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Recycling

Recycling Management in Taiwan

Through the implementation of the *2018-2020 Resource Recycling and Reuse Plan* (107至109年資源回收再利用推動計畫), the EPA expects Taiwan to advance toward a circular economy and achieve the sustainability goal of maximizing resource utilization and minimizing the impacts on the environment. In the future, the EPA will continue to guide enterprises to increase the value of reused resources, assist enterprises in resource recycling and reuse, and promote cooperation between industries. The EPA is also encouraging industry and academia to invest in technological development and applications to help upgrade the recycling industry.

Launched in 1997, the EPA's Four-in-one Resource Recycling Plan (資源回收四合一計畫) combines the efforts of four forces: communities, recycling enterprises, local sanitation crews, and the Recycling Fund. Its outstanding results, such as achieving a proper waste treatment rate of over 99%, are recognized the world over.

The implementation of the general waste recycling and reuse policy focuses on two tracks: resource recycling and reuse and recycling management. The goal of "strengthening recycling management" is to increase the recycling volume. The relevant measures and achievements currently being promoted are mainly as follows:

(1) Thirty-three regulated recyclable waste items under 13 categories have been announced by the EPA, and 25,444 enterprises (37,966 registrations) have registered as responsible enterprises as of the end of May 2020. From January to December 2019, the total reported operating volume was 749,855 metric tons with 1,722,378 entries of reported data audited and filed. The goal for the year was to audit the operating volume of more than 4,600 enterprises (20% of the total). From January to December 2019, the EPA completed the audit for the operating volume of 5,994 enterprises (26.5% of the total), exceeding the annual goal by 30.3%.

(2) Building storage sites: From 2020, construction of storage sites has been implemented in cities and counties. Subsidies have also been provided to build recycling and storage sites for those who need to store recyclables temporarily but have no place to store them. Furthermore, it will improve the efficiency of resource recycling operation and promote the high quality of material classification products, so as to effectively

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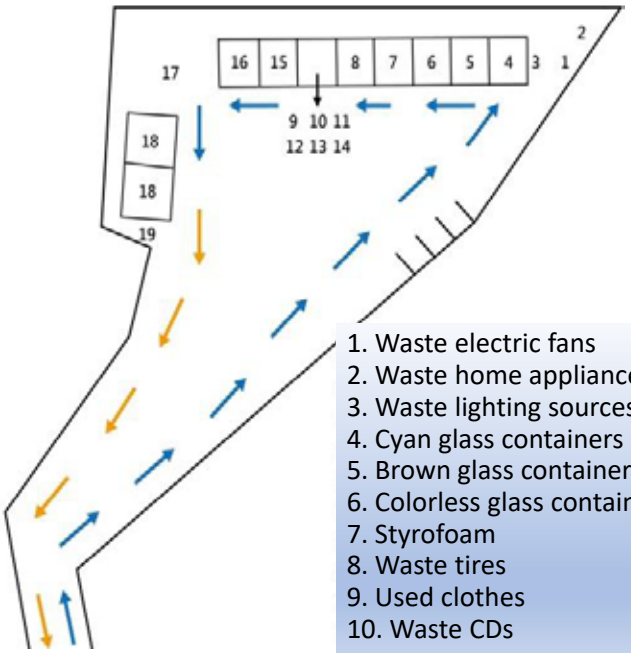
Configuration diagram of a recycling and storage site affiliated with the Madou Sanitation Crew (in Tainan City)



1. Waste electric fans
2. Waste home appliances
3. Waste lighting sources
4. Cyan glass containers
5. Brown glass containers
6. Colorless glass containers
7. Styrofoam
8. Waste tires
9. Used clothes
10. Waste CDs
11. Waste batteries
12. Waste electronic products
13. Waste keyboards
14. Waste pesticide containers
15. Scrap iron
16. Wastepaper
17. Waste shuck mattresses
18. Mixed
19. Waste cooking oil

expand their decontamination and reuse channels.

(3) Enhancing recycling by sanitation crews: Beginning from January 2020, sanitation crews were incentivized to collect and sort 14 materials or items with low recycling rates. Subsidies are calculated based on estimated recycled and sorted amounts as well as set unit prices, so the recycling rates can be raised via goal-oriented management.

(4) Optimizing recycling and storage sites: Local governments were subsidized to optimize and improve the facilities of existing recycling and storage sites, change the stereotypes of the recycling and storage sites that citizens hold, make the working environment of sanitation crews more friendly, strengthen the operation of existing storage sites, increase the recycling volume and enhance the image of recycling and storage sites.

(5) The *Recycling Care Program* (資收關懷計畫), launched in 2019, provides self-employed recyclers who sell recyclables with monthly subsidies of up to NT$3,500 per person. Local environmental bureaus are allowed to subsidize, by themselves or by commissioning welfare organizations, 8,900 registered recyclers. Starting from August 2019, self-employed recyclers have been eligible for the subsidies. Additional subsidies are given for less frequently recycled items such as electric fans, laptops, tablets, and keyboards. These measures aim to increase the income of self-employed recyclers as well as the amount of waste recycled.

