

# **E-Revolution & Mobilization on Managing Taiwan's Pollution Sources' — Experiences with Industrial Waste Control Center**

**Ching-Shi Yang**

Director General

Department of Air Quality Protection  
and Noise Control

Environmental Protection  
Administration

Taiwan, ROC

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# Outline



- **Introduction**
- **Integrated Control of Pollution Sources' Material Flow**
- **Industrial Waste Management Background**
- **e-Revolution and Mobilization of Industrial Waste Management**
- **Summary**

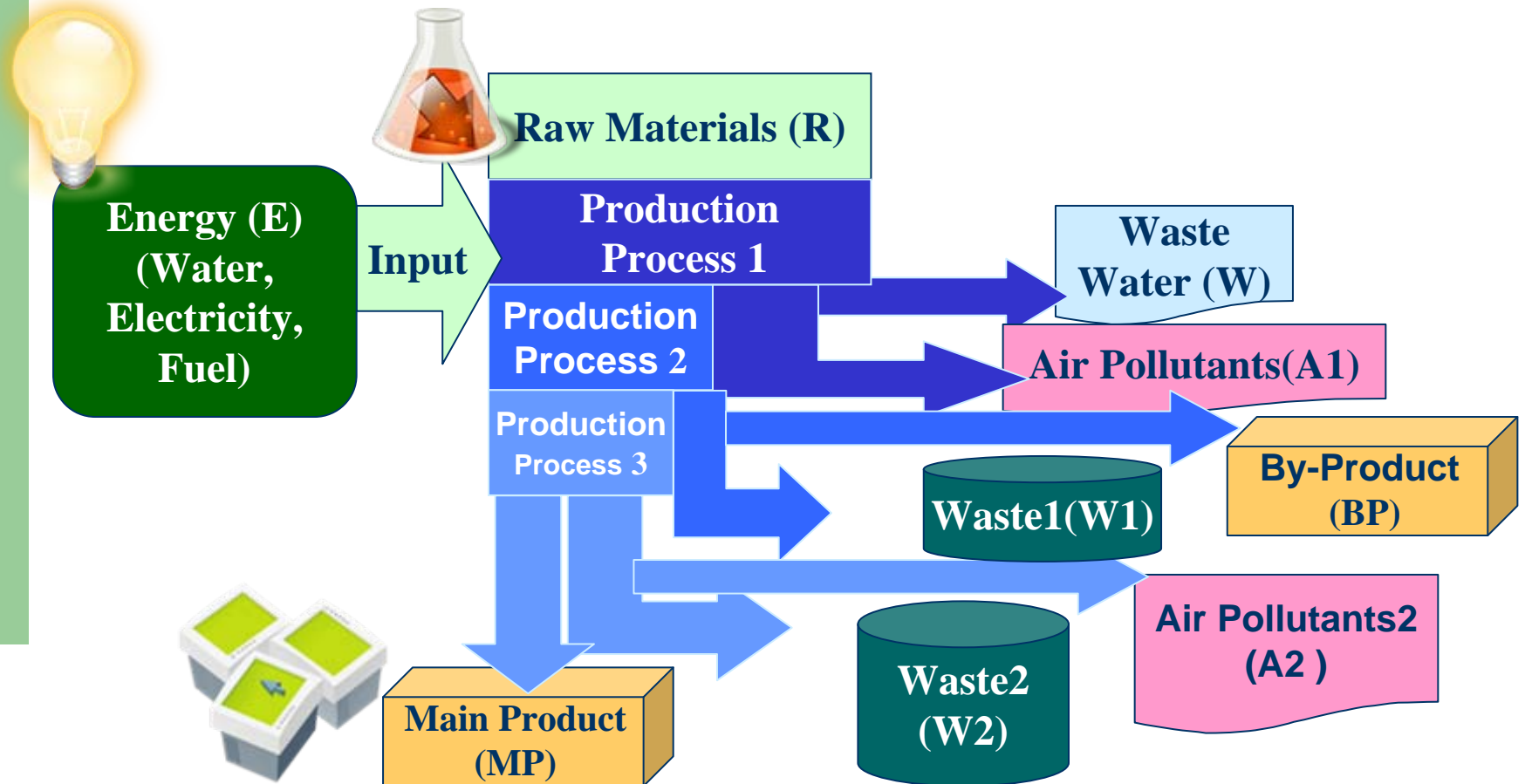
# Introduction (1)

- On-going **industrial development & intense human activities** lead to serious environmental pollution
- Taiwan EPA currently implementing various policies to manage **air & water pollution, toxic substances, waste disposal**
- Each EPA department established independent pollutant data, resulting in:
  - **Lack of integration** for data from different systems
  - Inability of local governments to verify the **accuracy** of reported data
  - **Repetitive reporting** of baseline data
  - Significant **waste of human and financial resources**



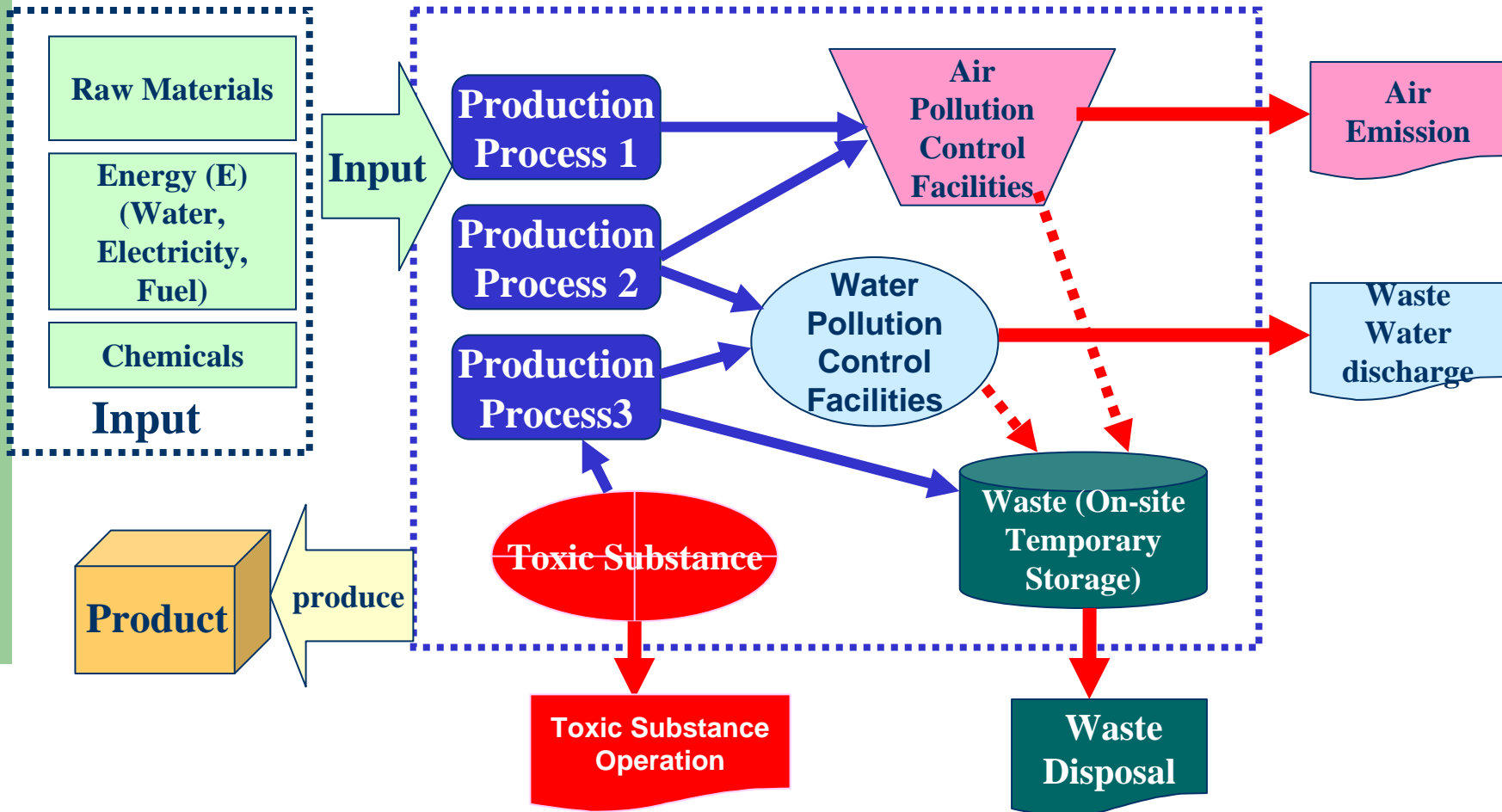
# Introduction (2)-Material Flow of Production Process

Raw Material (R)+Energy (E) =Waste Water+Air Pollutants +Waste+Product =(W)+ (A1+A2)+ (W1+W2) + (BP+MP)



