



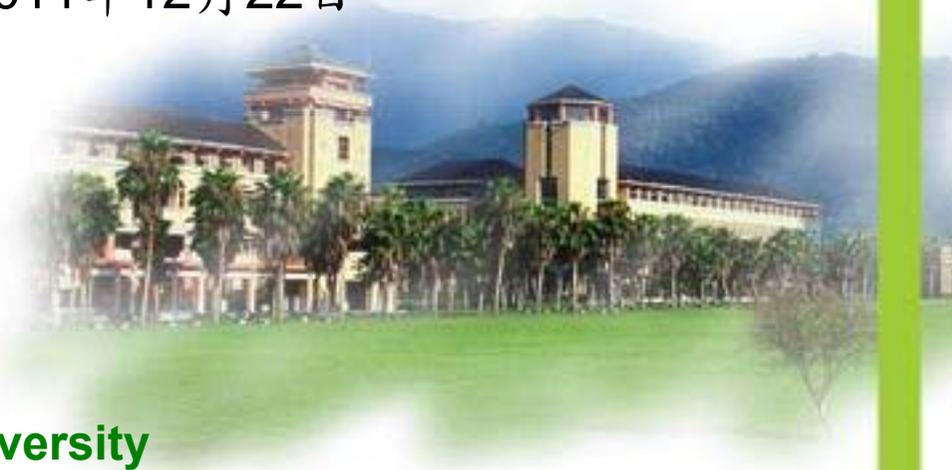
# 國內外永續物質之推動現況

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自然資源與環境系

國立東華大學

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# 永續物質管理定義

## (Sustainable Materials Management, SMM)

- OECD之定義：減少環境負面衝擊及確保資源永續，並依經濟效率及社會公平為原則下，規劃以生命週期之物質應用。
- 瑞士的定義，資源的永續使用意指減輕產品對環境之衝擊，因此在整個生命週期，包含原料的取得、生產、使用及處置，必需將生態、經濟及社會面向納入考量。





# 永續物質管理定義

## (Sustainable Materials Management, SMM)

- 荷蘭「搖籃到墳墓」的概念，減少資源使用所造成的環境衝擊及經濟成長的目標
- 芬蘭的SMM定義著重於生態效益及物質效益上，在生產產品及服務時投入較少的物料，最小化有害衝擊





# 永續消費

## ( Sustainable Consumption )

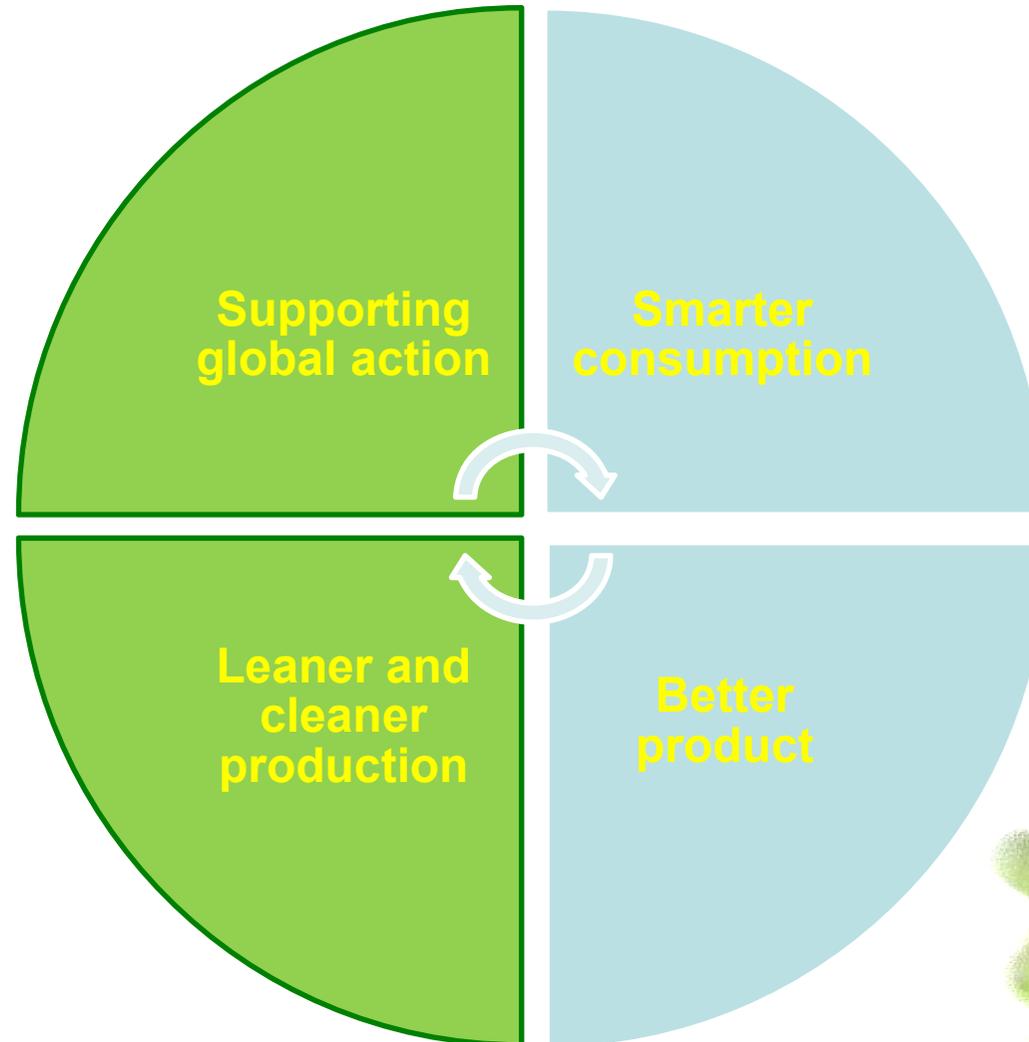
- 聯合國會員大會於1985年，將「消費者保護(Consumer Protection)」的概念納入其決議中，並在1995年由秘書處依聯合國經濟社會理事會要求，將「永續消費 ( Sustainable Consumption )」概念納入，於1999年延伸形成新的指南—《United Nations Guidelines for Consumer Protection》。





