Major Environmental Policies

September 2023

1. Feature Article: Upgrading Environmental Management to Improve Taiwan's Environment

Established on 22 August 2023, the Environmental Management Administration (hereinafter referred to as EMA) will continue to uphold the spirit of environmental protection passed down by the former Environmental Protection Administration (EPA) with four visions for the future: "proper disposal of general waste," "improvement of environmental hygiene and quality," "technological law enforcement to protect the environment," and "sustainable management of soil and groundwater."

The EMA oversees tasks related to environmental inspection and soil and groundwater remediation

With the upgrade of the EPA to the Ministry of Environment (MOENV), the EMB was formed by merging the Bureau of Environmental Inspection and the Soil and Groundwater Pollution Remediation Fund. It now oversees tasks related to general waste management, environmental hygiene, environmental law enforcement, and soil and groundwater pollution, among others.

In the area of general waste disposal, the EMA will continue to assist local governments in establishing and optimizing environmental facilities. It is promoting the upgrade and maintenance of incineration plants to ensure a stable incineration capacity. Through the revitalization and overhaul of landfills, it aims to increase landfills' capacity for multiple functions, including temporary storage, sorting, diversion and transportation of waste, recycled aggregate banks, mechanical sorting, green energy generation, and packaging and temporary storage. This will allow landfills to play a new role as a buffer and adjustment facility. These public environmental facilities can generate approximately 3.7 billion kilowatt-hours of electricity annually, which can provide electricity for approximately 920,000 households for a year and reduce 1.85 million metric tons of carbon emissions. A triple-win of proper waste disposal, resource circulation, and energy transformation can therefore be achieved.

As for the improvement of environmental hygiene and quality, the EMA is promoting a policy to optimize the working environment for cleaning personnel by ensuring their clothing is easy to wash and wear and that their working environment is safe. This includes updating their uniforms and replacing or upgrading garbage trucks. A platform for occupational safety promotion has also been established to comprehensively care for the more than 35,000 unsung heroes nationwide who maintain the cleanliness of our environment. Additionally, funding will be allocated for repairing or constructing public restrooms, incorporating smart management and the concept of green energy and carbon reduction. This will enhance existing restrooms and achieve the goal of making public restrooms clean, dry, and odor-free, ultimately improving the image of the nation's restrooms and overall environmental hygiene while also promoting tourism.

Regarding technological environmental law enforcement, the EMA will focus on pollution prevention and prioritize remote enforcement as an important policy. It will adopt a forward-thinking approach in planning strategies for comprehensive environmental improvement, including the development of "smart fence systems" for air, water, and waste pollution, as well as diversifying the methods for environmental impact assessment inspection to move forward with remote enforcement. In addition, the EMA will assist local governments in increasing inspection personnel. A multi-pronged

approach of using digital technology for pollution prevention, enhancing inspection capacity, and enabling real-time response at pollution sites will be taken to prevent the spread of pollution.
As for sustainable management of soil and groundwater, the EMA will utilize the Soil and Groundwater Pollution Remediation Fund to integrate resources across domains. It aims to establish long-term and effective monitoring and warning procedures to protect soil and groundwater. The goal is to prevent contamination at the source and protect farmland. In addition to promoting comprehensive site pollution remediation, it is also addressing the challenges posed by climate change by promoting green, sustainable and resilient remediation concepts and techniques. Moreover, the EMA is promoting the allocated utilization of national (public) lands and inter-ministerial cooperation. It is assisting environmental authorities and site owners to implement risk management, improvement and utilization operations. This is aimed at increasing the proportion of land resources that can be reused, ultimately achieving sustainable land use.

Future outlook

Looking ahead, the EMA will allocate NT$4.25 billion in 2024 for key tasks, including optimizing environmental facilities, transforming landfills, ensuring the cleanliness of forests and coastlines, caring for cleaning personnel, improving environmental hygiene, promoting high-quality public restrooms, applying technology to environmental law enforcement, sustainable management of soil and groundwater resources, and establishing an environmental management cloud to enhance the overall environmental quality nationwide.
The EMA stated that it would promote communication about the legislation of *Environmental Quality Enhancement Act* to create high-quality environments, enhance the effectiveness of general waste removal and disposal, and improve environmental hygiene and the quality of life for citizens. It will effectively utilize public construction projects, social development plans, and the Soil and Groundwater Pollution Remediation Fund to further upgrade environmental management, giving Taiwan a better environment.

The EMA continues to uphold the spirit of environmental protection passed down by the former EPA

2. **Latest Air Pollution Inventory Shows 19% Reduction Compared to Last**

Edition

On 15 September, the MOENV published on its official website (https://gov.tw/oU4) the 2021 report in the Taiwan Emission Data System (TEDS), an inventory of air pollution emissions. It shows that the emissions of major air pollutants have decreased by nearly 19% compared to the previous report (reference year 2019). When comparing the monitoring data for fine particulate matter ($PM_{2.5}$), the annual average concentration has also decreased from 16.2 mg/m^3 in 2019 to 14.4 mg/m^3 in 2021. This indicates that the joint efforts of the central and local authorities in promoting air pollution control measures have been effective.