# Introduction (3)- Material Flow and Mass Balance

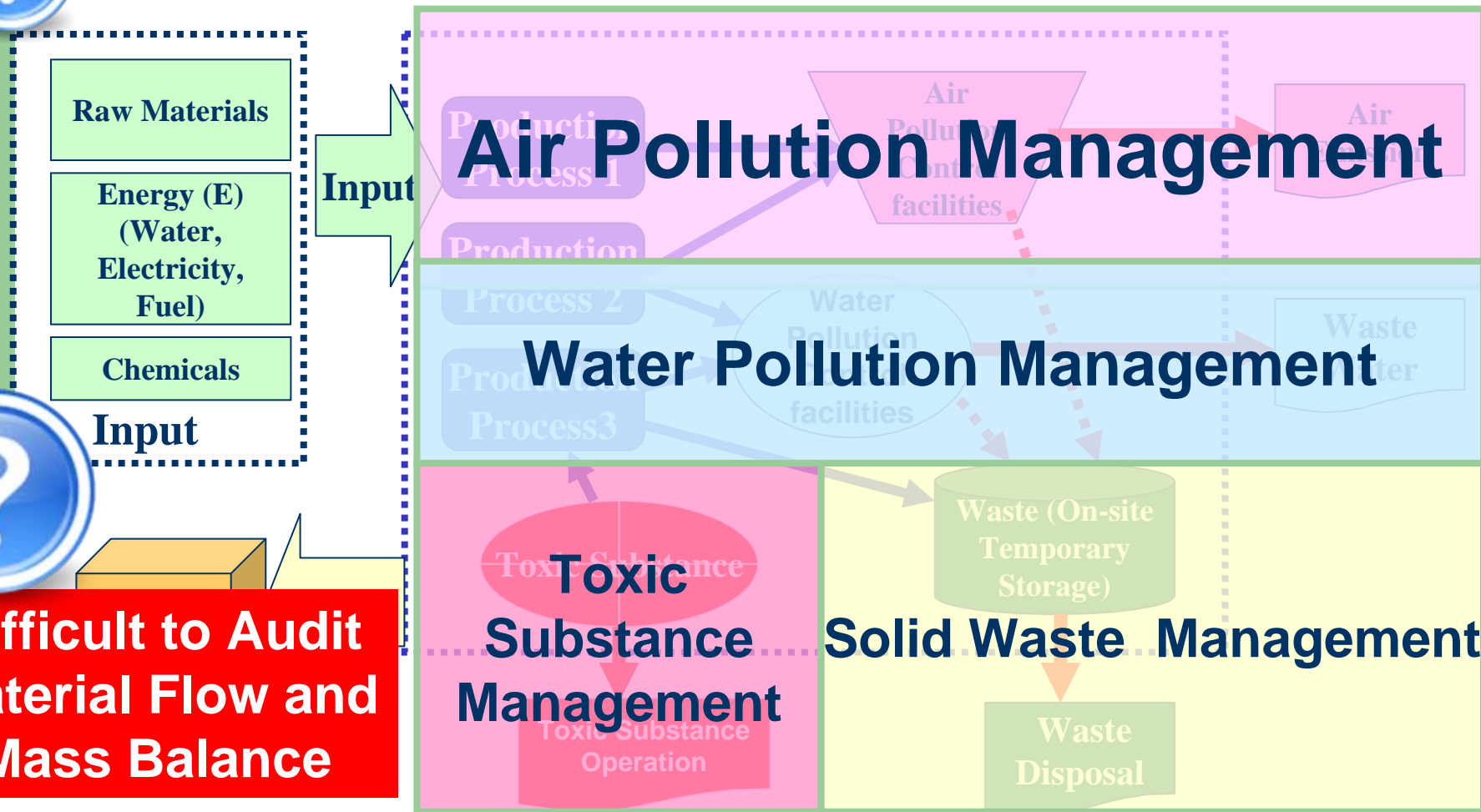
## Input = pollutants+products



# Introduction (4)- Individual Pollutant Management Problem



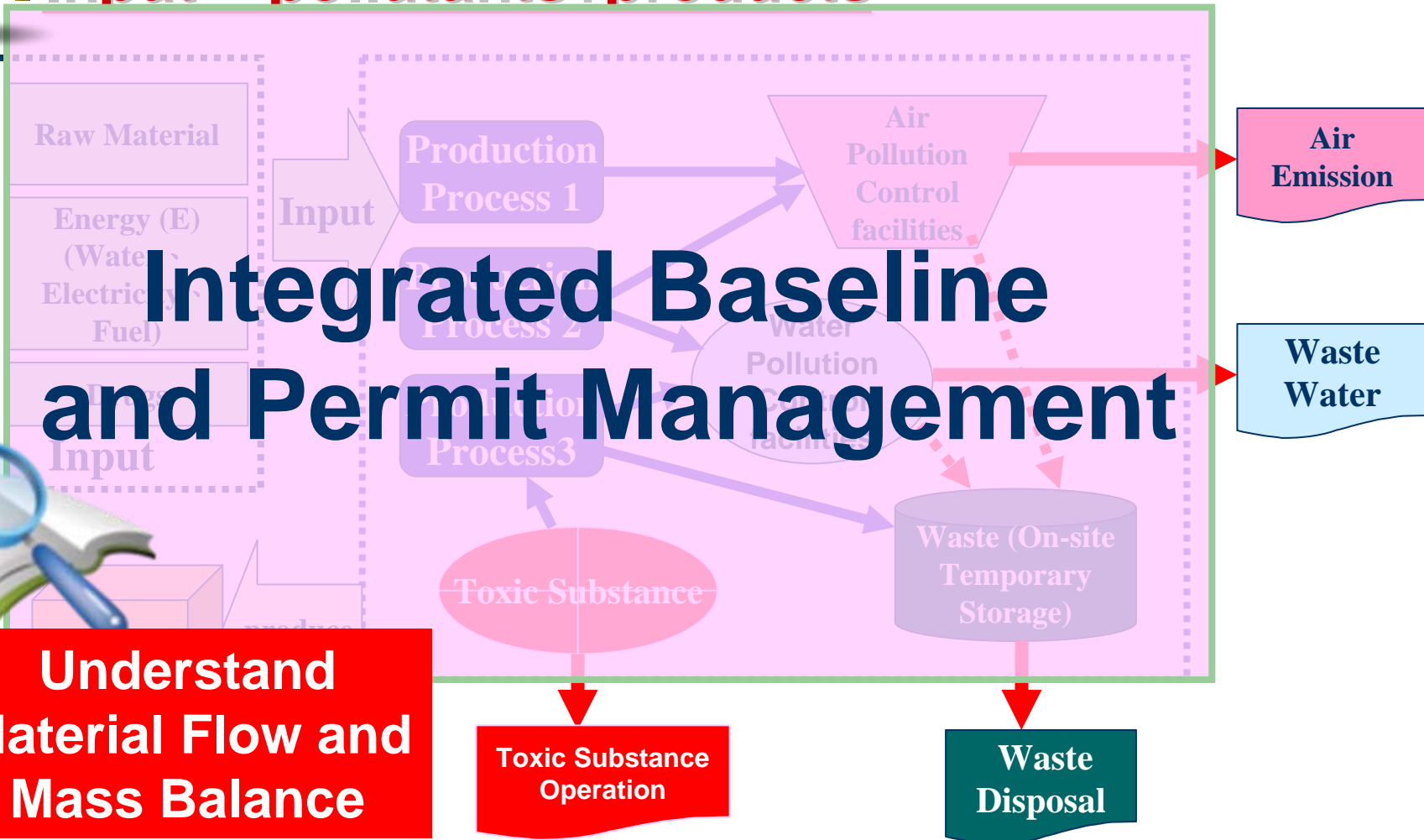
Input = pollutants+products



**Difficult to Audit Material Flow and Mass Balance**

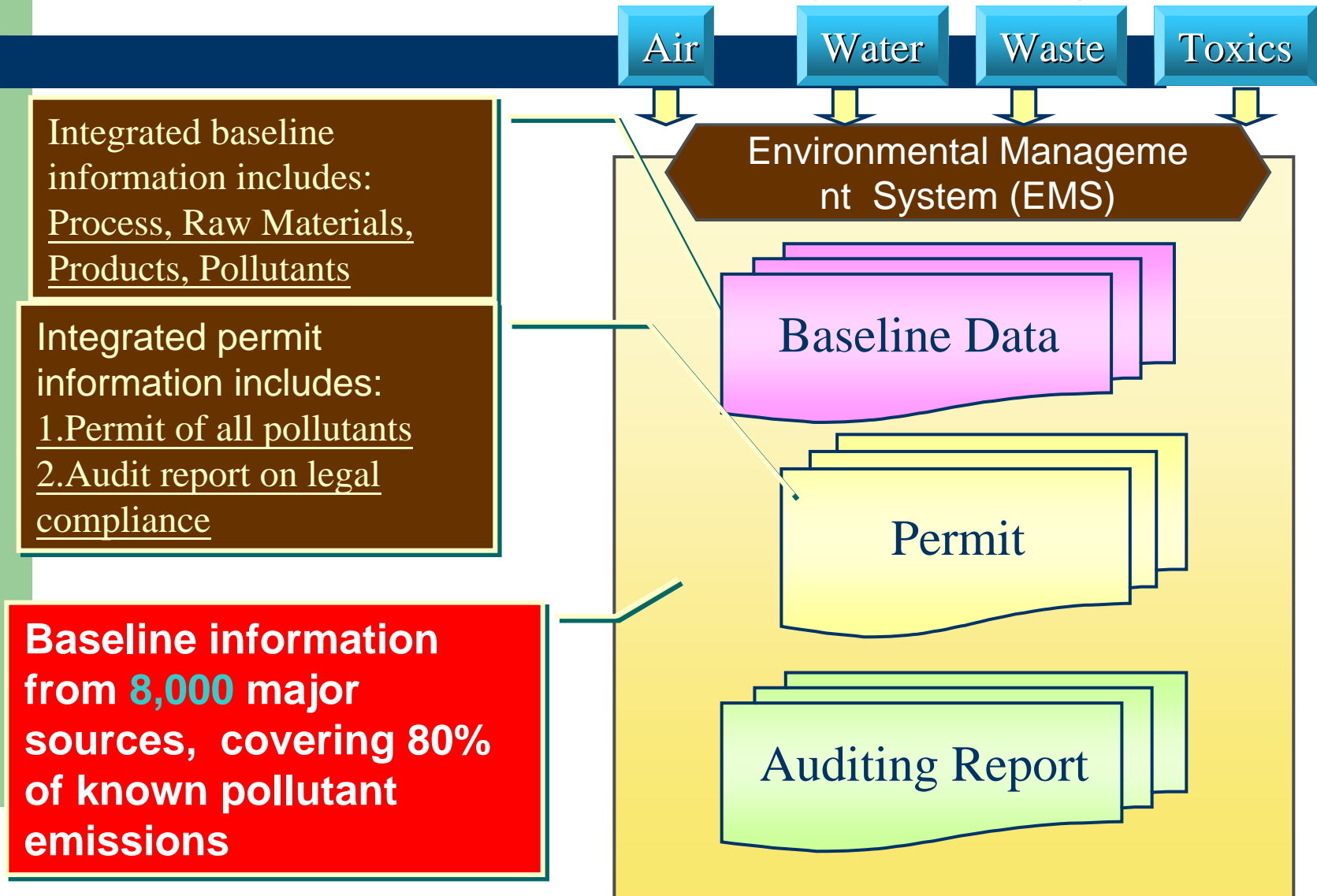
# Integrated Control of Pollution Sources' Material Flow (1)- **Integrated Baseline and Permit Management**

**Input = pollutants+products**



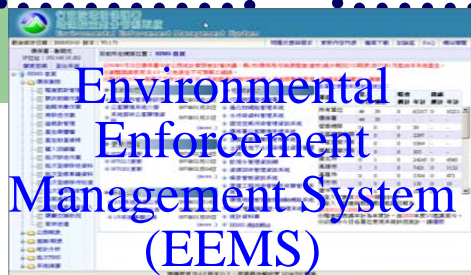
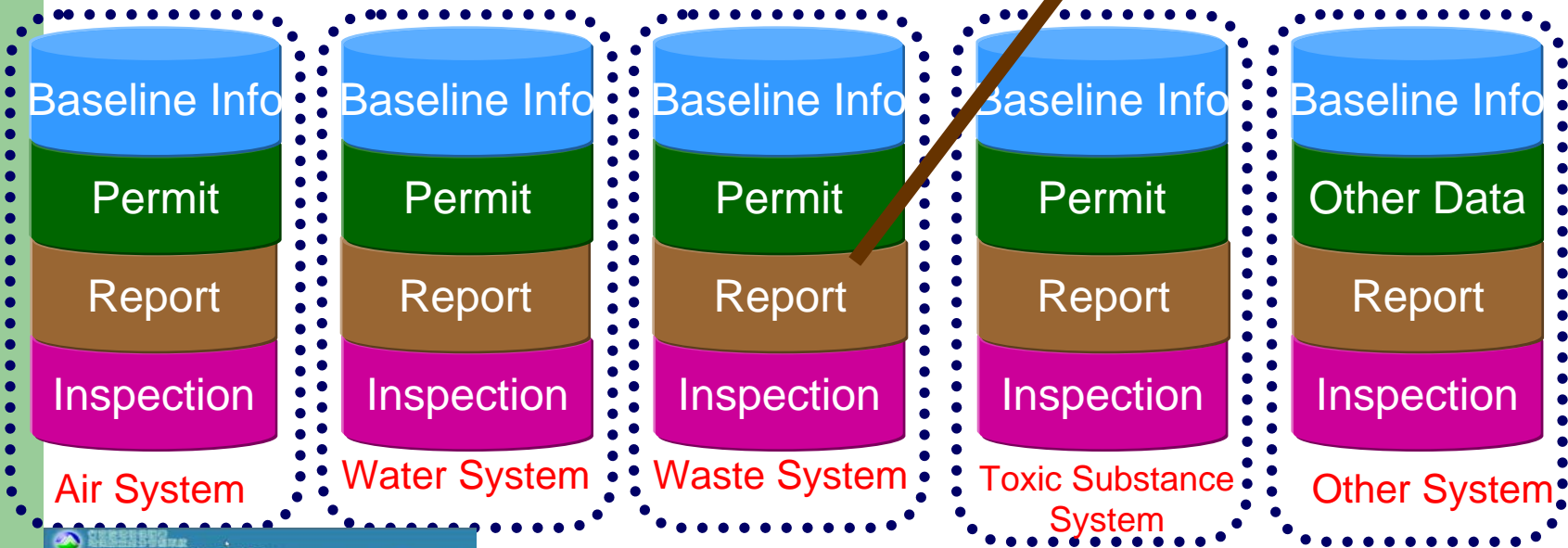
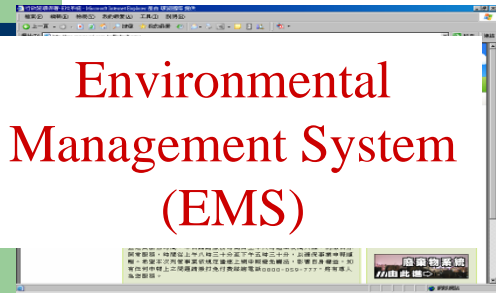
**Understand Material Flow and Mass Balance**

