

附 件 一

本署演講簡報

21 September, 2022

Join forces for Climate Action- Resource Circulation Policy and Development in Taiwan

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Director General

Waste Management Department, Taiwan EPA

- **Introduction**
- **The Milestone of Waste Management**
- **Strategies and Goals**
- **Circular Economy - Plastic**
- **Future Perspectives**

01

Introduction

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Background

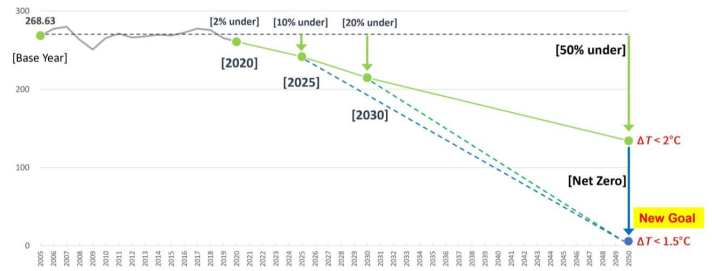
- **The Severity of The Waste Problems**
- **76% of Materials in Taiwan Are Imported**
- **Reducing Environmental Burdens**
- **Forming Business Models**



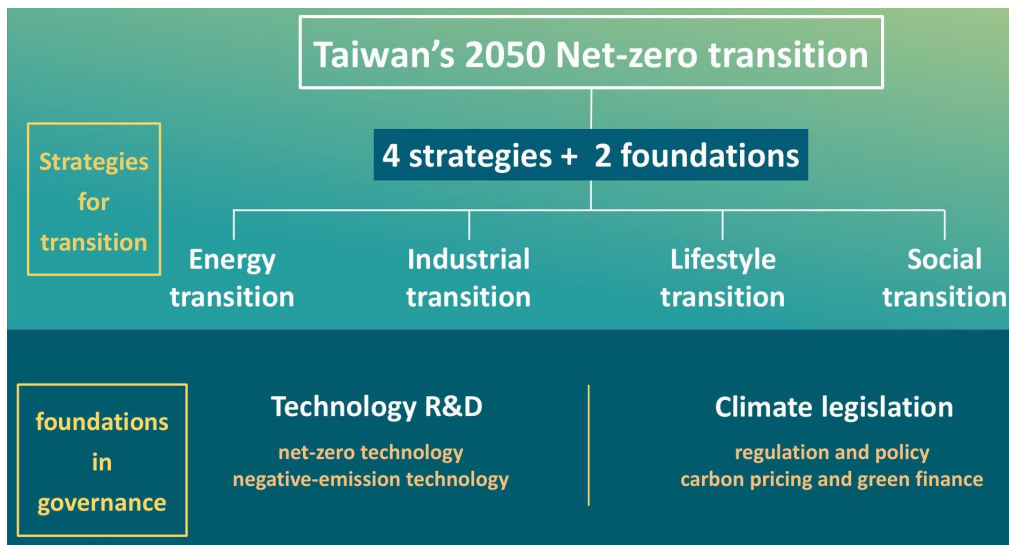
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Echoing the Global Climate Actions: Towards Net-Zero Emissions by 2050

- Net-zero emissions by 2050
- Low-carbon technologies and industries
- Climate Change Response Act :
 - Improving climate governance
 - Introducing carbon pricing instruments
 - Enhancing adaptation actions



Taiwan's 2050 Net-Zero Transition



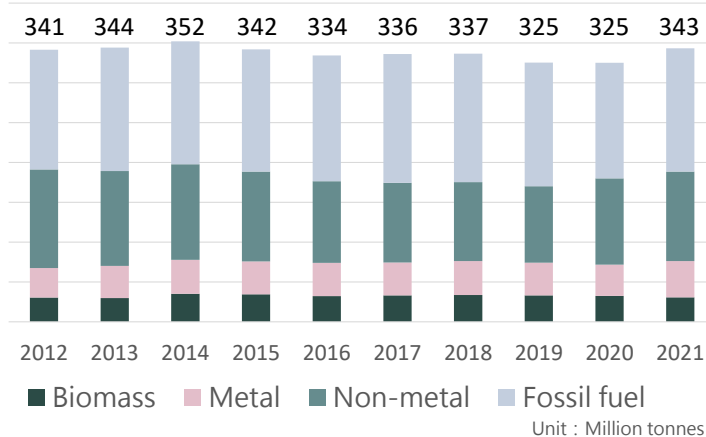
A Net-Zero Transition for Taiwan by 2050



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Consumption of Materials in Taiwan

- In 2021, approx. **343 million tonnes** of materials were used
 - **270 million tonnes** materials were consumed domestically after excluding materials that were processed and exported again.
 - Avg. 11.57 tonnes of materials consumed per capita annually.



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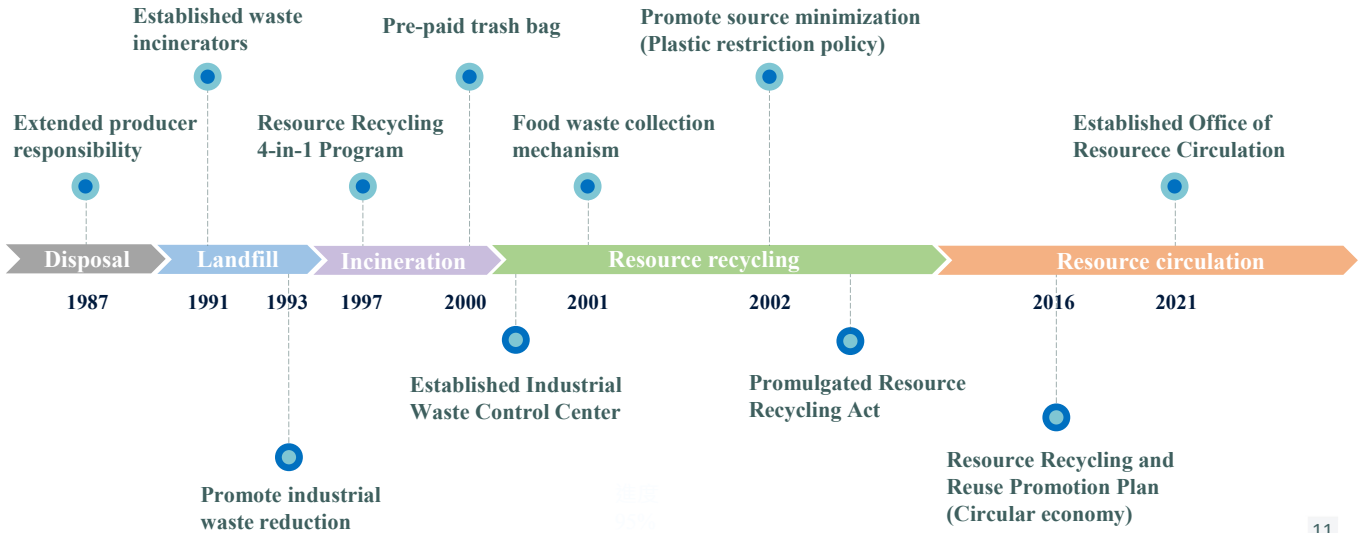
Waste Statistics



02

Milestone of Waste Management

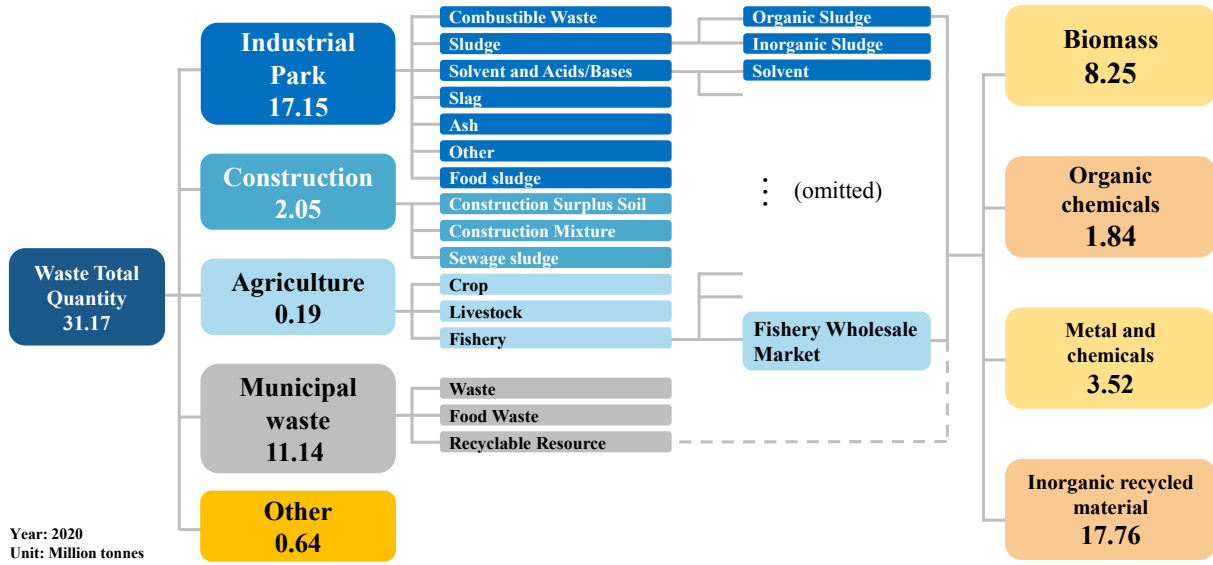
The Milestone of Resource Recycling Policy



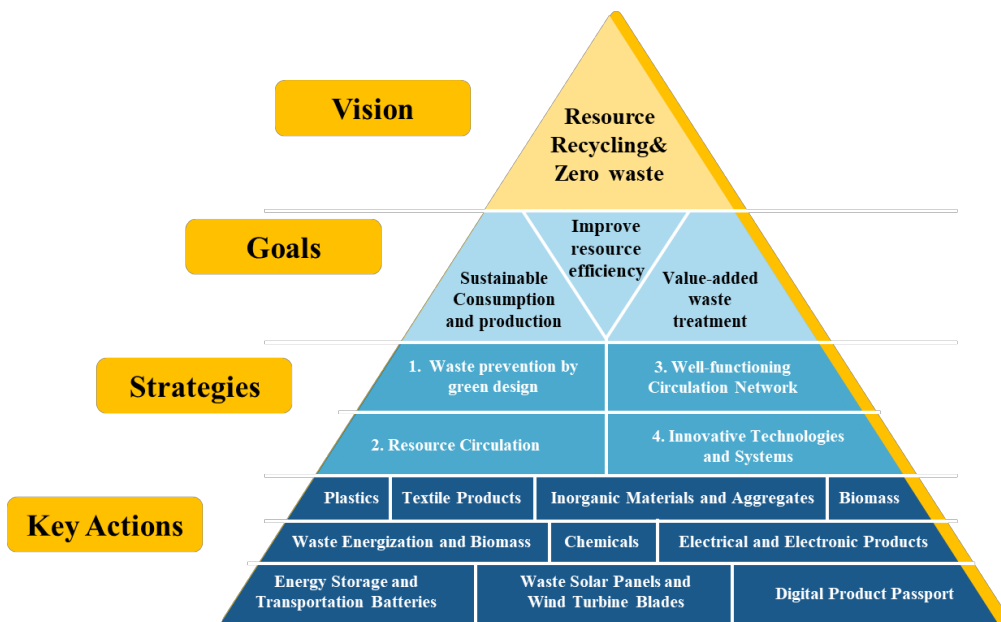
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Strategies and Goals

Resource Inventory From Waste Flows



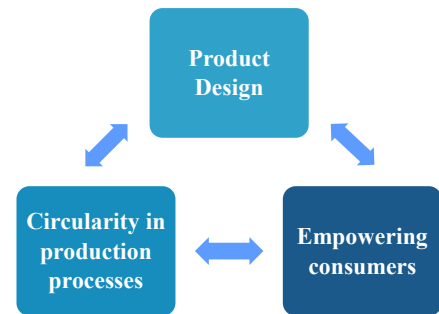
Policy Framework



Strategies (1/4)

1 Waste Prevention by Green Design

- Empower consumers to ensure that they receive information about products, and that sustainable consumption leads to product design and extended warranty services.
- Use single material, circular design, and increase the proportion of recycled materials.
- Make producers retain ownership of the product.
- Reduce the amount of single-use products to prevent waste.



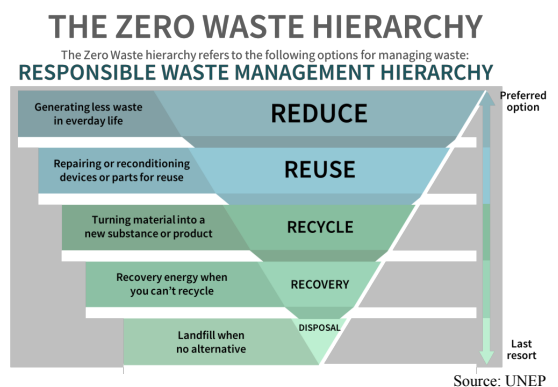
Source: European Union

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Strategies (2/4)

2 Resource Circulation

- Strengthen the separation of raw materials, recycled materials and waste.
- Transform organic waste into energy or resources.
- Transform combustible waste resources and biomass into energy.
- Transform metallic waste resources into materials and promote reuse of chemical resources.
- Recycle inorganic waste materials and transform the materials into recycled aggregates and building material banks.



Source: UNEP

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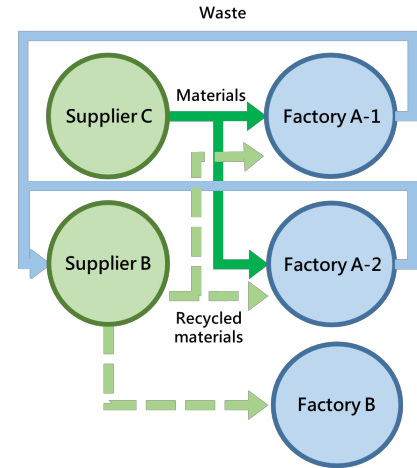
Strategies (3/4)

3 Well-functioning Circulation Network

- Form the industrial chains of resource circulation.
- Develop region-based industrial circulation centers or eco-industrial park.
- Strengthen the public communication.