In addition, in response to the COVID-19 epidemic, the monthly subsidy limit per person has been increased up to NT$5,000 from May 2020.

(6) The EPA has launched the *Paper Tableware Recycling-Friendly Shops Subsidization Plan* (紙餐具循環友善店家補助計畫) to encourage proper sorting and recycling of waste paper tableware. From 1 February to 31 December 2020, local environmental bureaus are taking inventory of eateries, providing needed guidance, and listing eateries for management. In addition, more demonstration sites will be set up to observe the recycling and sorting behaviors of the public. The observation will serve as reference for future legislation and policymaking. Meanwhile, authorities are to show target enterprises how the Plan works, offer assistance, and subsidize installation of recycling equipment. Subsidies under this Plan amount to NT$49.04 million in total.

The Plan's first trial run will audit and give advice to the targets, of which 7,210 have been registered. By promoting the setup of waste paper tableware recycling amenities and the "clearing,

sorting, and stacking" recycling steps, the EPA hopes to alter the habits of those who dine out, raise the public's awareness of waste paper tableware recycling, and increase the recycling rate from the 64% in 2018 to 80% in 2021.

Future outlook: Increasing recycling and reuse

(1) The EPA will assist enterprises to utilize recycled resources in Taiwan instead of exporting them, leading to higher profits and added value for the resources. Differentiated subsidization will be provided to enterprises to encourage technological development and strategy forming, creating positive competition for continuous progress and technology upgrades.

(2) Collaboration between different industries will be promoted. The EPA will continue to assist waste processors to work with reuse facilities or manufacturers that are able to further increase the value of recycled materials so as to form industry chains. Processing enterprises will also be eligible for higher subsidies once their applications are reviewed and approved by the EPA.

(3) Encouraging technological development and applications

To encourage academic institutions and enterprises to invest in the research and development of recycling technologies, attract talent to join the ranks of basic research, and open up more reuse channels, the EPA will publicly solicit innovative plans and R&D projects for the recycling and processing of recyclables, and subsidize public and private universities, research institutes, and waste processors to carry out recycling-related innovation, research and development. The purpose is to combine the forces of industry, government and academia to carry out the effort.

The Recycling Care Program provides self-employed recyclers with monthly subsidies.

Environmental Education

EPA Takes Climate Action to Mark World Environment Day

This year marks the 50th anniversary of Earth Day. In response to this year's theme of "climate action", the EPA held its environmental education summer events with a focus on "sufficiency in life". A retrospective exhibition was held on World Environment Day on 5 June in Tainan to remind citizens that the future environment we'll be living in depends on our action at present.

The final event was "Earth Day 50th Anniversary – Environmental Retrospective Exhibition," which took place from 5 to 7 June 2020 in Tainan. It highlighted major environmental incidents and topics, both globally and domestically, in the past 50 years. The exhibition featured an Environmental Video Zone where the environmental education documentary "Taivalu" was played daily. On the first day of the exhibition, there was also a "Conversation with EPA Minister", in which student representatives from Taiwan and US eco-campuses were invited to discuss the *National Environmental Protection Plans* with EPA Minister Tzi-chin Chang. During the activity, the students expressed their opinions on the strategies Taiwan can implement to realize the vision of "reducing carbon and disasters", "relaxing and breathing well", "enjoying clear water", "transforming waste to resources", "having zero forest loss", and "co-existing with wildlife" by 2030.

In the Actions to Protect the Planet Zone, an exhibition featured three types of postcards based on the themes of Earth Day and World Environment Day. When visitors completed the visit, they could obtain a so-called "future postcard" on which they could write down what they promised to do in their daily lives for environmental protection. The postcards would be mailed by the event organizers to the visitors three months after the exhibition as a reminder to examine their actions in light of the promises they have made and reflect on how to protect the environment in their daily lives.

Inspection

The EPA Coordinates Garbage Disposal as Incinerators Undergo Maintenance

Half of the 24 incinerators in Taiwan will one by one enter a period of major maintenance over the next five years. In addition to coordinating regional garbage disposal, the EPA will continue to actively assist local governments to strengthen temporary garbage storage and other temporary placement measures, and install their own disposal facilities. The purpose is to compensate for the deficiency in garbage disposal capacity during the maintenance period of each incinerator.

The EPA noted that with reduced garbage disposal capacity during incinerator maintenance periods, proper temporary garbage storage will be necessary to prevent it from scattering. All counties and cities are currently carrying out temporary garbage packing and storing the packed garbage temporarily in legal landfills. Proper packing can therefore reduce the space the garbage occupies while lowering the risk of environmental pollution. At the same time, the sorting step prior to the packing can also be used to separate high-heating-value materials, which can be used directly as auxiliary fuels.