# Integrated Control of Pollution Sources' Material Flow (2)-Efficiency of Integration





# Integrated Control of Pollution Sources' Material Flow (3)- Integrated Baseline Database Structure

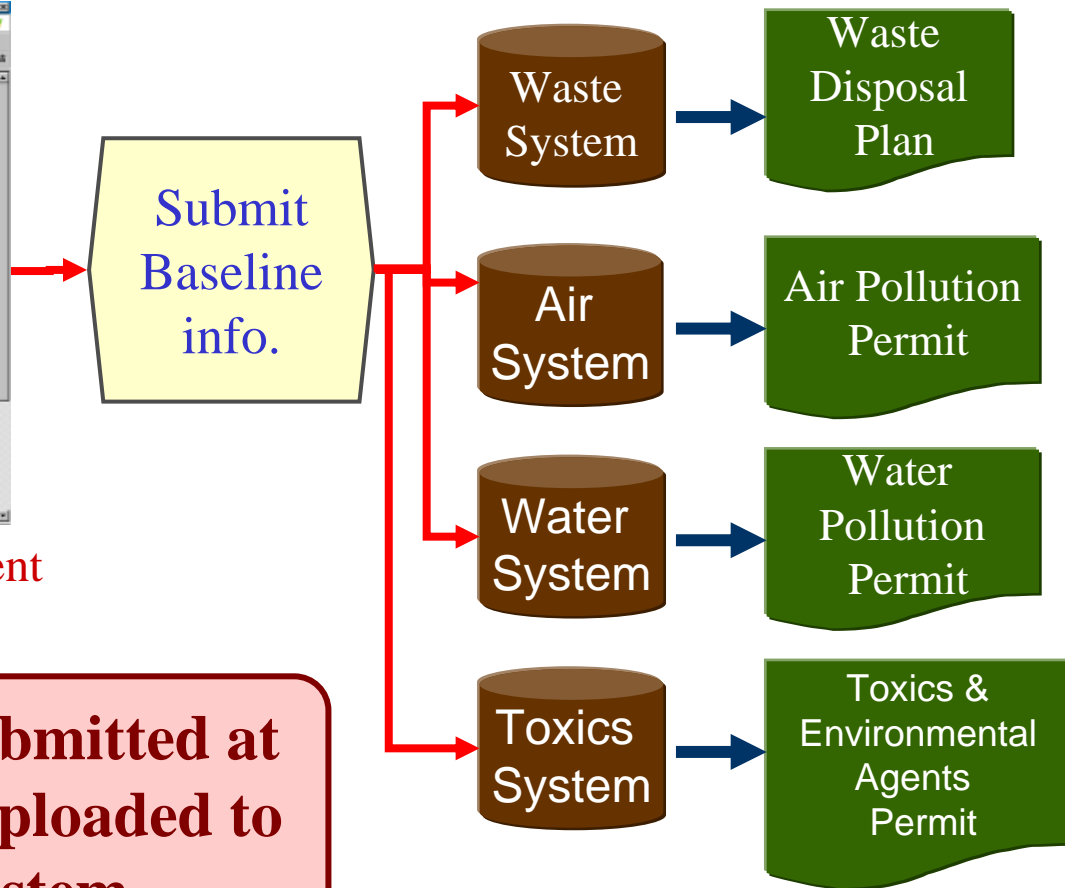


# Integrated Control of Pollution Sources' Material Flow (4)- Environmental Management System (EMS) Single Portal

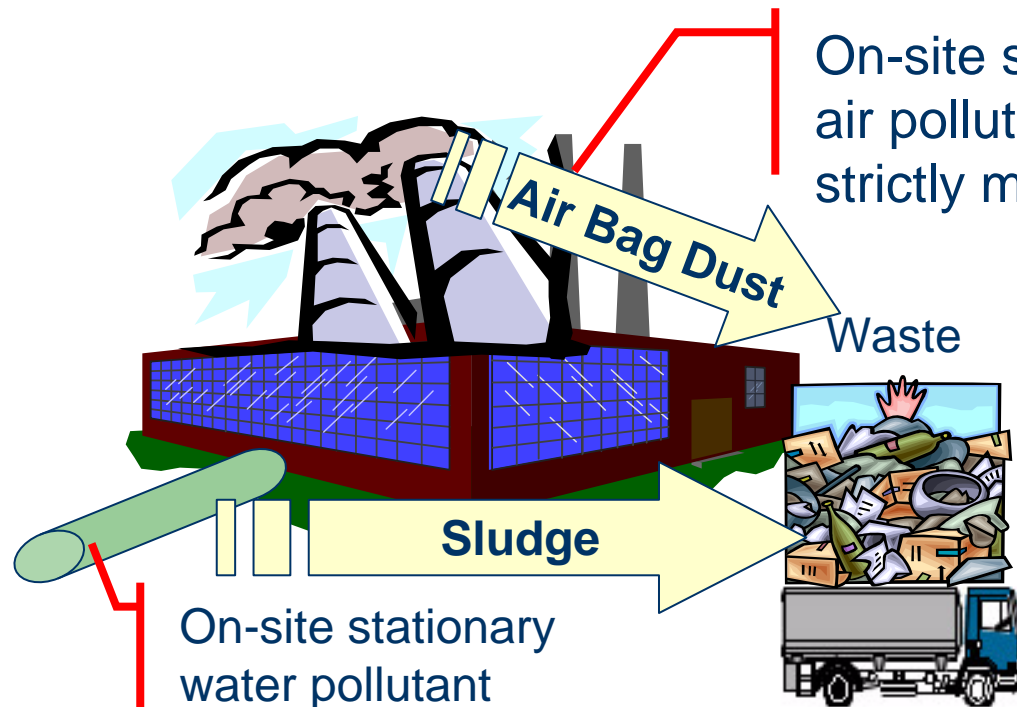


Environmental Management System (EMS)

All baseline info can be submitted at single portal system and uploaded to individual control system



# Industrial Waste Management Background (1)



On-site stationary  
air pollutant source  
strictly monitored

- CEMS
- Regular monitoring
- Emission Report

On-site stationary  
water pollutant  
source strictly  
monitored

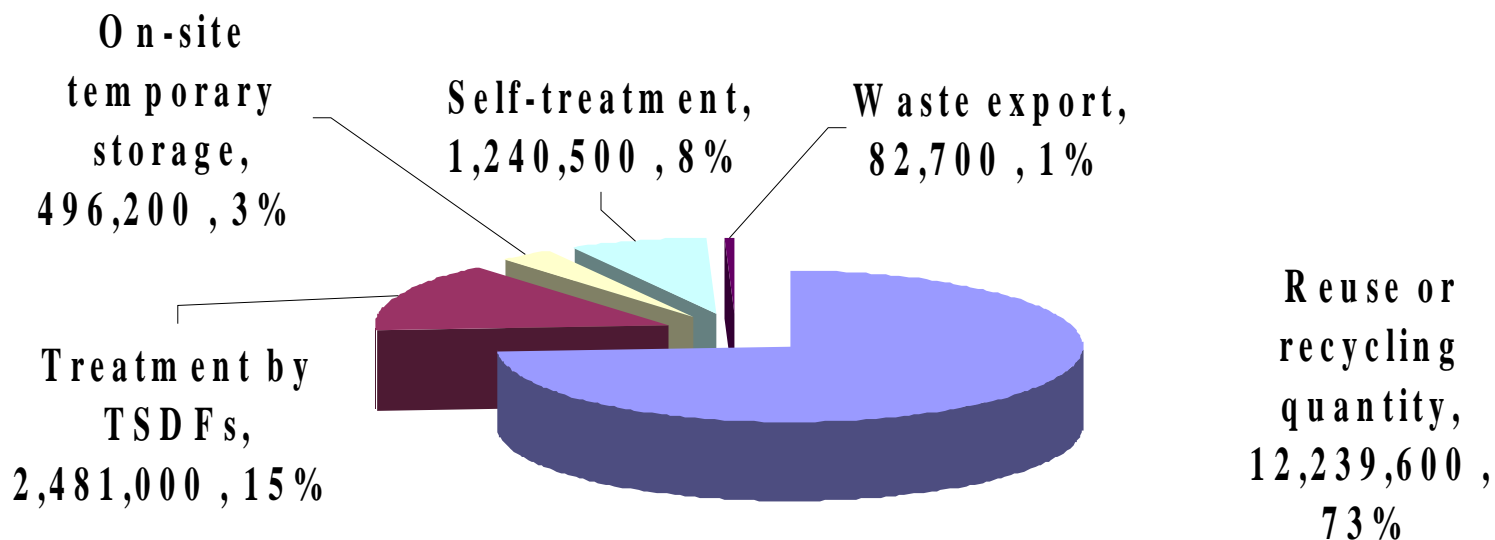
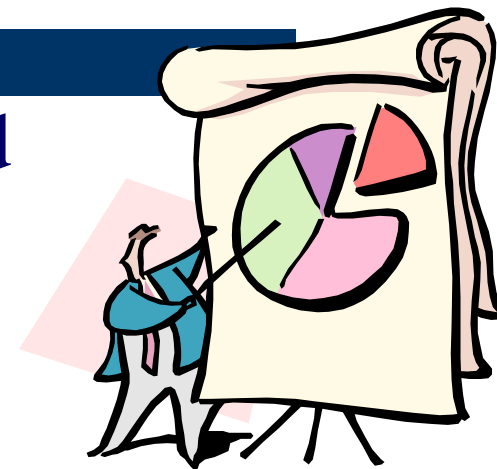
- Water Quality Monitoring Facilities
- Water Quality and Quantity Report

Waste treated off-site  
and become mobile  
pollutant source,  
requires flow tracking.

# Industrial Waste Management Background

## (2)- Waste Generation(

- 20,000 designated businesses and 4,000 TSDFs mandated for reporting, waste generated around 16,540,000MT per year.



