water restrictions, and irrigation for 43,000 hectares of farmland has been halted. The EPA hopes that the World Environment Day event will serve to remind people that natural resources are finite and will be depleted if they are not cherished. To prevent squandering of resources, each and every one of us should consume with care, which in itself is a form of environmental protection. Only through the combined efforts of all residents can the environment of Taiwan be protected.

EPA Minister Kuo-Yen Wei (middle, wearing green T-shirt) participating in the Cherish the Earth and Live a Green Life in Yilan: 2015 World Environment Day Event

Toxic Substance

Interministerial Control of Endocrine Disruptors Enters Sixth Year with Excellent Results

Endocrine disruptors are distributed widely in many forms and they are impossible to be controlled with a single regulation or by a single government agency. In 2000, the EPA formulated its interministerial Endocrine Disruptor Management Plan, which allocates tasks for each ministry to carry out within its jurisdiction. The EPA will continue to work together with other ministries to implement the Endocrine Disruptor Management Plan, which provides for the continuous monitoring and control of such chemical substances, reviewing and strengthening related regulations, random testing of products, and public education.

Endocrine disruptors can easily enter the human body through contact with the skin or ingestion. They have the ability to disrupt the human endocrine system and interfere with bio-regulatory processes. To protect public health from the threats posed by endocrine disruptors, in 2009 the Executive Yuan's Consumer Protection Committee designated the EPA as the government agency responsible for overseeing the management of endocrine disruptors. In 2000, the EPA formulated its interministerial Endocrine Disruptor Management Plan to provide for the continuous monitoring of these chemical substances, and the control of their use and discharge into the environment. Part of the plan also calls for raising the quality of Green Building Materials and ensuring that retail consumer products meet national standards, in order to minimize the risk of people being exposed to endocrine disruptors.

Because they are distributed in many forms, endocrine disruptors are impossible to control with a single regulation or by a single government agency, either in Taiwan or overseas. Tasks that each ministry can carry out within their jurisdiction are allocated under the Endocrine Disruptor Management Plan. For example, the Ministry of Health and Welfare (MOHW) has authority over endocrine disruptors in food, food containers, and medical instruments; the Council of Agriculture (COA) controls pesticides, livestock feed, and agricultural products; the Ministry of Economic Affairs (MOEA) oversees commercial products in general; the Ministry of the Interior (MOI) controls construction materials; the Ministry of Finance controls hygiene standards for alcoholic beverages; and the EPA has authority over environmental agents, drinking water, and indoor air quality. All of the aforementioned ministries actively enforce the relevant regulations, educate the public on appropriate product use, and undertake random testing of products to ensure that they are safe to use.

As for controlling the use of endocrine-disrupting plasticizers, the MOHW has already formulated the *Sanitation Standards for Food Utensils, Containers and Packaging* that limits the residual amounts of lead, cadmium, and plasticizers permissible in plastic food containers. The MOEA's Bureau of Standards, Metrology and Inspection has announced a list of tests that should be carried out on toys, as well as safety standards for children's toys that limits the total amount of eight types of phthalate esters – di (2-ethylhexyl)phthalate (DEHP), di-n-octyl phthalate (DNOP), benzyl butyl phthalate (BBP), diisononyl phthalate (DINP), diisodecyl phthalate (DIDP), diethyl phthalate (DEP), dimethyl phthalate (DMP), dibutyl phthalate (DBP) – and associated compounds to 0.1% w/w. The EPA has also declared 26 types of phthalate esters (including DEHP) to be toxic chemical substances as defined by the T*oxic Chemical Substances Control Act*. Nine of these phthalate esters are listed as Category 1 or Category 2 toxic chemicals, while 17 of them are in Category 4. Plasticizer maximums have also been added to the EPA's eco-labeling standards.

