

June 30, 2013



# Environmental Policy Monthly

Environmental Protection Administration, R.O.C. (Taiwan)

ISSN: 1811-4008 GPN: 2008600068

The EPM is available at <http://www.epa.gov.tw/environmentalpolicymonthly>

## Feature Article

### Promoting Soil and Groundwater Pollution Remediation

Soil and groundwater remediation in Taiwan starts not with the removal of pollutants but with the creation of political and economic incentives. Under conditions that benefit both the environment and public health, creating value anew out of polluted land that has been remediated benefits the polluters, the public, and the government alike.

Taiwan's *Soil and Groundwater Pollution Remediation Act* (土壤與地下水污染整治法) has been enforced for over a decade now. During the same period, many pollution problems have been discovered and become a cause for public concern. But land is a resource, and if soil and groundwater get polluted, they will directly or indirectly restrict the full use and development of this resource. Hence, it is not wise to manage soil and groundwater solely from a legal perspective, but better instead to take sustainable development as a starting point and rethink the tasks of remediation and management.

Nations in the EU and North America have shifted from thinking of their soil and groundwater pollution problems as basically a health risk management

policy issue to one that involves setting remediation targets for future use of the land. Their remediation methods are also becoming more eco-friendly. Under conditions where the risk is acceptable, they are also able to improve soil and groundwater pollution to the point where the land can be fully reused for large-scale developments, such as those sites in London where 2012 Olympic Games facilities were built.

#### Adoption of a dual threshold management system for pollution sites

The EPA's soil and groundwater remediation policies are based upon the concepts of "health risk assessments and management," "reuse of brownfields," and "green and sustainable

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remediation." This means that, on the one hand, the EPA tries to do what is right for the environment and fair to the public when dealing with pollution, and on the other hand tries to encourage remediation projects that will rejuvenate land resources and stimulate further development of the land and its surroundings to create real economic benefits.

Taiwan's soil and groundwater pollution site management policies have the following special

characteristics:

1. A dual threshold management system that includes the essence of risk assessment management

The Soil and Groundwater Pollution Remediation Act provides for a dual threshold approach to managing pollution sites in order to distinguish degrees of impact of the pollution on surrounding receivers. Pollution control standards and preliminary environmental

► *Table: Pollution Sites, Types and Current State of Improvement Work*

Type of Site	Nature of Pollution	Current Listed Sites		Total of De-listed Sites		Listed Sites Totaled
		Control sites	Remediation sites	Control sites	Remediation sites	
<b>Farmland</b>	Farmland pollution at a majority of these sites is caused by the same channels being used for irrigation and draining factory wastewater. Pollution can also be due to illegal dumping and burial of waste.	709	0	1789	0	2498
<b>Petrol stations</b>	Leakage of oil products caused by poor operating practices or faulty or old equipment	65	16	29	2	112
<b>Storage tanks</b>	Leakage of chemical products caused by poor tank bases or underground piping	1	1	1	1	4
<b>Illegal dumping sites</b>	Incidents of illegal dumping and burial of waste usually occur in remote farmland areas, valleys, coastlines, or river banks. The majority of culprits are waste disposal operators.	18	5	4	0	27
<b>Factories</b>	Factories are of 2 types: Operational or abandoned. The kind of pollution created differs according to the type of manufacturing operation.	76	30	31	0	137
<b>Other</b>	Non-industrial sites that have been discovered or reported by the public and subsequently verified as polluted. These include leaking oil pipes, etc.	44	9	10	0	63
<b>Total</b>		<b>913</b>	<b>61</b>	<b>1864</b>	<b>3</b>	<b>2841</b>

impact assessments are used to draw up regulations to govern the different tasks involved in controlling and remediating pollution sites. The preliminary environmental impact assessment reveals the scope of pollution and its impact upon environmental media and surrounding receivers, and is used to decide what grade of treatment the site needs. The dual threshold system also allows for the adoption of risk assessment methods in setting remediation targets and schedules that are environmentally, socially, and economically acceptable.

2. Determining and managing the party responsible for pollution, and designing supervisory mechanisms to ensure site improvement

In terms of the remediation responsibilities of the polluter, the Soil and Groundwater Pollution Remediation Act adopts the principle of liability without fault. This means that regardless of whether or not the polluter has abided by environmental regulations, they must take responsibility for remediating the soil pollution created by their emissions. The Act lays out the criteria for determining polluters, potential polluters, and interested parties of polluted land, as well as their duties and responsibilities. Guaranteeing that improvement work of adequate quality is undertaken is also provided for by a supervision mechanism that includes the submission of written plans, reviews, inspection patrols, and verification.