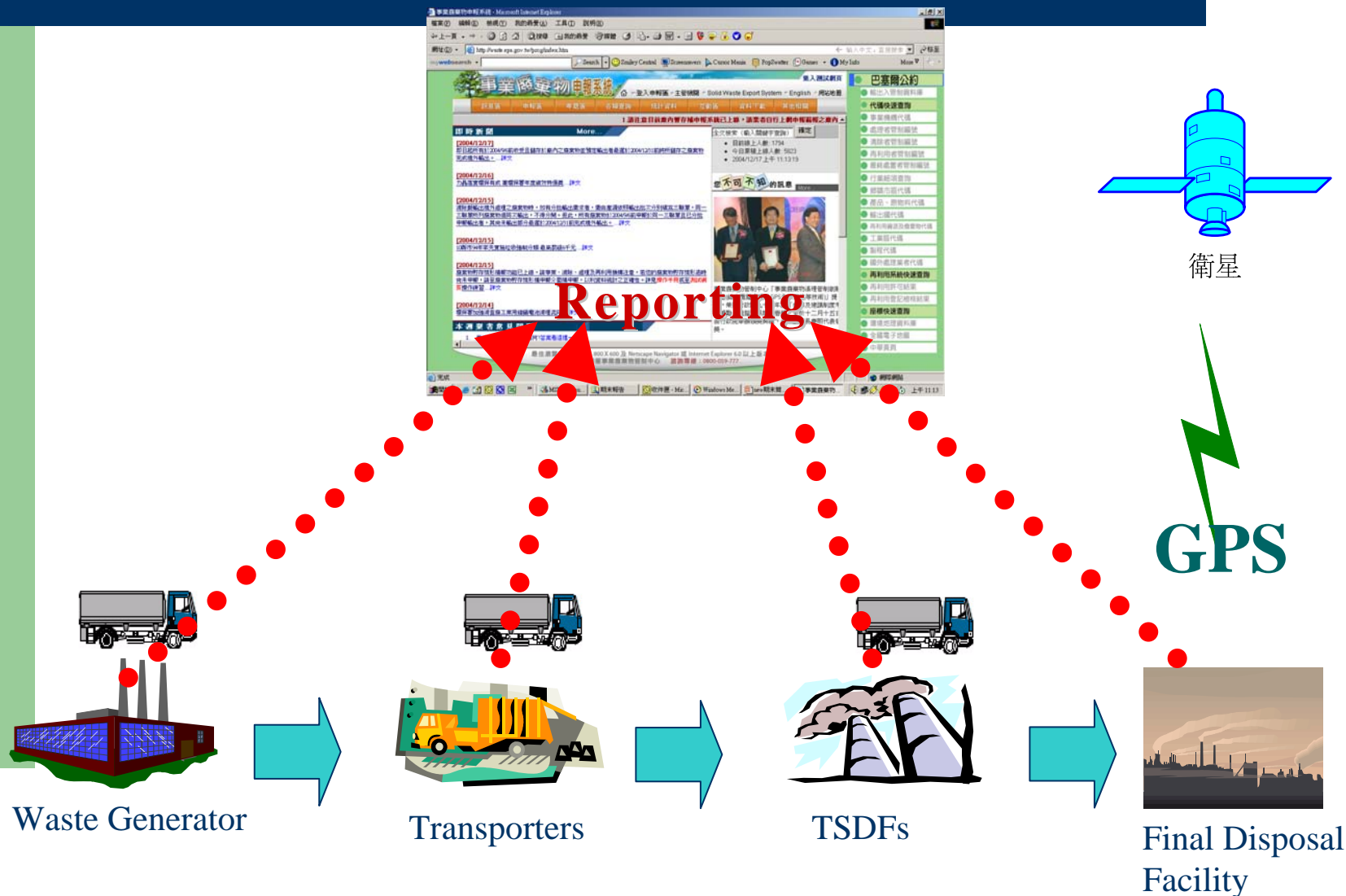
# e-Revolution and Mobilization of Industrial Waste Management (1)-

## Establishment of Industrial Waste Control Center

- Industrial Waste Control Center established in October, 2000.
- Mission: Integrate waste management by using electronic and wireless tools .

