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Feature Article

Atmospheric Background Monitoring in Taiwan

The problem of airborne pollutants being blown across international boundaries has become more acute in recent years. Taiwan lies on some of the routes that airborne pollutants take as they are transmitted around the globe, thus giving greater importance to monitoring these pollutants. Taiwan actively participates in international airborne pollutant transmission experiments and the exchange of related information, and will continue to seek cooperation with neighboring nations to accurately assess the impact of airborne pollutants on Taiwan.

As a result of rapid industrialization and economic growth in the Asia region, massive volumes of fossil fuels such as oil and coal are now being consumed daily. This has led to a marked increase in the amount of pollutants emitted into the atmosphere. Some of the major pollution issues in Asia that have gained widespread attention include acid rain, biomass burning, and the long-range atmospheric transmission of dangerous pollutants such as mercury and dioxins. Of particular concern to Taiwan are dust storms and biomass burning, which not only affect local air quality but also negatively impact regional ecologies and weather patterns

Taiwan is situated at the southeast extremity of Asia and it is common for the East Asian monsoon to carry pollutants to Taiwan. Thus although Taiwan has made great strides in recent years in controlling domestic pollution sources, the impact of long-range pollution on local air quality continues to grow year-by-year. A decision was therefore made by the EPA to establish an international atmospheric background monitoring station on the top of Mt. Lulin, a 2,862-meter high mountain in central Taiwan. The station was inaugurated on 13 April 2006.

Mt. Lulin Monitoring Station: International Functionality in an Ideal Location

In order to explore the impact of the long-range atmospheric transmission of pollutants from East Asia on Taiwan, and the planet as a whole, an atmospheric background monitoring station was established on the top of Mt. Lulin. Its high altitude location means that

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locally-produced pollution will not interfere with the station's measurements, thus giving a more reliable and accurate account of the impact of atmospheric pollutants on Taiwan. The Mt. Lulin monitoring station is in the middle of a line of monitoring stations stretching from the Indochina Peninsula and across southern China, to Hawaii in the Western Pacific. This excellent geographic location is to the station's great advantage when it comes to monitoring the long-range atmospheric transmission of pollutants.

The EPA points out that the Mt. Lulin monitoring station is one of only a few such stations in Asia capable of automatically monitoring levels of atmospheric mercury over long periods of time. Analysis of data collected from the station over the previous four years is now giving a clearer picture of the transmission of atmospheric mercury around the Western Pacific region. Analyzing the data in conjunction with data from Eastern Pacific stations in the US and Canada is also furthering our understanding of how atmospheric mercury is impacting the whole planet. Having atmospheric mercury monitoring technology that is on a par with that in developed nations means that Taiwan is able to produce research that significantly contributes to environmental protection efforts worldwide.

The Mt. Lulin monitoring station is equipped with automated instruments that are able to carry out continuous monitoring of the long-range transmission of atmospheric pollutants such as atmospheric mercury, acidic pollutants, trace gases, as well as those produced by biomass burning or carried by East Asian dust storms. The scope of the monitoring is in accordance with other international atmospheric background monitoring stations, and collects data related to meteorology, precipitation chemistry, gas phase chemistry, aerosol chemistry, and mercury chemistry.

All the instruments in the station are of international standard in terms of function and specifications, and include: a precision CO analyzer, an atmospheric mercury analyzer, a pyranometer, an acid rain sampler, a visibility meter, a CFC analyzer, a CO_2 analyzer, automatic meteorological and atmospheric pollutant (PM_{10}, CO, O_3) monitoring systems, and an automatic aerosol sampler.

Five Years of Operations Give Better Understanding of Long-Range Transmission of Atmospheric Pollutants

Monitoring at Mt. Lulin has already produced the following achievements:

1. Establishing High Mountain Monitoring Technology

The high mountain environment of Mt. Lulin station means that the environmental conditions in which it operates – air pressure, temperature, humidity, etc. – are all very different from those at sea level. Rain and fog are also common in the mountains of Taiwan, making the Mt. Lulin station more difficult to operate than other comparable stations around the world. Much valuable experience has been accumulated over five years of continuous operations, which have also allowed for fine-tuning of the instruments and formulation of operating and maintenance standards. Taiwan now possesses atmospheric background monitoring technologies that are fully consonant with the unique environmental features of the nation.