3. Bringing together pollution site remediation and reuse schemes and encouraging the private sector to actively participate in site regeneration

The EU and North American nations have been developing measures to reuse brownfield sites. In Taiwan, the Soil and Groundwater Pollution Remediation Act takes into account that remediating pollution sites may involve other land development regulations and the rights of users, and so gives the central competent authority the obligation to balance pollution remediation with land reuse schemes. The Soil and Groundwater Pollution Remediation Act stipulates that site remediation managers abide by other related regulations and take into account the actual conditions and the intended reuse of the land when setting out remediation targets and strategies, and integrating site remediation with urban planning and development to attract private sector participation in site regeneration.

4. Drawing up technique reference guidelines to encourage development of the soil and groundwater industry

In order to encourage the development of remediation methods for pollution sites, the EPA has been drawing up reference manuals for surveying and remediation of various types of pollutants and pollution sites, and has established technical specifications for natural attenuation. The EPA has also been encouraging site managers to adopt the most suitable treatment training methods to remediate their sites and has been working with academia to develop soil and groundwater remediation techniques through the use of R&D development plans. In recent years, the concept of "green and sustainable remediation" has been introduced, and it is hoped that future remediation work will be in greater harmony with the fundamentals of being eco-friendly while still benefiting society and the economy.

#### Soil and Groundwater Remediation Planning and Targets

The EPA takes it upon itself to conduct various types of site surveys. To date, 2,841 polluted sites have been discovered (2,777 control sites, and 64 remediation sites) and the improvement work for 1,864 control sites and 3 remediation sites has been completed and de-listed. However, 974 sites remain listed as control sites. The characteristics of each category of site are shown in the Table on Page 2.

To benefit both the environment and public health, and to create value anew out of remediated land, the main objectives and expectations of future remediation work include:

1) Establishing a comprehensive mechanism and associated measures for pollution site risk assessment management and promoting model sites based upon "green and sustainable remediation" and "land regeneration."

The EPA will continue to establish and promote site risk assessment, risk control, and risk communication channels to remove the negative impression that the public has of pollution sites. The EPA will incorporate its successful experiences with "green and sustainable remediation" and "land regeneration" into promoting model sites. The EPA will also establish

associated measures, a system of site remediation and development awards, and access to financing that will encourage the private sector to get involved in site remediation and development.

2) Establishing a comprehensive legal framework to strengthen administrative management

The EPA is strengthening pollution prevention mechanisms and increasing guidance and prevention monitoring powers to industry competent authorities in order to enhance prevention management efficacy and implement lifecycle management on pollution sites. The EPA will also continue to review funding for the Soil and Groundwater Remediation Fund and management of its applications to ensure the sufficiency and sustainability of funding for remediation work.

3) Expanding the scope of surveys and detecting potential pollution early

In order to protect soil quality and the sustainability of groundwater resources, the EPA will continue to conduct surveys and monitoring based upon past surveying experience and overall national soil quality survey planning. An early warning system will also be set up to reduce incidents of soil pollution.

4) Enhancing core techniques to boost the development of the soil and groundwater remediation industry

Through subsidizing and reviewing surveys and remediation technology development projects, the EPA is able to encourage academic and private sector entities to engage in soil and groundwater remediation research. Raising domestic remediation capability and expanding private sector participation should lead to more exchanges between government, industry, and academia.

5) Promoting Taiwan as a soil and groundwater remediation technical hub

The EPA has held numerous large-scale international soil and groundwater symposiums and has promoted the establishment of the East and Southeast Asia Soil and Groundwater Remediation Working Group, an initiative that has won plaudits from a number of nations in Europe, North America, and Asia. The EPA will continue to expand the scope of its international cooperative exchanges and will look to deepen knowledge and experience sharing across the Taiwan Strait.

## International Cooperation

### Taiwan Participates in Meetings of Three Conventions on Chemicals and Waste

The EPA sent personnel to participate in ordinary and extraordinary meetings of the conferences of the parties to the Basel, Rotterdam and Stockholm Conventions held in Basel, Switzerland from 28 April to 10 May 2013. The number of participants in these meetings was greater than any in the past with over 1,800 participants filling the auditorium, including delegates from over 200 nations and representatives of intergovernmental agencies, NGOs and UN organizations.