The latest emission inventory (TEDS 12) shows a continuous decrease in major air pollutants. Among them, $PM_{2.5}$ emissions have decreased by 23.5%, sulfur oxides (SOx) by 19.6%, nitrogen oxides (NOx) by 17.7%, and non-methane hydrocarbons (NMHC) by 19.2%. Moreover, the emission inventory used to be updated every three years in line with the practice of advanced countries such as the United States. However, with improved operating methods, it can now be updated biennially.

The MOENV provided the reasons for the reduction in air pollution emissions in 2021. The main reasons include the continued implementation of air pollution control programs and the impact of the COVID-19 pandemic, which resulted in some changes in economic activities. In the industrial sector (point sources), even though there was a 7% increase in energy consumption and a 9% increase in the number of regulated factories in 2021 compared to 2019 due to the increase of overseas business orders shifting to Taiwan, the major air pollution emissions still decreased by 8.5% from those of 2019. This reduction is attributed to cross-ministerial promotion of boiler improvements (2,502 units) and improvements in state enterprises, such as Taiwan Power Company, as well as stricter control measures.

In the transportation sector, in 2021, due to the increased demand for logistics and transportation during the Level 3 pandemic alert, the total mileage of diesel trucks increased by 5%. However, there was a 7% reduction in the mileage of private cars. In addition, the MOENV's efforts to replace old diesel vehicles (24,000 vehicles) and old motorcycles (1,298,000 vehicles) have yielded significant reduction results, leading to a 26.5% decrease in major air pollution emissions.

As for other types of air pollution, in 2021, the total area of construction projects increased by 46% compared to 2019, leading to increased pollution. However, in 2021, the MOENV tightened the regulations in the *Management Regulations for Construction Project Air Pollution Control Facilities* (營建工程空氣污染防制設施管理辦法) and enforced stricter limits on the sulfur content of marine fuel. It also promoted the use of straw-degrading fungi, reduced burning of joss paper by 10%, and provided guidance for kitchen smoke improvement in the food industry, resulting in a reduction of 23% in major air pollution emissions.

The MOENV emphasized that while there has been a trend of reduced air pollution emissions in recent years, achieving further reductions is becoming increasingly challenging. In addition to the implementation of the first phase of Air Pollution Control Program (from 2020 to 2023), which has resulted in improved air quality after the pandemic, the ministry has formulated the second phase of the Air Pollution Control Program (from 2024 to 2027), which is currently under review at the Executive Yuan.