2. Obtaining Monitoring Data on Long-Range Transmission of Pollutants

Analysis of data on gaseous elemental mercury (GEM) and air trajectories collected from the Mt. Lulin station over the last three years revealed that when the prevailing winds were blowing from the Pacific Ocean in the summer, the lowest density of background GEM was around 1.1 ng/m^3. However, when the winds blew from industrial zones in China, the maximum recorded values reached as high as 2.42 ng/m^3, which was nearly three times higher than the summer background value. On 29 December 2007 and the days following, a dust storm in China resulted in atmospheric densities of suspended particulate matter and SO_3 reaching 4~5 times the normal background density. During the same period the density of atmospheric mercury also showed a marked increase, up to 5.4 ng/m^3, far above the normal background density. The fact that the long-range atmospheric transmission of pollutants can be detected in the mountains at an elevation of 3,000 meters demands further investigation.

3. Enhancing International Cooperation

The EPA has already signed an agreement of cooperation with the US National Aeronautics and Space Administration (NASA), which allows Taiwan to participate in the Micro-Pulse Lidar Network (MPLNET) and the Aerosol Robotic Network (AERONET), and share findings from the Mt. Lulin station. The EPA will be investigating vertical distribution patterns of clouds and aerosols, which, in combination with data obtained from satellites, will allow for improved tracking of airborne pollutants. Under the auspices of the US National Oceanic and Atmospheric Administration (NOAA), the EPA is also taking part in the Carbon Cycle Greenhouse Gases global monitoring network, which entails cooperating with a number of international agencies to compare and analyze meteorological data. The EPA is also working with the US EPA to implement a plan to monitor the long-range transmission of atmospheric mercury. To facilitate this initiative, in 2011, the EPA joined the Atmospheric Mercury Network (AMNet) under the US National Atmosphere Deposition Program. Getting involved in as many international monitoring projects as possible will greatly assist the EPA in assessing the impact of atmospherically transmitted pollution on Taiwan.

Since beginning operations in 2006, the Mt. Lulin station has also participated in the UN's Atmospheric Brown Clouds international monitoring experiment and also in NASA's Biomass-burning Aerosols in South-East Asia (BASE-Asia) monitoring experiment. This has allowed the EPA to compare its own monitoring system with instruments that work on different operating principles used by other nations, and to observe how these nations carry out monitoring work. Such a degree of close cooperation has brought Taiwan's atmospheric monitoring program into line with international practice.

The EPA has held five international symposiums that have been attended by delegates from Japan, South Korea, the US, the EU, Italy, Switzerland, India, Kenya, and China. The symposiums have seen in-depth discussions and knowledge exchanges on a range of topics related to atmospheric monitoring, including: long-range transmission of pollutants, analysis of data, instrument operation, and maintenance of facilities.

