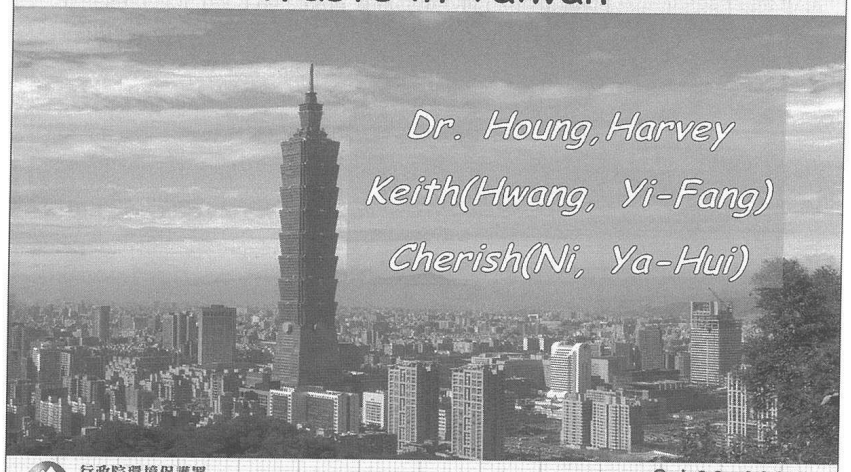
The Electronic Management of Waste in Taiwan



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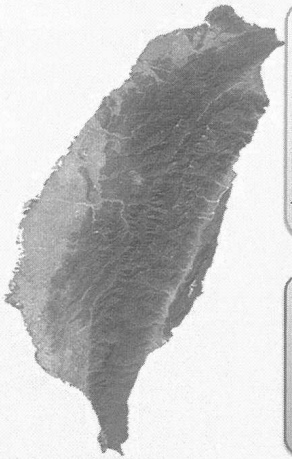
Outline

- Introduction
- Review of Taiwan's Industrial Waste Management
- Management Methods
  - Management scheme
  - Industrial Waste Reporting System
  - Statistics of All Industrial Waste Generation
  - Waste Flow Tracking Management
  - Statistical Analysis and Strategy Support
  - Integrated Air, Water, Waste and Toxic Substance Management Mechanism
- Results-Benefits of The System
- Future Vision

Natural Resources Deficient



Population: 23 millions

Area : 36,000 km²

Population density: 624 person/km²
(Urbanization: 78%)
(Taipei City: 9,956 person/km²)

Energy imported > 98%

Mineral imported > 80%

Food imported > 70%

Introduction

- **Review of Industrial Waste Management**
  - **Approaches**

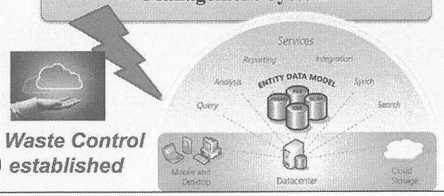
Disposal	Reduction	Reuse and Recycling	Sustainable Materials Management

Before 1990 — *Mid-1990s* — *Mid-2000s* — *After 2010*

  - **Management**

Using paper for reporting

Establishing Industrial Waste Report and Management System



The Industrial Waste Control Center (IWCC) established

REVIEW OF TAIWAN'S INDUSTRIAL WASTE MANAGEMENT

- **Before 1997**

→ A paper manifest system was used to trace industrial hazardous waste.

- **From 1997 and on**

→ Electronic system has been used with state-of-the-art technologies to track hazardous waste and general industrial waste.

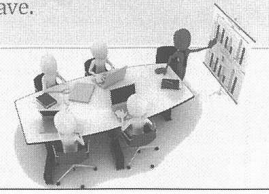
環保署成立事業廢棄物管制中心記者會

Press Conference on IWCC, 1997

The Industrial Waste Control Center

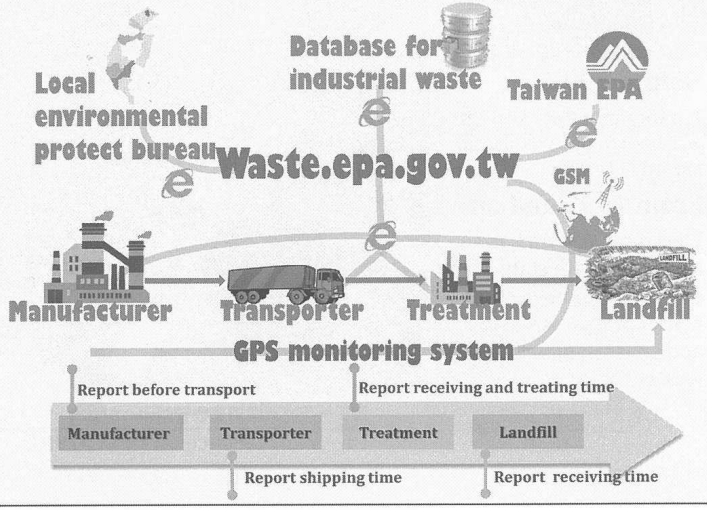
- **Establishment of the Industrial Waste Control Center**

→ The Taiwan EPA initiated the online system in 1997 to better manage tracking. After three years of testing, the Industrial Waste Control Center (IWCC) was sprung off and expanded, became an independent section in 2000. It offers functions like online integration, mobilization, and analysis tools. The reporting system has been improved to not only trace the waste flow, but also to monitor the actual amount of waste generated. The first goal of the IWCC is to establish a management system for waste disposal from cradle to grave.