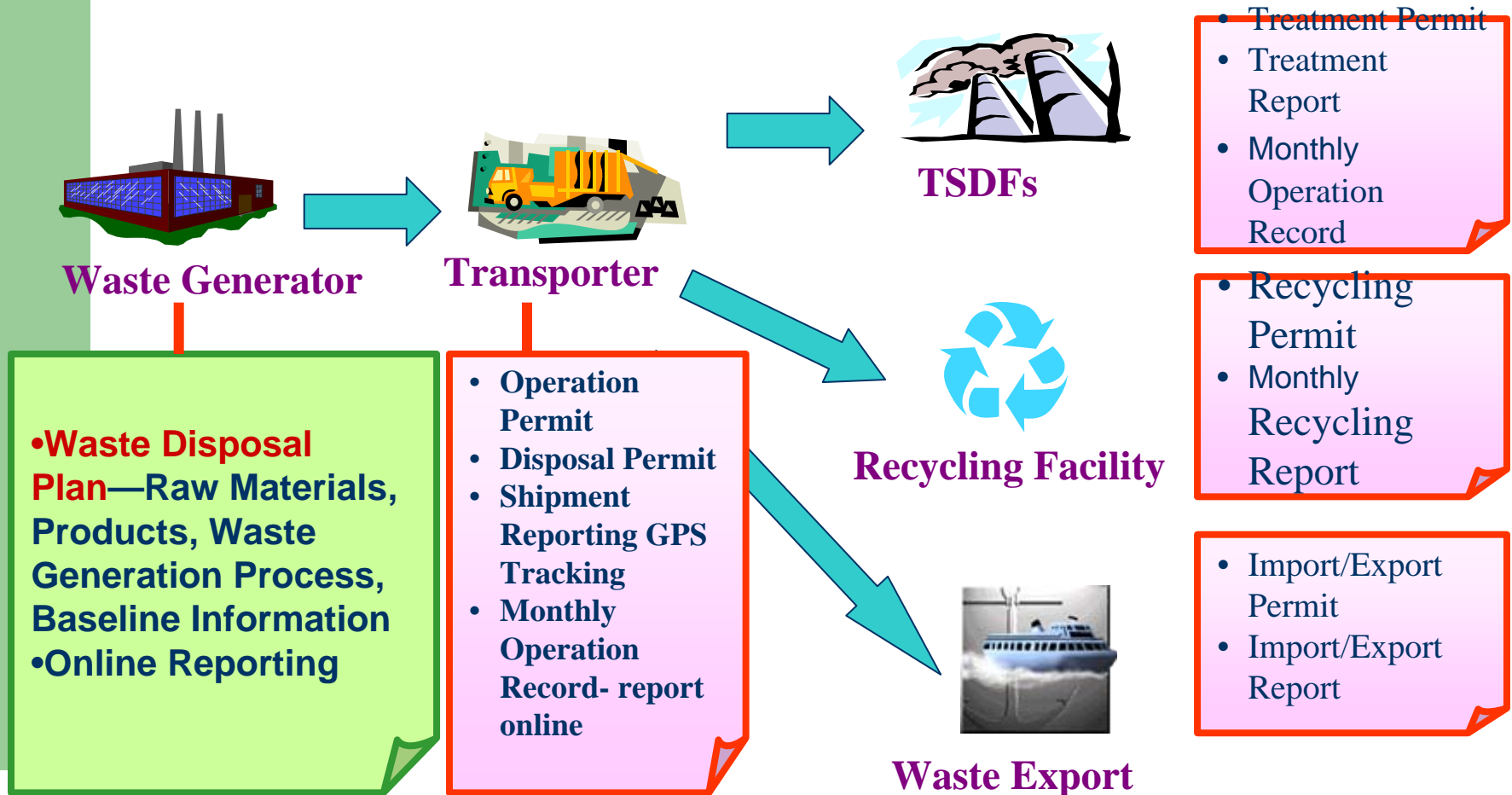


# e-Revolution and Mobilization of Industrial Waste Management (2)- From Cradle to Grave





# e-Revolution and Mobilization of Industrial Waste Management (3)-Report, Permit, and Material Flow Tracking

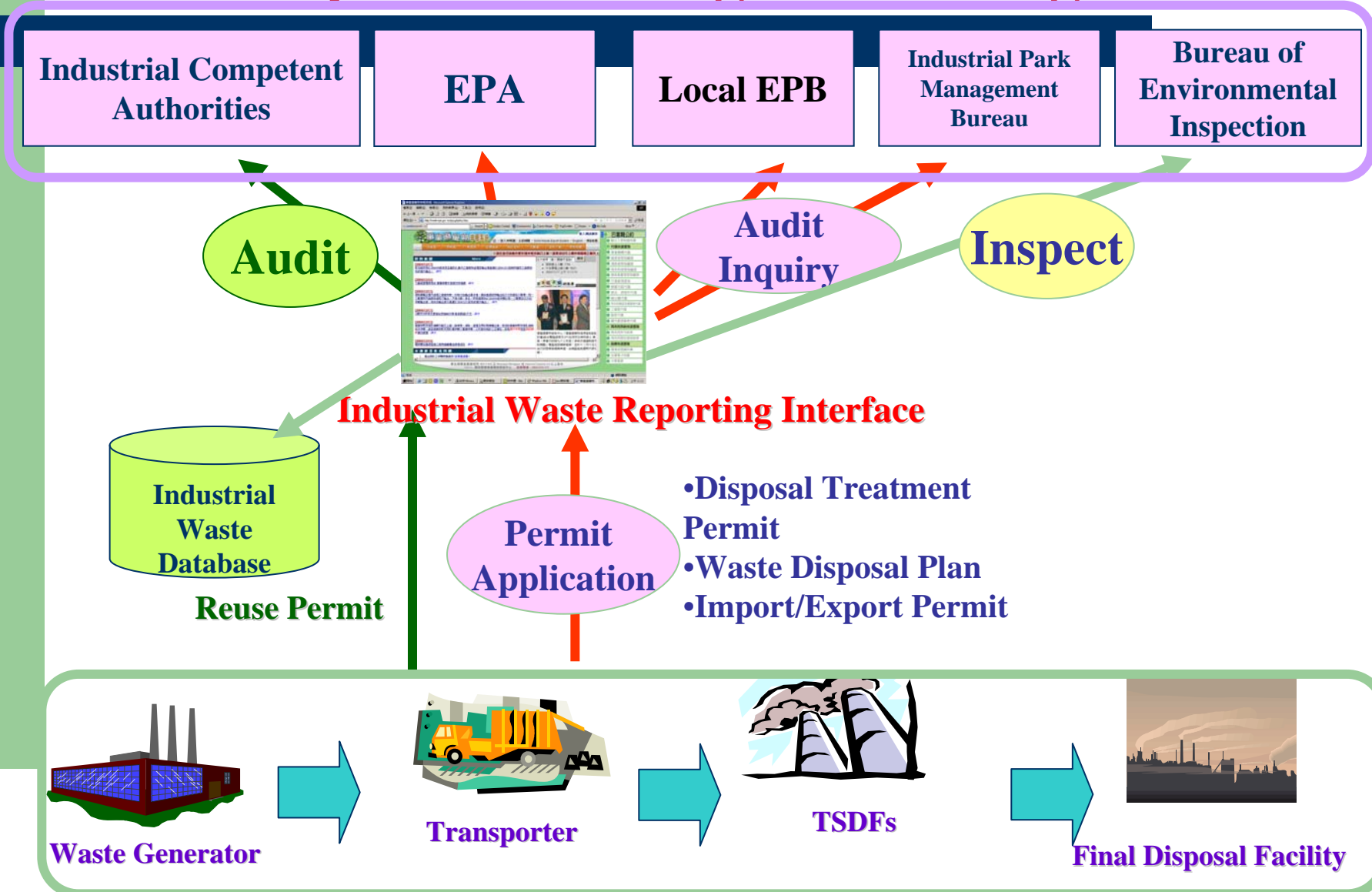


# Generator Management

- About 20,000 generators (22%) generate 80% of the total wastes designated as major sources. They must submit waste disposal plan for approval before starting waste generation; monthly report: production rate, amount of temporary on-site storage, and amount of total shipment. Also Online report each shipment.