Prospect: Continuous International Cooperation and Joint Monitoring

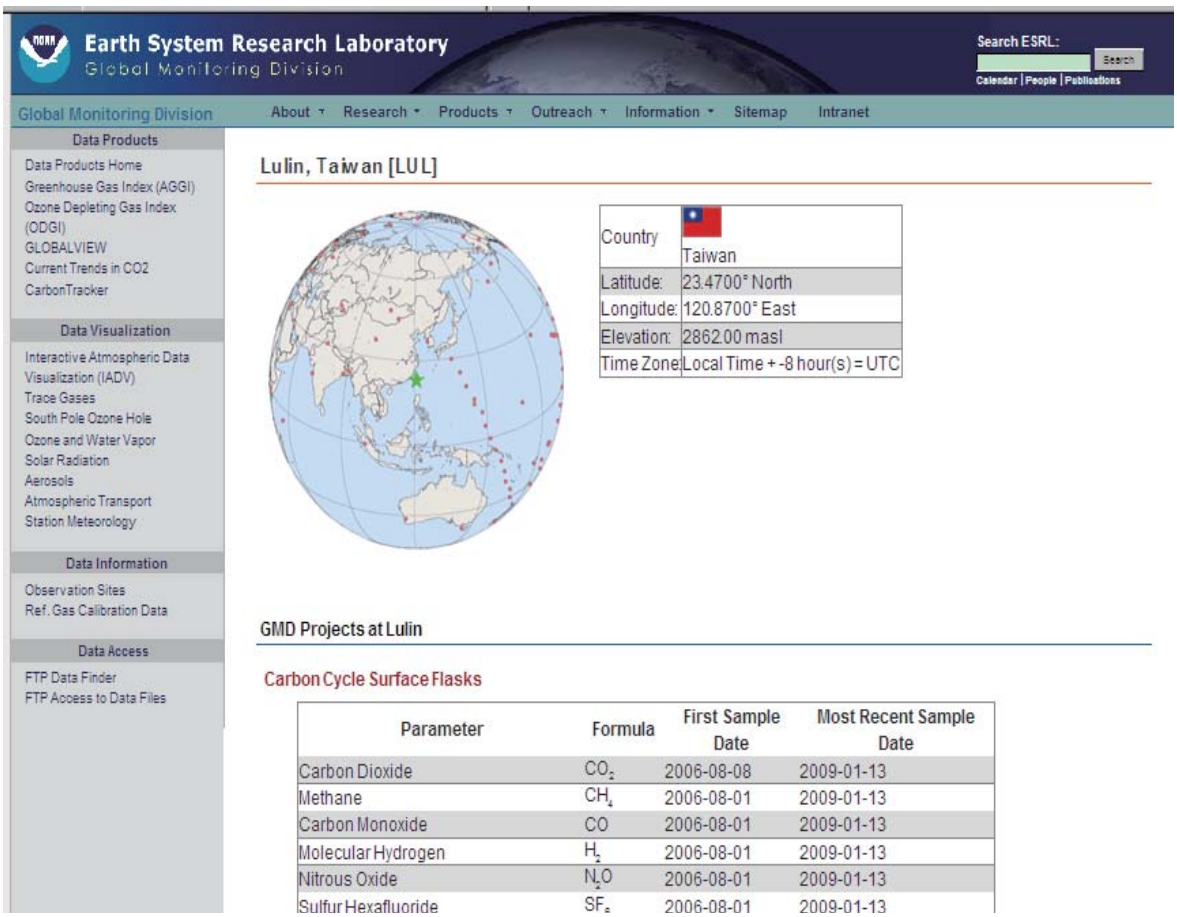

Diagram: Screenshot from NOAA's CCGG Web site showing data collected at Mt. Lulin

Much progress has been made in developing effective air monitoring in Taiwan, and the EPA will continue striving to meet the following targets:

1. Continue to monitor the impact of long-range pollutants on Taiwan

Over the last five years, the Mt. Lulin monitoring station has effectively performed its task of monitoring air quality. Data from the station clearly indicates that during periods of biomass burning and dust storms, and when air trajectories are coming from biomass burning regions or industrial zones in China, the densities of pollutants in the air (suspended particles, atmospheric mercury, etc.) are significantly higher than average background values. This is hard evidence that pollutants carried over long distances can have effects in Taiwan at elevations as high as 3,000 meters.

The influence of the East Asian monsoon turns the long-range transmission of pollutants into a regional problem requiring international cooperation, in terms of scientific experimentation and data exchange. To thoroughly assess the local impacts of long-range pollution, Taiwan will continue to seek close cooperation with neighboring nations regarding data exchange and joint monitoring. This information will also be an important part of international efforts to track the transmission of pollutants around the planet.

2. Improved Functions of Mt. Lulin Monitoring Station

Monitoring operations first started at Mt. Lulin in April 2006. Since then the list of precision instruments that have been installed at the station has grown continuously, in tandem with the maturation of monitoring technology development in Taiwan. In September 2008, the sampling platform was enlarged to accommodate more instruments, bringing yet greater functionality to the station. The Mt. Lulin station now functions on par with other international background monitoring stations and continues to record and analyze data on the long-range transmission of pollutants. This data is being stored in a database so that long-term overviews can be generated when necessary.

3. Further Enhance International Cooperation

In order to understand the impact of the long-range transmission of pollutants on the environment and the ecosystem of Taiwan as well as of the planet, in recent years the EPA has been actively seeking cooperation with relevant overseas agencies. These include the US EPA, NASA, and NOAA, among others. Taiwan will also continue to seek close cooperation with neighboring nations in Southeast Asia with regard to data exchange and joint monitoring in order to gain a thorough understanding of the long-range pollution phenomenon in the region. Thus, that an overall assessment of the impact of East Asian dust storms, industrial pollution, and Southeast Asian biomass burning on the local and global environment can be made.

Feature Article

Carbon Capture and Storage Strategic Alliance Formed

In order to further stimulate the development of greenhouse gas emission reduction technologies in Taiwan, on 28 March 2011 the EPA held a press conference to officially announce the forming of the Carbon Capture and Storage (CCS) Strategic Alliance, which combines expertise from government, industry, and academia. Taiwan's CCS Strategic Alliance is expected to begin commercial operations in 2020, a schedule in line with other CCS projects being promoted in developed nations.

CCS methods can be broken down into three stages: capturing the carbon, transporting it, and then storing it. Capturing the CO_2 is done in the stack using chemical or physical means, and the CO_2 is then separated from other emissions and purified. Piping, vehicles, or marine vessels are then used to transport the CO_2 to places where it can be sequestered into deep geological formations or ocean masses, or bonded to minerals using chemical catalysts. According to the 2010 Energy Technology

Perspectives published by the International Energy Agency, in order to reach the target of a 50% reduction in greenhouse gas emissions by 2050, CCS technologies will have to account for 19% of the reductions. Hence it is not surprising that developed nations such as the US, Australia, and Germany are engaged in strategic CCS planning and are competing with each other to invest in developing CCS technologies.