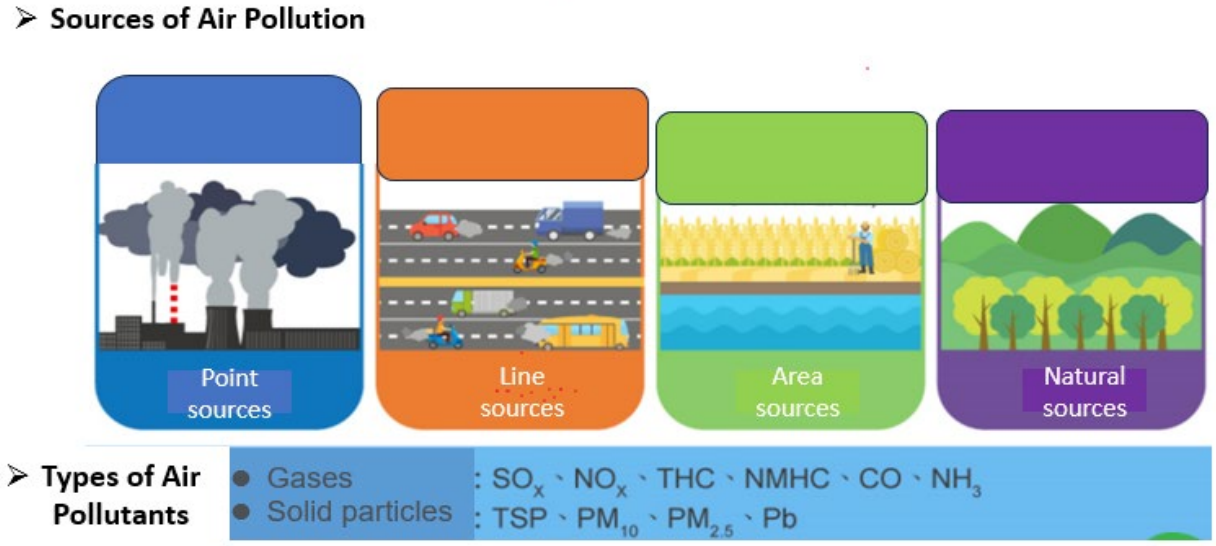


Figure: The latest Taiwan Emission Data System (TEDS 12)'s scope

3. Subsidies for Electric Buses to Be Based on the Number of Passengers to Encourage Services on High-Traffic Routes

To achieve the goal of full electrification of public buses by 2030, the MOENV announced the *Guidelines Governing the Subsidies for the Operation of Electric Buses* (補助電動大客車營運作業要點) on 21 September 2023. Instead of directly subsidizing the purchase of electric buses, the guidelines have been revised to provide operational subsidies based on the actual mileage driven and the number of passengers carried by electric buses. The subsidy cap has also been increased from NT$1.5 million to NT$1.6 million to encourage operators to run their services on high-traffic routes, thereby raising the effectiveness of carbon reduction.

To achieve the goal of "electrification and decarbonization of transportation," the Executive Yuan has approved the *2030 Passenger Vehicle Electrification Promotion Plan* (2030年客運車輛電動化推動計畫) jointly proposed by the Ministry of Transportation and Communications and the MOENV. The MOENV is responsible for implementing operational subsidies for electric public buses to encourage operators to phase out diesel buses in favor of electric ones as early as possible and prioritize the deployment of the buses on high-traffic and high-mileage routes, so as to reduce private vehicle use while achieving both carbon reduction and pollution reduction benefits.

Before 2022, the MOENV provided a one-time subsidy of NT$1.5 million per bus for the purchase of electric buses. However, starting from 2023, the subsidy application process has been revised to be based on the actual mileage driven and the number of passengers carried by electric public buses. It is no longer a simple subsidy for bus replacement. In addition, the maximum subsidy per bus has been increased to NT$1.6 million. The subsidy is allocated over a four-year period and is intended for long-distance and urban public bus operators. Subsidies are granted based on the actual mileage driven and the number of passengers carried by each bus. To account for regional differences, this subsidy program also sets different subsidy rates for counties and cities outside of the six special municipalities, as well as for areas in Eastern Taiwan and outlying islands. This is done to enhance the incentives for operators in all regions to switch to electric buses.

The MOENV estimated that the replacement demand for urban public buses, along with some highway and national highway public buses, from 2024 to 2030, will be approximately 12,170 buses. It is anticipated that once fully electrified, these buses will produce zero carbon emissions during

operation, resulting in a reduction of 307,000 metric tons of CO_2 emissions and a reduction of 4,327 metric tons of air pollutants annually. The operational subsidies are expected to incentivize operators to prioritize the operation of electric buses on popular routes, further reducing emissions by an estimated 62,000 metric tons of CO_2 and 1,450 metric tons of air pollutants annually.
In addition to the announced operational subsidies for electric public buses, the MOENV is also promoting a system for matching air pollution reduction benefits. Public bus operators who replace old diesel buses with electric ones can receive an additional subsidy of NT$30,000 per bus for air pollution reduction. They can also choose to use the Vehicle Replacement Offsets Matching Platform to match and sell their benefits to environmental impact assessment (EIA) developers in need and receive a higher amount of money.

4. List of Members of the First EIA Review Committee Announced

The MOENV has released the list of the first environmental impact assessment (EIA) review committee members. This committee includes a total of 14 experts and scholars with expertise in three major areas: living environment, natural environment, and social environment. Additionally, there are seven government representatives. The committee consists of nine female members and twelve male members (as shown in the table).

The selection of experts and scholars for the committee was conducted through an open recommendation process from late May to early June this year. The selection committee then compiled a list of candidates, which was subsequently approved and appointed by the MOENV Minister. EIA is a multidisciplinary field, and due to the limited number of experts in specific areas and restrictions on the committee's size, it is not always possible to cover all environmental aspects. As the central authority responsible for environmental governance in Taiwan, the MOENV prioritizes the appointment of expert and scholar committee members in the three major environmental domains based on its mandate for environmental protection.
As for other specialized fields, when the MOENV reviews EIA cases during the initial review phase of project teams, it may invite one to three experts or scholars from relevant professional domains to participate in the review based on the specific content and the location of the development activities. This approach helps incorporate perspectives from different fields into the EIA review process for better environmental oversight.
To improve the efficiency of reviews, the Executive Yuan has instructed all government agencies to follow the principle of parallel processing when conducting reviews in accordance with their respective governing regulations. This is aimed to avoid redundant reviews. Therefore, during an EIA review, when development activities involve matters falling under the jurisdiction of other government agencies (such as urban planning, land acquisition, wildlife conservation, cultural heritage, etc.), the relevant government agencies are requested to provide their input during the EIA review meetings. And the majority of government agencies have established review mechanisms for matters related to their respective responsibilities.
EIA is a scientific and objective investigation and evaluation process. The MOENV and the EIA review committee are determined to adhere to the principles of fairness, objectivity, and professionalism in conducting EIA reviews. This is done to uphold the principle of prevention to ensure sustainable development while safeguarding the environment of Taiwan.