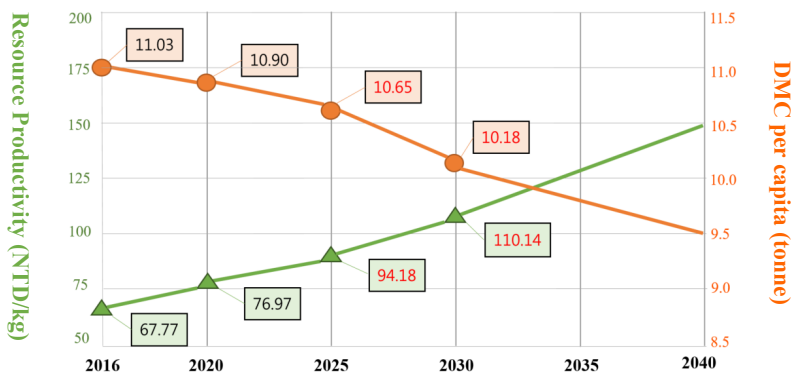
4 Innovative Technologies and Systems

- Strengthen the innovative technology research and development.
- Promote digital product passports to reveal product environmental information.
- Establish a material tracking system, apply digital technology and promote material verification mechanism and match-making application.
- Improve innovation of resource recycling law systems.
- Implement indicators to monitor the progress.



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Key Performance Indicators (4/4)



▲ **Resource Productivity** was 76.97 NTD/kg in 2020, targeting 94.18 NTD/kg in 2025 and 110.14 NTD/kg in 2030.

● **DMC per capita**, using 10.90 tonnes in 2020 as the benchmark, with a target of 10.65 tonnes in 2025 and 10.18 tonnes in 2030.

Note:

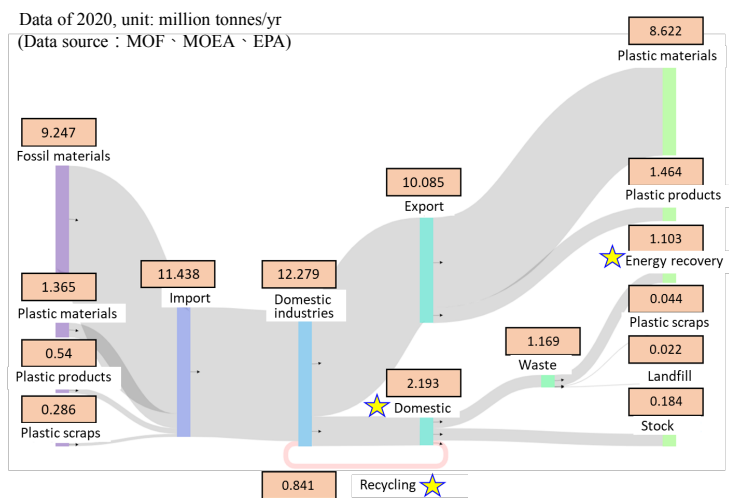
1. Resource Productivity = "Real GDP" divided by "Domestic Material Consumption (quantity of imported substances + all substances mined and used in the country - quantity of exported substances)"
2. DMC per capita = "Domestic Material Consumption" divided by "total population".
3. 2023-2030 GDP growth rate is about 16%, while DMC decreases about 5%, and economic development is decoupled from the use of raw materials.

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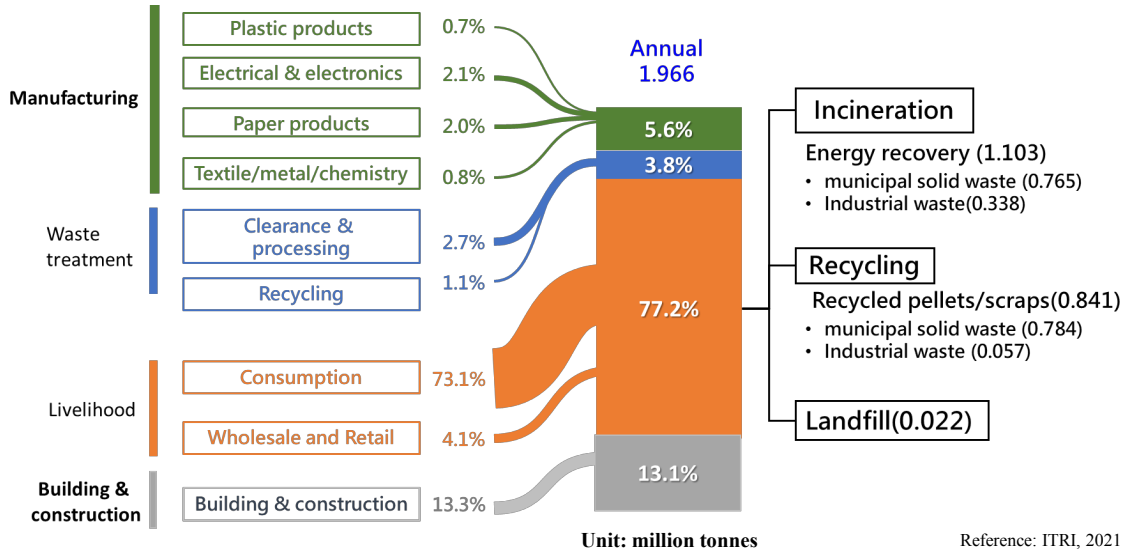
04 / Circular Economy --- Plastic

Over all plastic flow

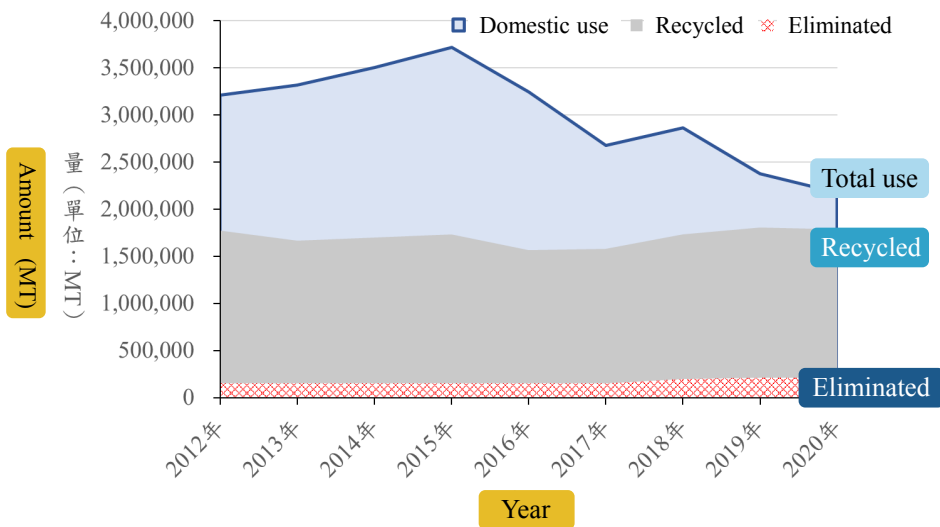
- **Plastic demand:**
12.28 million ton/year
- **Domestic use:**
2.19 million ton/year,
about 38% are recycled



Sources of plastic wasted and their disposal



Historical consumption and reduction



The way to a better circularity

- How to increase material recycling and to reduce raw material dependence?
- How to improve waste to energy efficiency and to reduce carbon emission of the system?

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Strategies

- Eco-design on products and innovative business models.
- All plastic wastes to be collected, sorted, and recycled and utilized.
- Value-added on recycled materials and industrial cooperation to drive circulation.
- Net zero carbon approach.

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Action 1 - Eco-design

■ Design and manufacture recyclable products and packaging

● Minimize the use of packaging

- ✓ Limit over-packaging and promote reusable packaging for online shopping
- ✓ Promote reduction and recycling of packaging for wholesales and retailers



Unpacked



Less offering



Package substitution



Reusable packaging

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Action 2 - Innovative business models

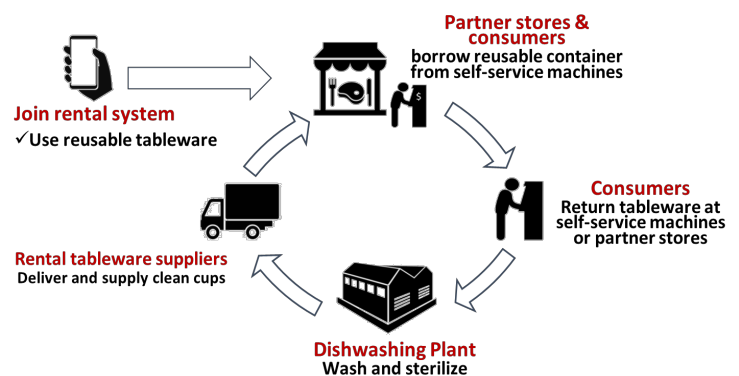
■ Promote reduction with business models combined with regulations/voluntary actions

● Case : reuse tableware and cups

- ✓ Provide leasing services based on sharing economy extensively

KPI

Reusable cups and containers up to 20% of the total consumption

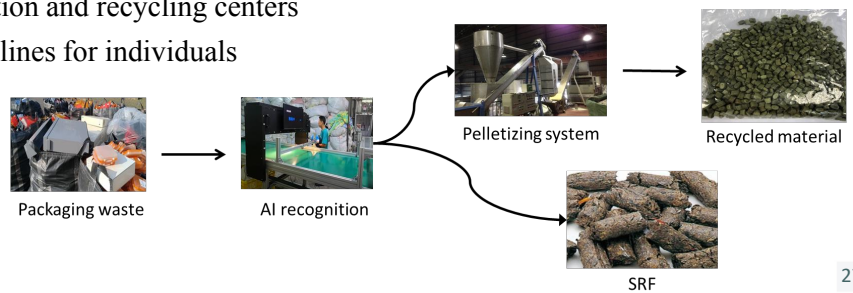


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Action 3 - Recycling maximization

■ Establish and optimize effective recycling

- **Strengthen infrastructure and smart recycling technology**
 - ✓ Develop spectral database/AI recognition model/automatic sorting system
 - ✓ Provide incentives: differential recycling fee or subsidies
- **Integrate industries to establish circulation model**
 - ✓ Organize regional collection and recycling centers
 - ✓ Set self-circulation guidelines for individuals



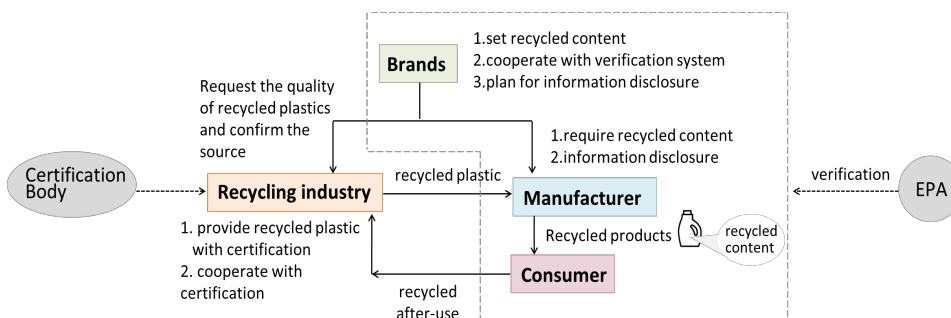
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Action 4 - Value-added & market expansion for recycled plastic

■ Increase the use of recycled materials

- Develop guidelines and incentives to create demand for recycled materials
- Set up targets on recycled content in products

■ Design a simplified verification system with AI technology



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Action 5 - Net zero carbon emission approach

■ Reduce carbon & energy consumption of the system

- **Case 1** : Convert waste plastic to solid recovered fuel (SRF)
- **Case 2** : Set up material recovery and water/energy consumption standards for recyclers to follow or improve



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Target

	2020 (Baseline)	2025	2030
Plastic packaging reduction(%)	-	20	25
Recycling rate of plastic packaging (%)	30	50	70
Recycled content in plastic packaging (%)	11	25	30

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Future Perspectives

- Keep promoting resource circulation and improve resource efficiency in line with net zero emission trends and policies.
- Promote green design and circular business model to build a society with sustainable resource utilization base on the United Nations SDG12.
- Revise regulations and develop innovative technologies; build circular networks and strengthen social communication.



Net-Zero
Emissions

SDG 12

Law

Innovation

*Thank You for
Your Attention*

附 件 二

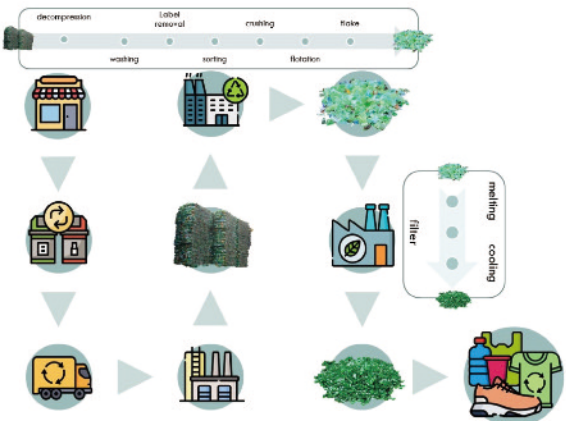
國內企業及公協會組織之展板

PET plastic recycling

Recycling PET- GREEN ECO FRIENDLY

YUNG IEE Environmental Technology CO., LTD. was established in 2003 and is located in Fangyuan Industrial Zone, Changhua County, Taiwan, specializing in the production of recycled bottle flakes from waste plastic containers made of PET, HDPE, and PP. We are an excellent waste plastic container recycling plant audited and certified by the Environmental Protection Agency in Taiwan. We specialize in the processing of post-consumption plastic containers, with a monthly production capacity of more than 3,500 tons with stable quality.

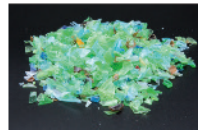
We are certified by GRS and also certified by ISO 9001 and ISO14001.



Since 2014, we have been devoted to rPET manufacturing and established SHENG-ZHAN GREENTECH CORPORATION LTD. With the concept of reduction, reuse, and recycling, we introduced energy-saving, low-pollution and FDA-certified production equipment to specialize in the production of plastic plates and PET recycled ester chips and the supply of high-quality and stable-quantity recycled raw materials.



**PET
Flakes Clear color**



**PET
Flakes Green with mixed color**



**PET
Flakes Clear with mixed color**



**PET
Chips Clear color**



**PET
Chips Green color**



**PET
Chips Tawny color**



**PET
Chips Clear color with blue**

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Inheriting the legacy of Sinotech

Sinotech Engineering Services Ltd was established in December, 2008, as a spin-off company of the Sinotech Engineering Consultants Ltd. With further adjustment in the corporate business strategy in 2016, the Sinotech Engineering Services Ltd had inherited the majority of the Environmental Engineering Departments from Sinotech Engineering Consultants Ltd and repositioned itself as a multi-discipline environmental engineering consultant firm.