國立東華大學 National Dong Hwa University

# EU's Sustainable Consumption and Production (SCP) and Sustainable Industrial Policy Action Plan (COM(2008) 397 final)

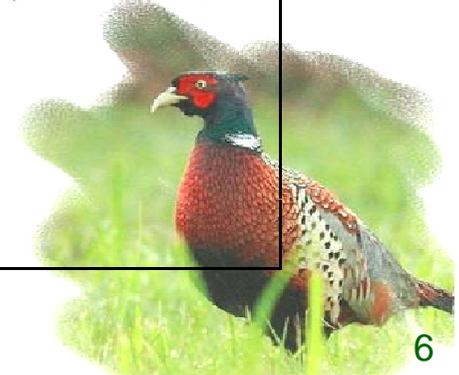


Source: [http://scp.eionet.europa.eu/facts/factsheets\\_scp/leaner\\_cleaner](http://scp.eionet.europa.eu/facts/factsheets_scp/leaner_cleaner)



# 國際SMM政策目標與方法

目標	方法
1. 減低經濟成長與環境衝擊間之連結	1. 加強再使用、回收及資源化(3R 策略)，使物質生命週期為一密閉循環系統
2. 預防污染及廢棄物	2. 設計對環境友善的產品/物質
3. 減少物質對健康及環境造成的負面影響	3. 促進生態效益，物質及能源效益
4. 最小化廢棄物及危害/毒性物質於其生命週期的產生量	4. 促進物質的安全使用及安全處置
5. 確保自然及生物資源的永續利用	
6. 確保物質消耗能達永續	





# 國際上永續物質管理的發展趨勢

- 以物質而言：塑膠、金屬、玻璃、木材、紙類及織品原料，為永續物質管理優先考量對象；
- 以產品而言：包含**電子電機設備、包裝、運載工具、電池**、建築材料、化學物質、輪胎、食物、大型家具、礦物、能源輸送等，且多數規範於**延長生產者責任**為架構
- 以產業活動劃分，則著重於運輸、**製造業**、能源生產、食品生產、礦業及服務業。





# 政策目標

- 減低經濟成長與環境衝擊間之聯結；
- 預防污染及廢棄物；
- 減少物質對健康及環境造成的負面影響；
- 最小化廢棄物及危害/毒性物質於其生命週期的產生量；
- 確保自然及生物資源的永續利用及確保物質應用能達永續；