Members of the 1st Environmental Impact Assessment Review Committee of the MOENV (Term: 1 September 2023 to 31 August 2025)

Name	Current Position
Shieu Fuh-sheng	Minister of the MOENV
Yeh Chun-hung	Deputy Minister of the MOENV
Yu Chien-hwa	Deputy Minister of the National Development Council
Chang Yung-ming	Secretary General of the Ministry of Health and Welfare
Fan Mei-ling	Secretary General of the Ministry of Agriculture
Hsu Tseng-ju	Director General, Department of Academia-Industry Collaboration and Science Park Affairs, National Science and Technology Council
Hsu Yen-hsing	Deputy Director-General, National Land Management Agency, Ministry of the Interior
Chiang Kung-yuh	Adjunct Professor, Graduate Institute of Environmental Engineering, National Central University
Wu Yee-lin	Professor, Department of Environmental Engineering, National Cheng Kung University
Kuan Wen-hui	Professor, Department of Safety, Health and Environmental Engineering, Meng Chi University of Technology
Chiou Chyi-rong	Associate Professor, School of Forestry and Resource Conservation, National Taiwan University
Hou Chia-hung	Professor, Graduate Institute of Environmental Engineering, National Taiwan University
Chang Chiung-fen	Professor, Department of Environmental Science and Engineering, Tunghai University
Chen Mei-lien	Adjunct Professor, Institute of Environmental and Occupational Health Sciences, National Yang Ming Chiao Tung University
Chen I-shiung	Professor, Institute of Marine Biology, National Taiwan Ocean University
Chen Yue-wen	Professor, Department of Biotechnology and Animal Science, National Ilan University
Feng Cheng-min	Professor Emeritus, Department of Transportation & Logistics Management, National Yang Ming Chiao Tung University
Huang Chihpin	Tenured Professor, Institute of Environmental Engineering, National Yang Ming Chiao Tung University
Liu Hsiao-lan	Part-time Professor, Department of Land Economics, National Chengchi University
Liou Ya-hsuan	Professor, Department of Geosciences, National Taiwan University

Chiueh Pei-te	Professor, Graduate Institute of Environmental Engineering, National Taiwan University

5. Carbon Pricing System Ready to Launch with Diverse Tools to Promote Effective Carbon Reduction

The *Climate Change Response Act* (氣候變遷因應法) was announced and implemented on 15 February this year, with the carbon fee collection system as its primary focus. It encourages regulated enterprises to take the initiative to reduce emissions, and those who achieve the specified reduction targets are eligible for preferential rates. This initiative aims to intensify and accelerate emission reductions by enterprises, while also incorporating a mechanism of granting carbon offsets for voluntary emission reduction to extend incentives to a broader range of entities. Through a variety of tools, the system is aimed to promote effective carbon reduction across Taiwan.

In Taiwan, greenhouse gas emissions are primarily from the electricity generation and manufacturing industries. The enterprises regulated by the *Climate Change Response Act* that are required to inventory and register emissions include traditional industries affecting people's livelihoods, such as electricity, steel, cement, papermaking, petrochemicals, and refining, as well as the optoelectronic semiconductor industry. These industries collectively account for nearly 80% of Taiwan's total emissions.

Carbon fee collection is implemented based on emissions to achieve the national emission reduction targets of different stages. The primary targets for the planned collection are the aforementioned electricity generation industry and large-scale manufacturing industries. According to the Climate Change Administration (CCA), starting from 2024, greenhouse gas emissions from entities subject to carbon fee collection will be accounted for carbon pricing. Preferential rates are available to enterprises that switch to low-carbon fuels, adopt negative emissions technologies, improve energy efficiency, use renewable energy, or improve manufacturing processes and are able to effectively lower emissions and meet specified reduction targets. And those who do not meet the targets in due time will be required to make payments to cover the shortfall.

The CCA stated that it aims to use a variety of mechanisms to guide enterprises to intensify and expedite emissions reductions. It is anticipated that related draft sub-laws will be proposed by the end of this year. The fee rates will be submitted for discussion to the review committee in the first quarter of next year, and they will be officially approved and announced by the MOENV.

The CCA emphasized that the carbon fee collection system is complemented by various tools, including using the inventory, audit and registration of greenhouse gas emissions to ascertain emissions, establishing emission benchmarks for enterprises to follow, and promoting voluntary emission reduction trading to extend incentives to a wider range of entities. At the current stage, draft sub-laws are being progressively preannounced, and consultation meetings are being held in preparation for the implementation of the system.