Our services cover almost all aspect of environmental engineering, including water supply and sanitation engineering, water pollution remediation, waste processing, environmental impact assessments, air pollution and noise prevention, soil and groundwater remediation, and hazardous substance management. In recent years we have also expanded our expertise into the field of waste recovery, resource and energy integration, water reclamation, carbon management, and climate change adaptation.

We have established ourselves as one of the largest, most experienced, and the most reputable environmental engineering consultant in the country. In the future, we will uphold our professionalism, quality, integrity, and innovativeness to continue to dedicate in environmental protection.

Company vision

Our vision is to bring brighter future and welcome more possibilities. We will provide better services, fulfilling innovation and efficiency, and working toward sustainable development. In the name of Sinotech, we shall achieve a new horizon in engineering consultancy and technology.

PURSUIT OF HIGHER STANDARD

We adhere to the business philosophy of quality, efficiency, innovation, and perseverance. By providing high quality, customer-oriented, and flexible service to our clients, we strive to become the new industry standard.

PROFESSIONALISM

We retain well-round engineers with capabilities in feasibility study, planning, design, and construction supervision to provide professional works in both engineering practice and project management.

EXPLORE GLOBAL MARKET

Other than broadening our services in Taiwan, we also focus on bringing our technological advantages in environmental protection, disaster prevention, disaster mitigation, climate change adaptation, and sustainable planning into the international arena.

INNOVATION

Having the most talented engineers with Ph.D. and master's degrees, we continuously research for better technologies and widely use professional software to provide innovative solutions in our projects.

CONSIDERATION

Serving with intimacy, enthusiasm, vigilance, patience, and empathy, the reputation of high-quality service we earned thereof has deeply rooted in the hearts our clients.

COLLABORATION

Inheriting the professional lineage of the Sinotech Group, we work with academics and international experts. We aspire for the integration of science and environmental engineering to achieve sustainable development of both the economy and the environment.

Core Technologies

Water Treatment Engineering and Water Pollution Management

- Tap water distribution and water purification system
- Sewer and waste water treatment system
- River and harbor pollution remediation
- Water reclamation and distribution system

Environmental Quality Management and Impact Assessment

- Noise assessment and management
- Environmental quality modeling and impact assessment
- Climate-change adaptation
- Environmental quality investigation, monitoring, and information system
- Environmental policy analysis and think tank

Air Quality Management

- Indoor and ambient air quality management
- Investigation and control of hazardous air pollutants
- Construction life cycle carbon-emission management
- Greenhouse gases reduction and assessment
- Carbon neutral strategy counseling and planning



Waste Treatment and Energy and Resource Integration

- Advanced waste incineration and multi-purpose treatment facilities
- Urban mining and reuse of incineration bottom ash
- Hazardous and special industrial waste treatment
- Recycling of renewable fuels and biomass energy
- Waste treatment facility operation supervising service
- Regional energy and resource integration matchmaking
- Integration and application high efficiency and low-carbon waste transportation units

Management and Counseling of Waste and Hazardous Substances

- Management and counseling of domestic waste disposal and recycling
- Management and counseling of industrial waste removal and recycling
- Management and counseling of chemicals and hazardous substances
- Waste-to-energy promotion and of inorganic pellets recycling

Soil and Groundwater Pollution Investigation and Remediation

- Investigation and turnkey remediation project of soil and groundwater pollution
- Ex-situ treatment of contaminated soil
- Supervision and verification of contaminated site remediation
- Health risk assessment and risk management decision making
- Soil quality inspection and brownfield redevelopment
- Persistent organic pollutants baseline investigation



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Company Introduction

Horng En Group has 42 years of experience in the recycling industry and has been developing various recycled resins for different applications including blow molding, blown film, extrusion, injection grade. We focus on sales of recycled plastics such as PP, PE, ABS, PS, PC, etc., and also provide customized service for color. Our certificates include ISO9001, ISO14001, ISO14067, ISO28000, ISO50001, BS8001, GRS, TUV, etc. The factory is equipped with 24 production lines and an internal QC laboratory. "Reuse of resources" is our goals of continuous enhancement. We take good care of communities and facilitate a sustainable system to guarantee all resources are fully used without causing any unnecessary waste.

Circular Economy

Green procurement

The process of recycling plastics waste complies with eco-friendly concepts, includes recyclability, low pollution, and resource-saving. Green products will be the prior choice while replacing equipment.

Circular design & Waste reclamation

Post-consumer plastic, after crushing, cleaning, melting, and then is extruded as the resin to produce various plastic products. The content of recycled materials that can be reused in the product is as high as 75% or more.

Process improvement

Improving machinery facilities, automation, and stabilization of the production process can reduce the emission of pollution sources and energy consumption in the manufacturing process.

Value Creation

It is estimated that 60,000 metric tons of plastic waste can be effectively processed each year and towards zero waste. Keep the faith in sustainable development and create the huge business opportunities for the green economy.



Economic Effectiveness and Future Plan

Our product, recycled plastic pellets, can reach 95-97% of the recycling rate; strengthening the recycling system can not only reduce the frequency of using incinerators but also reduce resource development costs.

Horng En Group has been paying high attention to global environmental issues and has an insight onto the recycled industry to strive for innovation. Develop the recycling industry integration from the upstream and downstream, establish an industrial symbiosis system, and keep promoting the circular economy to increase the company's value.

Innovation To Bring You A Great Future

CUSTOMIZED SERVICE

Recycled plastic pellets manufacturing ; Offering efficient customer service such as dyeing and mixing materials according to customers' needs. Material: PP / PE / ABS / PS / PC...etc.

PRODUCT APPLICATION

Automotive parts / Household tools / Fitness equipment / Industrial product Office appliance / Film / Bag / Bottle cap / Pipe / Flower pot / Pallet / Furniture / Keyboard / Wood plastic composite / 3C product

CERTIFICATE

New Plastics Economy - Global Commitment Signatory / Global Recycled Standard (GRS) / Recycled Material Verified (TUV Rheinland) / UL / RoHS / REACH / ISO 14067 (TUV) / ISO 9001 / ISO 14001 / ISO 28000 / ISO 50001 / BS8001



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Introduction

Taiwan Construction Research Institute (TCRI), a non-profit organization, was founded by the RSEA Engineering Corp. (formerly the Ret-Ser Engineering Agency of the Executive Yuan) with a seed fund of one million New Taiwan Dollar and the matching contribution of lab resources of the National Taiwan University and the National Taiwan University of Science and Technology (formerly the National Taiwan Institute of Technology) in May 1981. The Institute was expanded with a broader mission of research and service on the construction industry and its business management in September 1996.

Case Sharing on Circular Economy:

Holland Pavilion at the 2018 Taichung Flora Exposition:

The Holland Pavilion at the 2018 Taichung Flora Exposition was the first 100% circular building in Taiwan. With TCRI's assistance, the Building Information Modeling (BIM) was adopted to create the materials passport for building components, and through the dismantling process of the Pavilion, all information of building materials was recorded and hence accelerated efficiency of materials reuse. Meanwhile, TCRI collaborated with the Netherland Trade and Investment Office to make the Holland Pavilion the world's first circular construction checked by the British Standard Institution (BSI) with the Optimizing rank.

Marketing the Recycled Aggregate:

Exploring the market access is the necessary strategy for promotion of recycled aggregate. In addition, engineering technology and management measures can provide supports to enhance acceptance of these waste materials. TCRI promotes the recycled pellets including incineration bottom slag, power plant coal ash, steelmaking slags, and reservoir sludge. The main engineering applications include controlled low-strength materials (CLSM) backfill, asphalt concrete, road grade, the bottom layer of the aggregate and the base layer. TCRI also assists in the establishment of technical manuals and specifications.

Enhancing Competitiveness of the Cement Industry and the New Value of the Enterprise:

The cement industry is recognized as the heart of the vein industry due to its high temperature, long residence time, large turbulence, neutralization of pollutants and zero residue. TCRI assists the industry in the assessment of cement raw material replacement and technical solutions, including steelmaking slags (including reducing slag, desulfurization slag, steel slag fines, basic-oxygen-furnace (BOF) slag), waste glass, and incineration plant's bottom slag, etc. These experiences not only help reduce the pressure on Taiwan's industrial waste disposal, but also enhance the competitiveness of the cement industry and the new value of the enterprise.

Promotion of Road Asphalt Paving using Waste Tires:

TCRI is promoting the use of waste tires in road asphalt paving technology and marketization. We not only successfully introduced a complete set of machinery and automation technology, but also proposed applicable technical solutions and normative standards that matched the current situation of Taiwan's engineering community. This has resulted in an accumulation of nearly 80 kilometers of project performance.

Technical Development of Preparation for Lightweight Partition Walls with Recycled Glass:

Autoclaved Lightweight Concrete (ALC) partition walls, are considered as top choice for compartment partition walls because of their lightweight, excellent ability of thermal and acoustic insulation, and easy for construction works. The main ingredient for manufacturing the ALC is silicon dioxide. Techniques have been developed to manufacture ALC partition walls with domestic recycled glass to replace imported and expensive silicon dioxide.



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Introduction

The Waste Removal and Treatment Commercial Guild (WRTC, hereinafter referred to as: association) of Taiwan, Republic of China was established in 1998 with the approval of the Ministry of the Interior of the Republic of China. It has more than 1,500 members of various types of removal or treatment institutions. Currently, the chairman of the seventh board of directors is Mr. Chungren Lin, and the main members are nearly 100 member representatives from various waste removal and treatment business associations in Taiwan Province, Taipei City, New Taipei City, Taoyuan City, Taichung City, Tainan City, and Kaohsiung City. Established and operationally executed.

The core idea of this association is to assist the Environmental Protection Agency of the Executive Yuan to promote relevant waste removal and treatment business, and to maintain Taiwan's beautiful environment and national health. In order to strengthen the coordination with the industry, combine the strength of the industry, enhance common interests and build consensus, and establish the self-discipline and autonomous order of the industry, so as to promote the competitiveness of the group and the overall development of the waste removal and treatment industry, the main tasks include: to promote relevant waste removal and treatment business, and to maintain Taiwan's beautiful environment and national health. In order to strengthen the coordination with the industry, combine the strength of the industry, enhance common interests and build consensus, and establish the self-discipline and autonomous order of the industry, so as to promote the competitiveness of the group and the overall development of the waste removal and treatment industry, the main tasks include:

1. Matters concerning the government's economic policies and commercial and environmental protection laws and regulations to assist in the implementation, research and suggestions.
2. Matters concerning the investigation, statistics, research, development and promotion of the business operations of the company.
3. Matters concerning the mediation of intra-industry disputes.
4. Matters concerning the organization of skills training and business seminars for employees of the same industry.
5. Regarding the application, change, replacement and other service matters of the membership authorization certificate.
6. Matters concerning the organization of member public welfare undertakings.
7. Matters concerning the maintenance of members' legitimate rights and interests.
8. Matters concerning services entrusted by agencies and organizations.
9. Matters concerning participation in social services.
10. Guiding member associations to improve their organization and development of conference affairs.

In recent years, the Association has cooperated with the government to recycle and reuse resources and promote the development direction of circular economy, and support the active actions of the government. In addition to proper treatment of waste and making full use of resources, we will continue to strengthen the existing technical capabilities of waste removal and treatment and increase the capacity of removal and treatment. In addition, we are also doing our best to maintain the environmental quality of Taiwan and develop Taiwan's environmental protection, hoping that various wastes can be removed and treated in a more suitable way, so as to reduce the environmental pollution load and create an industrial environment that combines environmental protection and economic development.



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**GREEN ENERGY AND ENVIRONMENT
LABORATORIES OF ITRI**



Introduction

Industrial Technology Research Institute(ITRI) is a world-leading applied technology research institute with more than 6,000 outstanding employees. Its mission is to drive industrial development, create economic value, and enhance social well-being through technology R&D. Founded in 1973, it pioneered in IC development and started to nurture new tech ventures and deliver its R&D results to industries. ITRI has set up and incubated companies such as TSMC, UMC, Taiwan Mask Corp., Epistar Corp., Mirlle Automation Corp., and Taiwan Biomaterial Co. To meet the needs of sustainable development, the Green Energy and Environment Laboratories of ITRI has devoted its resources to developing novel green energy and environment technologies for a better future. In addition, the Lab also endeavors at supporting Taiwan's enterprises to break through the bottlenecks of establishing strong, competitive, and green industries with advanced research and development programs. The energy and environment topics that ITRI focuses on are renewable energy, energy efficiency, alternative energy, energy management and policy, clean environment, and natural resources.



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MING FU GROUP



Introduction

Mr. Chen Fu Song, the founder of Ming Fu Group, has successively established a number of resource recycling companies since 1975, and has stepped into a number of environmental protection business fields. In the era when the industry took off, it transformed from the traditional steel wholesale and retail industry and established the first privately run and privately run waste motor vehicle recycling, crushing and sorting plant in Taiwan to provide steel mills with recycled raw materials. In addition to reducing secondary pollution to the environment, it also implemented to achieve the goal of waste recycling and energy saving and carbon reduction.

**GREEN ENVIRONMENT
ENGINEERING INCORPORATION**

1. Recycle
2. Paper, plastic, iron and aluminum cans, special bottles, lamps, etc.
3. Metal Recycling
4. Collecting and Recycling Automobile/Motorcycle

**DAH FWU HER RESOURCES
REGENERATION CO., LTD.**

1. Plastic waste recycling and remanufacturing
2. Recycling waste plastic containers

Product:

- PP—Polypropylene
- PS—Polystyrene
- ABS—Acrylonitrile Butadiene Styrene
- HDPE—High Density Polyethylene

**Ming Ren Resources Technology
Co., Ltd.**

1. Waste dry battery recycling
2. Waste battery recycling
3. Waste rare earth metal recovery

Feng Qi Industrial Co., Ltd.