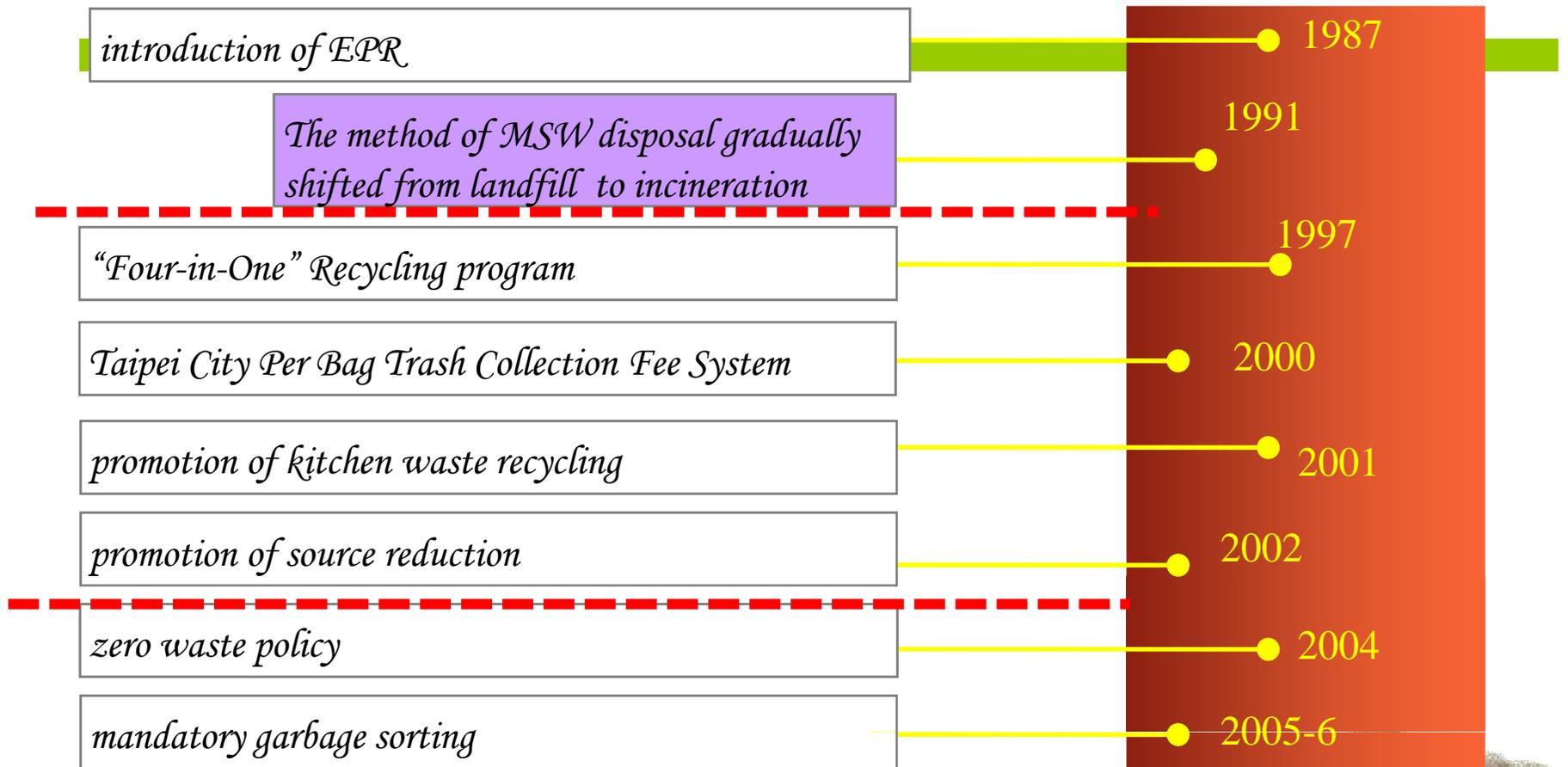
# 執行工具

- 以物質生命週期為工具加強再使用、回收及資源化；
- 設計對環境友善的產品/物質
- 以物質安全使用之管理為工具促進生態效益，物質及能源效益





# The Evolution of MSW Management



Source: Y. -Y. Lai, The Status and Policy of MSW Reduction and Recycling in Taiwan, 2011.