- Other 20% of waste generated from the remaining 78% generators is reported by the transporters and TSDFs through their monthly operation report.
- For the TSDFs, online report within 24 hrs after each shipment received and treated. Monthly report the operation conditions, energy and water consumptions.

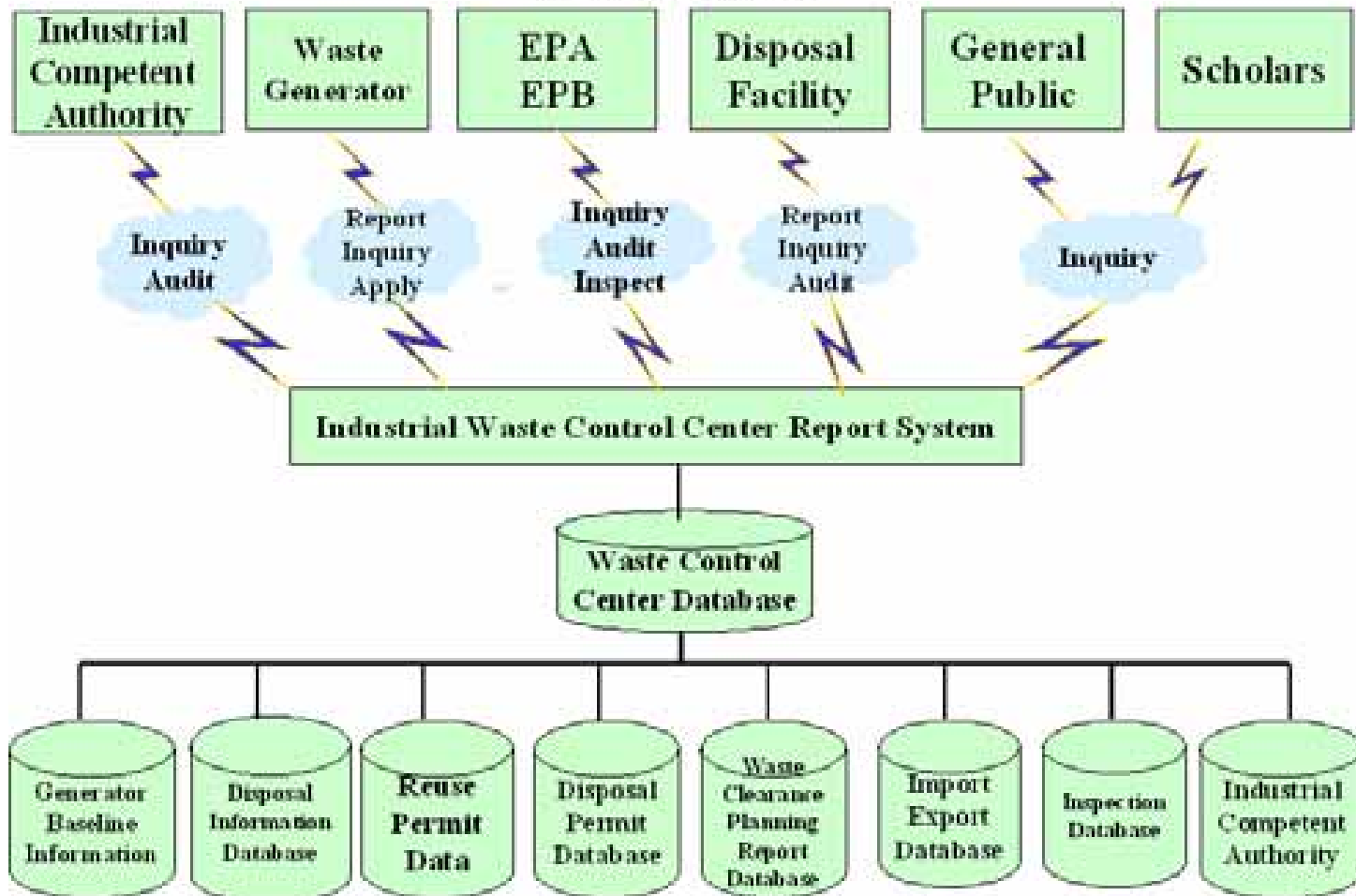


# e-Revolution and Mobilization of Industrial Waste Management (4)- Waste Disposal Tracking and Management



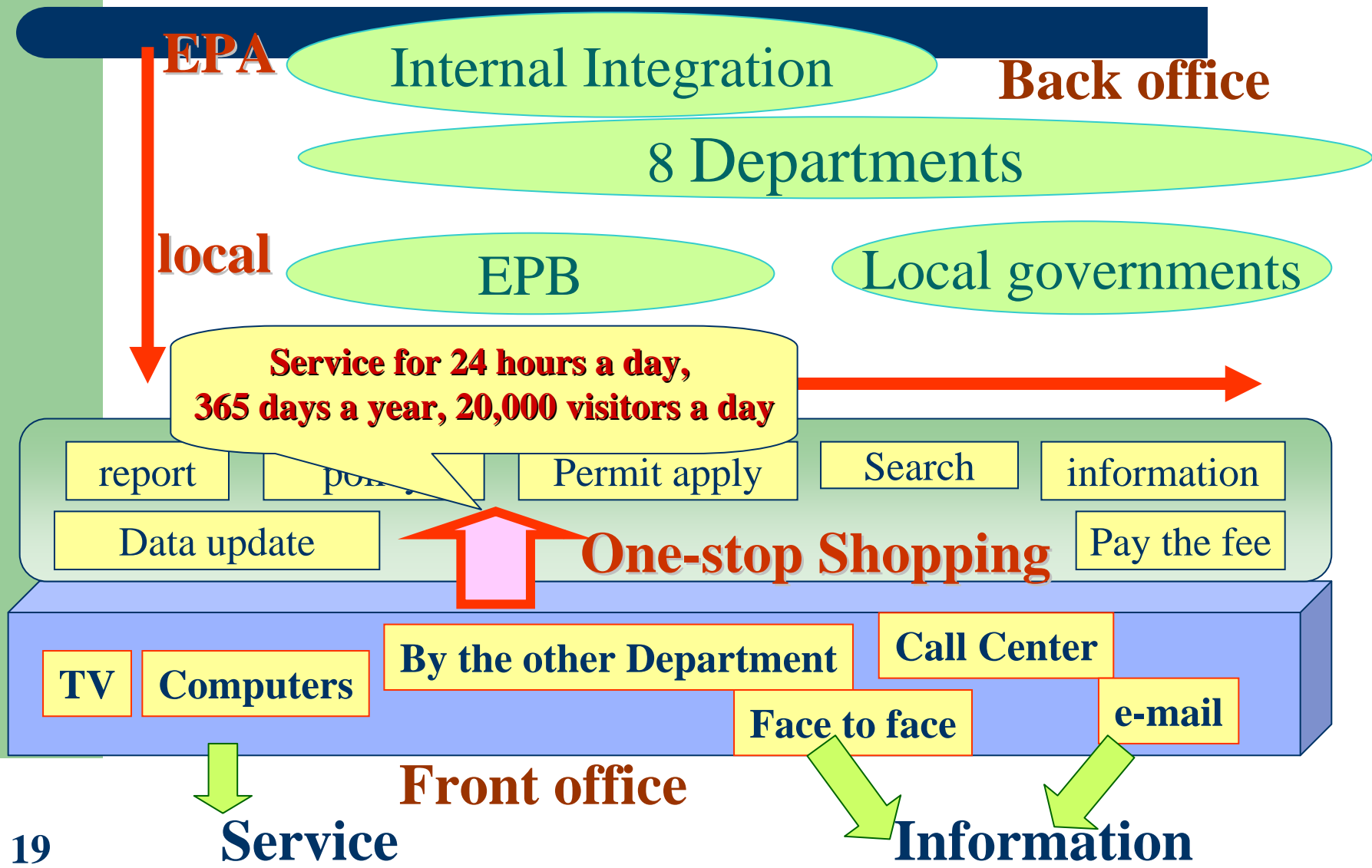
# e-Revolution and Mobilization of Industrial Waste Management (5)- Waste Management Single Portal