6. Taiwan and India Sign Memo to Promote Sustainable Water Environment

On 18 September 2023, the MOENV hosted the "Promotion of Emerging Wastewater Treatment Technologies and Taiwan-India Sustainable Water Environment Forum" at the Taipei International Convention Center, where the MOENV showcased achievements of its collaborative research and

development efforts with various local universities to promote emerging wastewater treatment technologies. Also, the Water Association of Taiwan (WAOT) and the Micro, Small, and Medium Enterprises Chamber of Commerce and Industry of India (MSMECCII) signed a memorandum of cooperation, aiming to advance the wastewater industry into markets of countries under the New Southbound Policy and deepen collaboration between Taiwan and India through bilateral exchanges.

MOENV Deputy Minister Shih Wen-chen stated that in response to the global challenge of achieving net-zero emissions by 2050, Taiwan has been taking concrete actions through legislative amendments and announcements of reduction pathways while assisting enterprises in their net-zero transition. In the field of wastewater treatment, in recent years the MOENV has collaborated with local universities to promote R&D of emerging wastewater treatment technologies characterized by low pollution, low energy consumption, low cost, low space utilization, and resource circulation (4L+C). Significant progress has been made in related research and development initiatives.

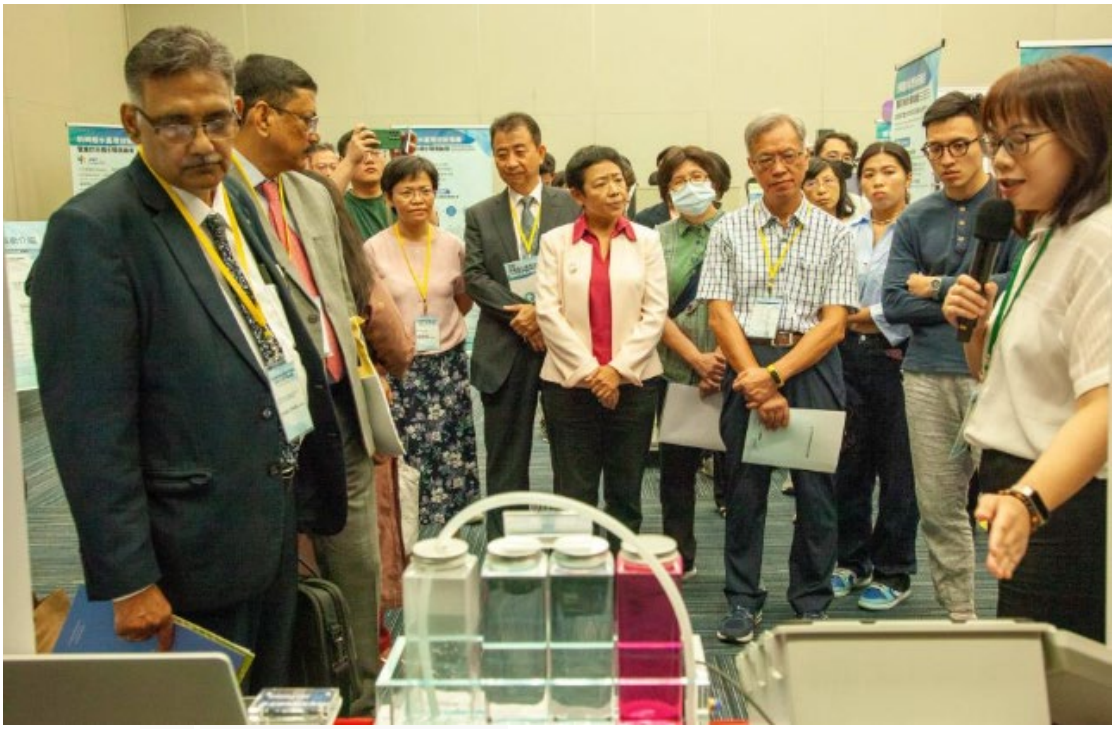
"Previously regarded as pollution, wastewater is now considered a valuable resource," stated Deputy Minister Shih, who pointed out that current technologies significantly reduce the space requirements and processing costs while effectively guide resource recycling and reuse efforts. By integrating smart cloud monitoring technology, wastewater management efficiency can be enhanced simultaneously. She further emphasized that the MOENV's perspective and approach have shifted from past end-of-pipe control to management at the source. The future direction of wastewater treatment is maximizing resource reuse and minimizing environmental impact.

At the event, 10 companies specializing in wastewater treatment equipment and smart cloud monitoring were invited to demonstrate their innovations. Take, for example, the packaged treatment system for ammonia nitrogen wastewater, which integrates film capacitors in ammonia nitrogen treatment technology, as well as ammonia nitrogen gas extraction and recycling technology. This system significantly increases concentrations of ammonia nitrogen in wastewater, facilitating its subsequent conversion into liquid ammonia and ammonium salts for reuse as raw materials. This resource-oriented approach replaces traditional method that treats the substance as pollutant and holds significant potential. Already some semiconductor enterprises are showing keen interest in adopting such technology. Furthermore, the application of catalytic oxidation-reduction technology and bio-ball technology has yielded practical results. An enterprise in Hsinchu Science Park has already employed in its factory catalytic technology to treat the high-concentration organic nitrogen wastewater generated by detergents, reducing operational costs and occupied space by approximately one-third compared to the traditional chemical methods. Bio-ball technology has been applied in treating domestic wastewater in a technology park and also wastewater from stainless steel production in the Changhua Coastal Industrial Park. It has resulted in an 80% reduction in sludge volume compared to the traditional biological treatment with the addition benefits of reducing space and processing costs, demonstrating its commercial value.