## SMM Initiatives Policy by the OECD Member Countries

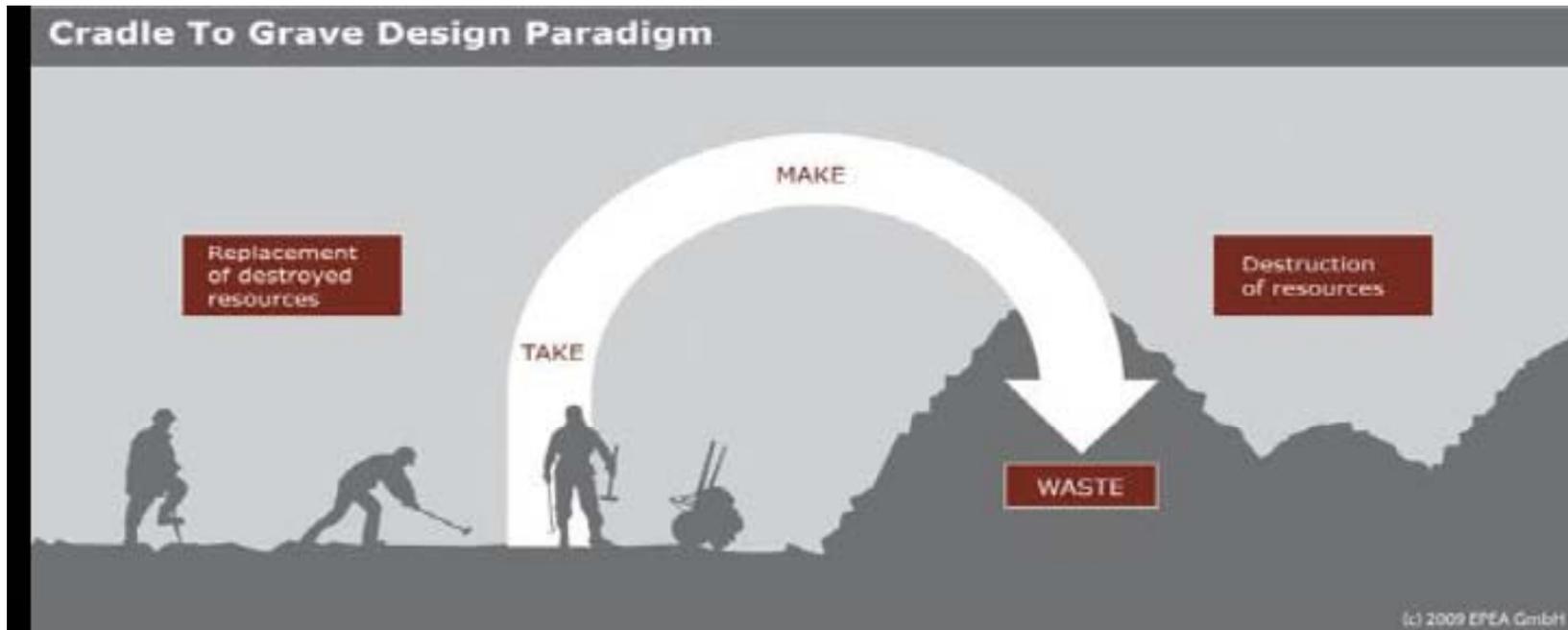
**Internalisation of externalities** mainly occurs through **EPR** schemes, which can be considered as both a regulatory and an economic instrument to finance the treatment cost of materials at the end of their useful life. **Material flows** usually concerned are electrical and electronic equipments (EEE), vehicles, tyres, batteries, packaging, oils (used lubricants and cooking oils).

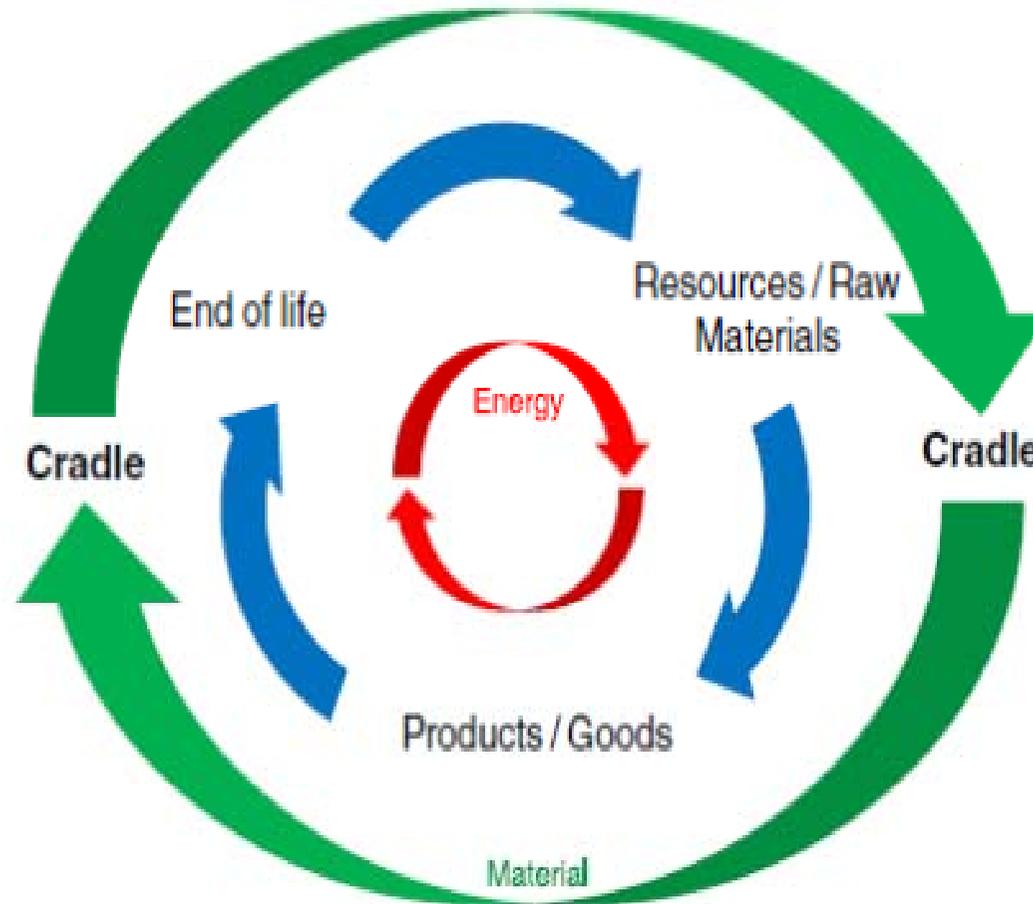
- Tools: Taxes and fees , Emission trading permit trading scheme for packaging, Tax reduction or exemption, Subsidies, Unit-based pricing or pay-as-you-throw schemes





# Cradle to Grave





## 「搖籃到搖籃」之永續物質管理

資料來源: Su, 2010.