The three conventions resulted in a number of important decisions. During the high-level segment from May 9~10 – which was attended by over 40 environment ministers from signatory nations – the main topic of discussion was management strategies and implementation of the three conventions that govern chemicals and hazardous waste safety at national, regional, and global levels. The objectives of the discussions were:

1) To ensure that signatory nations will be able to more effectively manage their chemical and hazardous waste problems.

2) To raise awareness among signatory nations about chemical and hazardous waste management problems so that it becomes a key part of their national sustainable development programs.



3) To share experience and knowledge of best practices. The cooperation developed through the three conventions should help to reduce the environmental impact of chemicals and hazardous waste, promote the green economy, and achieve the goal of sustainable use of resources.

The meetings ended with the adoption of the Geneva Statement on the Sound Management of Chemicals and Waste.

Taiwan EPA delegates interacted with delegates from various nations at the conference, and had fruitful sharing of experiences and exchanges of ideas. Trends in international sustainable materials management with regard to its impact on e-waste import/export policy were discussed with Japanese delegates. Cooperation between environment and customs departments and current issues regarding the import/export of specially designated hazardous waste were discussed with American delegates. In-depth exchanges of opinions on the subject of calculating financial guarantees for cross-boundary shipments of waste were had with British and German delegates. EPA delegates also gave a review of Taiwan's resource recycling management breakthroughs in terms of the global trend toward reuse of waste, and how the use of financial guarantee policies as well as

the cooperation of the customs department is reducing the risk associated with transboundary movements of waste.

The strategic management of persistent organic pollutants was also discussed with the Japanese delegation, and knowledge was exchanged on how to control brominated flame retardants, dioxins and furans. In Taiwan, all registered stationary sources of pollution are now included in dioxin regulations, and the inspection regime has been strengthened. During the discussions, the EPA delegates were more than happy to share Taiwan's successes in these fields, and by drawing on the experiences of other nations, Taiwan's own control strategies will be strengthened.

The EPA delegates also had a chance to hold discussions with the Burkino Faso Minister of Environment and Sustainable Development and his delegation on the topic of e-waste management and other environmental issues. Besides adding depth to the existing exchanges in environmental fields between Burkino Faso and Taiwan, it is expected that greater cooperation in the future will allow an even deeper understanding of Taiwan's e-waste management experience to be shared with the West African nation.



▶ Taiwan's delegation held a side event in the COP6 of Basel Convention



▶ EPA's delegates meeting with the Burkina Faso Minister of Environment and Sustainable Development

## Environmental Analysis

### Organizations Designated to Ensure Imported Used Vehicles Meet New Air Standards

The EPA has licensed five testing organizations to carry out the emissions testing: Yulon Motors, the Automotive Research & Testing Center, the Industrial Technology Research Institute, Chun Yuan Vehicle Technology Co., and Kingdom Vehicle Inspection Co. In total, these organizations test approximately 6,800 vehicles annually.

On 24 May 2013, EPA Deputy Minister Shin-Cheng Yeh visited the testing center at Yulon's Sanyi factory to see how emissions testing is carried out, listen to some suggestions from the industry, and encourage the testing organizations to work together with the EPA in controlling exhaust pollution from used imported cars.

To maintain high quality testing at the designated testing organizations, the EPA conducts biannual inspections of the testing facilities and also conducts unannounced spot-checks to ensure the accuracy of test data. Items on the inspection checklist include checking to ensure that the testing personnel are properly licensed, the emission tests are being conducted using stated testing methods, and



▶ Collecting and sampling vehicle exhaust for analysis

instruments are in good working order and are properly calibrated.

Some vehicle owners can be quite cunning and will immediately take their vehicle to another organization for a retest if it fails its first emission test at one organization. To prevent them from succumbing to guile and trickery, the five testing organizations have

been required to set up a communication channel so that the details and test results of vehicles that fail an emissions test at one of them can be immediately transmitted to the others. If a vehicle that has just failed an emissions test shows up at another center soon after, the testing personnel will know to carefully test the items that the vehicle originally failed. Testing quality can thus be maintained.

## Water Quality

### Remediation Work Completed for Six Metropolitan Rivers

In order to raise the quality of life of residents in metropolitan areas, the EPA has made the rejuvenation and remediation of metropolitan rivers a top priority. The six major EPA metropolitan river remediation plans have now been completed, and it is estimated that 1.62 million local residents will enjoy improved quality of life as a result.