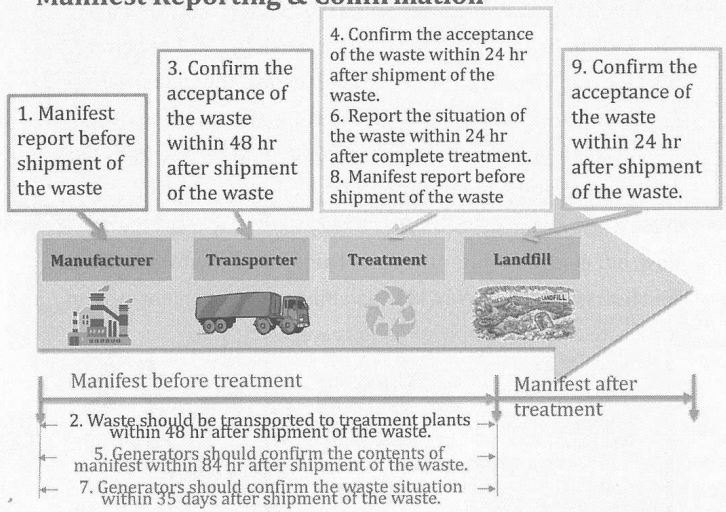
Management Scheme(1/4)

- **Flow Chart of Waste Disposal Tracking and Management**



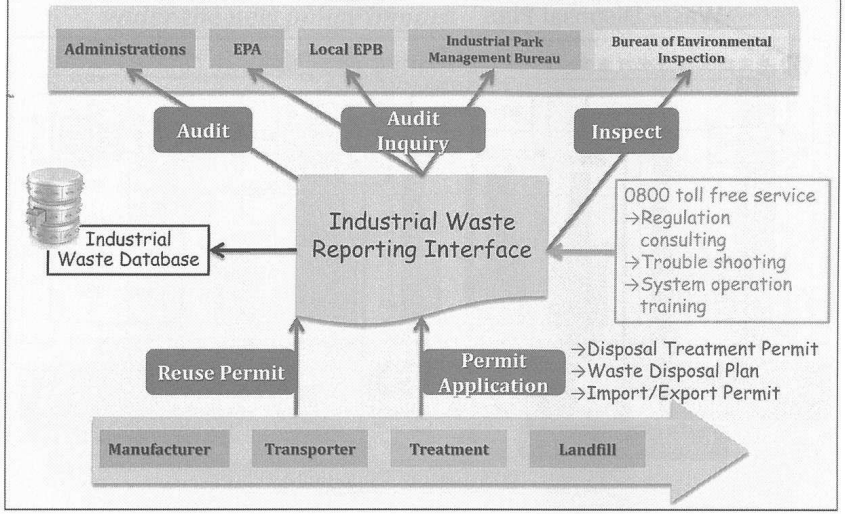
Management Scheme(2/4)

- **Manifest Reporting & Confirmation**



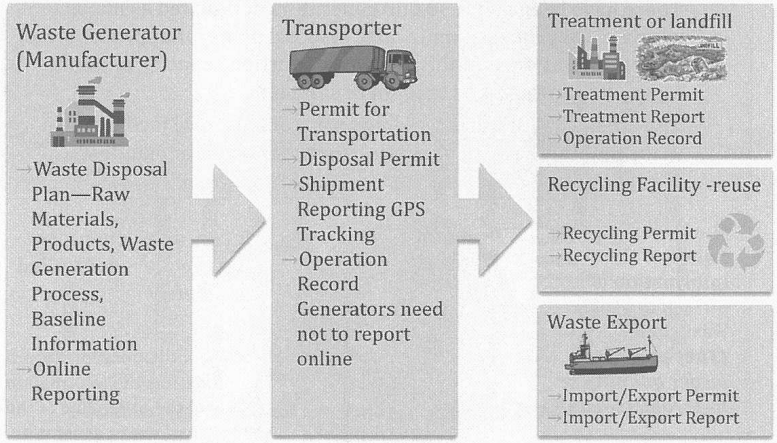
Industrial Waste Reporting & Management System (IWR&MS)