## Single Portal ---- Industrial Waste Control Center Mechanism



# e-Revolution and Mobilization of Industrial Waste Management (6)-

**e-Government, >20,000 visitors/day**



# e-Revolution and Mobilization of Industrial Waste Management (7)-

## Generators Management

### -Emission Factor and False Report Auditing

- False reporting may be uncovered during auditing through:
  - Understand the relationship between production capacity, raw material quantity, business type, and waste generation

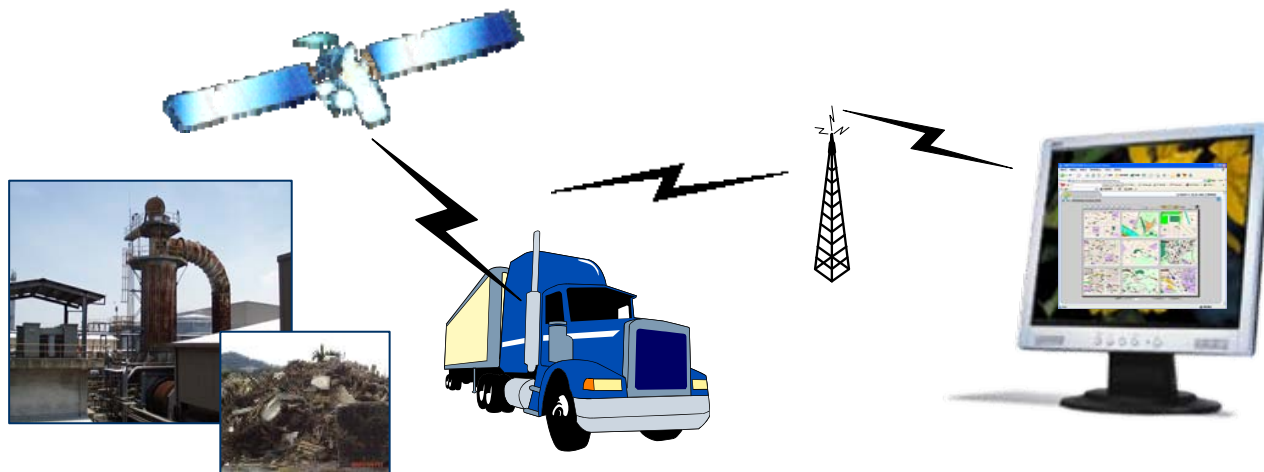
	Process	Raw Material	Product	Waste I	Waste II
A company	Metal Smelting	Waste Iron	Iron Container	Waste Foundry Sand	EAF Dust
B company	Metal Smelting	Waste Iron	Iron Container	Waste Foundry Sand	<b>No Report Data</b>

 Audit: The same business type with the same production process

A vs. B- Waste generation quantity/unit product must be the same.

# e-Revolution and Mobilization of Industrial Waste Management (8)- Waste Flow Tracking Management (1)

- System utilizes mobilization management tools (**Global Positioning System (GPS)**, RFID System, and PDA Inquiry System) to track waste position during transportation
- **2,715 vehicles** (Oct., 2008) passed system test/inspection.
- Next 3 years, another 3,000 vehicles will be installed with the tracking system and monitored.



# Waste Flow Tracking Management (2)

## -GPS Functions (1)

- Using PC or PDA, GPS tracking data can be shown promptly to inspection officer.
- Computer gives out **warning** to inspection officer
  - if the waste transporting vehicle enters **restricted area**.
- Tracking data records vehicle's speed, and transmit data to the traffic control bureau
  - able to monitor the traffic condition on the road.





# Waste Flow Tracking Management(2)

## -GPS Functions (2)

**Data Inquiry:**  
Tracking route, stopping points, and barcode scanning records are presented in table format

行政院環保署事業廢棄物清理機具即時監控系統 (目前使用者: epa) - Microsoft Internet Explorer

環境保護車輛歷史軌跡查詢系統

車牌號碼: 06-470

查詢

軌跡顯示日期: 2004/10/07 07:00:00

終止時間: 2004/10/07 23:59:59

軌跡放大區間: 07:00 | 10:59

軌跡查詢

車牌號碼: 06-470  
 機體代碼: H4914779  
 機體名稱: 建融企業有限公司  
 車機門號: 0970118196  
 駕駛姓名: 陳建忠  
 駕駛手機: 0959134839  
 車機廠牌: 康訊TechInnovate8  
 +遠傳電話

軌跡顯示起點日期: 2004/10/07 07:00:00

終止時間: 2004/10/07 23:59:59

軌跡放大區間: 07:00 | 10:59

軌跡查詢

車牌號碼: 06-470  
 開始: 2004/10/07 10:04:58  
 結束: 2004/10/07 10:46:38  
 經度: 42

**Historical route inquiry:**  
Disposal facilities can track own vehicles' routes and plan best routes for optimal efficiency

http://waste36.epa.gov.tw - 9A-498...

起訖點

項目	時間	位置	速度	衛星數	IO1
起點	2006/10/12 08:33:00	台南縣永康市	0	4	1
終點	2006/10/12 20:31:30	台南縣永康市	0	0	0

停頓點資料

開始停頓	結束停頓	停頓時間	位置	經緯度
2006/10/12 09:22:00	2006/10/12 09:34:00	12	台南市安南區海佃路二段	120.18837,23.0388
2006/10/12 09:11:00	2006/10/12 09:21:00	10	台南市安南區海佃路一段	120.19133,23.0256
2006/10/12 09:01:00	2006/10/12 09:06:30	5	台南市北區文賢路	120.19378,23.0132
2006/10/11 18:04:30	2006/10/12 08:36:00	872	台南縣永康市	120.23552,23.0097
2006/10/12 15:26:00	2006/10/13 07:49:00	983	台南縣永康市	120.23617,23.0092
2006/10/12 11:08:00	2006/10/12 11:15:00	7	台南縣鹽水鎮	120.26572,23.3216
2006/10/12 11:37:30	2006/10/12 11:53:00	16	台南縣新營市	120.31263,23.3097
2006/10/12 11:54:00	2006/10/12 12:10:00	16	台南縣新營市	120.31284,23.3095
2006/10/12 11:30:30	2006/10/12 11:36:00	6	台南縣新營市	120.31287,23.3096
2006/10/12 2006/10/12			高雄市	

http://waste36.epa.gov.tw - 9A-498...