**K**eelung City's Tianliao River; the Zhonggang Drainage Canal in Taipei County; Fengshan River in Kaohsiung County; Wannian River in Pingtung County; Liuchuan River in Taichung City; and Laojie River in Taoyuan County are the six rivers in question that flow through densely-populated urban areas and are thus an intimate part of many people's living environment. Large-scale urbanization has led to huge volumes of household effluent continuously flowing into these rivers, leading to serious pollution that affects the quality of life of local residents. In some areas tributaries have even been filled in and built upon, meaning that local people have even less riverbank space available. In 2008 the EPA started vigorously promoting the 2nd phase of the River and Marine Water Quality Conservation Improvement Plan. By diverting polluted wastewater and introducing clean water into the rivers, and simultaneously revitalizing riverbanks, a major transformation of living environments has been accomplished and the target of increasing riverbank space has been achieved as well.

As of the end of 2012, remediation work has been completed on sections of the Zhonggang Drainage Canal in New Taipei City; Fengshan River in Kaohsiung City (including Caogong Canal); Wannian River in Pingtung County; and Liuchuan River in Taichung City. Remediation has not only improved the immediate riverine environment but, by combining it with local culture and history, and sightseeing and leisure spots, a remarkable new appearance has

been created for these areas that will encourage urban development and raise the quality of life for local residents.

The remediation of Keelung City's Tianliao River involves diverting polluted water away from both sides of the river and from the Hsuchuan River that flows directly into Keelung Harbor. The polluted water now travels via the main effluent drain to Hoping Island Water Resource Recycling Center for treatment. The volume of polluted water diverted in this way is approximately 58,000 tonnes daily, and about 9,700 kg of organic pollutants (biological oxygen demand - BOD) is removed from the water daily. This particular remediation project benefits approximately 300,000 local residents. The construction was completed in March 2013, and should prove effective in eliminating some of the unpleasant odor that lingers around the banks of the Tianliao River, as well as improving the quality of the water in Keelung Harbor.

Both local and central governments have been working hard on the remediation of Laojie River in Taoyuan County since 2010. At the beginning of 2013, a milestone project in the remediation effort was completed: The completion of the Xinshi Park Gravel Contact Oxidation Water Purification Project has meant that about 30,000 tonnes of polluted water is now being purified daily. The purified water then flows into the uncovered sections of the Laojie River, greatly improving its overall water quality. An underground observation corridor has been built into



the middle of the trough that allows the public to gain a better understanding of how the water purification process works, and get a close-up view of a "near natural" method of purifying water. Other projects underway on the Laojie River include uncovering covered sections and reconstructing the river banks, greening Xinshi Park, and the building of sports facilities and a river education center. The EPA hopes that the water purification facilities will become a part of local residents' lives and exemplify the

achievements of the Laojie River remediation plan.

The EPA is currently actively involved in promoting the Aqueous Environment Water Quality Improvement and Operating Management Plan, a plan that has been approved by the Executive Yuan. This involves continuing to maintain close working relationships with local governments so that the remediation of other urban rivers can be carried out.



▶ *Liuchuan River in Taichung City before remediation*



▶ *Liuchuan River in Taichung City after remediation*



## Water Pollution Control Regulations Revised for Continuous Online Monitoring

In order to facilitate closer monitoring of industrial effluent and the quality of discharged water in drainage systems, the EPA has revised the *Regulations Governing Water Pollution Control Measures and Test Reporting Management* (水污染防治措施及檢測申報管理辦法). The revisions require operators of large-scale enterprises, industrial parks, and power plants to install automatic monitoring equipment in their sewer systems and ensure that equipment can continuously transmit data online to the local competent authority.

Automatic continuous water quality monitoring and data transmission technology is improving by the day. When used to monitor the water quality of industrial effluent or in water drainage systems, it can help enterprises, managing agencies, and competent authorities to detect problems early and adopt responsive measures. The EPA has thus amended the Regulations Governing Water Pollution Control Measures and Test Reporting Management to require operators of large-scale enterprises, industrial parks, and power plants to install automatic monitoring equipment in their sewer systems and ensure that the equipment can continuously transmit data to the local competent authority.

The main points of the revisions are as follows:

- Online transmission of monitoring data is to be done at set intervals and the data is to be transmitted online using transmission modules and the Internet. If the proportion of invalid or missing data exceeds a certain proportion then the transmission is to be regarded as abnormal.
- Premises required to transmit data online should regularly calibrate their instruments in accordance with

the frequencies required by the original manufacturer. For chemical oxygen demand and testing for suspended solids, they should regularly conduct a relative accuracy test audit.