- **The Function of IWR&MS**



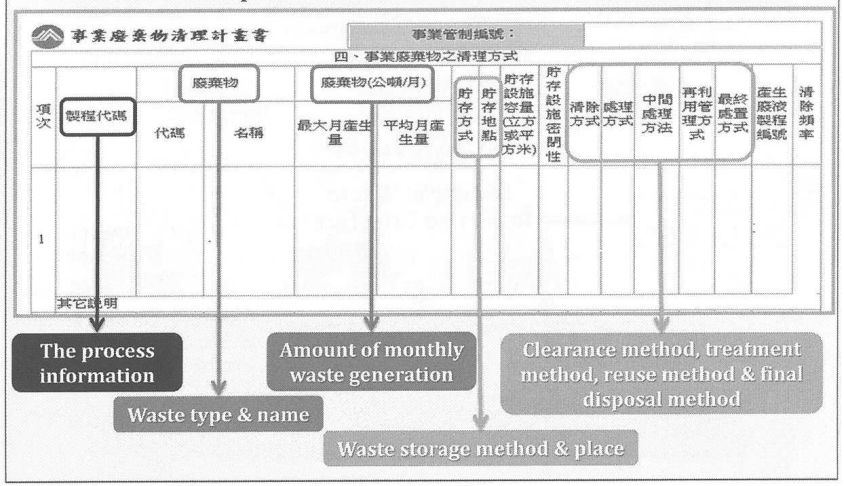
Management Scheme(3/4)

- **Article 31 of the Waste Disposal Act**



Waste Disposal Plan Reporting

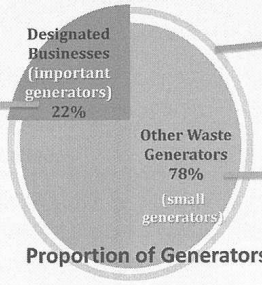
- **Waste Disposal Plan Reporting**
  →Waste Disposal Plan



Management Scheme(4/4)

- **To know who is the target to be controlled**
  → There have been about 30,000 generators designated as major sources. They must submit waste disposal plans for approval before waste generation; monthly report: production capacity, amount of temporary storage, and amount of shipment.
  → The other 20% of waste generation is from disposal facilities that make monthly reports on waste generation without manifest reporting .

Manifest reporting indicates the information of 80% of the total waste generation. ***(They produce larger quantity or hazardous waste)***

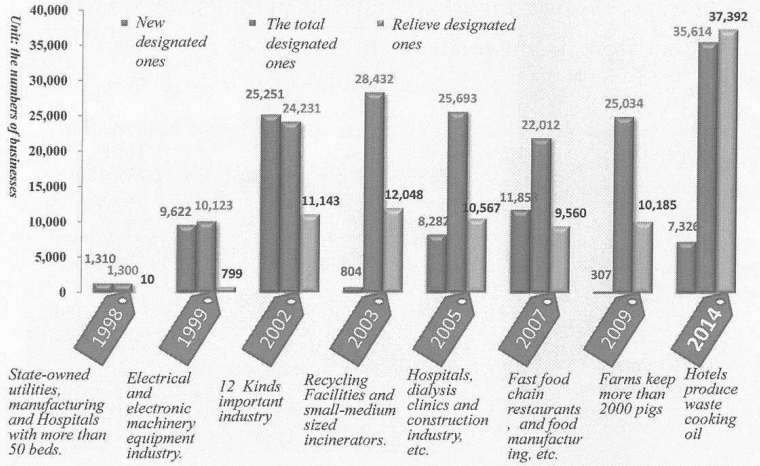


Total waste generation nationwide is controlled completely.

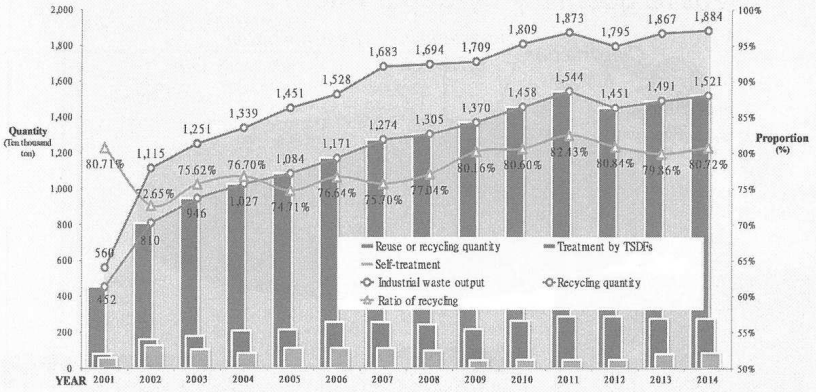
Operation Record indicates the information of the other 20% of the total waste generation.

The Growth of Designated Businesses

- ***The numbers of designated businesses over this years under the new policy impact.***



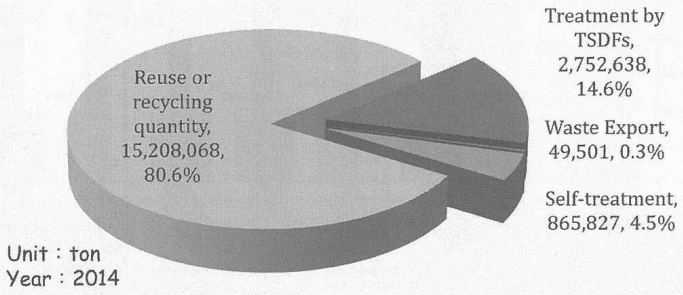
Statistics of All Industrial Waste Generation(1/4)