# From Cradle to Grave toward to Cradle to Cradle

## Eco-Efficiency

- Maximize profit / growth
- Using Less
- Maximize Productivity
- Relative Measure
- Minimize Loss
- Efficient Design

## Eco-Effectiveness

- Stability
- Using Less
- Minimize Impact
- Absolute Measure
- No Net Loss
- Effective Design





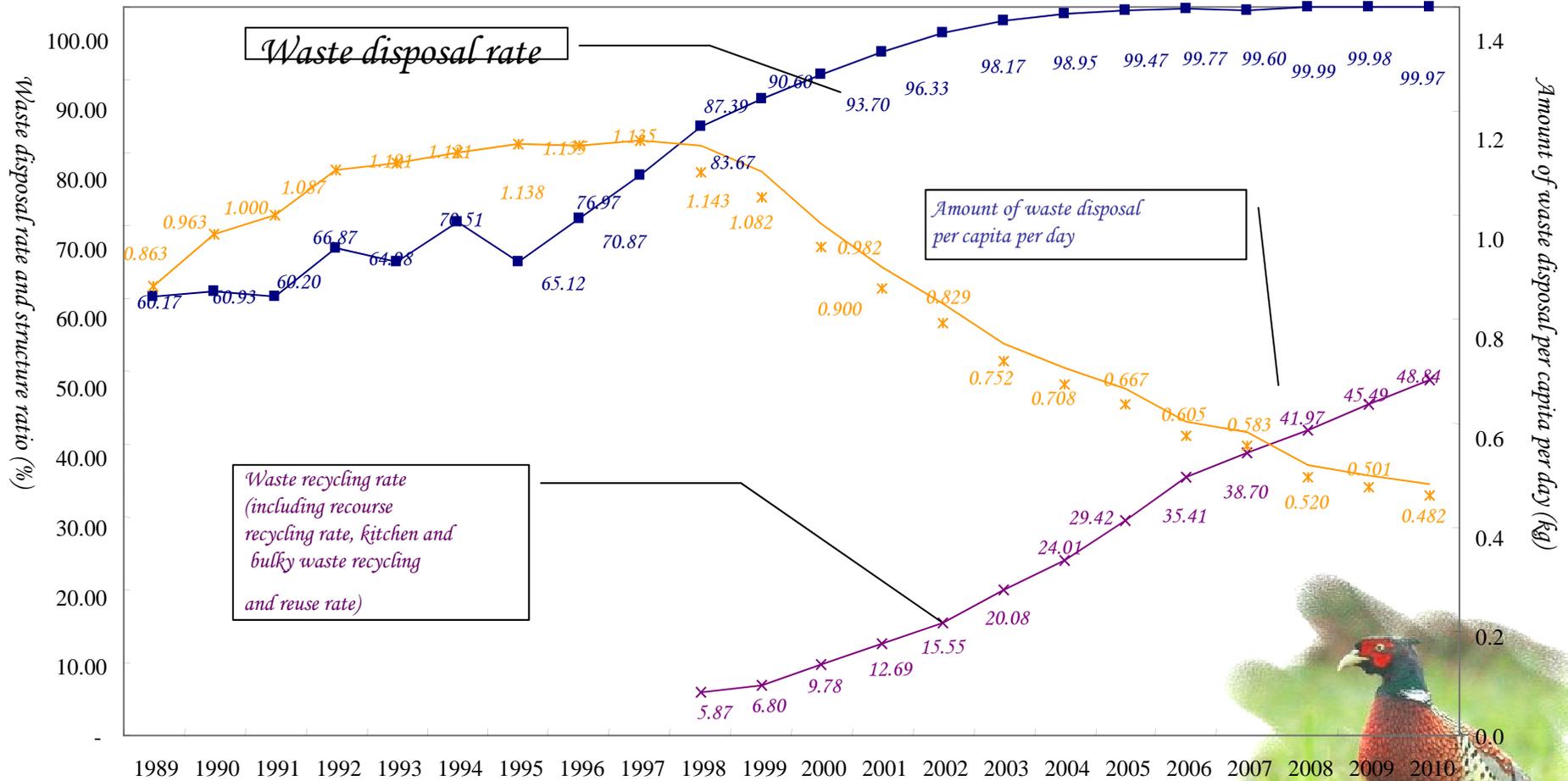
# Policies to Promote SMM

- Waste policy
- Material/product policy
- Energy policy
- Consumption policy
- Pollution prevention policy