1. Ready Mixed Concrete Manufacturing
2. Manufacturing of cement and concrete products
3. Controlled Low Strength Backfill Material Manufacturing
4. Uncategorized Other Building Materials Wholesale
5. Waste glass, ceramics, coal-fired fly ash, bottom ash recycling

**GREEN ENVIRONMENT
ENGINEERING INCORPORATION**

1. Recycling waste information items
2. Recycling waste household appliances

**DJIN LIAN CHENG RESOURCES AND
TECHNOLOGY CO., LTD.**

1. Waste lead storage battery recycling
2. Waste lead recycling
3. Waste plastic recycling

Group Vision

From the beginning of our commitment to environmental protection, we are better than yesterday. The countless experiences and strong strength we have accumulated have earned us the trust and recognition of the international community. I love the earth, achieve the corporate responsibility of "Urban Mining Green Economy", introduce the concepts of green energy, environmental protection and reuse into the industry, and actively invest resources to improve the accurate classification of waste and develop it with the purpose of "resource recycling and sustainable use". The way of resource recycling and utilization is expected to achieve the goal of Zero to Zero zero waste, make resource recovery effective treatment and reuse, and create the synergy of circular economy. We believe that green is the best starting point for innovation. We believe that it is our mission to improve the last mile of the process for our customers in a circular economy.



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Company Introduction

Taiwan Green Productivity Foundation (TGPF) was established in 1991. For the past 30 years, we persistently uphold the mottoes of "providing industries with consultations to increase environmental and economic benefits" and "assisting enterprises in achieving sustainable development".

With our colleagues' effort, the integrity of TGPF's organizational structure has been fully established and the business growth has been tremendous. Our services include: greenhouse gas reduction, energy conservation, resource circulation, environmental and energy management, low-carbon urban and community planning, and technology development of energy and resources. TGPF has been working towards enhancing the efficiency of energy utilization by users to achieve the ultimate goal of total solution in energy conservation and CO2 emission reduction. In order to assist enterprises in compliance with international standards and regulations, TGPF is devoted to promote green productivity strategies. We enable the enterprises to improve the production efficiency, energy utilization efficiency, and environmental protection performance. The above mentioned improvements shall bring significant contributions to the enterprises in sustainable business operation.

Services

Greenhouse Gas Reduction

- Greenhouse gas inventory
- Greenhouse gases tradeoff project
- Greenhouse gas Reduction
- Product carbon footprint analysis
- GHG information system
- Development Project EIA Reduction

Conserve Energy

- Energy-saving diagnosis and counseling
- Energy system energy assessment
- Improve energy efficiency verification
- Energy consumption equipment efficiency testing
- Energy improvement projects Technical Advisor

Resource Circulation

- Develop renewable resource's law systems
- Providing resource regeneration technical related consultations
- Promoting Recycled Products
- Renewable resources market assessment

Environment and Energy Management

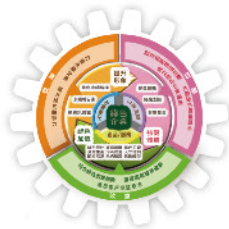
- Environmental management system
- Energy information management platform
- Corporate Social Responsibility Report
- Energy Information System Construction
- Energy management systems(ISO 50001)

Low-carbon Urban Community Planning

- Low carbon communities and urban ecological survey
- Low carbon communities and urban planning

Energy Resources Technology Development

- Tech research and development of renewable resources
- Energy application technology research and development
- Renewable energy and new energy applications assessed



CONTACT US

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Introduction

Since 1995, Gi Ding Technology (GD) has been committed to providing comprehensive and safe solutions in the field of waste treatment and renewable resources. Assist in the disposal of various special business wastes of domestic (Taiwan) enterprises and convert them into usable renewable resources, so that industrial development and environmental protection can be stably paralleled. GD TECH has rich development experience and technology research and development capabilities. It provides professional waste treatment services from air pollution control to industrial wastewater recycling and treatment, including the recovery of nearly 30% of copper-containing sludge in Taiwan, and the stabilization of heavy metal sludge. Recycling of valuable metals, such as copper, aluminum and nickel, etc., makes sustainable development possible.

- Copper sludge heat treatment and purification technology development
- Design and production of Rotary kilns (Rotary furnace) heat treatment system
- Heat treatment hazardous waste technology development. (aircraft/harmless)
- Recycling metal such as copper, aluminum and nickel.

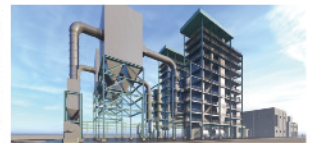
Core treatment technology

METHOD	FUNCTION	PRODUCT
HEAT TREATMENT	Sludge drying and accumulation reduction	Copper oxide semi-finished products
EXTRACTION	Transfer valuable metals in sludge from solid phase to liquid phase	Copper sulfate
NEUTRALIZATION	Neutralization and adjustment	Copper oxide, Copper hydroxide
PERMUTATION	Reduction of target metal by using the difference of metal potential	Aluminum sulfate, copper powder, Ferrous sulfate
PHYSICS	Purification and recrystallization of waste copper sulfate crystals	Copper sulfate



SRF Renewable Energy Power Plant

Technology continuously innovates and evolves. The industry also needs a friendlier approach to protect and develop the environment together. Therefore, GD TECH established Yang Bao Industry, the investment scale reached USD 150million. Obtained the first SRF renewable energy license in central Taiwan. Established "SRF Renewable Energy Power Plant" Introduced a number of new generation technologies, contributing to the environmental goal of carbon neutrality.

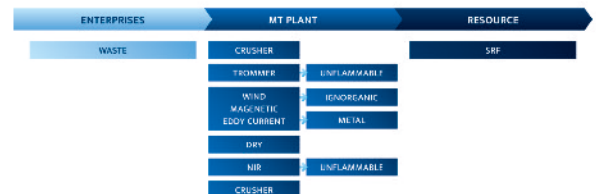


MT station (Mechanical treatment) Mechanical intelligence system Manufactures high-quality SRF power plant fuel rods. Significantly reduces waste on the environment. Provides a stable and safe fuel source for power plants Taiwan's first SRF Renewable Energy Power Plant. Use high performing and clean TFB technology. The leading domestic energy conversion efficiency of 27%. Reduces the impact of air pollution by 90%. 30% reduction in CO2 emissions. The pioneer of waste conversion into energy.



Mechanical treatment process

Mechanical treatment, the waste is passing over crushing, screening, magnetic separation, eddy current, wind separation, homogenization, etc., and the waste is completely classified and processed to achieve the purpose of recycling. Yang Bao Industry looks forward to using years of experience and a number of patent technologies to assist the industry in an environmentally friendly way where waste are recycled, reduced and become harmless for environmental development. We will also cooperate with industry to promote environmental education to the next generation carbon reduction, energy conservation and resource reuse. Let's protect the environment for future generations.



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CONTACT US

FGD RECYCLING INDUSTRIAL CO., LTD.



Introduction

Green energy and renewable raw materials are the global trend nowadays. Since 1997, based on the core value and long-term strategy in environmental protection of recycling the resource & recovering the resource, FGD has fully dedicated to waste electronics and IT products recycling, removal, processing and resourcing. With constant effort to this field, our ultimate target is to reduce the consumption of natural resources and alleviate the burden of our environment. FGD has been constantly trying its best to establish an ecological system to achieve the "zero waste" goal. Based on EPR (extended producer responsibility), FGD has become one of the qualified recycling processing institutes to receive the 4-in-1 subsidy from EPA since the very beginning. And now FGD has developed into 3 different BUS with turnkey solution after 25 years of operation.

FGD has the leading position in recycling industry and the highest IT&LHA recycling capacity in central Taiwan. It has gained top recognition by EPA evaluation for many years. In order to serve our clients more strategically, FGD has developed more tools to meet customer demands and solve all types of issues. FGD has a diversified customer portfolio including major science parks, schools and listed companies. We've served over 1000 clients in various fields and FGD is definitely your reliable partner when it comes to e-waste-recycling.



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CONTACT US

ECOVE SOLVENT RECYCLING CORPORATION



Introduction

ECOVE — an affiliate of CTCI, a global engineering services provider — founded in 1999 in Taipei. ECOVE provides professional investment and operation services related to the resource recycling industry in 3 major areas: Energy-from-Waste (EFW) & Mechatronics, Renewable Energy and Recycling & Reuse. Public and private entities in Greater China, Southeast Asia, India and the United States have trusted ECOVE and its subsidiary companies for comprehensive environmental services. In 2017, a new green brand "ECOVE" was built, striving to practice the core concept of "Every Resource Counts", and established four brand associations in the market:

- Resource Cycling Efficiency™
- Intelligent Data-Driven Operational Systems
- Active participation in national/regional agenda and policy
- Community Collaboration and Contribution

Energy-from Waste & Mechatronics

ECOVE specialists integrate over two decades of knowledge and experience to deliver high-quality overhaul and maintenance services for energy-from waste & mechatronics. Ecove is also the first company who has expanded commissioning scope to EFW plants outside Taiwan.

Renewable Energy

ECOVE has stepped into Taiwan's solar photovoltaic power field with a total capacity of 130MW now in operation. The Lumberton Solar Power Plant in the U.S. is also fully owned and operated by ECOVE. We have actively promoted the development of both domestic and overseas renewable energy.

Recycling & Reuse

ECOVE started business from energy-from waste and waste management. With the model of "life-cycle extending, remanufacturing and reusing," we have created a circular economy business model such as recovery energy, recovery material and value-added reuse. Now we successfully provides resource recycling service such as Waste isopropanol (W-IPA) from the semiconductor industries to reuse in the industrial process.



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CONTACT US

惠嘉電實業股份有限公司

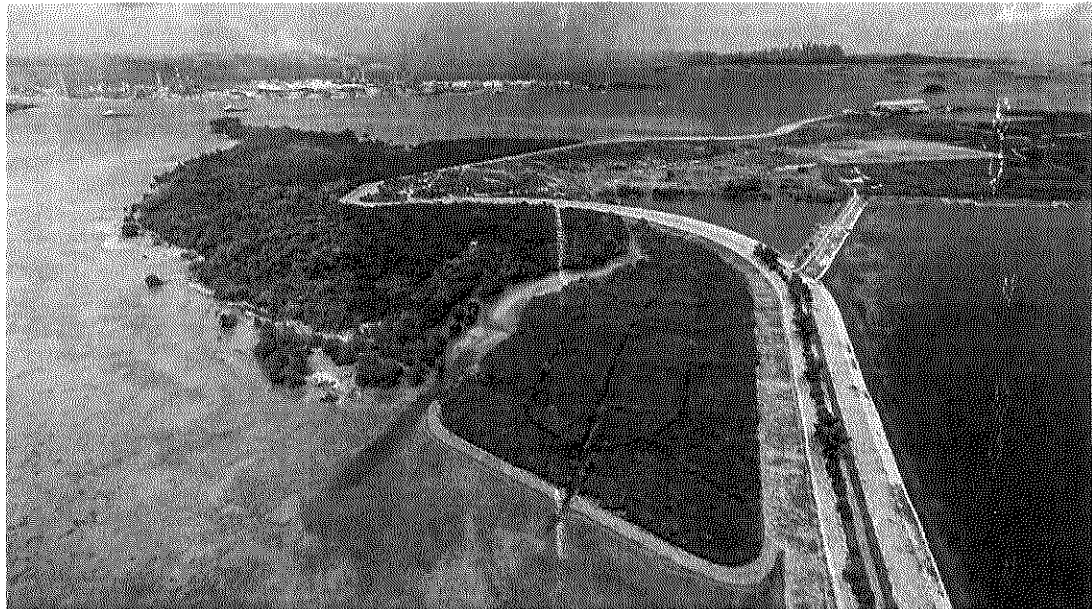
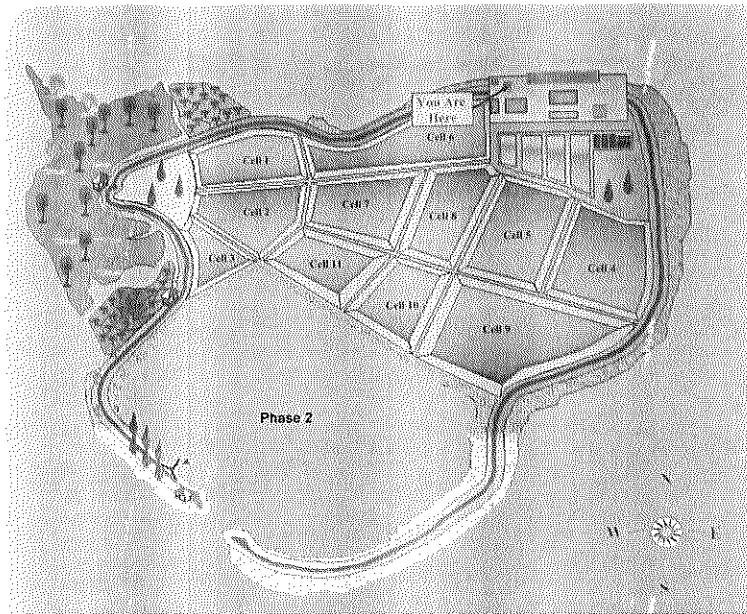
耀鼎資源循環股份有限公司

附 件 三

與亞洲水泥新加坡分公司交流資料

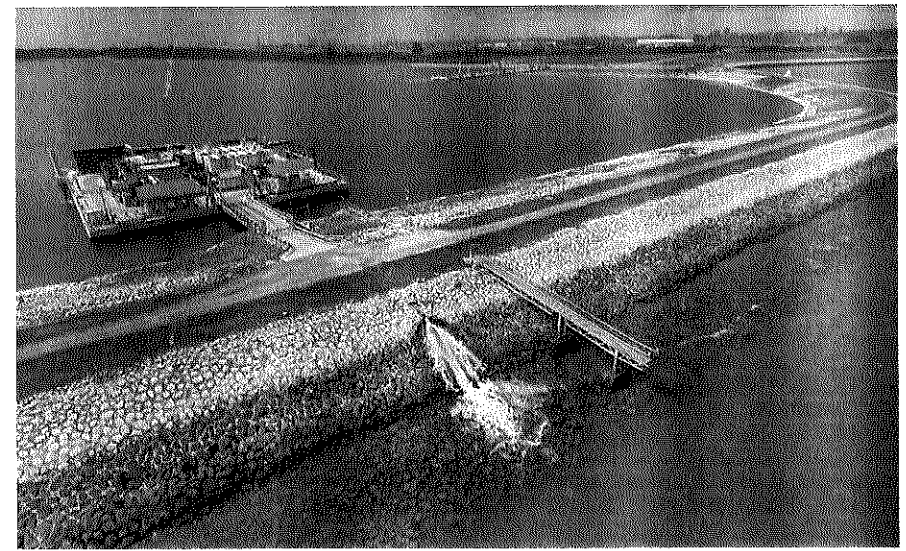
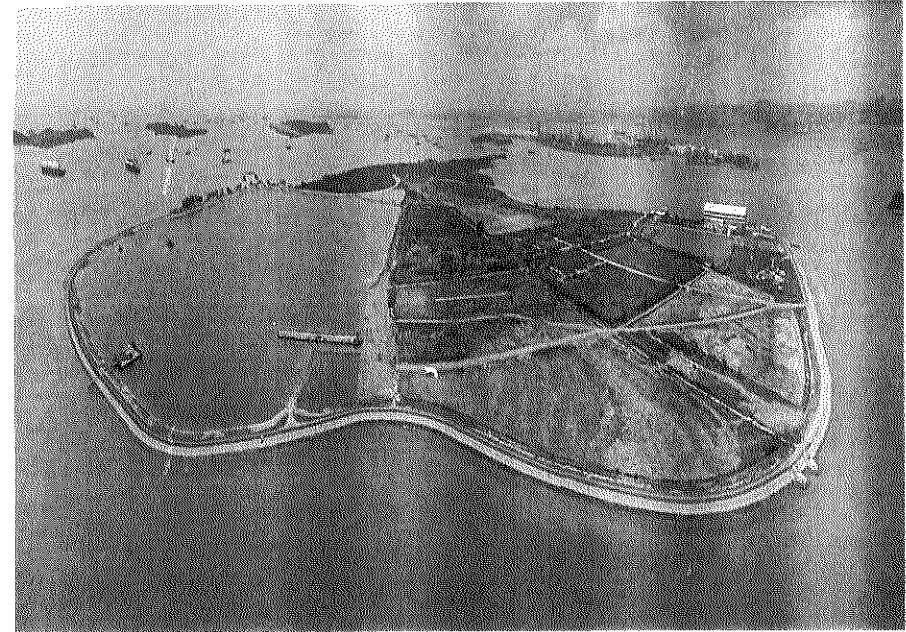
2022.09.21與亞泥新加坡分公司交流議題