- ***18 million tons industrial waste was reported in 2014.***
- ***Recycling rate:80.72%***

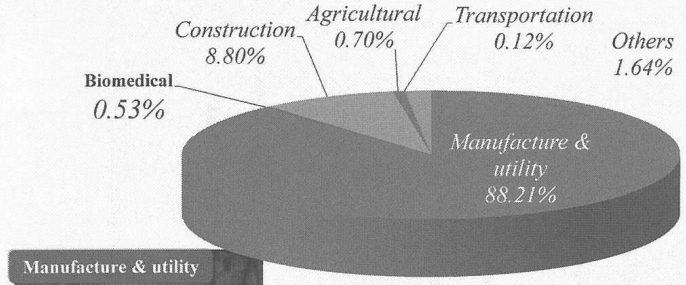
Statistics of All Industrial Waste Generation(2/4)

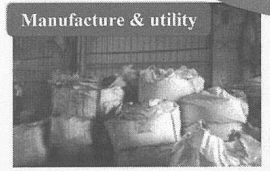
→There were about 18 million tons of industrial waste reported on-line in 2014



Statistics of All Industrial Waste Generation(3/4)

- Waste quantity by departments





Industrial Waste Recycling

- *Industrial waste recycling rate of 80.51% and output value of NT $ 65.9 billion were reached in 2013 , while the strategy of industrial source reduction was implemented*

Industrial Waste

Industrial Raw Material
Chemical raw materials
Re-grind resin

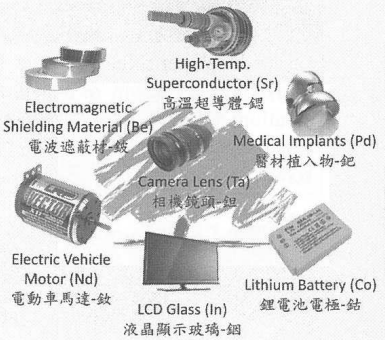
Soil Amendment
Material for organic fertilizer
Material for mscellaneous organic planting substrates
Material for culture soil

Construction Engineering
Reclamation material for Non-agricultural land
Aggregate for road construction
Raw material for concrete additions
Asphalt concrete additions
Artificial aggregate materials

Resources Requirements in Taiwan

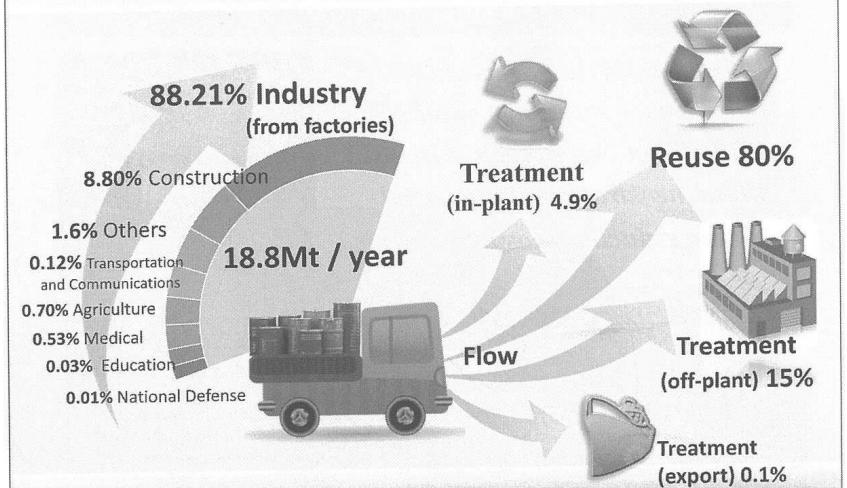
➢ **Taiwan is a Big Manufacturing Country, but has Few Natural Resources.**

4 Major Industries	Panel, Printed Circuit Board, Solar Energy/Photoelectric, Illumination Light Source			
Production Values	33 Billion USD			
Necessary Items (unit: kg)	Ni	607,275	Co	26,990
	Ge	313,900	Tb	17,550
	Y	199,800	Eu	15,530
	Ag	111,334	Mo	4,723
	In	90,790	Pd	3,711
	La	71,550	Au	2,699
	Ce	50,619	Pt	1,012
	Ga	34,920		



Ref. A Study of Rare Resources Recycling and strategic stock

Industrial Waste Status in Taiwan



Precious Metals in Industrial Waste

➢ **There are many industrial waste containing precious metals received and reused in Taiwan**

Industrial Waste	Precious Metals
Waste developer solution, waste solution with molybdenum, indium or palladium, plating solution, X-ray films, GaAs sewage, lead frame, waste electronic scraps and NG parts, waste PCB scraps and cuttings, etc.	Gold(Au), silver (Ag), palladium(Pd), indium (In), gallium (Ga), molybdenum (Mo)

IC substrate (IC載板) | lead frame (導線架廢料) | FPCB (印刷電路板軟板) | Plating Solution (廢電鍍液) | X-ray Film (廢攝影膠片)

Precious Metals in Industrial Waste

Year	2010	2011	2012	2013	2014	
Total Amount of Industrial Waste (廢棄物總量)	18.09	18.73	17.95	18.67	18.88	unit : million tons
Industrial Waste Reuse for Refining Precious metal	4,284	3,342	2,538	4,372	4,010	unit : tons

About 21 kinds of waste can be used to refine precious metals ,

Mainly contains 6 kinds of pure metal or metal oxide.