Under the EPA's recently launched *Diversified Garbage Disposal Plan* (多元化垃圾處理計畫), eight counties with no garbage disposal capacity have gradually begun to plan construction of their own disposal facilities, which are expected to be finished within two to three years. These ongoing projects include gasification and high-performance disposal facilities on offshore islands, the collaboration of Hualien County with Taiwan Cement Cooperation to use its cement kilns, high-performance disposal parks planned by Hsinchu County, and Nantou County's green energy park project. Additionally, the Taitung County Government has decided to relaunch the Taitung Incinerator, which has been idle for years, and is currently going through restart procedures.

The EPA stated that it has proposed to the Executive Yuan to revise the *Diversified Garbage Disposal Plan*. It will further invest NT$1 billion to assist local governments to alleviate the piling up of garbage and expand landfill capacities. The EPA also urged everyone to work together during this difficult time to reduce incinerator loads by strengthening waste recycling and reduction.

Environmental Management

Public and Private Sectors Collaborate in Taipei 101 Offset Project

On 12 May 2020, at an EPA press conference at Taipei 101 on the Public and Private Sector Collaboration on Carbon Emission Reduction in the Residential and Commercial Sectors, the EPA pledged to reduce carbon emissions by working jointly with the civic sector. The Department of Environmental Protection of the Taipei City Government also participated in the press conference to recognize the achievements in carbon emission reduction and energy conservation of Taipei 101. The carbon offset project proposed by Taipei 101 management passed a review by the EPA on 20 March 2020, and it completed the registration process in April. This is the first offset project implemented by the residential/commercial sector and it is estimated that it will reduce emissions by 2,718 metric tons of carbon dioxide equivalent (tCO2e). Taipei 101 and the Taipei City Government can also apply for reduction credits subsequent to the implementation of the project.

EPA Minister Tzi-chin Chang (second from left), Commissioner of the Department of Environmental Protection of the Taipei City Government, Ming-lone Liou (first from right), and Taipei 101 President Angela Chang (second from right) witnessed the achievements of Taipei 101 in energy conservation and carbon reduction.

EPA Minister Tzi-chin Chang stated that Taiwan is devoted to energy saving and carbon emission reduction and is one of the few countries in the world that has written greenhouse gas (GHG) emission reduction goals into law. Emissions growth in Taiwan has slowed owing to the joint efforts of every government department. However, there is still a small gap to be crossed to reach the Phase 1 emissions control goal of a 2% reduction of domestic GHG emissions by 2020. The Phase 2 goals aim to reduce emissions by 10%. Minister Chang pointed out that even though emissions from the manufacturing sector make up 52% of total emissions, the residential/commercial sector still accounts for 20%. Hence, the EPA has reviewed and simplified the application procedures for micro-scale offset projects to encourage participation of the residential/commercial sector.

According to the Commissioner of the Department of Environmental Protection of the Taipei City Government, Ming-lone Liou, the main source of carbon emissions in Taipei City is from the residential/commercial sector. Due to its hard work to promote energy conservation in this sector, among Taiwan's six major cities, Taipei City is the only one that has accomplished a reduction in electricity use for three years in a row, equaling 2.58% of energy saved. With Taipei 101 leading the way, the commissioner anticipated more residential/commercial properties will participate, and he encouraged other department stores in Xinyi District to follow suit and make the district a center for carbon reduction.

Commissioner Liou indicated that Taipei 101 not only achieved the Leadership in Energy and Environmental Design Platinum status as a green building but also assisted the Department of Environmental Protection of the Taipei City Government with air quality monitoring. Taipei City will receive 50% of the reduction credits from this offset project, which can be used to offset the carbon footprint produced in international events in the future.

Taipei 101 President Angela Chang stated that Taipei 101 has been selected as one of the "50 Most Influential Tall Buildings" in the world, hence it has the corporate social responsibility to take the lead in environmental protection. Taipei 101 management started with disclosing the building's carbon footprint and worked with the government to come up with feasible emission mitigation measures. This time, Taipei 101 voluntarily launched the offset project in support of government policies, which makes it the first micro-scale offset project implemented by the residential/commercial sector. The reduction credits earned can also be used for its New Year fireworks shows.

To promote emission reduction in the residential/commercial sector, the Department of Environmental Protection of the Taipei City Government also assisted Taipei 101 to apply to be the first of the residential/commercial sector micro-scale offset projects. Being an iconic establishment in the residential/commercial sector, Taipei 101 not only conducted a voluntary GHG inventory, but also disclosed information on its corporate social responsibility report. To further reduce emissions, Taipei 101 formulated a new plan last year that entails the replacement of lighting systems in its underground parking lot with 2,841 LED light bulbs. The plan is estimated to save 7.7% of electricity per year, or 510,000 kWh of electricity.