- If the monitoring instruments malfunction, or under maintenance or replacement, then samples must be taken and tested manually.

Promoting automatic monitoring and online data transmission for industrial effluent or in water drainage systems allows for greater control over the operation and functionality of wastewater treatment facilities and greater self-regulation. In the case of abnormal water quality or sudden emergencies, the monitoring equipment can issue alerts so that emergency response measures can be taken and improvements made immediately. The installation of monitoring equipment thus enhances pollution prevention management within the premises. The EPA is also provided with complete and up-to-date data on discharges of effluent from the enterprises, which aids the EPA in controlling pollution and improving river water quality.

## Methods and Procedures for Testing Motorcycle Exhaust Revised

The EPA has announced revisions to the *Methods and Procedures for Testing Motorcycle Exhaust* (機車廢氣排放測試方法及程序). Some regulations were revised and new regulations were also added after referring to EU exhaust testing regulations.

The main points of the revisions include modifying the way fuel tank weight is calculated and bringing accuracy of vehicle speed testing and

regulations regarding testing oil into accord with EU regulations. New regulations covering pollution emission testing that are in line with EU law have also

been added. The new regulations will come into effect on 1 July 2013, and will cover:

- Testing oil specifications for alternative clean fuel vehicles, dual fuel or flex fuel vehicles, and hybrid electric vehicles
- Testing regulations for hybrid electric vehicles
- Resistance settings for dynamometer test
- Use of manual choke
- Exclusion clauses for vehicles with idling stop functions

The fifth phase emission standards for motorcycles came into effect on 1 July 2007, and since then domestic manufacturers and importers have been obliged to send their vehicles to certified testing laboratories to undergo exhaust emission certification testing. In order to encourage the upgrading of Taiwan's motorcycle manufacturing technology so that it keeps up with worldwide developments, the testing method and procedure was amended. By eliminating out-of-date regulations and adding new ones that are in line with EU pollution emission regulations, Taiwan's vehicle exhaust emission regulations are now more consonant with international trends.

## Environmental Monitoring

### Query System for Pollution Sources Expanded

Effective immediately, the Regulated Pollution Source Information Query System expanded its database to allow the general public to access information on hazardous air pollutant test results, wastewater effluents and rulings on violations of environmental laws. This information is available on the EPA Web site: <http://prtr.epa.gov.tw>.

The EPA's various departments, including those for air, water, waste, and toxic substances, uploaded their respective permit and reporting data, which are integrated into the Regulated Pollution Source Information Query System, thereby obtaining the effect of a single portal. By logging onto this query system, the public can instantly check information on air pollution, water pollution, volume of wastes, and manufacturing and import of toxic substances.

The EPA emphasizes that the expanded information concerning "hazardous air pollutants" are listed in accordance with the existing *Air Pollution Control Act*, which only specifies lead and other heavy metals as air pollutants, which need to be monitored and reported regularly. For waste incineration processes, lead, cadmium, and mercury are designated as air pollutants that need to be monitored and reported regularly. This information has been incorporated into the query system for public access.

As for the disclosure of information on the emission of arsenic and other air pollutants, the EPA said this information would be announced pending subsequent deliberations. In addition, the achievement reports

of the hazardous air pollutants commissioned by the various departments of the EPA over the years have been posted on the EPA's Environmental Projects Logging System and can be accessed via its Web site.

The EPA points out that the expanded information contains data on the "volume of wastewater effluents," which can be directly viewed by linking to the Query System. In addition to making effluent volumes of pollution sources public, the expanded information also includes the test results of these pollution sources. Finally, the "ruling information" refers to the fines and penalties exacted by various environmental agencies on the pollution sources on the EPA watch list over the past five years.

In order to increase the benefits provided by the information system, in the future the EPA will make the pollution source data open-sourced, so that software development companies and the general public can access them directly through their software programs. In this way, value-added effects of these information can be achieved.

## Development Activity EIAs to Protect Underwater Cultural Assets

The *Working Standards for Environmental Impact Assessments for Development Activity* (開發行為環境影響評估作業準則) has been revised a number of times in response to current trends and environmental changes. The latest revision includes the addition of regulatory protection for underwater cultural assets.

The *Working Standards for Environmental Impact Assessments for Development Activity* were promulgated on 31 December 1997, and were originally formulated to meet the requirements of Article 5 Paragraph 2 of the *Environmental Impact Assessment Act* (環境影響評估法). To date, the standards have been amended eight times, the most recent occasion being on 7 October 2011. The EPA made the latest revisions in order to bolster the protection of underwater cultural assets, to lend support to regulations governing sensitive geologic areas under the *Geology Act* (地質法), and to coincide with the implementation of revisions to the *Air Quality Control Standards* (空氣品質標準).