The focus of this forum was the collaborative exchange on water quality protection between Taiwan and India. The MOENV invited experts from India’s Ministry of Housing and Urban Affairs to deliver keynote speeches on opportunities in India's water, wastewater, and smart systems, as well as how Taiwan can assist it in achieving sustainable development goals. Additionally, among the forum invitees were three senior executives from Delhi State Industrial and Infrastructure Development Corporation (DSIIDC), who were interested in the feasibility of applying Taiwan's technologies and equipment to improve wastewater treatment facilities in 15 industrial zones in the Delhi region.

The MOENV stated that Taiwan and India have begun to engage in exchanges in the field of wastewater treatment since 2017. Taiwan possesses highly mature wastewater treatment technologies, and local companies have been actively visiting India to share their experience and

develop initiatives. This forum witnessed the signing of a memorandum of cooperation between the WAOT and the MSMECCII, setting a solid foundation for mutual cooperation. Both organizations will jointly promote wastewater treatment technologies and work toward achieving net-zero carbon emissions.



Deputy Minister Shih Wen-chen (middle front) and Indian representatives visited the exhibition venue

7. Training Incorporates VR and Simulations to Enhance Response to Chemical Disasters

The MOENV's Chemical Administration (CA) has introduced a virtual reality integration of chemical disaster all-around training for the first time. In collaboration with the Industrial Technology Research Institute (ITRI), they have developed a virtual reality (VR) training module and the extended reality simulation module. The two modules encompass a total of 20 response training scenarios and 30 instructional training courses. Installed on mobile vehicles, these modules can provide on-the-move, specialized training and testing for toxic chemical disasters and help enhance enterprises' capabilities in responding to incidents involving hazardous chemical substances.

The CA Director General Hsieh Yein-rui pointed out that, with over 4,400 enterprises in Taiwan engaged in handling toxic substances and hazardous chemicals, effective disaster prevention and response requires collaboration between the public and private sectors. Currently, there are two consultation and monitoring centers as well as 10 technical teams specialized in toxic chemical disaster response across Taiwan. They are manned by 194 professionals who stand ready 24/7 to provide consultations and dispatch specialists to the scene within one hour of a toxic chemical disaster. Furthermore, they engage in preliminary onsite response on the frontline by coordinating with firefighting units and enterprises' response personnel, which has been crucial for the decrease of toxic chemical incidents over the past two years. As of July this year, there were 5,521 registered professional response personnel in various enterprises, as legally mandated. Currently, 12,771 individuals have completed the required training.

The CA and ITRI have utilized simulation training and VR technology to create a database of past toxic

chemical disasters in Taiwan for training purposes. To enhance enterprises' capability by learning from past response experiences in simulated scenarios, the simulation training modules replicate common industrial components such as valves and pipelines using 3D printing technology. These custom-made transparent pipelines and valves allow trainees to understand their operational mechanisms. Trainees can observe the flow of gases and liquids in real time, and also the dispersions of chemical gases or splashes of liquids in various scenarios that simulate pipeline leakage caused by different pressures.
Utilizing the latest technologies such as mixed reality, augmented reality, and VR, both the VR training module and the extended reality simulation module began to be developed in 2020 and have been progressively deployed in public sector's training since 2022. The VR training module features various accident settings in different venues, including high-tech factories, petrochemical plants, warehouses, and transportation premises. Simulated scenarios include fires, explosions, and pipeline leakage, all of which can also be combined to closely resemble real-life accidents.
The CA indicated that the toxic chemical disaster response training programs initially only targeted toxic substance-handling enterprises listed for control, government agencies, and professional technical teams. In response to the recent organizational restructuring, such programs have been further carried out in training for enterprises that handle hazardous chemical substances, such as high-tech factories, petrochemical plants, and warehouses. A minimum of 30 sessions, involving 2,000 participants in total, are conducted every year. The programs will be promoted during nationwide and regional toxic chemical disaster drills, on National Disaster Prevention Day, or at major events to enhance awareness. The CA will foster collaboration among the industries, the government, and academia so as to improve prevention of and response to toxic substance and hazardous chemical disasters while emphasizing proactive measures to always be at the ready. The goal is to continually enhance Taiwan's training capacity for disaster response to safeguard people's lives and properties.
These two modules include a total of 20 response training scenarios and 30 instructional training courses. Besides being available for training institutions, they are also designed to be mounted on vehicles and therefore allow for mobile deployment and providing enterprises with onsite training for toxic chemical disaster response. This way training sessions are no longer bound by physical locations and are strengthened in quality. Consultation visits and unannounced testing may be incorporated in the future to enhance response personnel's capabilities.