Water

Water Quality Improvement Projects

In line with the *National Water Environment Improvement Plan* (2017 to 2021) of the Ministry of Economic Affairs (MOEA), the EPA has incorporated waterfront environments into its overall planning to improve the quality of water bodies. Out of the budget for all 67 water environment highlight spots maintained by different agencies, the EPA alone has been allocated over NT$6.4 billion. In addition, NT$3.7 billion has been earmarked for the *Sustainable Water Quality Promotion Plan* (2020 to 2023) to improve the water quality of seven designated rivers from the "seriously polluted" category to the "moderately polluted" category.

Due to people's increasing concerns and demands on the environment, Taiwan's current environmental policies are based on maintaining public health and building high-quality living environments with "clean air", "circular economy", "water quality improvement", "sustainable generations", "environmental friendliness", and "life quality improvement" as the main focuses. The EPA works with local governments to implement these policies, among which improving water quality is one of the priorities.

Ⅰ. Total amount of water pollution generated in Taiwan

The total amount of water pollution generated in Taiwan is approximately 2,075 metric tons/day (based on the biochemical oxygen demands (BOD)), including 1,044 metric tons/day (50.3%) in municipal wastewater, 470 metric tons/day (22.2%) in industrial wastewater, and 571 metric tons/day (27.2%) in agricultural wastewater. The wastewater is treated by sewage systems or treatment facilities until it meets the *Effluent Standards* (放流水標準), and is then discharged to water bodies. The total pollution reduction is 1,442 metric tons/day, and the remaining pollution discharged is 634 metric tons/day, meaning 69.5% of the total generated pollution is removed. In the discharged wastewater, municipal wastewater takes up the highest percentage.

Ⅱ. Current implementation of pollution reduction measures

1. Amendments of water pollution control regulations
   In 2019, the EPA amended items in the *Regulations for Determination of Fines Under the Water Pollution Control Act* (違反水污染防治法罰鍰額度裁罰準則), tables and items in the *Water Pollution Control Measures and Test Reporting Management Regulations* (水污染防治措施及檢測申報管理辦法), and itmes in the *Effluent Standards*. The EPA also announced revisions to the *Water Pollution Control Act Enterprise Classification and Definitions* (水污染防治法事業分類及定義).

2. Collection and usage of water pollution control fees
   The collection of water pollution control fees began on 1 May 2015, and the targeted entities included enterprises (including livestock industry) and operators of wastewater systems in industrial parks, as well as operators of dedicated wastewater systems in other designated regions or premises. By 29 February 2020, the total amount collected was NT$1,656,990,000, of which 40% (NT$662,790,000) has been allocated to the EPA and 60% (NT$994,190,000) to local governments.

Improving water body quality

The average national river pollution index (RPI) droped from 3.9 in 2001 to 2.5 in 2019, showing an improvement trend in the river water quality. In 2019, there were nine monitoring stations with average RPI showing severe pollution levels, fewer than that in 2018 and 2017.

Reducing household wastewater pollution

The EPA has been coordinating with the Construction and Planning Agency, Ministry of the Interior (MOI) and other competent authorities in charge of sewers to expedite public sewage system construction or projects that connect households with sewage systems. Priorities are given to rivers or river sections that are severely polluted with excessive amounts of household wastewater.

For the watersheds of severely polluted rivers that have yet to connect to public sewage or have public sewage constructed, subsidies have been provided for projects like wastewater interception or onsite purification

and treatment. As of the end of 2019, improvement projects had been completed at 151 sites with a daily total capacity of 1.23 million metric tons of household wastewater intercepted and treated.

Reducing enterprise wastewater pollution

Local governments are urged to actively investigate major violations such as rerouting discharge or unpermitted discharge, confiscate illegal gains, and punish violators. As for regions densely populated with enterprises or with major pollution hotspots, the joint force of the EPA's Environmental Police Unit, the environmental police of the MOI's National Police Agency, and regional competent authorities, has increased efforts to investigate and stop environmental pollution.

In addition, the EPA has given top priority to remediating some surface water bodies by selecting key water quality monitoring stations and integrating central and regional resources. Selections are based on river pollution levels and whether there's excessive heavy metals (at rivers and water intake points for different uses).