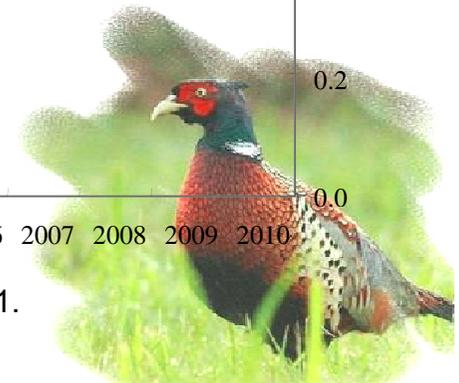




# Collection and disposal statistics (1/2)



Source: Y. -Y. Lai, The Status and Policy of MSW Reduction and Recycling in Taiwan, 2011.





# Policy Initiatives Contribute to SMM

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1. Detoxification (e.g. IPPC, REACH).
2. Dematerialization (e.g. Taiwan's 4 in 1 policy, waste separate collection, landfill and incineration bans)
3. Internalization of externalities ( e.g. EPR)





## SMM Initiatives Policy by the OECD Member Countries

**Detoxification** is a typical policy element, part of risk-based approaches used by all countries to ensure safe use and disposal of materials.

– Tools:

1. Regulatory instruments (IPPC, REACH....),
2. Information-based instruments (eco-labelling of products, PRTR....)





## SMM Initiatives Policy by the OECD Member Countries

**Dematerialization** occurs at all stages of material life-cycle:

1. At the production phase
2. At the consumption phase
3. Substituting services for products at the end-of-life phase of materials

– Tools:

1. Regulatory instruments:
2. Economic
3. Information-based instruments

4. Partnership programmes





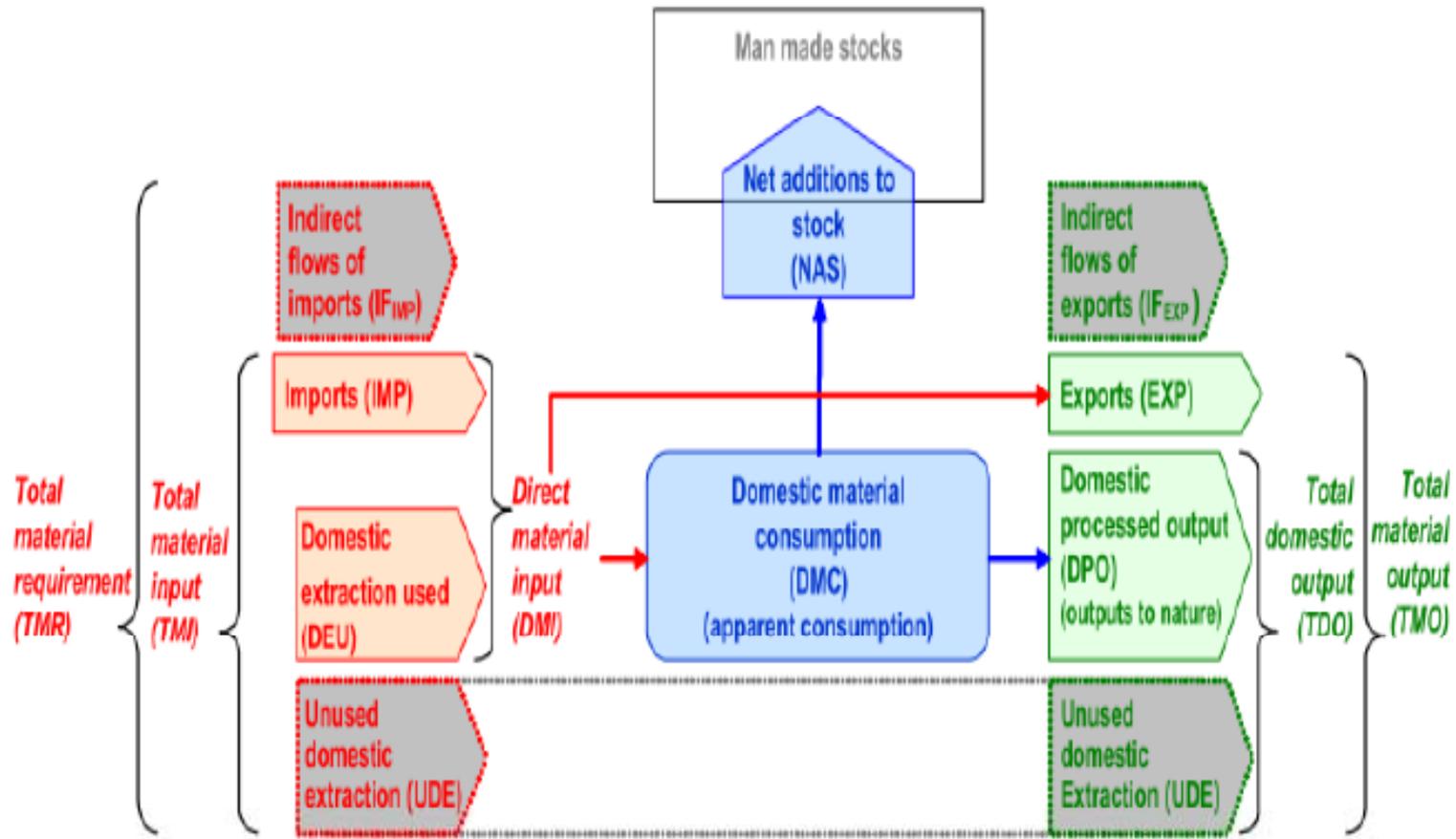
# SMM Initiatives **Methodologies** by the OECD Member Countries