(gold, silver, palladium, indium, gallium, molybdenum)

Statistics from the Permits for Industrial Waste Reuse

Kinds of Waste	Average Weight of Waste for Refining Precious Metal
Cyanides Plating Solution	2000
Waste Developer Solution	600
Waste Catalyst	450
Waste PCB Scraps	200
Others	450

unit : tons / year

Ref. Review and Integrate Industrial Waste Reuse-Related Laws and Maintain Resource Recycling (2015)

Recycling Case : Waste LCD Recycling

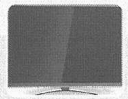
Waste LCD Monitors
Waste LCD Panels
5900tons/year

Past

Landfill

now

Green LCD



Shredding
↓
Continuous Extraction System
↓
LC, Indium and Glasses
↓
Blending

Recycling Technology of LC(液晶) in Panels

Reducing the Disposal Fee USD 1.18 Million

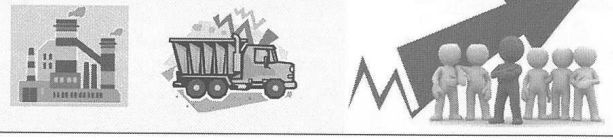
Reducing the Material Cost USD 1.33 Million

Product Control after Recycling

- At present, the Ministry of Economic Affairs (MOEA) announces 58 items including waste iron and etc. that can be recycled. Also, the flow of recycled products has been required to be reported since 2011.
- Both MOEA and EPA offer the same function – providing the reused products reported by the recycling institutes, selling targets, production capacity, inventory level and so on, in order to completely control the production capacity as well as stock status.

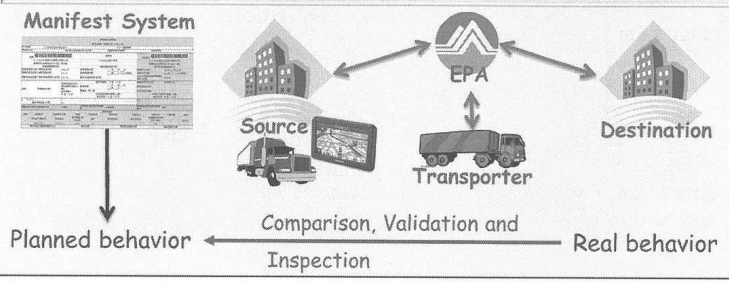
Statistics of All Industrial Waste Generation(4/4)

- There are about 79,439 industrial waste generators and 21,713 medical ones in Taiwan.
- They generate 18 million tons of industrial waste per year.
- Currently there are about 33,000 generators, 4,000 transporters, and 865 TSDFs that are required to make online reports.
- Starting in 2002, more than 8,752vehicles are equipped with a global positioning system (GPS) for waste tracking, over 986 of which transport hazardous waste.



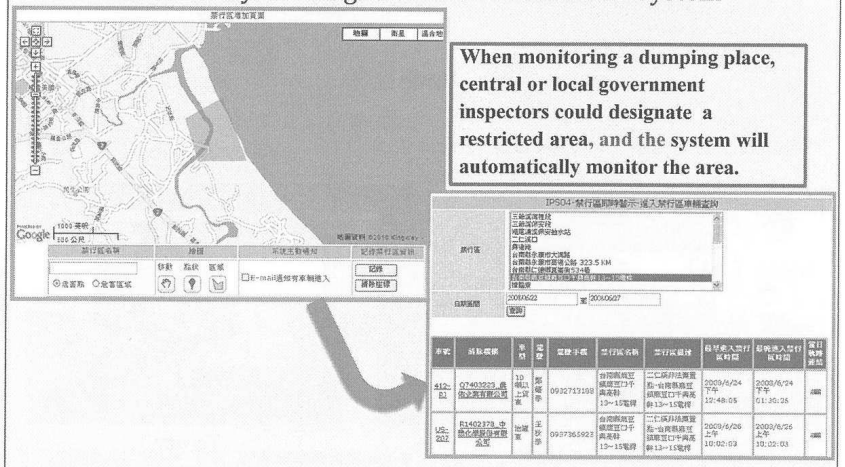
Waste Flow Tracking Management

- **Real-Time Tracking Systems Introduction**
  - → Article 31 of the Waste Disposal Act: Industrial waste clearance and transport machinery designated and officially announced by the central competent authority shall be installed with real-time tracking systems in accordance with the specifications designated by the central competent authority, and shall maintain normal operation.
  - → EPA invests in this program about 4M NTD (≈ 0.12 M USD)/year.
  - → GPS in Industrial Waste Transportation Management Strategies