8. Control Tightened to Enhance Transformation of Combustible Wastes into Fuels

Taiwan has strived to facilitate conversion of combustible wastes into fuels by following the trends of advanced nations such as those in Europe and Japan. The MOENV has established relevant control systems and standards concerning solid recovered fuels (SRFs), designating both necessary facilities that are to be installed in SRF manufacturing plants and types of end-of-use facilities. Guidance will also be provided to help SRF plants enhance manufacturing techniques and quality. To prevent SRF-generated air pollution emissions, the MOENV preannounced amendments to the component standards for waste fuel as well as emission standards for boilers' air pollutants in July 2023. These amendments include additional standards for source components, specifications for pollution-control equipment during manufacturing process, and end-of-pipe emission standards. The aim is to safeguard environmental air quality by cutting down pollution, emissions, as well as waste generation.
To promote utilization of combustible waste resources as fuels, the MOENV has formulated the *Guidelines and Quality Standards for Solid Recovered Fuel Manufacturing Technology* (固體再生燃

料製造技術指引與品質規範). The regulations have outlined SRF management systems and standards, mandating SRF manufacturing factories to install necessary equipment, verify users' needs and waste characteristics beforehand to ensure employment of appropriate equipment, conduct regular sampling and testing of finished products, and sell final products directly to SRF users who meet the specified requirements. And the evaluating authorities are to coordinate evaluation of both the manufacturers and users and conduct onsite inspections so as to ensure SRF quality and proper management of SRF utilization and that the evaluating authorities will be able to follow it accordingly.

After undergoing sorting, crushing, mixing, and other processes, combustible wastes are transformed into SRFs which can substitute coal. This substitution is able to lower emissions as one metric ton of SRF can replace 0.86 metric tons of coal, resulting in reducing 0.77 metric tons of carbon dioxide emissions. This approach aligns with Taiwan's key strategy of achieving "Resource Recycling and Zero Waste" in its transition toward net-zero emissions. From 2019 to 2022, Taiwan's annual SRF production grew from approximately 50,000 metric tons to 200,000 metric tons, and the number of SRF manufacturers also rose from four to 28. Additionally, SRF usage increased from approximately 60,000 metric tons to 180,000 metric tons annually, and the number of SRF users went from four to 14.

Moreover, to prevent air pollution caused by the use of waste-derived fuels, the MOENV preannounced the amendment of the fuels' component standards in July 2023. The amendments strive to manage the end of SRF utilization via source fuel standards, mandatory facilities and pollution-control equipment for users, and regulations concerning end-of-use emissions. SRF users are required to specify the type, compositions, and quantity of fuel used in their operation permit of stationary pollution source. Users are to operate in accordance with the permit's specifications once they obtain the permit after being approved, and also adhere to relevant emission standards and regulations under the *Air Pollution Control Act* (空氣污染防制法). In addition, they are required to regularly report to municipal, county, or city authorities the previous quarter's fuel usage, operational details related to pollution-control equipment, and test results of emitted air pollutants.

The MOENV stated that, for practices turning non-hazardous and combustible waste materials such as waste plastics, paper, and wood into SRFs that meets quality standards, there are currently stringent checks in place for the source, manufacture, quality, type of end-of-use facilities, and pollution-control equipment. SRFs can substitute coals and therefore are able to reduce the environmental impact from coal mining and utilization, ultimately leading to resource circulation, zero waste, and carbon reduction.

9. Venous Industry Assisted in Conducting Carbon Inventory to Raise Competitiveness

Given Taiwan's policy and goal to reach net-zero emissions by 2050, the Resource Circulation Administration (RECA) will select 20 enterprises from this year's list of resource recirculation enterprises with green transition and carbon reduction potential and assist them in completing their greenhouse gas inventory reports (ISO 14064-1:2018). It is also training greenhouse gas inventory personnel to raise the competitiveness of Taiwan's venous industry in the era of net-zero emissions and save enterprises significant costs related to carbon inventory and personnel training.

The aforementioned list of enterprises with green transition and carbon reduction potential consists of over 1,000 companies, collectively representing more than 80% of the total operational capacity within the resource recirculation industry. The RECA has conducted visits to and assessments of

approximately 60 companies that showed high potential for carbon reduction benefits and were key targets for green transition. This was done to establish carbon emission hotspot and baseline data for the industry. Additionally, the RECA is selecting and providing guidance to 20 companies to conduct organizational carbon inventories and complete the reports. It is also assisting multiple organizations in adopting AIC (Automation, Intelligence, and Carbon Reduction) processes with the signing of MOUs. The aim is to encourage these organizations to adopt a leading role in the industry and assist smaller companies, and through the integration of industry supply chains, to develop methodologies for carbon reduction in the resource circulation industry. Furthermore, the RECA plans to formulate carbon reduction technical manuals and organize carbon reduction demonstration visits to build the carbon reduction capacity of the industry.