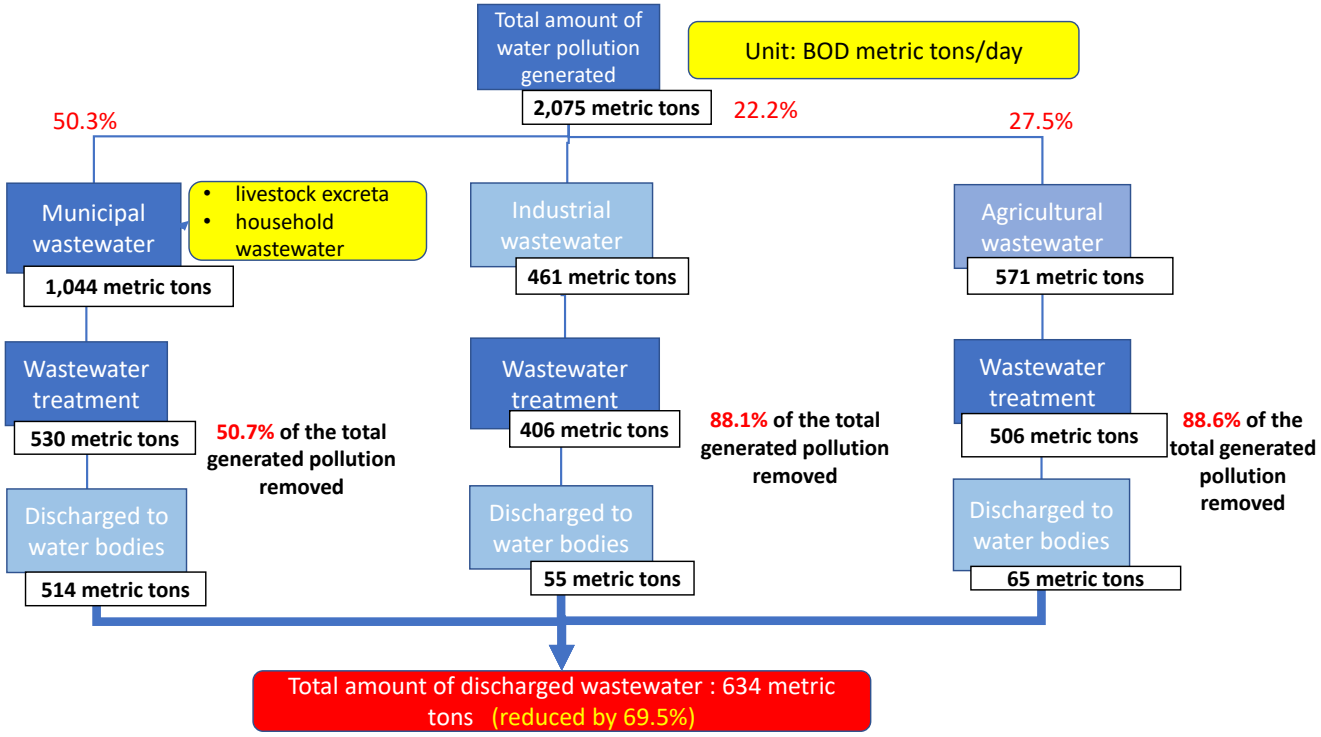
And for severely polluted rivers and water bodies under special protection, the EPA continues to supervise and assist local governments in the implementation of total mass based control, or works to tighten the *Effluent Standards*.

Reducing livestock wastewater pollution

From 27 December 2017 to 8 March 2019, the EPA revised and announced the *Water Pollution Control Measures and Test Reporting Management Regulations* (水污染防治措施及檢測申報管理辦法) to intensify implementation efforts and reach the set goals faster. The Regulations specify the ratio of livestock wastewater reutilization to encourage small-scale livestock enterprises to adopt reutilization measures, and simplify application and review procedures for enterprises with fewer than 200 pigs. Livestock wastewater reutilization refers to the use of digestate sediment and fluid as farmland fertilizers, animal excreta recycling under the *Regulations Governing the Recycled Use of Agricultural Wastes* (農業事業廢棄物再利用管理辦法), and use for plant irrigation that is compliant with the *Effluent Standards*. By the end of April 2019, a total of 1,278 livestock farms were practicing excreta reutilization.

Collecting, treating, and reutilizing animal excreta from other livestock farms

On 23 February 2018, the EPA



Total amount of water pollution generated in Taiwan

announced plans to subsidize local governments to install reutilization facilities to treat animal excreta from other livestock farms. The goal is to promote centralization of excreta treatment and reutilization. A total of nine applications had been approved by the end of January 2020, processing excreta from 79,117 pigs and 697 cows in 30 farms.

Easing livestock industry's burden in transporting digestate fluid and increasing irrigation flexibility

On 10 May 2018, the EPA announced plans to subsidize local governments to purchase livestock excreta transporting vehicles, irrigation vehicles and machinery, and storage tanks in farmlands. As of the end of January 2020, local governments had been subsidized to purchase 35 vehicles for transporting and irrigating digestate sediment and fluid and 64 farmland storage barrels.

Ⅲ. Future implementation

1. National Water Environment Improvement Plan
   To be in line with the MOEA's *National Water Environment Improvement Plan*, the EPA has put waterfront environments in its overall planning consideration. The MOEA has been integrating different agencies' resources to work on enhancing water environments, intercepting wastewater, improving sewage systems, and promoting water purification and wastewater treatment facilities. The goal in the first stage (2017 – 2021) is to create 67 water environment highlight spots covering 305 hectares of waterfront leisure space. The EPA has given top priority to rivers or river sections with medium or worse pollution levels, as well as areas with no sewage systems or whose households cannot be connected to existing sewage systems within a short period of time, and is subsidizing local governments to install water quality improvement equipment, such as gravel contact oxidation or aeration facilities so as to enhance wastewater interception and treatment.