As for environmental monitoring and testing, the EPA has conducted surveys of the distribution of phthalate esters and other endocrine disruptors in and around major rivers and has also conducted random testing of eco-labeled products. Testing agencies approved by the MOI carry out random testing for heavy metals and phthalate esters (plasticizers) in green building materials every three months. The MOEA also has a similar inspection and testing plan that targets retail products such as handheld lanterns, inflatable toys, rubber bands for DIY weaving, erasers, pencils with erasers, colored book protectors, drawing and coloring products, and children's rainwear and rain boots.

In addition to the continuous implementation of the interministerial Endocrine Disruptor Management Plan, the EPA stressed that manufacturers should also fulfill their corporate social responsibilities, comply with the regulations and do their part to protect the environment and safeguard human health.

Water

EPA Publishes Results of First Seabed Waste Survey

Between March and May 2015, the EPA conducted marine waste clean-up and disposal surveys at six ports that it had selected. The survey results showed that the main sources of marine waste are from the land, with waste being carried downstream by rivers or solid objects being thrown into the sea from the coast. The most common item was metal cans, followed by plastic bags, plastic bottles, and glass jars.

With the arrival of summer, coastal areas become popular destinations for people to go for leisure activities or just to cool off. To maintain the quality of beaches, environmental agencies and citizen groups have led the way in coastal cleanups. In addition to coastal waste, seabed waste and related issues such as its distribution, sources and environmental impacts also need to be investigated and tackled. To this end, the EPA implemented its Taiwan Marine Territory Waste Clearance and Disposal Survey Plan.

The large majority of marine waste comes from land-based sources, with waste being carried downstream by rivers or solid objects being thrown into the sea from along coastlines. In 2013, an EU marine waste research project used trawling nets to gather waste from the seabed of the eastern Mediterranean and the Black Sea. A total of 5,398 items were brought up by the nets, of which nearly half (49.6%) were plastic items, 8.7-22% were metal items, and 6-22% were glass or ceramic containers. Analysis revealed that plastic bags comprised 50% of the plastic waste, plastic bottles 17.5%, plastic film 13.5%, and fishing line and nets that were discarded by fishermen, 6.7%.

In 2014, Kenting National Park Headquarters（墾丁國家公園管理處）completed a clean-up of some sites in and around the park including Houbi Lake（後壁湖）, a nearby lagoon, the Maanshan Nuclear Power Plant water intake channel, and the eastern side of Nanwan Vision Stone（南灣眺石）. The seabed waste recovered was 70% composed of fishing lines and nets, with plastic bags and metal cans each accounting for 10%.

To better understand the current seabed waste situation around Taiwan, from 22 March to 19 May 2015 the EPA selected six of Taiwan's ports, river estuaries and areas with prominent cliffs in which to conduct the Taiwan Marine Territory Waste Clearance and Disposal Survey Plan. The surveys were carried out by teams of two divers each at Anping Port in Tainan（臺南安平港）, Beinan River（卑南溪）estuary, Lanyang River（蘭陽溪） estuary, Tamshui River（淡水河） estuary, Nanwan at Kenting（墾丁南灣）, and Jialeshui（佳樂水）, within a 10,000 m^2 area of sea approximately 300 m from the coast.

Overall, the seabed waste survey/clean-up resulted in 24 items weighing a total of 17 kg being recovered. Among them, metal cans were the most common item, with a total of 11 collected. Other common items included plastic bags and bottles, and glass bottles and jars. Larger items such as waste tires, fishing nets and rubber tubes were also recovered.

The results of the surveys conducted at Anping Port, Beinan River estuary, Lanyang River estuary, and Tamshui River estuary showed there were no large amounts of trash on the seabed in and around these areas. This may be because the area surveyed at Anping does not see many visitors, while large waves often wash over the Beinan River, Lanyang River and Tamshui River estuary survey sites. In addition, the sandy seabeds of these sites also make it easier for the trash to be carried onto the shore by local currents. In contrast, at Kenting Nanwan and Jialeshui, coral reefs are prominent geological features and larger items such as used fishing nets, rubber tubing, and tires get caught on the jagged coral reefs. Of these, used fishing nets can end up spread out over a wide area of coral reef and pose a more serious threat to local ecosystems.