Research shows that Taiwan has excellent CO_2 storage capacities both on land and at sea: The terrestrial storage capacity is estimated to be around 2.8 billion tonnes of CO_2e, while the marine capacity along the coast and in the Taiwan Strait is estimated to be from 13.8~99.7 billion tonnes of CO_2e. There are also rich deposits of marble and limestone along the east coast of Taiwan (approximately 300 billion tonnes). Moreover, all of Taiwan's power stations are located by the sea, and will be conducive to the development of accelerated weathering of limestone methods to sequester carbon. In short, Taiwan possesses multiple options when it comes to developing CCS technologies. To this end, in 2010 the EPA started the task of promoting CCS R&D as well as formulating relevant strategies and regulations. The EPA has also been holding a number of symposiums with other government departments to begin planning for the establishment of the CCS Strategic Alliance. To date, the organizational framework, member's duties, and timetable have been completed.

Taiwan's CCS Strategic Alliance is made up of entities from government, industry, and academia, including the Council for Economic Planning and Development, the National Science Council, Bureau of Energy, Industrial Development Bureau, Bureau of Mines, and the state-run companies Taiwan Power, China Petroleum and China Steel. Experts representing these entities have been divided into two teams working on regulatory strategies and technology promotion. A separate consultant group of experts has also been put together to give suggestions to the alliance on suitable directions for future development. Planning is now underway for a pilot project to sequester 10,000 tonnes of CO_2e by 2015, and then to gradually increase this amount so that by 2020 CCS can become commercially viable in Taiwan.

The EPA states that since climate change has become an issue that concerns the very survival of humankind, it is imperative that greenhouse gas reduction technologies are developed as soon as possible. The formation of the CCS Strategic Alliance is but a first step in this direction and the EPA will continue its task of modeling and assessing related technologies. The EPA is working to gain a deeper understanding of which technologies meet the criteria of being feasible, economical, safe, and efficient in order to give commercial CCS operations in Taiwan a firm foundation on which to grow. But the growth of CCS technologies in Taiwan will require expertise from many fields, not just initial policymaking and government promotion. The EPA thus calls on the general public to take an interest in CCS, and particularly urges large corporations to help carry the torch with regards to CCS R&D as a part of the national effort to reduce greenhouse gas emissions in Taiwan.

Soil & Groundwater

Soil Pollution Fees to Be Collected from Fifteen More Industries

The EPA promulgated revisions to the Soil and Groundwater Pollution Remediation Fee Collection Regulations (土壤及地下水污染整治費收費辦法) on 7 March 2011 to facilitate soil and groundwater pollution inspection and remediation work. The revision process focused on expanding the scope of applications of the Soil and Groundwater Pollution Remediation Fund, evaluating the current status of fee collection, and expanding the scale of fee collection. Fees will be collected from 15 more industries including the steel smelting industry and the power generation industry. Nearly 3000 companies will be included in the first stage of fee collection. This measure is expected to increase the current fund by NT$270 million (an increase of 36.7%). Fee collection will be enforced from 1 July 2011.

The EPA has been collecting soil and groundwater pollution remediation fees since 2002 to support soil and groundwater remediation work on land where it is difficult to determine liability for polluting

activities. By the end of 2010 around NT$6.1 billion in fees had been collected, over 90% of which was from petrochemical industries. However, there are still many cases of uninspected land where liability for prior illegal dumping is unclear. In order to ensure that the fee collection system is fair and reasonable to all, the regulations have been revised to collect fees from manufacturers' consumption of nickel and copper, which are commonly detected in pollution sites, and from the waste of fifteen additional industries. Different fee rates are applied according to specific waste treatment risks.

The collection of soil remediation fees is a funding source mechanism, serving as a special levy for all, regardless of whether they are polluters or not. Those charged with polluting behavior are liable for carrying out remediation according to soil and groundwater pollution remediation regulations. In consideration of the export of surplus imported chemical substances, the pollution from products not used in Taiwan, as well as the need to reduce the burden on industries, an export refund mechanism was created in the preliminary stage. This is now being cancelled due