- 一、 實馬高掩埋場填築空間多大？填築什麼種類的廢棄物？每年填築量多少？未來規劃？
- 二、 廢棄物填築前有經過前處理嗎？前處理的方式為何？經前處理後需符合哪些標準才能進行填築？
- 三、 以何種工法進行填築？實馬高掩埋場底部及周圍是否有鋪設不透水布，滲出水如何收集及處理？
- 四、 實馬高掩埋場有辦理相關環境監測計畫嗎？環境監測項目頻率為何？若不符合監測標準要如何處理？
- 五、 興設及經營實馬高掩埋場有遭遇民眾抗爭嗎？與民眾溝通的方式為何？



垃圾处理流程：

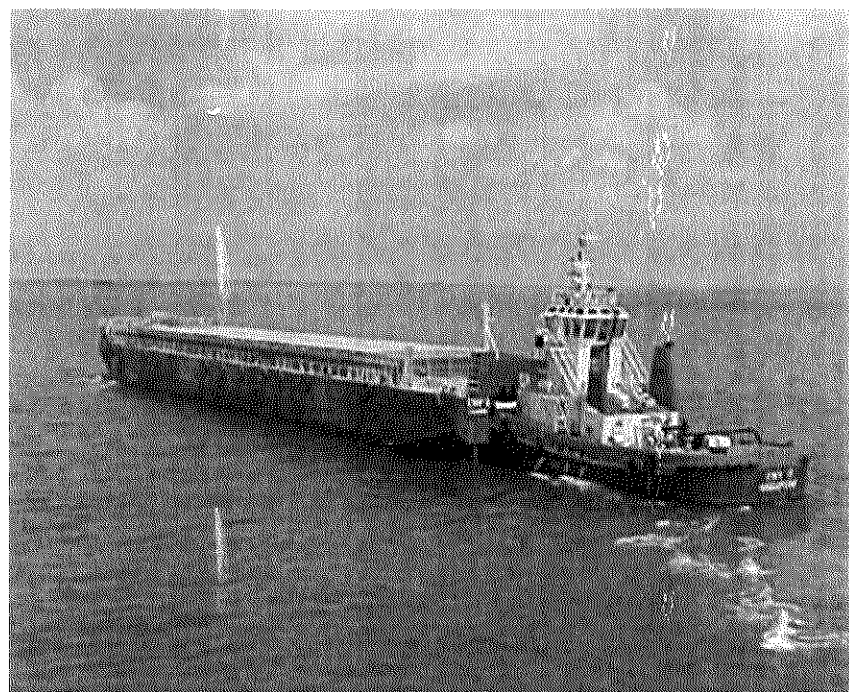
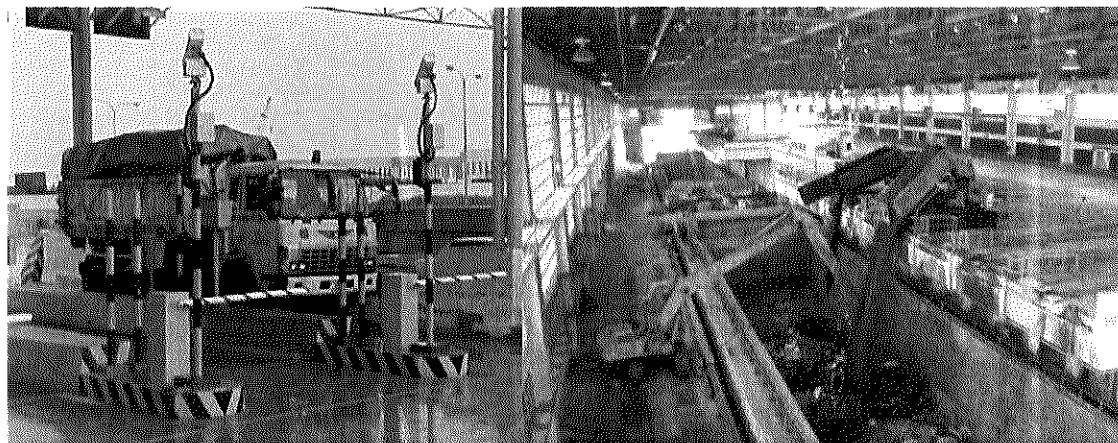
- 1) 扔进垃圾槽的垃圾由垃圾收集器收集并运送到四个垃圾发电厂——大士、圣诺科、大士南和吉宝西格斯大士。
- 2) 垃圾车将其装载的垃圾倾倒入一个地堡中，起重机操作员在此混合垃圾以确保其成分均匀，然后再将垃圾送入焚化炉。焚烧过程可减少高达 90% 的废物量。产生的热量被用来发电，并被送入国家电网。
- 3) 焚烧过程中产生的烟气经过过滤去除颗粒物、有害酸性气体、二恶英和呋喃，然后通过烟囱排放到环境中。
- 4) 金属回收设施使用磁力和涡流分离器从焚烧底灰中回收小至 2 毫米的黑色金属和有色金属，如铜和铝。
- 5) 剩余的灰烬和不可焚烧的废物被运送到大士海运转运站。
- 6) 一艘拖船轻推一艘驳船，驳船将垃圾运往 Semakau 垃圾填埋场的转运大楼，路程长达 33.3 公里。
- 7) 带有专门设计的抓斗的大型挖掘机用于将垃圾从驳船上卸到 35 吨自卸卡车上。
- 8) 自卸车将焚烧灰运至浮式平台，在浮式平台上排入二期隔间，使海床变浅并变平——这将允许使用推土机、挖掘机和压实机进行常规填埋。填埋阶段。



大士海运转运站

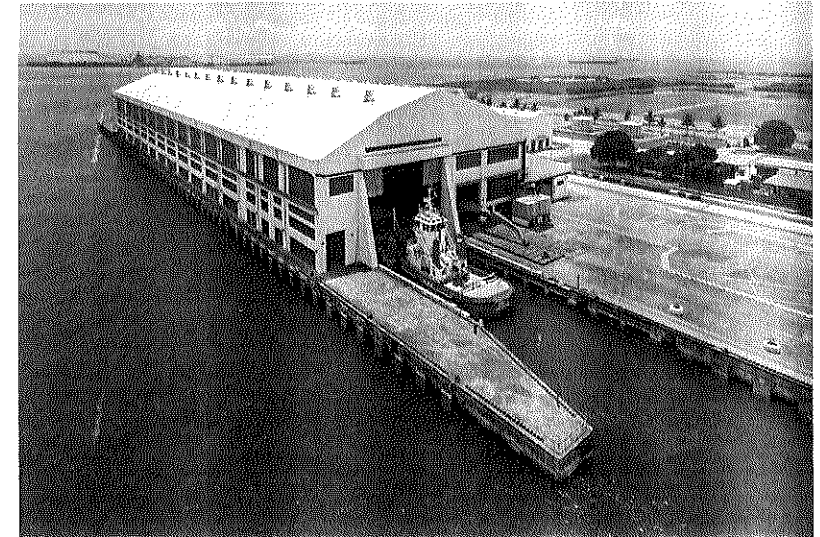
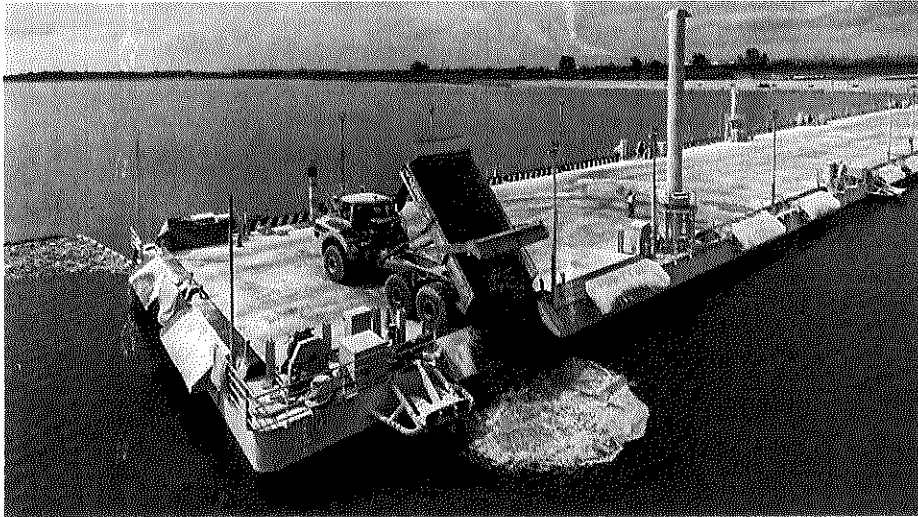
大士海运转运站 (TMTS) 是垃圾焚烧发电厂的灰烬和不可焚化垃圾运往实马高垃圾填埋场之前的中间收集点。它与实马高垃圾填埋场同时建造，毗邻大士南焚化厂。

1. 所有运载不可焚化废物的许可收集车辆在进入转运大楼之前首先在地磅处称重。运送焚烧灰烬到 TMTS 的车辆也被称重
2. 接待大厅设计用于快速周转时间，设有 20 个悬垂的卸货区，供车辆将废物直接卸入驳船。倾卸平台设计为悬垂到驳船上，以便将垃圾倾倒入驳船的中央。挖掘机用于将垃圾散布在驳船上，以确保垃圾得到最佳装载
3. 将不可焚化废物运往 TMTS 的空车再次称重。这允许确定交付的废物的重量。在一天结束时，满载驳船的舱口盖将关闭，以在前往 Semakau 的 33.3 公里海上旅程中保护货物免受风和水的影响



实马高垃圾填埋场

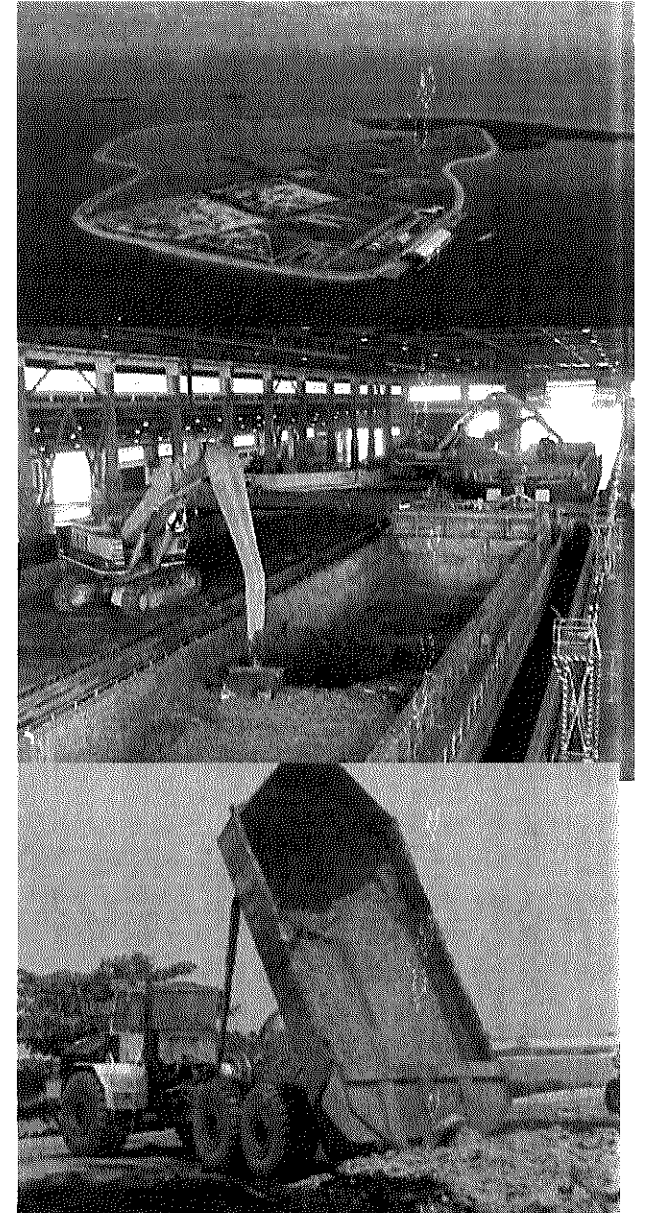
- 实马高垃圾填埋场位于新加坡以南约 8 公里处。一个 7 公里长的岩石堤围住了 Pulau Semakau 和 Pulau Sakeng 附近的部分海域，为垃圾填埋场创造了空间。外滩衬有防渗膜和一层海洋粘土，确保垃圾渗滤液包含在垃圾填埋场中。建造了辅助设施，以确保垃圾填埋场的运作能够自我维持。
- 它分两个阶段建造，第一阶段耗资 6.1 亿美元，第二阶段耗资 3600 万美元。实马高垃圾填埋场一期于 1999 年 4 月 1 日启用，垃圾填埋量为 1360 万立方米，而二期在 16 年后于 2015 年 7 月 11 日开放，垃圾填埋量为 1450 万立方米。
- 采取多种措施，尽量减少施工对环境的影响。这包括种植 400,000 棵红树林树苗以取代那些受建筑工程影响的树苗，以及在工作区附近安装细网淤泥筛，以减少沉积物对珊瑚的影响。