The main points of the revisions are as follows:

1. A new addition to the principles that coastal area developments must abide by stipulates that underwater cultural assets must not be damaged.
2. Developers must assess the impact of development activities – both during the construction and operational phases – on cultural assets in neighboring areas. Details of responsive measures or alternative projects that will mitigate any negative environmental impact caused by development activities must be submitted. Cultural asset impact assessments must henceforth include underwater cultural assets.
3. Operators of construction projects in bays, harbors, or those that include coastal land reclamation must henceforth submit written explanations of how new structures will impact upon underwater cultural assets and any necessary responsive measures that will be undertaken. Enterprises that extract sand from marine territory or excavate navigation channels will be required to conduct detailed surveys of the scope and degree of impact of their operations on underwater cultural assets and suggest responsive measures.
4. The regulation stipulating that “developers must

first obtain permission from local competent authorities in charge of cultural assets” in Item 12 of the Survey Form of Restrictions for Environmentally Sensitive Areas and Special Purpose Areas, has been deleted. An additional survey of effluent drainage areas has been added to Item 18. A question has also been added to Item 20: “Is the activity occurring in a zone announced as geologically sensitive in the *Geology Act*?” Activities in a zone announced as geologically sensitive in the *Geology Act* for which foundation geology surveys and geological safety assessments are required must henceforth submit their survey and safety assessment reports for approval.

5. A revision to the list of documents that must accompany the Items and Evaluation Requirements to Be Recorded in statements states that foundation geology surveys and geological safety assessment reports must be submitted in accordance with the requirements of Attachment 2, Article 5 of the *Geology Act*.
6. A revision to the list of documents that must accompany the Items and Evaluation Requirements to Be Recorded in the Assessment Reports and Preliminary Drafts of Assessment Reports states that foundation geology surveys and geological safety assessment reports must be submitted in accordance with the requirements of Attachment 2 Article 5 of the *Geology Act*.
7. A requirement to compare post-emission air quality and particulate matter smaller or equal to PM<sub>2.5</sub> has been added to the Definition of Scope Guidelines, a set of reference material for defining the scope of air quality monitoring.
8. PM<sub>2.5</sub> has been added to the list of inspection items in the air quality category in the Current State of Development Activity Environmental Quality Inspection Form. Historical buildings, ancient settlements, heritage sites, and underwater cultural

assets have been added to the list of inspection items in the culture category.

9. PM<sub>2.5</sub> has been added to the list of inspection items in the air quality category in the Current State of Environmental Quality Inspection Details Form.

## News Brief

### EPA Holds Lectures on Renewable Energy Technology Applications

In order to actively promote the trends and strategic planning of renewable energies, the EPA held "Lectures on Renewable Energy Technology Applications" on 7 May, to which Dr. Jason C.H. Shih of Academia Sinica, and Dr. Sheng-Shung Cheng of National Cheng Kung University were invited to share their expertise on biogas and biomass energy technologies and anaerobic treatment of food wastes. In addition, Dr. David Luh of the University of California was also invited to talk about the topic of renewable energy in the new era of environmental engineering. During these lectures,

extensive discussions and exchanges took place among the participating guests and related industry members.

In his opening speech, EPA Minister Stephen Shu-hung Shen pointed out that the promotion of biomass energy applications and the establishment of local biomass energy centers were EPA's current focus of attention. Aside from comprehensively enhancing overall waste disposal pollution control, development of biomass energy technology can transform reusable resources into renewable energies which can be applied in many ways. "In doing so, our society shall take one giant step forward toward zero waste and sustainable recycling," Minister Shen said.



▶ Minister Shen delivering a keynote speech at a lecture

Environmental Policy Monthly  
R.O.C. (Taiwan)

Publisher  
Stephen Shu-hung Shen, Minister

Editor-in-Chief  
Tsung Yung Liu

Executive Editors  
Y. F. Liang; Yu-ling Yang; Li-kuo Hsiao;  
Shaowen Chang; Jason Hoy

Translator  
Peter Morehead

Editorial and translation support  
provided by:  
Hui-kuo Consulting, Ltd.

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Printed with soy ink on recycled paper.

行政院新聞局出版登記證局版北市誌字第1611號  
中華郵政北台字第6128號執照登記為雜誌交寄