Through implementing the marine waste clearance and survey project, the EPA has been able to gain a preliminary overview of the seabed waste situation for the various types of seabed environments around Taiwan. As most marine waste originates inland or because of improper disposal in coastal areas, the EPA will continue to promote at-source management and waste reduction, and is also planning to subsidize local governments to carry out seabed clean-ups in 2016.

Recycling

Amendments to Waste Container Recycling Fee Rates Preannounced

To add extra stability to the functioning of the Resource Recycling Fund and the recycling system, on 28 May 2015, the EPA preannounced revisions to the waste container recycling fee rates. The fee rates will be implemented in two stages starting from 1 March 2016.

Manufacturers or importers of recyclable containers as defined in Article 15 of the *Waste Disposal Act* should register with the EPA and pay their recycling fees in accordance with the announced fee rates. The current Waste Container Recycling Fee Rates were last amended on 1 July 2012. A review by the EPA on the income and expenditure of the recycling fund derived from containers indicated that for Tetra Paks, sealed paper bags and containers made from iron, glass and expanded or non-expanded polystyrene, the fund was losing money overall and that a significant negative balance has been building up. Thus, in order to add extra stability to the functioning of the Recycling Fund and the recycling system, the EPA revised the recycling fee rates for said materials.

The EPA is also keen to encourage manufacturers to design containers that are easy to recycle. To this end, there is a reduced polyethylene terephthalate (PET) container fee rate for bottle designs that use shrink film labeling and perforated lines and bottle designs that use non-self-adhesive wrap-around labeling. The criteria for the reduced fee rates are currently only published on the EPA's website that acts as a portal for applications from responsible enterprises. To make the criteria more accessible to relevant enterprises, the EPA has clearly defined the types of containers eligible for the reduced fee rates in the draft amendments to the Waste Container Recycling Fee Rates.

1. Definition:

(1) Type A PET: bottle designs that use shrink film labeling and perforated lines or bottle designs that use non-self-adhesive wrap-around labeling.

(2) Type B PET: bottles that do not belong to the Type A PET.

Amended Waste Container Recycling Fee Rates (draft)

Item	Fee rate	Date of implementation
Iron containers	1.48 NT$/kg	1 March 2016
	1.64 NT$/kg	1 March 2018
Glass containers	2 NT$/kg	1 January 2017
Tetra Paks	5.635 NT$/kg	1 March 2016
	6.42 NT$/kg	1 March 2018
Gas-tight or liquid-tight paper bags (not including disposable dining utensils)	3.165 NT$/kg	1 March 2016
	3.32 NT$/kg	1 March 2018
Plastic containers (unexpanded polystyrene)	9.91 NT$/kg	1 March 2016
	11.64 NT$/kg	1 March 2018
Plastic containers (expanded polystyrene)	53.56 NT$/kg	1 March 2016
	69.83 NT$/kg	1 March 2018

2. Supplement for perforated line and non-self-adhesive wrap-around labeling

(1) Perforated line refers to those PET bottle designs that use shrink film labeling with a dotted line for easy tearing.

(2) Non-self-adhesive wrap-around labeling refers to either of the following two designs:

(i) Labeling designs without self-adhesive wrap-around nor completely adhered to the bottle but only partly stuck to the adhesive region to prevent the label from falling apart.

(ii) Labeling designs that use paper labels with environmentally friendly water-soluble polyvinyl alcohol (PVA) glue.

The amendments will increase the fee rates 10% to 80% depending on the materials. The increases will be implemented in two stages to reduce the impact upon enterprises. The first stage is scheduled to come into effect on 1 March 2016 and the second stage on 1 March 2018. The new fee rate for glass containers will be implemented on 1 January 2017.

Waste

Licensed Operator Caught Treating Waste Illegally

The EPA's Northern Branch of the Bureau of Environmental Inspection, the New Taipei City Environmental Protection Bureau, the New Taipei District Prosecutor's Office and the police recently uncovered a case of a licensed waste clearance operator who illegally treated waste mixed metals. A number of offenders were arrested in the act, and production and clearance equipment were confiscated. All those involved in the violation have been transferred for juridical investigation.