Waste Flow Tracking Management

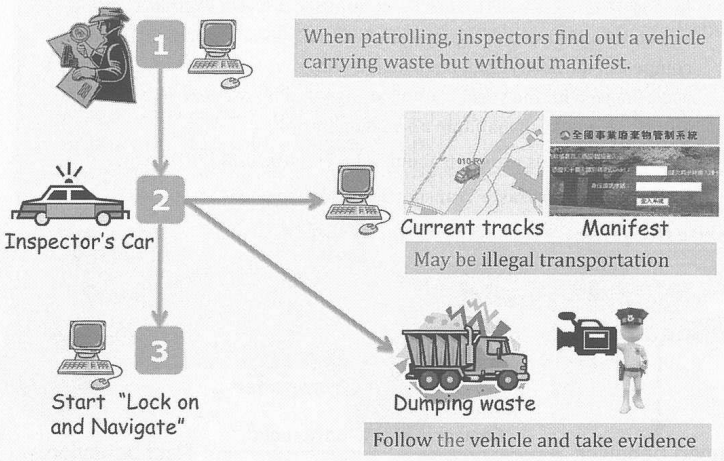
- **Real-Time Monitoring System/Alarm**
  - →Area Analysis-Integrated with Information System



When monitoring a dumping place, central or local government inspectors could designate a restricted area, and the system will automatically monitor the area.

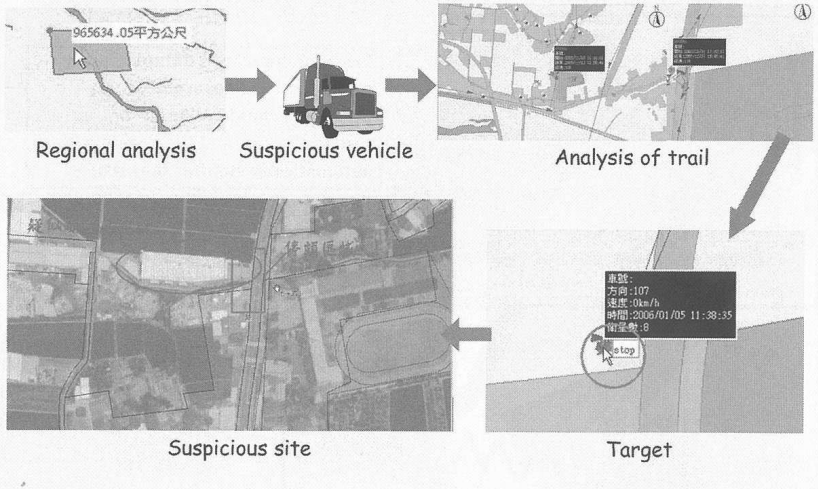
Waste Flow Tracking Management

- **Mobile Inspection**



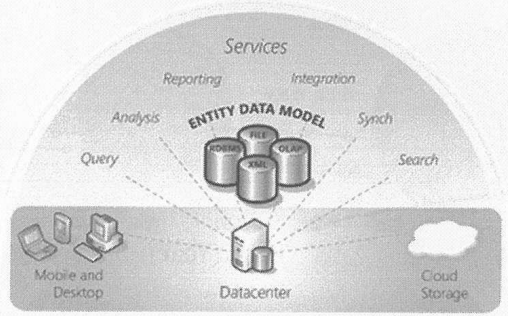
Waste Flow Tracking Management

- **Mobile Inspection**



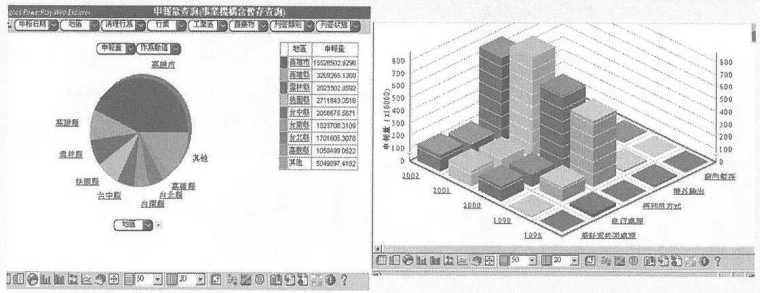
Statistical Analysis and Strategy Support

- Using "Microsoft SQL Server" as database server
- Until now the total amount of the database is 200 million (including e-manifests, production, storage and operation records)



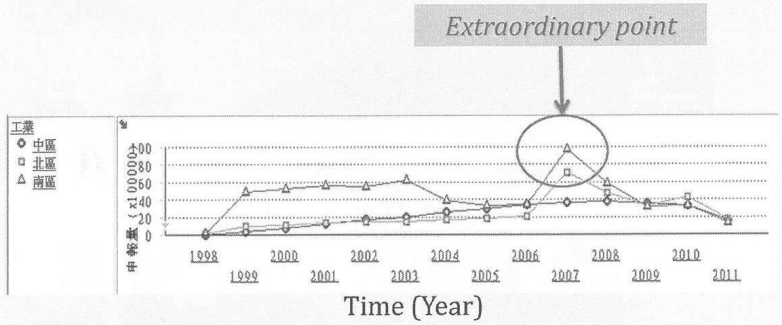
Statistical Analysis and Strategy Support

- OLAP (Online Analytical Processing) System (Web Based)
  - → OLAP real-time online analysis system offers excellent strategy support.
  - → Multi-dimension tables can be made promptly.
  - → "Information and data mining" is easy even with huge amount of data.