Fifteen industries newly added to the list for collection of soil pollution fees

<table>
<tr><th>Category</th><th>Industry</th><th colspan="4">Fee rate (NT$/tonne)</th></tr>
<tr><td>1</td><td>Steel smelting</td><td colspan="4">6 (steel billets produced)</td></tr>
<tr><td>2</td><td>Power generation</td><td colspan="4">1 (coal used)</td></tr>
<tr><td>3</td><td>Printed circuit board manufacturing</td><td rowspan="8">Hazardous industrial waste (intermediate treatment and final disposal)</td><td rowspan="8">Hazardous industrial waste (reuse)</td><td rowspan="8">General industrial waste (intermediate treatment and final disposal)</td><td rowspan="8">General industrial waste (reuse and renewable resources)</td></tr>
<tr><td>4</td><td>Petrochemical raw material manufacturing</td></tr>
<tr><td>5</td><td>Semiconductor manufacturing</td></tr>
<tr><td>6</td><td>Metal surfacing</td></tr>
<tr><td>7</td><td>Optoelectronic material and component manufacturing</td></tr>
<tr><td>8</td><td>Petroleum refining</td></tr>
<tr><td>9</td><td>Basic chemical engineering</td></tr>
<tr><td>10</td><td>Synthetic fiber manufacturing</td><td rowspan="6">165</td><td rowspan="6">83</td><td rowspan="6">17</td><td rowspan="6">8</td></tr>
<tr><td>11</td><td>Leather and fur product manufacturing</td></tr>
<tr><td>12</td><td>Copper smelting</td></tr>
<tr><td>13</td><td>Aluminum smelting</td></tr>
<tr><td>14</td><td>Pesticides and environmental agent manufacturing</td></tr>
<tr><td>15</td><td>Waste treatment</td><td colspan="4">17 (solid waste)</td></tr>
</table>

Notes: 1) Fees for steel smelting and power generation are based on waste amounts in terms of steel billets produced and coal used. 2) Current copper and nickel smelting fee rates are NT$64/tonne and NT$62/tonne, respectively.

to pollution risks posed by manufacture processes, domestic storage and transport. The cancellation of the domestic manufacture export refund is in keeping with the principles of original legislation and was decided after a comprehensive review of the existing system. Now applications for export refunds can only be made after surplus imported substances have already been exported. The refund rate is based on substantial risk and has been lowered from 95% to 70%. Existing fee rates for chemical substances have also been evaluated.

In addition, to encourage businesses to invest in soil and groundwater pollution prevention equipment and obtain environmental liability insurance coverage, this revision allows construction refunds and insurance refunds to a combined maximum of 25% (the original construction refund maximum was 20% and the insurance refund maximum was 5%).

Four years after the revision came into effect, based on the actual expenses of the fund, site inspections, and remediation and pollution control standards, further evaluation and adjustment will be made to the substances subjected to fee collection, and the fee rates for each industry category, in order to create a fair and reasonable system. Details on the revision can be found on the EPA Web site (http://ivy5.epa.gov.tw/epalaw/index.aspx).

EIA

Revisions to Environmental Impact Assessment Act Enforcement Rules Preannounced

The EPA has pre-announced draft revisions to Articles 19 and 48 of the Environmental Impact Assessment Act Enforcement Rules. Details of the revisions have been published on the EPA Web site under the section dealing with regulation preannouncements at http://ivy5.epa.gov.tw/epalaw/index.aspx.

The Environmental Impact Assessment Act Enforcement Rules (環境影響評估法施行細則) were first announced on 25 October 1995. Since then, the requirements of the Administrative Procedure Act and the on-site inspections, plus a desire for more clarity, have resulted in six revisions to some of the articles of the Rules. A number of disputes have arisen over the years due to different interpretations of the wording of some articles. These include whether or not development activities need to undergo a second phase of environmental impact assessments, the categorization of inspection findings, and how to deal with inspection findings after they have been rescinded by the Administrative Court. The EPA has received many suggestions from various parties concerning environmental impact assessments and is working to integrate them into a major revision of the Environmental Impact Assessment Act. However, it is difficult to set a timetable for such a major revision. In the meantime, the recently pre-announced revisions to the two articles are intended to deal with some immediate operational issues.

The main points to the revisions of Articles 19 and 48 are as follows:

1. The method of determining what is classified as having a major potential impact on the environment, as laid out in Article 8 of the Environmental Impact Assessment Act, is to be revised. Article 8 states that any development activities which inspectors conclude will have a potentially major impact on the environment are obliged to undergo a second phase environmental impact assessment. The latest revision removes ambiguous definitions of "environmental impact" and replaces them with the following definitions:

A. Certain development activity categories, or any large-scale development plans that are of a certain size, are to be listed and will automatically be subjected to a second phase environmental impact assessment.

B. In cases where developers and the review committee disagree on whether or not a development activity will have a major impact on the environment, then Article 8 should be referred to. Article 8 states that the authority to decide whether or not a second phase environmental impact assessment is necessary lies with the Environmental Assessment Review Committee and so it is this committee

that should make decisions in disputed cases.

2. In accordance with revisions to Article 19, Article 48 has also been revised regarding Article 28 of the Act, dealing with the necessary involvement of competent authorities.