On 12 May 2015, a joint raid was conducted involving the EPA's Northern Branch of the Bureau of Environmental Inspection, the Criminal Investigation Corps, the Luzhou Precinct of the New Taipei Police Department, and the New Taipei City Environmental Protection Bureau (EPB), under the command of New Taipei District Prosecutor's Office. The raid uncovered an illegal disposal site in Linkou (林口), New Taipei City. The inspectors found that the operator – who had a class 2 waste clearance

EPA inspectors taking samples from a manufacturing wastewater discharge outlet

license – was accepting waste such as printed circuit boards, waste electronic parts and components, waste cables and wires and was illegally crushing, pulverizing, disassembling, and vibration washing and filtering to recover the mixed metals. The inspectors also discovered nearly 100 sacks of industrial sludge believed to contain copper that were lying outdoors on a slope near the plant. Industrial wastewater from the plant's operations was also being willfully discharged into nearby surface water bodies, thus having a direct and indirect impact upon the surrounding environment.

Three violators were caught in the act at the scene and 24 pieces of production and cleaning machines were confiscated. All of the people suspected of illegal acts were taken away by the Criminal Investigation Corps of New Taipei City Police Department for questioning on record. They were then charged with violating Article 14 of the *Water Pollution Control Act* and with criminal acts under Articles 41 and 46 of the *Waste Disposal Act*, then handed over to the New Taipei District Prosecutor's Office for investigation.

The EPA stresses that it will continue to work closely and tirelessly with police and prosecutors in chasing down operators that illegally handle waste, and all other businesses that break environmental laws. The EPA-police-prosecutor joint raid regime will definitely not be halted, and environmental criminals should expect to continue to feel the full force of the law bearing down on them. Enterprises should thus ensure that they dispose of waste and treat wastewater produced in their manufacturing processes appropriately to stay on the right side of the law.

Near 100 sacks of sludge believed to contain copper dumped on a slope close to the plant

Toxic Substance

Promotional Campaign Launched for Chemical Safety on Campuses

To construct a toxin-free, healthy living environment, the EPA collaborated with the Ministry of Education (MOE) to organize a series of campus events promoting chemical safety. The campaign aims to strengthen the safety and management of laboratories on university campuses by integrating knowledge of chemical substances and disaster prevention into lively teaching materials, and to deepen learners' impressions through simulations and interactions. This campaign runs from May to November 2015 and will visit 20 universities in Taiwan.

Although chemical substances bring convenience to people's lives, knowledge of their safe use needs to be further strengthened. Universities normally use a smaller amount of toxic chemicals, but chemical substances come in great assortments and students are inexperienced in handling them. As a result, improper handling can wreak havoc and lead to environmental pollution. To strengthen response capability from the very source and reduce the risk of accidents, the EPA collaborated with the MOE to map out this year's promotional program. The program includes an indoor and outdoor curriculum, coupled with drill exercises, lectures, training sessions, and so on. Well-trained professionals will visit campuses, and through case studies, film viewings, interactive games, emergency response equipment displays, outdoor simulations, and pamphlet distribution, will impart to students accurate and practical knowledge on the prevention of toxic chemical incidents.

A total of 20 universities were selected to participate in the activity: nine in northern, six in central, and five in southern Taiwan. The participation of these universities not only will serve as models for campus promotions, but also encourage laboratory personnel to use toxic chemicals safely. Moreover, this promotional activity can raise the awareness of students and the general public regarding the hazards of toxic chemicals, reinforce the concepts and consensus for campus disaster prevention, and help improve overall campus environmental safety. The EPA expects that more than 2,000 people will attend this series of events. The kick-off activity was launched on 27 May 2015 at Fu Jen Catholic University and was attended by 250 participants from the EPA, the MOE, universities that are located in New Taipei City and industrial members of the toxic chemical substance accident joint prevention organizations.