條碼掃描資料

掃描時間	條碼	內容	清除註記	經度	緯度
2006/10/12 09:33:00	D32A1480	抵達產源		120.1884	23.03886
2006/10/12 10:28:30	R0200110	抵達產源		120.128667	23.25026
2006/10/12 11:14:30	R8500537	抵達產源		120.26575	23.32171
2006/10/12 11:45:30	R8400881	抵達產源		120.3128	23.30953
2006/10/12 13:45:30	E5606549	抵達處理機構		120.362917	22.5165
2006/10/12 13:45:30	E5606549	抵達處理機構		120.362917	22.5165
2006/10/12 13:45:30	E5606549	抵達處理機構		120.362917	22.5165
2006/10/12 13:45:30	E5606549	抵達處理機構		120.362917	22.5165
2006/10/12 13:46:00	E5606549	抵達處理機構		120.362983	22.51635

軌跡資料

時間	經度	緯度	方向	速度	衛星數	IO1
2006/10/12 08:33:00	120.235367	23.009783	250	0	4	開
2006/10/12 08:33:30	120.235383	23.009767	250	0	4	開
2006/10/12						

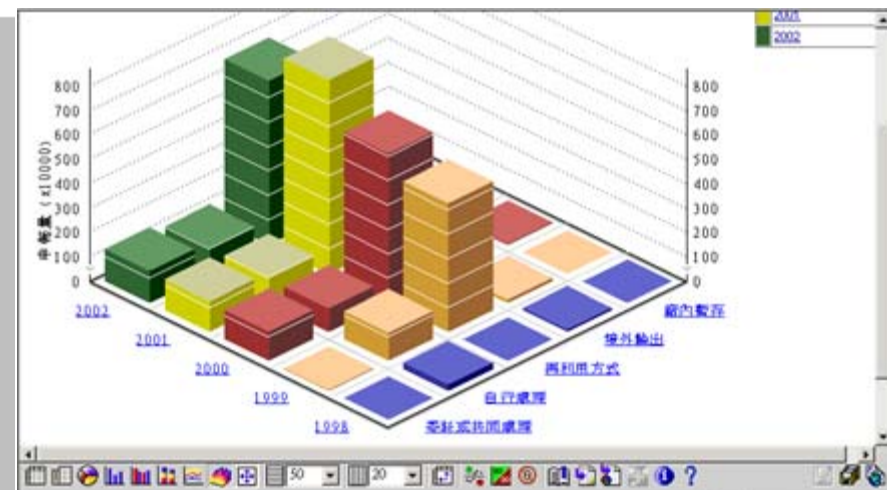




# Waste Management Strategy Employing Electronic and Wireless Tools(9)- Statistical Analysis and Strategic Support (1)

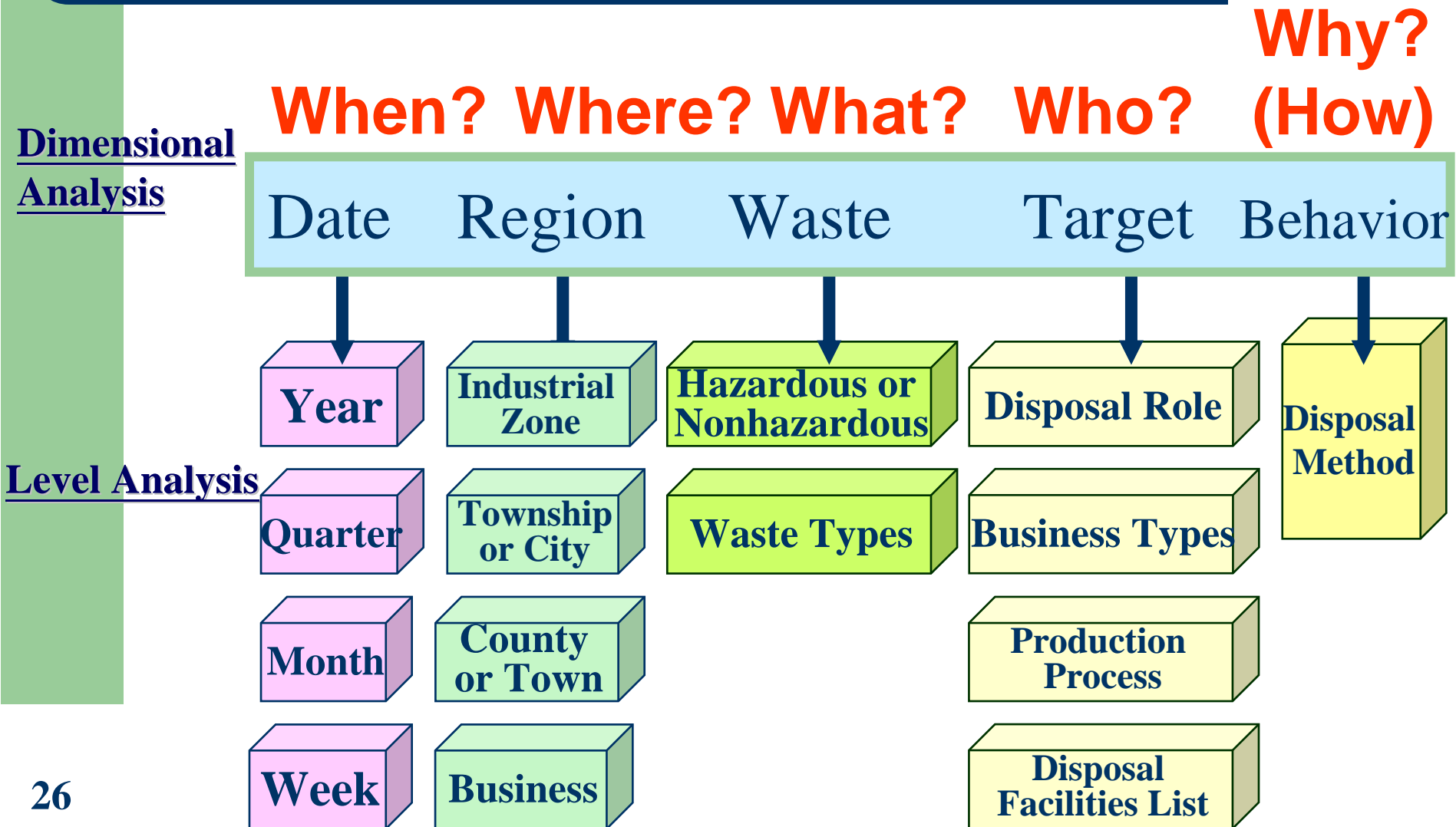
## -OLAP (Online Analytical Processing) System (Web Based)

- OLAP prompts online analysis system to offer excellent strategic support.
- **Multi-dimension** table can be created promptly.
- “Information and **data mining**” is easily dug out.
- Offer waste generation trend chart to academic institutions for research.



# 5. Statistical Analysis and Strategy Support(2)

## -OLAP system (Web Based)



# Statistical Analysis and Strategic Support (2)

## - Promote Better Self-Regulation

Energy



Raw Material



Product



Waste

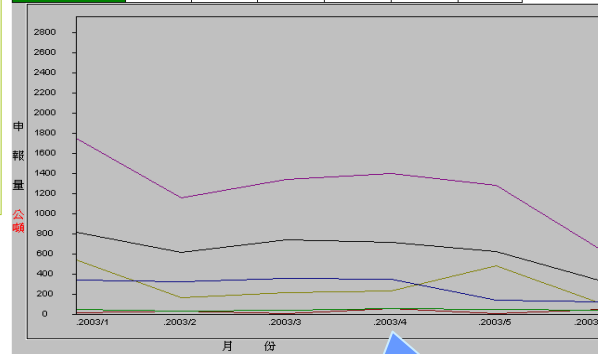


Other pollutants



各月份詳細申報重量 註：若圖無法顯示請按F5重新整理

申報量\月份	2003/1	2003/2	2003/3	2003/4	2003/5	2003/6
總申報量	810,289	616,304	738,195	713,998	619,321	332,983
廠內自行處理申報量	15,336	31,940	0,820	51,194	0,070	48,071
廠外處理申報量	42,482	28,801	34,834	52,557	48,142	34,830
再利用申報量	541,417	161,128	214,171	228,372	478,303	106,610
暫存申報量	340,387	321,713	355,723	348,992	134,390	117,142
總申報量	1,749,910	1,159,885	1,343,743	1,395,113	1,280,227	639,637



Allow businesses to analyze:

- Mass balance
  - Emission factors-
    - ✓ waste/product
    - ✓ electricity/product
    - ✓ water/product
    - ✓ .....
  - Historical trend
  - Comparison within same business type

Enhance businesses' self-regulation



# Summary



## System Benefits

- **Complete understanding of material flow and mass balance**
  - also offer mass balance information to the enterprises
- **Spontaneously monitoring and tracking of waste's whereabouts**
- **Help competent authorities uncover illegal activity**
  - by analyzing material flow & examining pollutant discharges
- **Enhance self-regulation of waste**
  - by offering enterprises with generation factors, and material flow information etc.
- **Achieve dual goals of convenient service and environmental control**

# Awards & Achievements

- ROC Government's 2004 Award of Outstanding Information Management—in the Performance Appraisal of Public Affair Participation and Commenting Category
  - The Waste Control Center's “Invention of Industrial Waste Management by Combining Information Technology with Global Positioning System”
- ROC Government's 2008 Honorable Award of Information Science—in the “Award of Government Participation & Regulation Suggestion” category
  - Environmental Pollution Management Integration & Application”



**Thank you !**