   The first stage of the *Forward-Looking Infrastructure Plan* spanned from September 2017 to August 2021. The *National Water Environment Improvement Plan's* budget for the EPA alone amounts to NT$6.465 billion, 85.1% (NT$5.503 billion) of which are earmarked for expenditure on capital items. The second stage (2019 – 2020) special budget also allocated a total of NT$1.7 billion to the EPA in 2020.

2. Sustainable Water Quality Promotion Plan
   The plan specifically targets seven rivers, including Nankan River, New Huwei River, Erren River, Laojie River, Beigang River, Donggang River, and Jishui River. The goal is to lower the percentage of ammonia nitrogen levels and improve the rivers' status from severely polluted (>3mg/L) to moderately polluted (≦3mg/L). The percentage of ammonia nitrogen levels lower than 3 mg/L as determined by station samples is to be raised from 53% to 70%. The plan spans from 2020 to 2023 and was allocated a total budget of NT$3,727,127,000.

Waste

Heavier Penalties Planned for Listed Enterprises Violating the Waste Disposal Act

The EPA preannounced revisions to Article 2 of the *Regulations for Determination of Fines of Violations of the Waste Disposal Act* (違反廢棄物清理法罰鍰額度裁罰準則) to induce waste producers to take responsibilities. Violators' financial capacities are to be considered in fine calculation.

The EPA noted that the *Regulations for Determination of Fines of Violations of the Waste Disposal Act* (hereinafter as the "Regulations"), announced on 28 May 2019, specify how fines are calculated based on the type of violation of the *Waste Disposal Act*. The fine calculation methods are clearly stated in Tables 1 to 4 as references for authorities that issue penalties.

The EPA expressed that, besides issuing fines in accordance with the Regulations, the penalized parties' financial resources can also be considered in the fine calculation based on Article 2, paragraph 1 of the Regulations. With greater financial capacities and larger

operation scales, exchange or OTC-listed enterprises often have access to more social resources and also produce more industrial wastes. For environmental justice and to discourage illegal practices, these enterprises shall shoulder more environmental responsibility.

For this reason, the EPA preannounced the addition of paragraph 2 to the Regulations' Article 2 to incorporate whether violators are exchange or OTC-listed enterprises as a determining factor in calculating a fine.

Waste

Waste Solar Panels Recycling and Disposal Mechanism Launched with Mandatory Registrations

Along with Taiwan's ongoing green energy development efforts, the EPA has established a complete recycling, clearance, and disposal system in anticipation of waste solar panel disposal in the future. A batch of 50 waste panels retired from a solar photovoltaic installation in Penghu and was properly disposed of recently

This recycling, clearance and disposal system, jointly developed by the EPA and MOEA's Bureau of Energy (BOE), is currently run by Taiwan Photovoltaic Industry Association. Installers of photovoltaic generation equipment, they pay recycling and clearance fees in advance, and then professional disposal enterprises are commissioned for the recycling work.

Large-scale photovoltaic power generating enterprises are required to register the serial number of each solar panel with the BOE and also pay the recycling and clearance fees. When panels are to be replaced, enterprises must register online, gather the old panels together in line with regulations, and have clearance enterprises dispose of them. Households, campers or those who use a small number of solar panels can also call a dedicated number for disposal-related assistance.

Not only does this system prevent waste panels from being dumped randomly causing pollution, it can also actively promote reutilization, creating a circular green energy economy. Random dumping of waste panels or clearance and disposal by illegal means can lead to penalties of up to NT$3 million according to the *Waste Disposal Act*.

According to Taiwan's green energy policy, photovoltaic generation capacity is set to reach 20 gigawatts in five years. Presuming the life cycle of solar panels is 20 years, there would be over 100,000 metric tons of waste panels per year starting from 2035. Additionally, annual generation of waste panels due to natural disasters is estimated to be about 0.5% of annual panel installation. Random dumping can lead to pollution caused by heavy metals leaked from circuit boards, which is why the EPA has preemptively planned and developed this recycling system.

Solar panels are mainly composed of glass (74.16%), aluminum (10.30%), silicon (3.35%), copper (0.57%), precious metals, and plastics. Many of them can be recycled and reused after proper sorting and dismantling. At present, enterprises use heat treatment (melting or "hot knife method") to separate glass and battery sheets and reuse them.