Air Quality

Preannouncement of Electric Scooter Battery Swapping System Subsidization Regulations

The EPA is actively promoting an electric battery swapping system to make the recharging of electric scooters as easy as filling up a conventional vehicle with gasoline. In principle, consumers should be able to exchange their batteries at a battery exchange station at any time, with no need to worry about their battery power or maintenance problems. Thus the EPA has drafted the Electric Scooter Battery Swapping System Subsidization Regulations (電動機車電池交換系統補助辦法) to encourage industry to actively establish an electric scooter battery exchange operating system.

The EPA states that electric vehicles are advantageous in that they do not emit pollution while in motion and are thus worth promoting as an environmentally friendly transportation option, as compared to conventional vehicles with internal combustion engines. Yet the biggest concern among consumers about electric vehicles is the lifetime of batteries. It can be quite worrisome to think of whether you have enough power, or whether you will be able to reach your destination. A battery swapping system is one of the best solutions to these problems, and consumers need not worry about battery power or maintenance as they will be able to exchange their battery at a designated station at any time.

The EPA is starting a pilot run with electric scooters by actively promoting the establishment of a battery swapping system. A baseline subsidy will be given to businesses to set up 30 swapping stations to serve about 5,000 electric scooter drivers. Each station can receive up to NT$1.5 million. The EPA encourages businesses to apply for this subsidy and actively establish a battery swapping system to accelerate the replacement of scooters with internal combustion engines and reduce air pollution.

Environmental Sanitation

Three New Microbial Agents for Disease Vector Control Considered for Control List

The EPA pre-announced the addition of three types of microbial agents used for controlling disease vectors. Application for a microbial environmental agent permit must be processed in compliance with regulations. These include *Bacillus sphaericus, Beauveria bassiana*, and *Metarhizium anisopliae.* The contents of the preannouncement have been posted on the EPA Web site (http://ivy5.epa.gov.tw/epalaw/index.aspx).

The use of microbial agents for disease vector control is an international trend, giving the advantage of specificity without leaving chemical residues. A review of the types of microorganisms used for environmental pest control registered internationally revealed that in addition to *Bacillus thuringiensis*, serotype H-14 (which had been announced by the EPA), the previously unannounced *Bacillus sphaericus, Beauveria bassiana,* and *Metarhizium anisopliae* are also used for controlling pests, such as mosquito larvae, fire ants, ants, and cockroaches.

To reinforce the management of microbial agents used for controlling disease vectors, the EPA is considering the addition of these three microorganisms used for pest control. In the future, those intending to manufacture, process, or import these microbial agents for pest control must comply with regulations of the Environmental Agents Control Act (環境用藥管理法) regulations by applying to the EPA for a permit prior to commencement of manufacturing, processing, or importation.

Soil & Groundwater

Groundwater Pollution Control Standards Revised

On 10 February 2011, the EPA promulgated revisions to the Groundwater Pollution Control Standards in accordance with Article 6, paragraph 2 of the Soil and Groundwater Pollution Remediation Act. The Standards contain six articles.

Concentrations for listed substances in groundwater are affected by regional hydrogeological conditions and environmental background. If solid scientific data confirms that external pollution sources are not the cause of monitoring values exceeding standards for listed pollutants, the pollution standards will not be applicable to certain cases, upon approval by the EPA.

According to groundwater pollution monitoring standards, groundwater is categorized as one of the following:

1. Category I: Groundwater in the drinking water source water quality protection area
2. Category II: Groundwater not belonging to the first category.

Groundwater pollution monitoring items and limits are as follows:

Concentration units: mg/l

Pollution items:	Limits*	
	Category I	Category II
Heavy metals:		
Arsenic (As)	0.025	0.25
Cadmium（Cd）	0.0025	0.025
Chromium（Cr）	0.025	0.25
Copper（Cu）	0.50	5.0
Lead（Pb）	0.025	0.25
Zinc（Zn）	2.5	25
Iron（Fe）	0.15	1.5
Manganese（Mn）	0.025	0.25
General items:		
Total hardness as $CaCO_3$	150	750
Suspended solids	250	1250
Chloride	125	625
Ammonium nitrogen	0.050	0.25
Nitrate as N	5.0	25
Sulfate as SO_4^{2-}	125	625
Total organic carbon	2.0	10

**(rounded down to significant digits)*

Climate Change

EPA Holds "Targeting Carbon Neutral" International Conference

On 9 and 10 March 2011, the EPA held a two-day international forum titled "Targeting Carbon Neutral," offering the public an opportunity to better understand carbon neutrality. Industry operators, governmental officials, scholars, and researchers from the US and the UK were invited to share experiences on the development of carbon neutrality.

All production and assemblage activities initiated by humans generate a carbon footprint, but if people strive to reduce emissions and obtain carbon credits to offset the emissions from products,

organizations, and activities, there will be no net increase in greenhouse gases and carbon neutrality* can be attained. In recent years the United Nations Environment Programme (UNEP) and other institutions have actively promoted carbon neutrality and have received enthusiastic response from governments and enterprises worldwide.