In addition, to assist the industry in facing future challenges related to international trade carbon tariffs (CBAM, CCA), the RECA commissioned the Office of Industrial Carbon Offset Promotions at National Chung Hsing University to conduct professional personnel training. This training has already equipped over 50 seed greenhouse gas inventory personnel, enabling them to engage in carbon reduction efforts within the industry and will contribute to the promotion of ESG (environmental, social, and governance) and CSR (corporate social responsibility) implementation throughout the entire industry chain in the future.

10. **Businesses Visit Factories that Adopt Modified Liquid Crystal Glass as Adsorption Material**

On 20 September, the MOENV's Southern Region Environmental Management Center of the Environmental Management Administration (EMA) invited businesses to visit electroplating factories in the Changhua Coastal Industrial Park that have successfully transitioned to use porous waste liquid crystal glass as an adsorption material for wastewater treatment. During the visit, the businesses learned about nanotechnologies that allow the conversion of discarded liquid crystal panel glass into a material with porous adsorption capabilities. They also experienced innovative technologies that save water and energy while reducing waste in the manufacturing process.

In the past, electroplating, metal surface treatment, and metal manufacturing industries often had to allocate a significant proportion of production costs for wastewater treatment. Inadequate wastewater treatment practices and insufficient use of treatment chemicals, driven by cost considerations, led to a high rate of non-compliance with effluent standards. In some cases, businesses resorted to risky practices such as illegal discharge through concealed pipes, resulting in pollution of nearby water bodies and consequent penalties, including operation suspension.

The Southern Region Environmental Management Center invited businesses to visit the Changhua Coastal Industrial Park on 20 September to help businesses in its jurisdiction enhance wastewater treatment technology. During the visit, they explored electroplating factories that have successfully transitioned to using porous waste liquid crystal glass developed by the Industrial Technology Research Institute (ITRI) as an adsorption material for wastewater treatment. They also gained insights into nanotechnology-related experiences that enable the transformation of discarded liquid crystal panel glass into a material with porous adsorption capabilities. This innovative technology allowed visiting businesses to experience processes that saved water, conserved energy, and reduced the costs associated with wastewater treatment and waste disposal.

In certain areas of Southern Taiwan, particularly in river basins and areas such as the Erren River, Yanshui River basins, as well as at locations like Gangshan, Luzhu, and Hunei, there are industrial

clusters of electroplating, metal surface treatment, and metal manufacturing businesses. These concentrated industrial clusters discharge wastewater, imposing a significant burden on the rivers in the region. To comprehensively improve the water quality of rivers in Southern Taiwan, the EMA has been working on integrating resources from relevant industrial, governmental, and academic sectors. Starting from visiting regulated businesses, it has horizontally connected various government agencies to provide multifaceted guidance, inspection and management for regulated businesses within river basins. This comprehensive effort encompasses both specific businesses and those of the broader context to enhance the water quality in Southern Taiwan. As part of the efforts, the EMA has specially invited business operators from Southern Taiwan to visit Central Taiwan, allowing them to experience in person the application of innovative technologies aimed at conserving water and reducing waste.

The Huang brothers, who took over their electroplating factory from their father, pointed out that the operational costs of the electroplating factory have significantly increased compared to the past. Wastewater effluent standards have become increasingly stringent. In the past, the approach to meet effluent standards involved the addition of various capture agents or chelating agents for wastewater treatment. However, the cost of these chemicals is a significant expense. The more chemicals added, the more waste sludge is generated, and the cost of sludge disposal has been increasing year by year. This vicious cycle has made it challenging to remain competitive and secure overseas orders. Now, witnessing the successful application of new technologies for wastewater treatment in other electroplating factories, they see a clear path for improvement in their own electroplating factory. Furthermore, they have the opportunity for constructive interactions and exchanges with government agencies and peers in the industry.

Ms. Lin, who is involved in the metal surface treatment industry, mentioned that in the past, visits to factories in similar industries were rare due to the competitive nature of the industry. However, this time, the EMA proactively invited businesses to visit their peers who have already successfully implemented new technologies. Witnessing the significant water savings achieved by using modified adsorption materials from waste liquid crystal, they noted a considerable reduction in the burden of wastewater treatment, which contributed to lowering the overall operational costs of the company.

The EMA emphasized that in the future, it will continue to organize similar initiatives for the promotion and exchanges in new pollution prevention and control technologies. The aim is to enhance the overall use of pollution reduction technologies in the industry and improve the quality of the living environment for the public.

Waste liquid crystal glass transitioned to the adsorption material for wastewater treatment

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