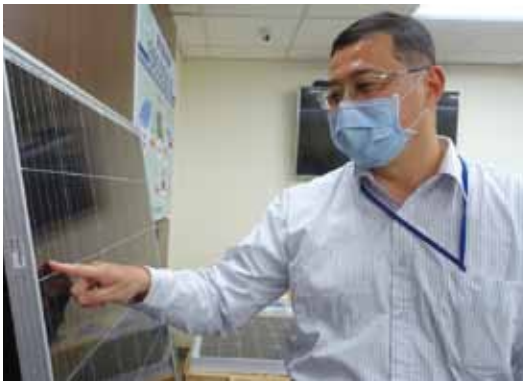
This recycling system set up by the EPA requires registration from installation to disposal to ensure that every solar panel is properly recycled. Enterprises which registered their solar panels before 18 December 2019 are encouraged to go to the Waste Solar Panels Recycling Service Management Information System to register when they will dispose of them. For those that registered after that date, the BOE will provide the electronic data and import them directly into the Information System.

Online application is mandatory to dispose of used solar panels. The approval is mainly based on checking the module serial number, supplemented by the case-by-case total quantity control of individual sites. The goal is to ensure that each decommissioned panel can be traced back to the registration of individual sites.

Four steps are required to recycle waste solar panels: asking, filling out, gathering, and collecting.

Photovoltaic equipment owners or people who have waste panels can dispose of them by themselves or by commissioning certified publicly or privately run waste clearance enterprises to do so. Also, they can go to the Waste Solar Panels Recycling Service Management Information System (https://pvis.epa.gov.tw) to register relevant panel decommissioning information. When the number of registered waste panels reaches 50, a case will be set up to deploy clearance enterprises to handle them. Aside from power generating enterprises, households that install small-scale solar panel systems can use the online registration system to properly dispose of their waste panels. As for gasoline and diesel used in land transportation, the carcinogens benzene and PAHs, which can affect the environment and human health, are subject to tighter control. The maximum benzene content in gasoline has been tightened from 1% to 0.9%, and the maximum PAH content in diesel from 11% to 8%. The revision was made to safeguard air quality and protect human health by reducing the risk of exposure to carcinogens.

The EPA stated that, with the *Standards for Fuel Compositions of Mobile Sources* taking effect in on 1 July 2020, CPC Corporation, Formosa Petrochemical Corporation, and other fuel providers will begin to provide products compliant with the latest standards. Users of all transportation vehicles are urged to use such products instead of recycled or mixed fuel products of unknown origins to help improve air quality. Moreover, in an attempt to improve recycling technology and develop high-value applications, the EPA has been working with industry and academia on developing continuous waste tire devulcanization recycling technologies. These technologies can be used to produce high-quality recycled rubber suitable for making various rubber products. The next step is collaborating with factories for mass production to further diversify processing technologies, increase reutilization values, and create more green business opportunities.



The serial number of each waste solar panel helps confirm the production source.

Climate Change

State-Run/Owned Enterprises Reach Excellent Carbon Reduction Results Under the EPA's Supervision

The EPA continues to cooperate with the Ministry of Economic Affairs (MOEA) on the inventory of carbon reduction achievement by state-run enterprises. Taking Taichung Power Plant as an example, the air pollution emission of this plant in 2018 was 23% less than that in 2016, a result from implementing measures like reducing coal and increasing natural gas use, installing wet electrostatic precipitators on existing coal-burning power generators, improving coal pulverizers, updating gas desulfurization equipment, and improving catalytic denitrification equipment. It is estimated that the reduction in 2020 can reach 48%, which is better than the result from simply cutting down coal use by 40%.

Besides Taichung Power Plant, the EPA emphasized that Dragon Steel Corporation (DSC) in central Taiwan has also completed projects, including enhanced coke oven gas desulfurization, installation of dust-collection equipment on coke conveyor systems, and automatic temperature control projects in hot rolling mills. DSC will continue to work on projects to bring material piles indoors and improve control equipment.

Through pollution reduction inventorying, the EPA has promoted various air pollution prevention and control projects in state-run/owned enterprises, such as TaiPower, China Steel Corporation, China Petroleum Corporation, Dragon Steel Corporation and China Ship Building Corporation. From 2016 to 2019, air pollution reduction of over 9,000 metric tons have been achieved. As a result of

these and other pollution measures, concentrations of air pollutants in counties and cities throughout Taiwan were shown to be on a downward trend. In addition, in order to ensure that state-run/owned enterprises implement air pollution control and improvement tasks according to the planned schedule, the improvement tracking and review meetings originally presided by the MOEA are presided by both the EPA and MOEA as of the first quarter of 2020. This was done to enhance the administrative supervision and reviewing capacity for strict monitoring of air quality improvement efforts.

EPA Deputy Minister Shen Chih-hsiu (second from the left) visits a state-run/owned enterprise to inspect progress on carbon-reduction.

Taking the air quality in Taichung as an example, the EPA noted that it has seen significant improvement as the number of monitoring stations showing red alert days (average daily $PM_{2.5}$ concentration≧54μg/m^3) was lowered from 71 stations in 2016 to five stations in 2019, a 93% drop. The monitoring data has shown the average $PM_{2.5}$ went down from 21.8μg/m^3 in 2016 to 17.2μg/m^3 in 2019, a 21% improvement. All show that Taiwan's air pollution control strategies have been effective leading to continual air quality improvement.