- LCA
- MFA
- EIA
- CBA
- EIO
- EFA
- MIPs





# MFA Framework



資料來源：OECD, 2008.

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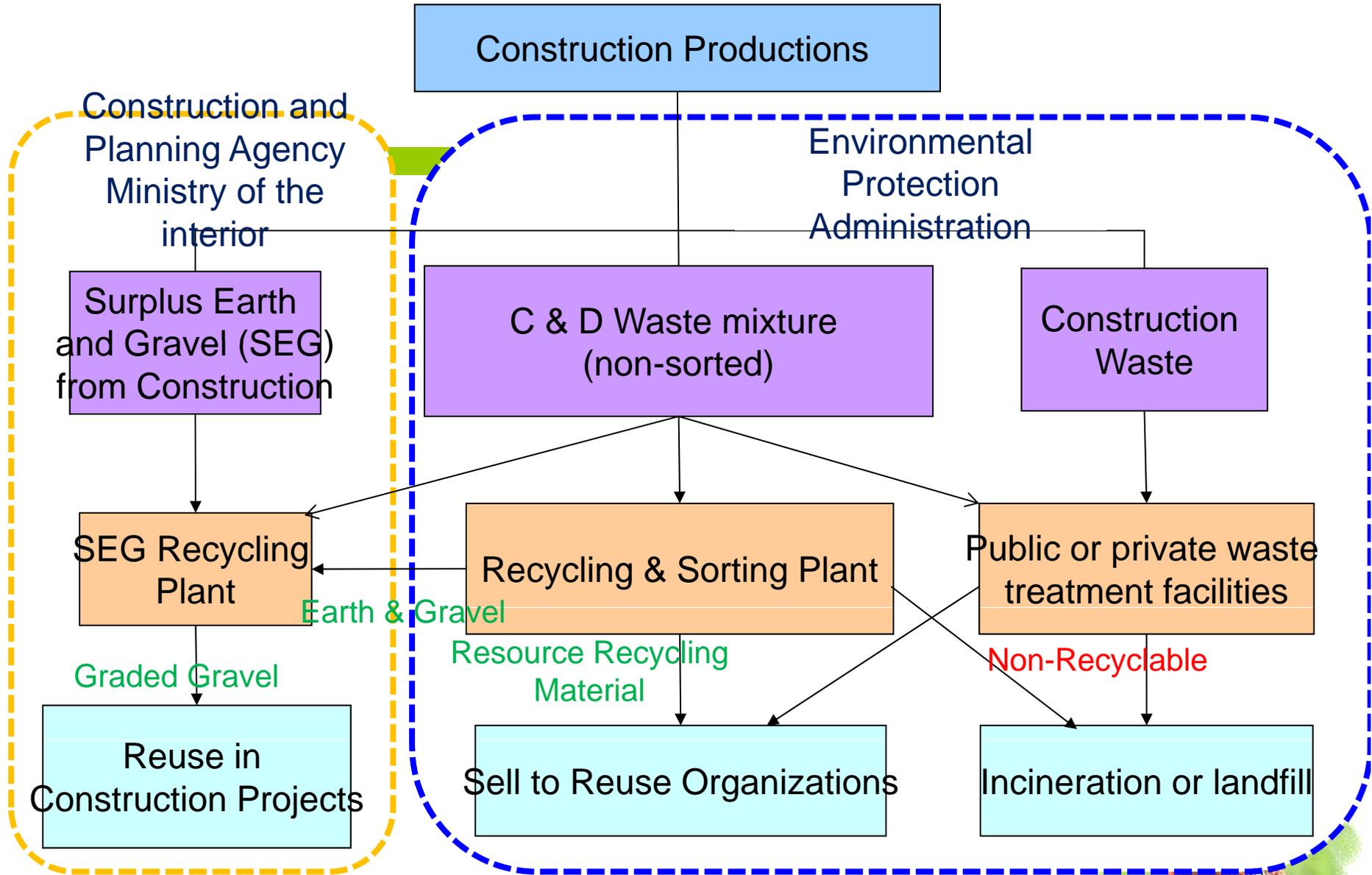