实马高垃圾填埋场

Semakau垃圾填埋场的填埋过程：

1. 抵达实马高垃圾填埋场后，驳船停靠在封闭的转运大楼。拖船随后自行脱离并带着空驳船返回 TMTS。
2. 带有可互换和专门设计的抓斗的大型挖掘机从驳船上卸下固体废物。然后将固体废物放置在一个 35 吨有效载荷的转储车上。
3. 沿周边外滩顶部的一条 10m 宽的铺砌道路可通往垃圾填埋场。自卸卡车前往指定的倾卸地点，将焚烧的灰烬和不可燃烧的废物卸入垃圾填埋场。然后推土机和压实机平整并压实焚烧的灰烬和不可燃烧的废物
4. 一旦被填满到地面，每个单元都会被一层泥土覆盖。随后，草木生根，形成绿色景观。一个新的倾翻单元通过密封连接单元与大海的混凝土管道而被激活。将创建一个用于倾倒固体废物的空间。



13.6 hectares	重新种植以取代受垃圾填埋场建设影响的红树林的大小。
33.3 km	垃圾从大士海运转运站到实马高垃圾填埋场转运大楼的距离
80	在实马高垃圾填埋场和实马高岛发现的鸟类数量，包括濒危物种。
350 hectares	整个 Semakau 垃圾填埋场的大小
700	在第二阶段开发期间收获并移植到姐妹岛的珊瑚群落数量。
2,035	垃圾填埋场预计填满的年份
2,100 tonnes	每天送往 Semakau 垃圾填埋场的垃圾量。它包括 600 吨不可焚烧垃圾和 1,500 吨焚烧灰烬。
700,000 tonnes	每年送往实马高垃圾填埋场的焚烧灰和不可焚烧垃圾的数量
28 million cubic metres	Semakau 垃圾填埋场可容纳的垃圾总容量。
\$36 million	2015 年完成第二阶段所花费的金额。
\$610 million	1999 年完成第一阶段所花费的金额。

(125) Semakau Landfill Corporate Video - YouTube

(125) Video 1 Pulau Semakau Landfill - YouTube

(125) Phase II and the Biodiversity of Semakau Landfill -
YouTube

附 件 四

與大士南焚化廠交流資料

Plant Design Data

Incineration Capacity	3,000 tonnes per day
Steam Generation per Boiler	105 tonnes per hour, 35 barG at 370 °C
Condensing Pressure	0.17 barA
Power Generation Capacity	80 MW, 10.5kV generator voltage

Main Plant Equipment

Waste Handling	8 weighbridges of 50 tonnes capacity each 24 waste discharge bays and 2 waste screening bays served by a hydraulic polyp grab 4 bulky waste rotary shears with 25 tonnes per hour capacity 2 bulky waste cranes and 4 waste cranes of 10m ³ each (wire rope operated) 2 separate waste storage bunkers and 1 bulky waste storage pit
Waste Incineration and Steam Generation	6 stoker / furnace units with integral boilers
Flue Gas Handling	6 two-zone electrostatic precipitators 6 ten-compartment catalytic bag filters each comprising 2,240 fabric bags 2 concrete chimneys of 150m height with ceramic brick inner lining 2 lime silos and 2 reaction product silos
Ash Handling (each incinerator unit)	2 pusher-type hydraulic slag extractors and vibrating conveyors
Scrap Metal Recovery	2 magnetic separators to each incinerator unit
Ash / Scrap Loading	3 overhead wire rope operated cranes of 3.5 m ³ each
Power Generation	2 condensing steam turbines coupled to generators (max. rating of 66.3MW each)
Steam Condensation	2 air-cooled condenser systems with 12 fans each
Cooling	Closed-loop system with treated water
Rain Water Collection	2 rain water buffer basins with 7,000m ³ storage capacity
Boiler Feedwater Treatment	NEWater is polished with activated carbon, multi-gravel filters and is treated with cation, anion and mixed bed ion exchangers

TSIP Environmental Policy

TSIP is committed to carry out our activities with minimal impact on the environment. We value the well being of our employees, customers, contractors, members of public and the environment in which we live in and are committed to:

1. Establish and implement an effective environmental management system and ensuring that our operations comply with the relevant local environmental regulations and requirements.
2. Minimize pollution through adoption of new technology where feasible and proper management of flue gas emission, waste disposal and wastewater discharge.
3. Improve continually our environmental performance and operating conditions by reviewing objectives and targets periodically.
4. Train, educate and encourage our employees, contractors and customers to conduct their activities in an environmentally responsible manner.
5. Seek to communicate the environmental policy to employees, contractors, customers and the public.

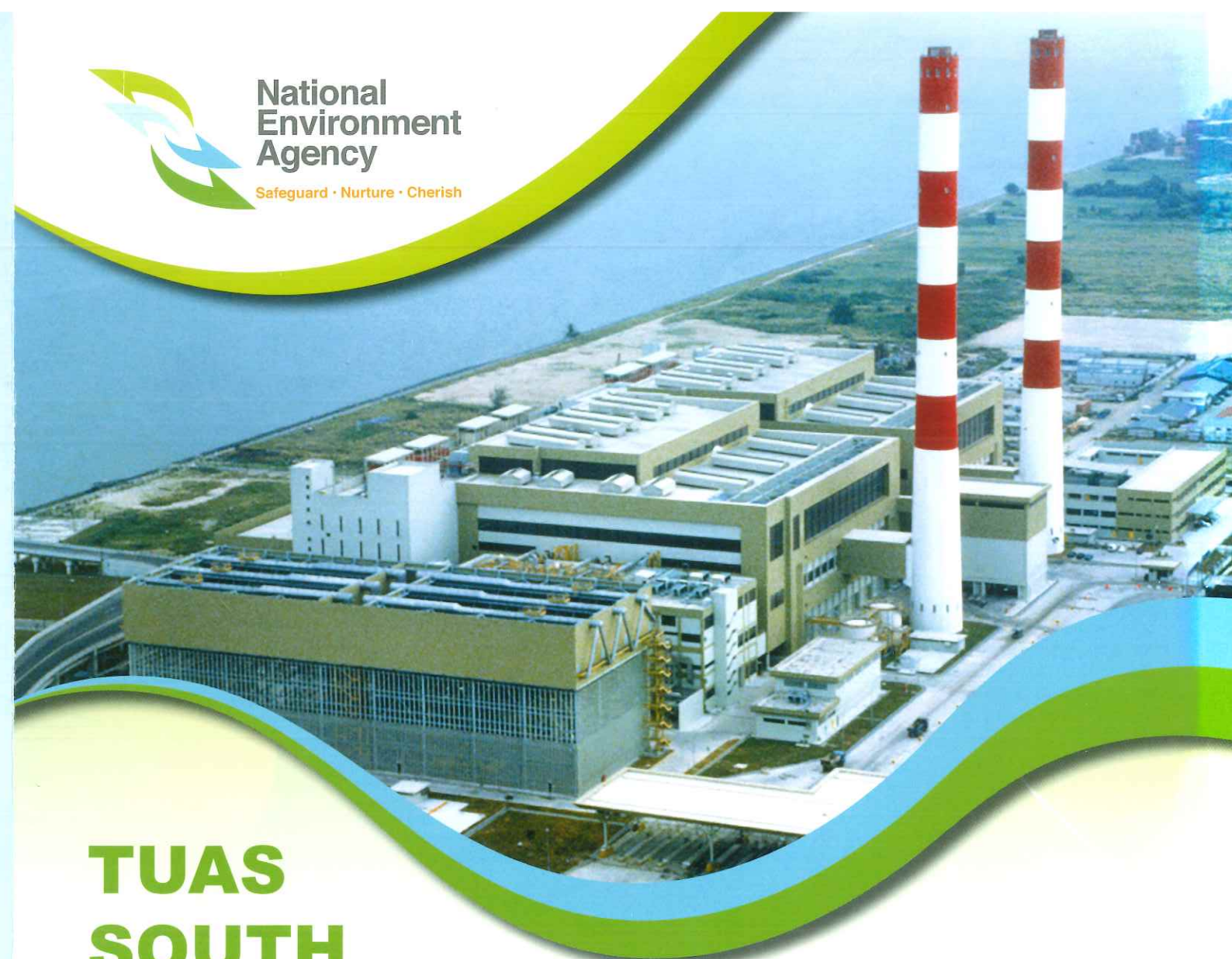
Plant Emission Data for 2021

(units in mg/Nm³ except otherwise indicated)

Parameter	Limit*	Plant Level
Particulate substances	50	7.52
Hydrogen chloride	200	162
Sulphur dioxide	1700	92
Carbon monoxide	250	17
Dioxin and furans**	1 ng TEQ/Nm ³	0.105 ng TEQ/Nm ³
Mercury and its compounds	0.05	0.00085

** for waste incinerators commissioned before 1 Jan 2001

*Environmental Protection & Management (Air Impurities) Regulations



TUAS SOUTH INCINERATION PLANT

Tuas South Incineration Plant is the fourth and one of the largest waste-to-energy plants in Singapore. Built at a cost of S\$890 million and completed in June 2000, it was designed to incinerate 3,000 tonnes of waste daily. The Plant is sited on 10.5 ha of reclaimed land and enables incinerable waste generated in Singapore to be disposed of by incineration. The Plant was built with state-of-the-art technology. The various processes are highly automated and controlled via a distributed control system. Modern equipment incorporating advanced technology is used in the Plant to ensure a high level of efficiency and reliability.

Incineration achieves about 90% reduction in volume of the waste. Hence, all incinerable wastes are disposed of at the waste-to-energy plants while non incinerable waste and ash from the waste-to-energy plants are disposed of at the Semakau Landfill. This helps to conserve the use of scarce land in Singapore. Tuas South Incineration Plant, together with the other waste-to-energy plants and the Semakau Landfill, will meet the waste disposal needs of Singapore and help in achieving a clean living environment for all Singaporeans.



1 Incoming waste collection vehicles are first weighed at the weighbridges. They are then driven up to the reception hall where their waste is unloaded into one of the two waste bunkers. The empty trucks are weighed again before they leave the Plant to determine the weight of waste disposed of.



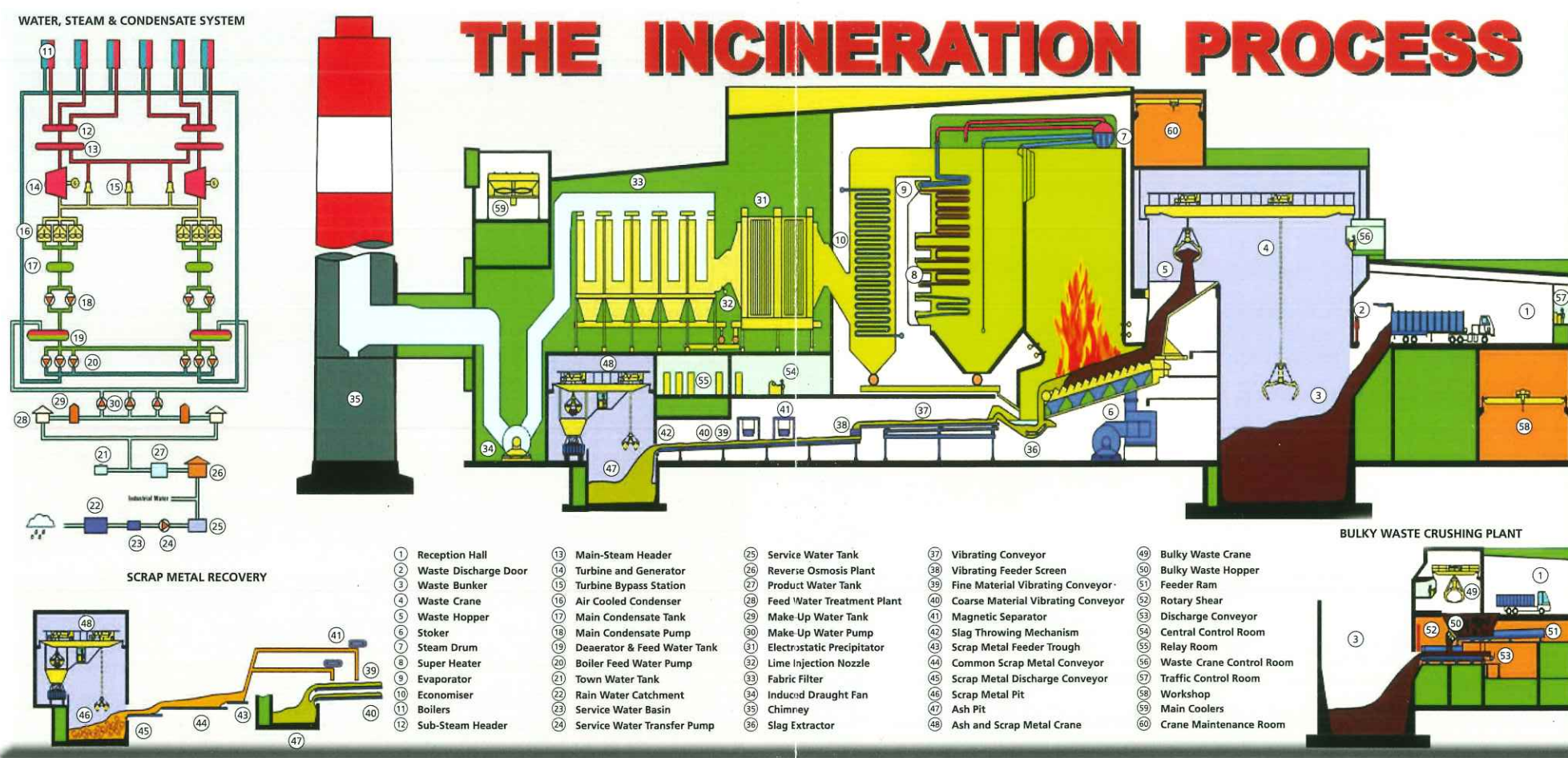
2 The pressure in the two waste bunkers is kept below atmospheric pressure to prevent odours from escaping. The waste in the bunker is fed by waste cranes into the six incinerators.