During the forum, British Standards Institution (BSI) Senior Manager Mark Fraser spoke on the development experiences of cities and enterprises promoting carbon neutrality in England. Assistant Chancellor for Facilities at the University of South Carolina Aiken (USC Aiken), Mike Jara, discussed US university responses to carbon neutrality initiatives. To date, 677 university presidents have signed pledges to propose carbon neutral campus plans within two years. BSI Managing Director Gao Yi-min explained that to resolve the lack of global accreditation standards for carbon neutrality procedures and practices, in April 2010 the PAS 2060 Standard for Carbon Neutrality (a specification for the demonstration of carbon neutrality) was announced as the standard procedures and specifications for carbon neutrality.

EPA Minister Stephen Shu-hung Shen stated that the current international initiative of putting carbon neutrality into practice is extremely multidimensional, with products, activities, enterprises, cities, and even national governments promoting carbon neutral projects. The EPA is presently engaged in assisting local manufacturers of panel boards and shampoo to implement trial carbon neutral plans. In addition to accelerating the dissemination of carbon neutral concepts and ensuring environmental benefits, the EPA is actively engaged in setting up a carbon neutral registration management platform. This platform will provide related local and overseas information, and the public can also use the platform to register and announce carbon neutral activities. The EPA is currently drawing up national "Carbon Neutral Implementation and Declaration Guidelines (draft)" as it continues to take progressive steps towards encouraging the public's compliance with carbon neutral standards.

At this forum, local and foreign speakers along with distinguished guests shared a breadth of valuable knowledge and experiences on promoting carbon neutrality. The EPA took note of these recommendations and intends to use this feedback in future policy planning and promotion. Moreover, this forum invited the public to join together and cooperate with government institutions and organizations in efforts to implement carbon neutrality. The general public is encouraged to support carbon neutral enterprises and their products to help take steps towards achieving "net zero" emissions.

** Carbon neutrality refers to first inventorying and reducing the carbon footprints of organizations, products, services, and activities, and then obtaining reduction credits to offset unavoidable emissions, thus ensuring there will be no net increase in greenhouse gases.*

EIA

EPA Convenes Experts to Discuss Six Energy Strategies

The 204th meeting of the EPA's Environmental Impact Assessment Committee (EIAC) was convened with a group of experts to discuss six energy strategies, including: Proportionate Use of Energy, Nuclear Energy Phase-Out, Thermoelectric System Development, Upgrading Energy Efficiency, Renewable Energy Development, Carbon Capture and Storage Development, and their environmental impacts.

In accordance with the Environmental Impact Assessment Act, the Ministry of Economic Affairs recently drafted the Energy Development Programme Policy Assessment Report. The EPA thus held a public briefing in order to expand public participation while it is currently engaged in the strategic environmental assessment (SEA) of this report. The EIAC convened experts to join its 204th meeting on 23 March 2011 to come to a decision on the six policy issues to be discussed during the next meeting: Proportionate Use of Energy, Nuclear Energy Phase-Out, Thermoelectric System Development, Upgrading Energy Efficiency, Renewable Energy Development, Carbon Capture and Storage Development, and their environmental impacts.

Separate discussions will be held for the six abovementioned issues, and experts recommended from each circle will be convened to provide a communication platform for policymaking on energy development via discussion on the strategic environmental assessment of energy policies. A consensus will be then formed to make it easier for the public, organizations, experts and governments to decide on energy development policies related to technology and other affairs. This will serve as an important reference for energy policy decision-makers. The EPA indicated that the nuclear energy issue will be discussed in full, based on the discussion of the six abovementioned energy policies.

The EPA indicated that the proportionate use and development of each type of energy are closely related to CO_2 emissions, power generation costs, and electricity costs. If the proportionate use of renewable energy is hastily increased to reduce CO_2 emissions, electricity costs will also need to be raised to reflect actual cost. If the proportionate use of nuclear energy goes up, this may cut CO_2 emissions, but there are still concerns about nuclear safety and radioactivity. If the proportionate use of coal-fired power generation goes up, CO_2 emissions will increase and complicate efforts to achieve international carbon reduction goals.

Two of the topics discussed during the SEA of the energy development programme included Proportionate Use of Energy and Nuclear Energy Phase-Out. Discussion regarding the length of time needed to phase out nuclear energy was based on the premise of the nuclear-free homeland policy. The experts concluded that it must first be confirmed how much room there is for the development of renewable energy in Taiwan. After all possible methods are developed, the installation capacity and power capacity of renewable energy should be determined for all types of energy sources including wind, photovoltaic, solar thermal, biomass, etc. Then an assessment should be made of how much more room there is for the development of natural gas, how much air pollution and greenhouse gases are emitted by coal-fired power generation, and how much coal-fired power generation is acceptable. After drawing up energy conservation measures based on the assessment of actual needs and estimating the national demand for electricity in the future, the length of the transition period for phasing out nuclear power can finally be confirmed. Further plans on taking steps toward the goal of a nuclear-free nation can then be drawn up.