News Briefs

Amendments to the Best Available Control Technology for Stationary Sources of Air Pollution Announced

To effectively control air pollution in Class 3 control regions, as well as the emissions of new or altered stationary sources whose emissions fail to meet standards in total quantity control zones, the EPA has reviewed and amended the *Best Available Control Technology for Stationary Sources of Air Pollution*. Amendments were announced on 26 May 2015, the main points of which are as follows:

1. New air pollution control technologies and requirements for seven industries or commercially operated manufacturing processes including the power industry, the glass industry and wastewater treatment plants for petrochemical manufacturing were added.

2. Requirements for seven manufacturing processes including steel sintering and arc furnace refinery were amended.

3. Regulations on control technologies for the optoelectronics industry and storage yards were added.

4. Flare towers were deleted as being a best available control technology for the petrochemical industry.

With the amendments in place, the EPA expects that the emission growth from newly established sources will be greatly reduced in the Class 3 control regions, and that the newly established sources will be required to adopt better control technologies to reduce air pollutants. For instance, to meet the criteria for the best available air pollution control technology for the power industry, the emission concentration of sulfur oxides have to drop to 25 ppm instead of the current 50 ppm, or the reduction rate has to reach 96% instead of the current 90%, a sharp 50% reduction in emissions. The EPA will continue to review the relevant control technologies for air pollutants in the future and adopt a rolling type evaluation process to amend its regulations on the best available control technologies. Detailed information about the current amendment can be accessed at the EPA website http://ivy5.epa.gov.tw/epalaw/index.aspx.

Environmental Education E-Books Available Online

Environmental education ebooks, published to mark the ongoing cooperation between the EPA and the National Library of Public Information, are now officially available online. As of the end of 2014, 32 complete books on subjects related to environmental education have been published by the EPA, covering topics such as air, water, waste, toxic chemicals, and environmental sanitation. The EPA invited the National Library of Public Information to create digital versions of these books and make them available on their ebook service platform for perusal by experts and scholars, students in tertiary education, and members of the public who have an interest in environmental protection.

The ebook service platform works in a similar way to a physical library. Each ebook can only be checked out to

a limited number of readers at one time, and so if the ebook is not available the next borrower must wait for one to be returned. When the book expires, the platform will automatically return it to the library free of charge. The platform supports personal computers, tablets, and cellphones, and the quick and easy downloading allows the ebooks to be read almost immediately. There are six ways that ebooks can be borrowed through the platform and so users can choose the reading mode that suits them best and download books anywhere, anytime without having to worry about fines for overdue books. More details on borrowing, reading, and returning ebooks can be found on the National Library of Public Information website http://ebook.nlpi.edu.tw/mp.asp?mp=1.

Lunbei Main Drainage Water Purification Facility Inaugurated on Hsinhuwei River

The EPA subsidized the Yunlin County（雲林縣）Government to construct water purification facilities at the Lunbei （崙背）Main Drainage on Hsinhuwei River （新虎尾溪）. The construction was inaugurated on 6 June 2015 and marked a step forward in the task of remediating Hsinhuwei River. The EPA will continue to pay close attention to the remediation of Yunlin's rivers and work closely with the Yunlin government so that local residents can enjoy good quality river environments.

Hsinhuwei River is 49.8 km long and most of its water comes from Jhuoshuei River （濁水溪）. The Lunbei Main Drainage accounts for 13.6% of the pollution that passes into Hsinhuwei River. Effluent from a number of piggeries and various factories in the catchment area have caused sections of the river to be categorized as medium or even heavily polluted. In 2013 the EPA approved a subsidy of NT$48.78 million to Yunlin County Government for water purification works at the Lunbei Main Drainage on Hsinhuwei River, which resulted in a gravel contact oxidation facility being constructed. This facility now treats 5,500 tonnes of wastewater per day, removing 154 kg of suspended solids and 69 kg of ammonia nitrogen, and reducing biochemical oxygen demand (BOD) by 115 kg, from the water daily. Since operations began, there has been a noticeable improvement in water quality in downstream sections of Hsinhuwei River.

Ribbon-cutting ceremony for the Lunbei Main Drainage water purification facility

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