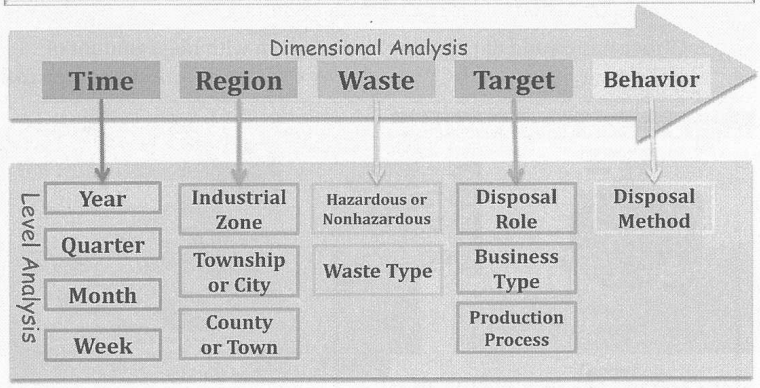
Statistical Analysis and Strategy Support

- OLAP System (Web Based)
  - → Many kinds of analytical charts can be made rapidly.
  - → Extraordinary point of report data can be easily found.



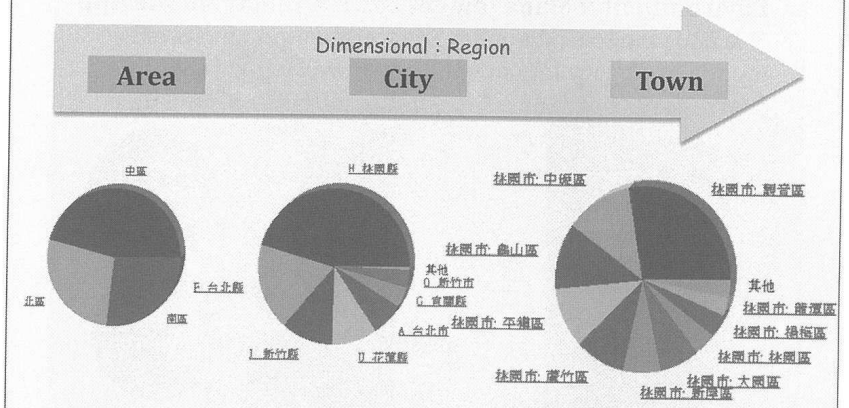
Statistical Analysis and Strategy Support

- OLAP System (Web Based)
  - → The system can perform rapid analysis on when, where, and what kind of waste is disposed of.



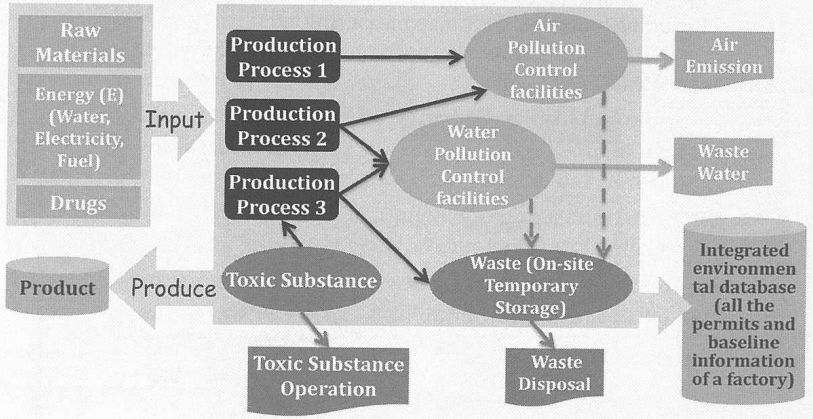
Statistical Analysis and Strategy Support

- **Example of dimensional & level analysis**



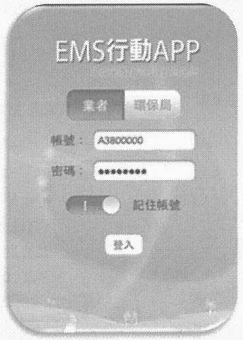
Integrated Air, Water, Waste and Toxic Substance Management Mechanism

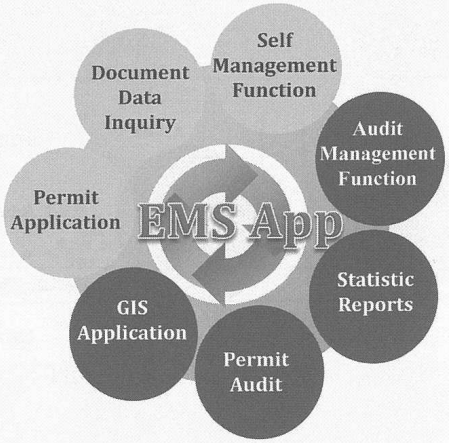
- **Input = Pollutants + Products**



Integrated Air, Water, Waste and Toxic Substance Management Mechanism

- **Environmental Management System (EMS) Mobile App**





Integrated Air, Water, Waste and Toxic Substance Management Mechanism

- **Environmental Management System (EMS) Mobile App**
  - → EMS is able to inquire 12 permits and 7 kinds of documents.
  - → Including functions: GPS, map measuring, etc.