3 The Plant has four high capacity rotary bulky waste crushers integrated in the waste reception hall so that waste trucks are able to discharge their loads directly into the crushers. A bulky waste pit, which is a temporary storage facility, allows peak intake of bulky waste to be stored and crushed during off-peak hours.



8 Modern equipment utilising advanced technologies are used in the various processes in the Plant. The control and monitoring of these processes are done using an advanced Distributed Control System (DCS) in the Central Control Room. The DCS not only increases the efficiency of operations through a higher degree of automation but also allows more equipment to be operated and monitored simultaneously. The Central Control Room is manned round the clock every day by a lean force of trained operators working on rotating shifts.



4 Advanced combustion control systems regulate the waste feeding and combustion rate to achieve a complete burnout of the waste.



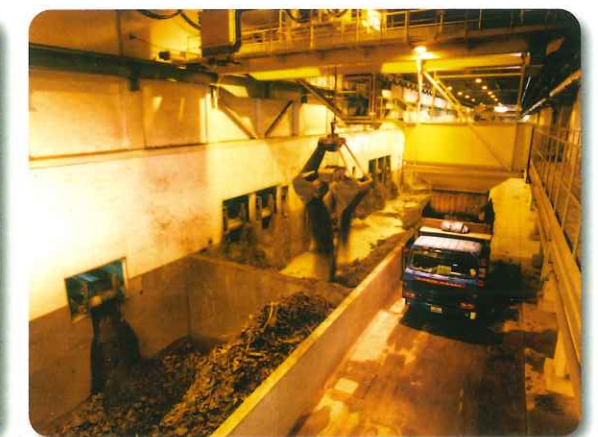
5 A catalytic fabric filter system is installed after a 2-zone electrostatic precipitator to clean the flue gas. The cleaned flue gas then passes through the two 150m tall chimneys that maximise the flue gas dispersion into the atmosphere.



7 The heat from combustion is used to generate steam in boilers. The steam drives two steam turbines coupled to generators to produce electricity. The Plant consumes about 20% of the electricity it produces and the excess 80% is sold. The exhaust steam from the two turbines is cooled by air condenser fans. The condensate is then pumped back into the boilers, forming a closed-loop system.



6 The ash and slag from the incineration process are transported via vibrating conveyors to the ash pits. Ferrous scrap metal is picked up by electro-magnetic separators and transported via vibrating conveyors to the scrap pits. These scrap metal are sent to a local steel mill for recycling. The ash and slag are loaded onto trucks and sent to the Tuas Marine Transfer Station where they are unloaded onto barges and transported to the offshore Semakau Landfill for disposal.



附 件 五

新加坡 ISWA 年會完整議程

新加坡 ISWA 年會完整議程

時間	演講主題	講者及官銜
主題一：創造永續生活環境		
9月21日(三)		
08:45-09:05	全球垃圾場封場倡議報告：每人替無人化垃圾場支付多少金額？ (Global Closing Dumpsites Initiative Report: What will be the Price Everyone Pays for Unmanaged Dumpsites)	James Law Chair, Landfill Working Group, ISWA
09:05-09:25	垃圾掩埋的開採技術及其永續金融 (Landfill Mining Technologies and its Financial Sustainability)	René Møller Rosendal Senior Project Manager, AV Miljø and Partner, Danish Waste Solutions, Denmark
09:25-09:45	全球氣候融資用於可能面臨封場的垃圾場 (Global Climate Financing in Potential Dumpsite Closure)	James D. Michelsen Sr. Industry Specialists, International Finance Corporation (IFC), USA
09:45-10:05	首屆塑膠信用標準要點：塑膠污染減排標準 (Salient Points of the First Plastic Credit Standards: Plastic Pollution Reduction Standard)	Richard de Guzman Standards and Compliance Manager, Plastic Credit Exchange, Philippines
10:20-10:40	正規與非正規的廢棄物回收系統相遇：秘魯利馬案例分析 (When Formality Meets Informality in Waste Collection System: A Case Study from Lima, Perú)	Sara Bottausci Phd Student, University of Bologna, Italy
10:40-11:00	管末時代的終結：邁向印尼永續的固體廢棄物管理 (The End of End-of-Pipe Era: Towards Sustainable Solid Waste Management in Indonesia)	Windi Adriani Solid Waste Management Officer, Ministry of Environment and Forestry, Indonesia
11:00-12:00	防止開放式廢棄物焚燒的解決方案 (Compiling Solutions to Prevent Open Burning of Waste)	Aditi Ramola Technical Director, ISWA Jiao Tang Director of Programmes, R20, Subnational Climate Fund

時間	演講主題	講者及官銜
		<p>Sandra Mazo-Nix Programme Manager, CCAC</p> <p>Hazel Ingham Senior Manager, UK Royal Academy of Engineering</p> <p>Destá Mebratu Extraordinary Professor, Center for Sustainability Transition, Stellenbosch University</p> <p>Andrew Horan US EPA</p>
13:20-13:40	整合式垃圾掩埋開採：垃圾場的救星 (Integrated Landfill Mining: A Saviour from Dumpsites)	<p>Nagesh Chinivarthá Co-Founder, Zigma Global Environ Solutions, India</p>
13:40-14:00	讓我賺錢：通過無形資產分享價值 (Show Me the Money: Sharing Value Through Intangibles)	<p>Soraia Taipa Innovation Manager, LIPOR, Portugal</p>
14:00-14:40	通過清潔社區來清潔海洋 (Clean Oceans through Clean Communities, CLOCC)	<p>Sigve Andera Programme Director, CLOCC Global</p> <p>Satya Oktamalandi Secretary-General, Indonesia Solid Waste Association, Indonesia</p> <p>Vivek Agrawal Institute of Chartered Waste Managers, India</p>
14:40-15:00	世界各地城市的塑膠污染和廢棄物全面解析 (Plastic Pollution in Cities Around the World and Waste – A Comprehensive Understanding)	<p>Costas Velis ISWA TF Leader and University of Leeds, Academic</p> <p>Josh Cottom ISWA TF Expert, Research Fellow, University of Leeds</p> <p>Gunilla Carlson Public Affairs Director, Sysav, Sweden</p> <p>Nancy Strand Senior Advisor, Avfall Norge</p>
9 月 22 日 (四)		

時間	演講主題	講者及官銜
12:40-13:00	向印尼學習永續經營村莊，印尼的經驗分享 (Learning from Sustainable Waste Operations Village in Muncar Indonesia? Lessons for Indonesia)	Prasetyo Ibnuat Governance Lead, SYSTEMIQ, Indonesia Kartika Karosekali Collection Officer, STOP Project Muncar, SYSTEMIQ, Indonesia
13:00-13:20	新地方政府固體廢棄物管理指數指出需要幫助 減少海洋塑膠污染 (New Local Government SWM Index Pinpoints Capacity Needs to Help Reduce Ocean Plastics Pollution)	Lori Scozzafava Director for Capacity Development and Governance, Clean Cities, Blue Oceans, USA
13:20-13:40	塑料處理和循環經濟的整體方法 (Holistic Approach in Tackling Plastics and A Circular Economy)	Jacob Rognhaug Vice President for Public Affairs System Design, TOMRA
13:40-14:00	延伸生產者責任(EPR)介紹：通過國際合作解決東亞和東南亞的塑膠包裝廢棄物 (The Introduction of EPR: Tackling Plastic Packaging Waste in East and Southeast Asia through International Cooperation)	Elena Rabbow Waste Prevention, Gesellschaft für Internationale Zusammenarbeit (GIZ), Germany Christophe Pautrat Regional COO, Landbell Group, Germany Sebastian Frisch Founder & Managing Director, BlackForest Solutions, Germany
14:00-14:20	大阿克拉都會區公共場所垃圾的構成和來源： 邁向有效的廢棄物治理 (The composition and sources of litter in public spaces in the Greater Accra Metropolitan Area: Towards effective waste governance)	Rebecca K. Yandam Senior Research Officer, Zoomlion Ghana, Ghana
14:20-14:40	塑膠回收為全球循環經濟帶來的契機 (Opportunities for a Global Circular Economy with Plastic Recycling)	Maryam Al Mansoori General Manager, Rebound Plastic Exchange, Abu Dhabi
14:40-15:00	恢復一般包裝的逆向物流計劃 (Recupera: Reverse Logistics Program for Packaging in General)	Dione Manetti CEO, Pragma Soluções Sustentáveis, Brazil
主題二：透過科技打造性感、聰明的廢棄物管理		

時間	演講主題	講者及官銜
9 月 21 日 (三)		
08:45-09:05	ISO/TC 297 的目標是什麼及這些標準如何幫助提升垃圾車(RCV)的安全性及性能？ (What are the Objectives of ISO/TC 297 and How Can Standards Help Improve RCV Safety and Performance?)	Frank Diedrich Director, EUnited Municipal Equipment & Chair for ISO/TC 297, Belgium
09:05-09:25	為什麼調和廢棄物收集和運輸的術語和定義至關重要？ (Why is it Essential to Harmonize Terms & Definitions for Waste Collection and Transportation?)	Melissa Tan Chairman, WMRAS & Convenor, ISO/TC 297, Singapore
09:25-10:05	利用廢棄物收集和運輸技術來協調清潔環境的實踐 (Harnessing Technology for Waste Collection & Transportation and Harmonizing Practices for Clean Environment)	Kwok Wai Choong Deputy Director (Cluster Development Department) Environmental Technology & Industry Development Division, Joint Operations and Technology Group, National Environment Agency, Singapore Jakob Lambsdorff CEO, ALBA WH Smart City, Singapore Sean Tay Business Manager, Zenith Engineering, Singapore Dong Chongqing CMO, Shanghai Montai Environmental Engineering Co., People's Republic of China Taisuke Watanabe Executive Consultant, EX Research Institute Ltd, Japan
10:20-10:40	收集有機物—聰明的垃圾桶和愚蠢的人類？ (Collecting Organics – Smart Bins and Stupid People?)	Marco Ricci Managing Director, Altereko sas and Vice- Chair, Biological Treatment of Waste Working Group, ISWA
10:40-11:00	側向裝載城市固體廢棄物收集系統的優點及優勢 (Benefits and Advantages of the Side Loading	Raúl Amérigo Torralba Asia Pacific Regional Manager, Contenur S.L., Spain

時間	演講主題	講者及官銜
	Municipal Solid Waste Collection System)	
11:00-11:20	Siptex - 瑞典紡織品分揀創新平台 (Siptex - Swedish Innovation Platform for Textile Sorting)	Gunilla Carlsson Public Affairs Director, Sysav, Sweden
11:20-11:40	智能垃圾槽和數位干預：一個有希望的做法來影響多住宅環境中的廢棄物和回收？ (Smart Waste Chutes & Digital Interventions: A promising approach for influencing waste & recycling in multi-residential contexts?)	Henrik Siepelmeyer PhD Researcher, University of Agder (UiA), Norway
11:40-12:00	綠色廢棄物走向數位化 (Green Waste Going Digital)	Ana Lopes Project Manager, LIPOR, Portugal
13:20-13:40	數據驅動的廢棄物管理。結果就在這裡！ (Data-Driven Waste Management. The Results Are Already Here!)	Peter Knaz Director, DRS & Take Back Systems Division, Sensoneo, Slovakia
13:40-14:00	通過國家廢棄物管理資訊系統技術監測印尼地方政府的廢棄物管理 (Monitoring Local Government Waste Management in Indonesia Through National Waste Management Information System Technology)	Perdana Samudra Software Engineer, Ministry of Environment and Forestry, Indonesia
14:00-14:20	分類和分析塑膠回收的解決方案 (Sorting and Analysing Solutions for Plastics Recycling)	Michael Perl Regional Sales Manager, SESOTEC
14:20-14:40	激勵當地公民履行循環經濟 (Enabling Citizens to Activate Their Local Circular Economies)	Davis Chee Regional Sales Manager, Envac Singapore Pte Ltd
14:40-15:00	使用數位平台讓居民參與當地循環經濟—以瑞典斯德哥爾摩皇家港區的試點研究為例 (Engaging Residents in the Local Circular Economy Using a Digital Platform - Learning from a Pilot Study in Stockholm Royal Seaport, Sweden)	David Enarsson Project Manager & Behavioural Strategist, LocalLife, Sweden
主題三：循環是個新趨勢，你要跟上腳步了嗎？		
9月21日(三)		

時間	演講主題	講者及官銜
08:45-09:05	廢棄物管理部門循環經濟的概念和貢獻 (Concepts and Contributions on Circular Economy from and for the Waste Sector)	Bjorn Appelqvist Chair, Scientific Technical Committee, ISWA and Senior Chief Consultant, Ramboll
09:05-09:45	循環和低碳城市 (Circular and Low Carbon Cities, CALC)	Anne Scheinberg Chair of the Working Group on Recycling and Waste Minimisation & Gunilla Carlsson, ISWA Board Member and Sysav Public Affairs Director Dr. Jane Gilbert Malti Gadgil Dr. Henning Friege Kartik Kapoor Francesca Calisesi
09:45-10:05	十個基本組成廢棄物管理部門轉型的關鍵推動力 (Ten Fundamental Building Blocks as Key Enabler of a Lean WM Sector Transformation)	Hani Tohme Senior Partner, Head of Sustainability MENA & Head of Waste Management Global, Roland Berger, UAE
10:20-10:40	韓國循環經濟現狀及政策方向 (Current Status and Policy Direction of Circular Economy in South Korea)	Ji Hye Jo Senior Research Fellow, Korea Environment Institute, South Korea
10:40-11:00	企業零廢棄、案例研究以及對於廢棄物收集者的影響 (Zero Waste for Businesses, Case Studies, and the Impact on Waste Collectors)	Remi Cesaro Founder and CEO, Zero Waste City, Singapore
11:00-11:20	建立整合廢棄物管理平台以產生正面影響 (Building an Integrated Waste Management Platform to Deliver a Net Positive Impact)	Prashant Singh CEO & Co-Founder, Blue Planet Environmental Solutions, Singapore
11:20-11:40	整合式的環境計畫如何支持地方朝循環經濟轉型 (How Integrated Environmental Projects Can Support Transition Towards Circular Economy on A Local Level)	Jovana Husemann Business Development Manager, Naue GmbH & Co. KG, Germany
11:40-12:00	是什麼阻止了包裝的循環以及如何處理它 (What Prevents Packaging from Circularity and How to Deal with It)	Ola Ronæss CEO, Circular Packaging Cluster, Norway
13:20-13:40	法蘭德斯的循環經濟：挑戰、陷阱和成功之旅	Christof Delatter