To further prevent impacts on national reduction targets due to increased carbon emissions from development projects, the EPA is using the EIA process to demand that developers adopt technology that conforms with EU Best Available Techniques (BAT) to ensure emissions are minimized. Developers must also actively invest in new reduction technology such as carbon capture and storage as well as research and develop new energy technology.

As for offset plans, developers are required to prioritize domestic carbon credits. To achieve national reduction targets the government is currently formulating carbon reduction measures that work to greatly reduce carbon emissions according to Taiwan's previously set schedule in a way that does not affect the establishment of new development plans and economic development and growth. It is hoped that more private investment can be encouraged by investing in renewable energy for power generation and setting reasonable special rates for electricity.

Climate Change

Eleven Counties/Cities Reach Second Round in Model Low-Carbon City Selection

On 8 March 2011, the EPA announced its decisions for the first round of its Model Low-Carbon City selection. Of the 17 counties/cities originally entered, eleven, representing the four main administrative regions of Taiwan (north, central, south, and east), have been selected to enter the second round.

The Executive Yuan has decreed that by 2014 Taiwan should have six model low-carbon cities. The EPA has thus been busy drawing up relevant plans. It has been decided that Penghu and Kinmen will become low-carbon islands, which leaves four cities on mainland Taiwan to be selected. The winning candidates will have clearly-stated visions and targets, obvious potential to reduce carbon

emissions, as well as have proven to be capable of implementing policy. Funding for establishing these four model cities will come from both central and local governments, and it is hoped that they will act as catalysts for the eventual establishment of four large-scale low-carbon living spheres.

In order to ensure that the selection process is fair, open, and objective, in 2010 the EPA carefully devised a suitable selection mechanism and formed a selection committee consisting of 15 experts in the field of carbon reduction drawn from government agencies, academia, industry, and citizen groups. The committee is charged with assisting the evaluation of candidate cities' applications and selecting the winners.

The first round of the selection process required local governments to submit an outline plan that covered the vision for their city, specific targets, low-carbon strategies, financial planning, promotion mechanisms, and an overall benefit assessment. The hope is that local governments will come up with creative ideas and policies that fully take advantage of local environments and available resources to bring about low-carbon lifestyles for residents.

The 11 cities that have reached the second round are: Northern region: Taipei City, New Taipei City, Hsinchu City; Central region: Taichung City, Nantou City, Yunlin County; Southern region: Chiayi County, Tainan City, Kaohsiung City; Eastern region: Yilan County, Hualian County. The second-round evaluation process to decide the four winning candidates has already begun and should be completed by the end of August 2011.

The local governments that were chosen by the EPA submitted preliminary plans that were judged to have a number of special features. These included:

- Formulating carbon reduction policies that took into consideration local environmental conditions.
- Implementing joint efforts with local industries to promote low-carbon, energy-saving manufacturing.
- Modifying existing public facilities so that they operate on low-carbon principles.
- Conducting research into urban development models that save energy and reduce carbon emissions.
- Using the combined energy and experience of government, industry, academia, and local residents to promote low-carbon lifestyles.
- Taking into account the advantages of both urban areas and villages and drawing up carbon reduction policies accordingly.
- Promoting energy saving as a means to nurture the growth of energy saving industries locally.
- Creating detailed plans for promoting green tourism.

Measures that save energy and reduce carbon emissions require the application of energy-saving technologies and encompass the fields of environmental protection, transportation, architecture, land planning, and law. Such complexity can only be overcome by carefully integrating available educational and human resources. Delegations from the 11 local governments in the second round making preliminary reports to the selection committee included experts, department heads, mayors, county magistrates, or their second-in-command. These leaders have already started the task of integrating their governmental resources in order to plan for carbon reduction, which reflects their commitment to becoming low-carbon model cities.

The EPA stresses that those cities not among the selected four should not abandon their carbon reduction policies, as the coming implementation of the Low–Carbon Cities Program will see the creation of low-carbon living spheres - centered on the four low-carbon model cities – that will incorporate neighboring municipalities.

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Environmental Policy Monthly
Environmental Protection Administration
Office of Sustainable Development

83, Sec. 1, Jhonghua Rd.,
Taipei 100, R.O.C. (Taiwan)
tel: 886-2-2311-7722, ext. 2211
fax: 886-2-2311-5486
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