The EPA emphasized that coal use reduction is not the only means to reduce air pollution, and it will continue to strengthen the promotion of different control measures under the authority of the *Air Pollution Control Act* (空氣污染防制法). These measures include source control measures such as setting fuel composition standards, management and preventive measures such as improving fuel use permit criteria, stationary source operation permit management, and end-of-pipe control measures such as reviewing and tightening emission standards for different industry categories and pollutant types. Along with these measures the EPA will also promote the best available control technologies and the designated pollutant reduction system for existing pollution sources in Class 3 control regions. The goal is to maximize emission reduction through multiple means and improve overall air quality. By reviewing control measures, the EPA also aims to integrate the capabilities of government agencies and strengthen the cooperation between the central and local governments.

Air

Stricter Standards for Fuels of Land, Marine, and Air Vessels Effective in July

On 20 March, the EPA revised and announced the *Standards for Fuel Compositions of Mobile Sources* (hereinafter the Standards). The revision added standards for marine vessel fuels and aircraft fuels to the original standards named *Standards for the Composition of Automobile Gasoline and Diesel Fuels* and tightened the standards for gasoline benzene content and diesel polycyclic aromatic hydrocarbons (PAHs) content. The new standards, expected to take effect on 1 July 2020, are in line with and, in part, exceed the European and American ones.

The EPA noted that burning fuels leads to generation of pollutants like sulfur oxides and hydrocarbons and causes problems such as odors, acid rain, and smog. Governments are increasingly tightening controls on mobile source fuel contents. Aiming to improve air quality, the EPA

amended the existing standards and expanded the control targets so as to strengthen source control.

The newly added regulations concerning marine vessel fuels is aimed at the control of sulfur content. Fishing boats and other marine vessels are to switch from the previous fuels with maximum 3.5% sulfur content to ones with 0.5% or lower sulfur content. This move shows Taiwan's efforts to voluntarily follow international conventions.

The *Commercial Port Law* (商港法) has since 2019 mandated that international shipping vessels are required to switch to fuels with 0.5% or lower sulfur content after entering international commercial port areas. The data of air quality monitoring stations in Keelung and Siaogang, Kaohsiung show a 29% and 45% drop in sulfur dioxide concentration in the air respectively between 2018 and 2019.

The Standards, after taking effect, will require all vessels and fishing boats to use fuels of 0.5% or lower sulfur content, and are expected to cut sulfur dioxide emissions by 5,229 metric tons. The EPA further estimated a 9% and 16% drop in sulfur dioxide concentration in the air of Keelung and Siaogang respectively between 2019 and 2020.

The EPA stated that it will conduct inspections on all vessels in industrial ports, special loading docks, fishing ports, international and domestic commercial ports and other waters. The operation will be jointly carried out with the Ocean Affairs Council, the Coast Guard Administration, and local environmental bureaus.

Although it is not a member of the International Maritime Organization (IMO), Taiwan voluntarily abides by the regulations concerning low-sulfur fuels under the International Convention for the Prevention of Pollution from Ships (MARPOL). This has not only significantly improved air quality but also helped Taiwan's ports maintain excellent reviews among its peers around the globe.

The Standards have also lowered the maximum sulfur content in aircraft fuels from 0.3% to 0.2%, 1/3 stricter than previously and surpassing the standards of many countries.

As for gasoline and diesel used in land transportation, the carcinogens benzene and PAHs that can affect the environment and human health are subject to tighter control. The maximum benzene content in gasoline has been tightened from 1% to 0.9%, and the maximum PAH content in diesel from 11% to 8%. The revision was to safeguard air quality and protect human health by reducing the risk of exposure to carcinogens.

The EPA stated that, with the *Standards for Fuel Compositions of Mobile Sources* taking effect in on 1 July 2020, CPC Corporation (CPC), Formosa Petrochemical Corporation (FPC), and other fuel providers will begin to provide products compliant with the latest standards. Users of all transportation vehicles are urged to use such products instead of recycled or mixed fuel products of unknown origin to help improve the air quality. Moreover, in an attempt to improve recycling technology and develop high-value applications, the EPA has been working with industry and academia on developing continuous waste tire devulcanization recycling technologies. These technologies can be used to produce high-quality recycled rubber suitable for making various rubber products. The next step is collaborating with factories for mass production to further diversify processing technologies, increase reutilization values, and create more green business opportunities.

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For inquiries or subscriptions, please contact:
Environmental Policy Quarterly
Office of Sustainable Development
Environmental Protection Administration
83, Sec. 1, Zhonghua Rd., Taipei 100, R.O.C. (Taiwan)
tel: 886-2-2311-7722 ext. 2217
fax: 886-2-2311-5486

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