時間	演講主題	講者及官銜
	(Circular Economy in Flanders: A Road Trip Along Challenges, Pitfalls and Successes)	Administrator General, OVAM, Belgium Piet Coopman Director Interafval, Federation of Intermunicipal Waste Companies in Flanders, Belgium Tim De Mulder COO, City of Antwerp, and Responsible for City Maintenance and Waste Policy, Belgium Kristof Bossuyt Mayor, City of Wilrijk and Chairman, Board of Intermunicipal Association (ISVAG), Belgium
14:20-14:40	沙烏地阿拉伯朝向循環經濟轉型 (Saudi Arabia's Transformation Towards Circular Economy)	Nawaf Bilasi CEO Advisor for Technical Affairs, National Center for Waste Management, Kingdom of Saudi Arabia
14:40-15:00	臺灣循環政策與發展 (Circular Policy and Development in Taiwan)	Lai Ying-Ying Director-General, Department of Waste Management, Environmental Protection Administration, Taiwan
主題四：新能源時代下的廢棄物管理		
9月22日(四)		
15:20-15:40	碳捕捉、利用和封存的標準化應用於廢棄物能源化 (Carbon Capture, Usage and Storage (CCUS) Standardized for Waste-to-Energy)	Johnny Stuen Chair of Waste to Energy Working Group, ISWA
15:40-16:00	碳捕捉和封存以實現氣候目標的必要性 (The Need for Carbon Capture Storage to Reach Climate Goals)	Gunilla Carlson Public Affairs Director, Sysav, Sweden
16:00-16:20	城市固體廢棄物處理的減碳的系統性思考 (Systematic Thinking on Carbon Emission Reduction of Municipal Solid Waste Treatment)	Zhan Liang General Manager, International Business Department, Shanghai SUS Environment
16:20-16:40	南亞塑膠的氣候變遷成本 (Climate Change Costs of Plastics in South Asia)	Nina Tsydenova Environmental Specialist, World Bank

時間	演講主題	講者及官銜
		Group, Singapore
16:40-17:00	對廢棄物而言，現在是氣候變遷的關鍵時刻 (Now is the Climate Moment for Waste)	Tom Frankiewicz Subject Matter Expert, Waste Sector Methane RMI, USA
17:00-17:20	未來燃料：向清潔和低碳燃料轉型 (Future Fuels: A Transition to Clean and Low Carbon Fuels)	Michael Harrison Partner, Ashurst, Singapore
17:20-17:40	廢棄物能源化的最新進展 (Latest developments for Waste to Energy)	Fritz Bruehl General Manager, MARTIN GmbH, Germany
9月23日(五)		
09:20-09:40	如何選擇—在廢棄物能源化計畫您需要考慮哪 些方面？ (How to Choose - What Aspects Do You Need to Consider in a Waste-to-Energy Project?)	Christophe Cord' Homme Vice Chair of Waste to Energy Working Group, ISWA, France
09:40-10:00	先進技術在廢棄物管理上的未來 (The Future of Advanced Technology in Waste Management)	Ole Hedegaard Madsen Director, Babcock & Wilcox, Denmark
10:00-10:20	從垃圾掩埋問題到氫經濟 (From Landfill Problem to the Hydrogen Economy)	Johnny Stuen WtE and CCS Onshore Area Manager, Kanfa AS, Norway
10:20-10:40	使用先進的垃圾掩埋場封場和太陽能技術將垃 圾掩埋場轉變為可再生能源資產 (Using Advanced Landfill Closure and Solar Technologies to Transform Landfills into Renewable Energy Assets)	Ming Zhu Director of Engineering Services, Watershed Geosynthetics, USA
10:40-11:00	東南亞的燃料混燒：以該系統為何能夠助於提 升廢棄物管理為例 (Multifuel Combustion in Southeast Asia: A Case Study and Why the System Could Contribute to a More Efficient WM)	Matteo Molena Business Development Director, DP Cleantech, Thailand
11:00-11:20	評估中國 16 個垃圾掩埋沼氣發電計畫的能源 潛力，由國際金融公司提供融資 (Evaluating the Energy Potential of 16 Landfill Gas to Energy Projects in China to be Finance by IFC)	Alex Stege Senior Project Advisor, SCS Engineers, USA

時間	演講主題	講者及官銜
主題五：從廢棄物回收中做出明智的決定		
9月22日(四)		
12:40-13:00	聯合國環境總署(UNEP)全球汞夥伴關係將政策 付諸實踐 (Turning A Policy into Practices by UNEP Global Mercury Partnership)	Koji Ono Ministry of the Environment, Japan; and Co-lead, Mercury Waste Management Area, Global Mercury Partnership
13:00-13:40	對全球協定的回應 (Responses to the Global Agreement)	Koji Ono Taeko Takashi Secretariat of the Global Mercury Partnership Waste Management Area (GMP-WMA) Gabriel Chifflier GMP-WMA industry Partner Nicolas Humez Leader of the GMP Waste Management Area Working Group for resource development and Chair of Hazardous Waste Working Group of ISWA
13:40-14:00	塑膠廢棄物轉製能源：在印度的農村地區創造 價值 (Plastic Waste to Fuel: Creating Value in Rural Areas of India)	Medha Tadpatrikar Co-Founder, Rudra Environmental Solutions, India
14:00-14:20	再生塑膠再應用的塑膠之路 (Reuse of Recycled Plastics for Plastic Road)	Sahadat Hossain P.E. Director, Solid Waste Institute for Sustainability (SWIS), University of Texas at Arlington, USA
14:20-14:40	來自使用過的流體化觸媒裂解(FCC)催化劑的 加值化產品 (Value Added Products From Spent FCC Catalysts)	Yeo Tze Yuen Senior Research Engineer, Institute of Sustainability for Chemicals, Energy, and the Environment
14:40-15:00	聖馬利諾共和國優質堆肥的生產和使用 (Production and Use in Organic Farming of Quality Compost in the Republic of San Marino)	Giulio Ferrari GFambiente Srl; Department of Territory and Environment of R.S.M., Italy
15:20-15:40	防止和去除有機廢棄物中的污染物 (Preventing and Removing Contaminants from	Jane Gilbert Chair of Biological Treatment of Waste

時間	演講主題	講者及官銜
	Organic Wastes)	Working Group, ISWA
15:40-16:00	農業塑膠—減少土壤污染的政策機制 (Agricultural Plastics – Policy Mechanisms to Reduce Contamination of Soil)	Richard Thompson Agricultural Plastics and Sustainability Specialist, Food and Agriculture Organization of the United Nations (FAO), Italy
16:00-16:20	如何妥善處理食物廢棄物—集中式或分散式 (How Food Waste Can be Handled Appropriately – by Centralized or Decentralized Approach)	Jude Chow CEO, AEL International, Hong Kong
16:20-16:40	應用於生物廢棄物回收的生物甲烷生產在循環經濟中的作用越趨強大：以義大利 2030 年的展望及案例為例 (The Increasing Role of Bio-Methane Production in the Circular Economy Applied to Biowaste Recycling: Outlook and Case Study from Italy for 2030)	Massimo Centemero General Director, CIC (Italian Composting and Biogas Association), Italy
16:40-17:00	用於從電子廢棄物中提取貴重金屬的環保型浸出劑 (Environmentally Green Lixiviants for Extraction of Precious Metals from Electronic Wastes)	Thomas Goh Senior Researcher, Singapore Polytechnic, Singapore
17:00-17:20	鋰電池回收的創新雙閉鎖式循環流程 (Innovative Double Closed Loop Process for Recycling Lithium Battery)	David Lee Chief Strategy Officer, TES Singapore Farouk Tedjar Principal Scientist, Energy Research Institute (NTU Singapore), Scientific Advisor, TES Singapore
17:20-17:40	電動汽車鎳錳鈷(NMC)電池回收的全面性的永續評估 (Full Sustainability Assessment of an Electric Car NMC Battery Recycling)	Diana Bizarro Sustainability and Circular Economy scientist, TNO, Netherlands
9 月 23 日 (五)		
09:20-10:00	聯合國人居署(UN-Habitat)與 ISWA 對話—廢棄物智慧城市工具 (UN-Habitat – ISWA Dialogue on Waste Wise Cities Tool)	Philip Heylen Business Development Manager, Ackermans & van Haaren, Belgium Carlos Silva Filho President, ISWA Francesca Calisesi

時間	演講主題	講者及官銜
		Associate Officer Solid Waste Management and Energy, UN-Habitat, Nairobi
10:00-10:20	處理液體廢棄物和工業廢水一直至零液體排放 (ZLD)的揀選程序 (Handling of Liquid Waste and Industrial Wastewater - Process Selection Up to Zero Liquid Discharge (ZLD))	Frank Natau Business Development Water Processes, Wehrle, Germany
10:20-10:40	廢棄物衍生燃料(RDF)工廠在 3 年內將特拉維夫都會區的回收率提高到 40% (RDF Plant Promoted Tel-Aviv Metropolitan to 40% Recycling Rate Within 3 Years)	Gil Livne CEO, Dan Region Association of Towns, Former Mayor of Shoham, Israel
10:40-11:00	用於測量 PET 製造中的多層標籤、不透明 PET 和碳酸鈣添加劑的技術和科學儀器 (Technological & Scientific Instruments to Measure Against Multi-Layer Labelling, Opaque PET, and Calcium Carbonate Additives in PET Manufacturing)	Joshua Palfreman Waste Management Specialist, World Bank Group, USA
11:00-11:20	個人或社會？在城市環境中激起資源分類行為的有效干預措施 (Personal or Social? Effective Interventions Motivating Source Separation Behaviour in an Urban Environment)	Riva Waldman Director of Communication & Education, Dan Region Associations of Towns, Israel
11:20-11:40	用氣化技術實現零廢棄物世界 (Realizing A World of Zero Waste with Gasification Technology)	Hai Dang Project Manager, Green Desert Company Limited, Vietnam
主題六：健康、安全及廢棄物管理規定		
9 月 22 日 (四)		
12:40-13:00	管理醫療廢棄物及該如何減輕它們的危害和風險 (Hazards & Risks Association with Managing Healthcare Waste and How to Mitigate Them)	Anne Woolridge Chief Operating Officer, Independent Safety Services, United Kingdom
13:00-13:20	在健康層面疫情對醫療廢棄物的產生和管理的效用 (Effects of the Pandemic on Waste Generation and	Paeng Lopez Plastics in Healthcare Program Manager for Southeast Asia, Health Care without

時間	演講主題	講者及官銜
	Management in Healthcare)	Harm, Philippines
13:20-13:40	改善固體廢棄物收集和處理的工人安全 (Improving Worker Safety in Solid Waste Collection and Disposal)	David Biderman Executive Director, SWANA, USA
13:40-14:00	當地市政當局運用挨家挨戶收集石棉水泥廢料的方式進行創新 (Local Municipalities Innovate with a Door-to-Door Collection of Asbestos Cement Waste)	Piet Coopman Coordinator, Interafval, Belgium Christof Delatter Head of Strategy and Policy, and Interim Administrator General, OVAM, Belgium
14:00-14:20	將有害廢棄物轉化為資源 (Turning Hazardous Waste to Resources)	Shanmuga Kittappa Manager, Research and Development, Environmental Preservation and Innovation Centre, Malaysia
14:20-14:40	阿曼的有害廢棄物管理 (Hazardous Waste Management in Oman)	Salma Al Busaidi Planning Lead, Be'Ah, Oman
14:40-15:00	家戶有害廢棄物分類收集的良好做法 (Good Practices to Separate Collection of Households Hazardous Wastes)	Alan Encinas Technical Programme Manager, ISWA
15:20-15:40	對於有害廢棄物安全回收的全面性構想 (Comprehensive Concept for the Safe Recycling of Hazardous Wastes)	Nicolas Humez Chair of Hazardous Waste Working Group, ISWA
15:40-16:00	亞洲有害廢棄物回收的良好典範 (Good Examples of Recycling from Hazardous Wastes in Asia)	Matt Stanelos Director of Operations, Veolia Southeast Asia, Singapore
主題七：驅動者及行動者對於經濟、環境、社會責任三重底線的推動		
9月22日(四)		
16:00-16:40	在發展中國家實施延伸生產者責任的挑戰 (Challenges for Extended Producer Responsibility (EPR) Implementation in The Developing World)	Marius Brinzea WGGLI Member and Strategy Director of Reciclad'or, Rumania Dirk Nelen Vice- Chair ISWA Working Group on Recycling and Waste Minimisation, Belgium Kartik Kapoor

時間	演講主題	講者及官銜
		GIZ, CALCC project consultant, India Yvonne Linn Materials Expert, WWF Tze Ni Yeoh Circular Economy Manager Danone, Consumer Packaged Goods Forum Malti Gadgil Programme Manager - Asia, Plastic Solutions Fund
17:00-17:20	超越善意和理想主義？如何通過創新和非正規的財政支付工具來支應廢棄物管理和回收來發展經濟 (Beyond Good Intentions and Idealism? How to Pay for Waste Management and Recycling in Developing Economies through Innovative and Unorthodox Fiscal Instruments)	Joshua Palfreman Waste Management Specialist, World Bank Group, USA
17:20-17:40	建立健全的治理並確保為廢棄物管理提供充足的資金：以 SYSTEMIQ 的經驗教訓為例 (Building Robust Governance and Securing Sufficient Funding for Waste Management: Lessons from SYSTEMIQ's Experience)	Lincoln Sihotang Senior Program Manager, SYSTEMIQ, Indonesia
9 月 23 日 (五)		
09:20-09:40	塑膠回收結構在經濟成就上的考量因素 (Considerations for Economic Success in Plastic Recycling Structure)	Michael Langen General Manager, HTP GmbH & Co. KG, Germany
09:40-10:00	向循環經濟轉型：世界銀行集團對城市固體廢棄物管理的支持評估（2010-2020） (Transitioning to a Circular Economy: An Evaluation of WBG's Support for Municipal Solid Waste Management (2010-2020))	Ramachandra Jammi Senior Evaluation Officer, Independent Evaluation Group (IEG) of the World
10:00-10:20	三重影響估值矩陣 (Triple Impact Valuation Matrix)	Lucia Barcia CEO of IMPACTOS AMBIENTALES S.A., Argentina
10:20-10:40	巴西回收的信用證書 (Recycling Credit Certificate in Brazil)	Fabricio Soler Executive Committee, Felsberg Law Firm, Brazil Fernando Bernardes

時間	演講主題	講者及官銜
		CEO, Central de Custódia, Brazil
10:40-11:40	為廢棄物管理進行融資 (Financing Waste Management)	-