Results

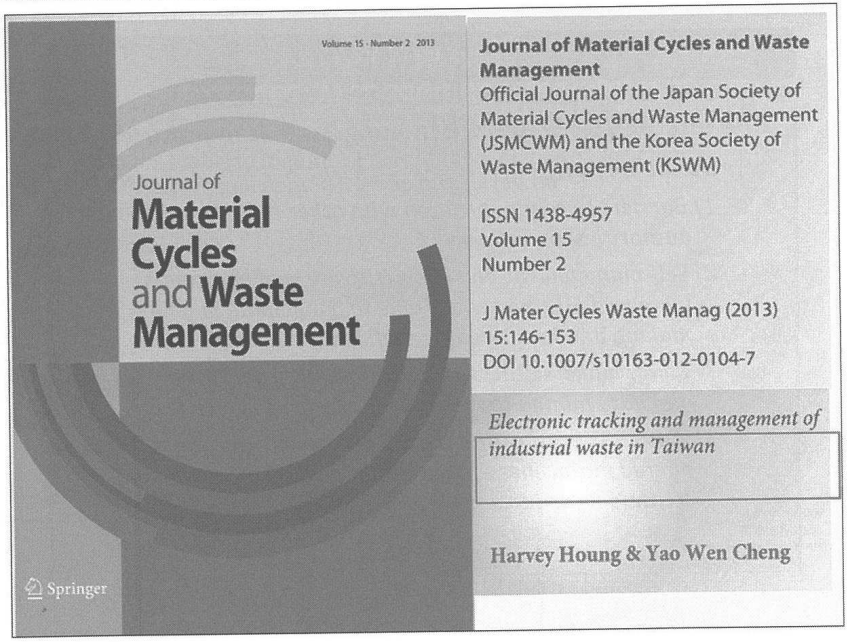
- *Benefits of the System*
  - → *Besides an expenditure of 3 million NT dollars (US$ 0.1 million) in hardware, the Taiwan EPA spends an annual 20 million NT dollars (US$ 0.67 million) in construction, maintenance, and user toll free service.*
  - → *The system saves more than 300 million NT dollars (US$ 10 million) in administrative costs annually. After this system was established, there were only a few cases of illegal dumping of demolition waste in the past two years.*

Results

- *Benefits of the System*
  - → *Other benefits :*
    1) *Barriers to communication with other industry competent authorities are removed;*
    2) *Self-management and competitiveness of businesses increased. Businesses are able to participate in policy making and have greater confidence in our government;*
    3) *Policy makers utilize analytical reports, database storage, and data mining to promptly make correct policies;*
    4) *Waste generation and treatment capacity information is offered for businesses that are interested in setting up treatment facilities.*

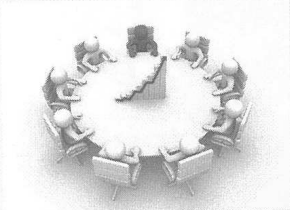
Results

- *Benefits of the System*
  - → *The quality of data reported is gradually improved through inspection in conjunction with local governments and on-site inspection by professional technicians. The goal of waste flow management "from cradle to grave" is thereby made effectively.*
  - → *Characteristics of waste generated by different businesses and production processes enable analysis of waste generation, quantity, and material flow. They provide industries with critical information for decision making on the swapping and recycling of waste, and can further help us reach the goal of managing waste "from cradle to cradle", that is, sustainable use of resources.*



Future Vision

- *We will complete our industrial waste flow control, continue planning to expand the list of control targets, such as hotels, restaurants, etc., and strictly request transporters to install GPS in their vehicles and to submit their clearance items.*
- *Until now the total amount of the database is 200 million, it is a real Big Data. Although we have developed OLAP system for over 10 years, we keep to develop a better auditing system and data Mining System to have better decision making.*



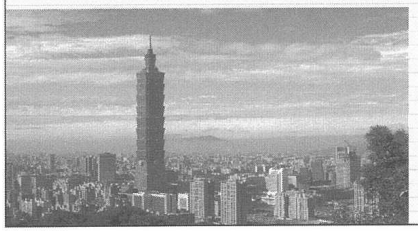
Create Capacity Database

There was **41.8 million tons** of e-waste produced globally,

but only **6.5 million tons** of which was recorded in the official recycling systems .....United Nations University(2014)

Waste management is already highly IT in Taiwan
We need to enhance database for urban mining

Thank you for your listening



Session 3

K eco Food Waste Mgt System Introduction & Demonstration