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# *Case Study*

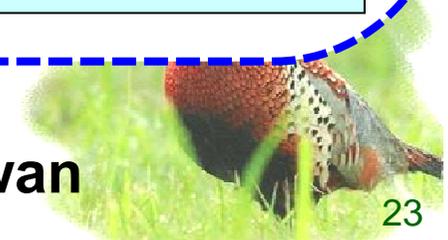
## *CONSTRUCTION AND DEMOLITION WASTE IN TAIWAN*





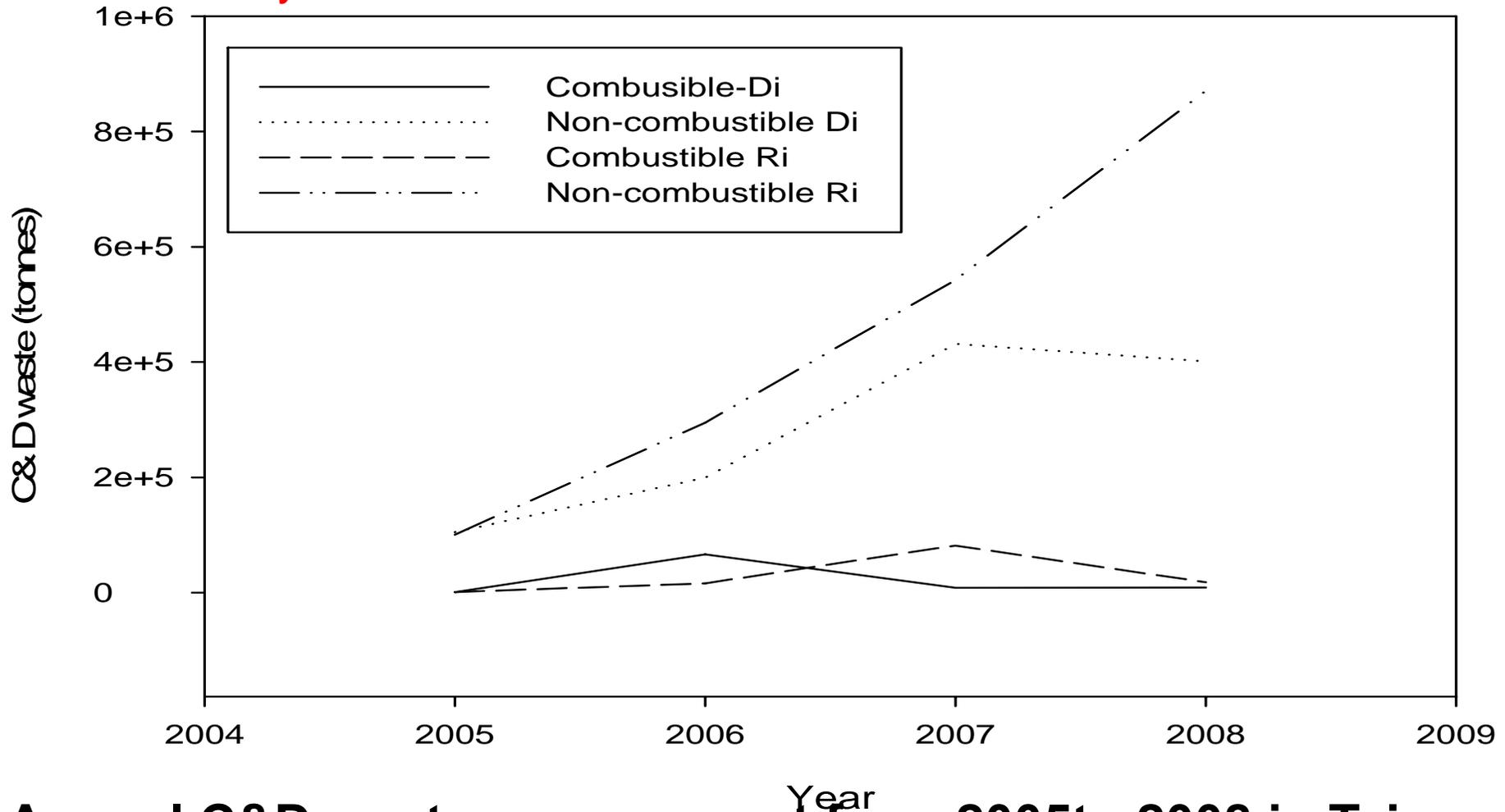
## C & D Waste management implementation in Taiwan

Source: Su et al., 2010.





- The result indicates a dominating concept of resource recovery in construction projects, which it becomes the main stream to approach sustainability



Annual C&D waste management from 2005 to 2008 in Taiwan







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# ***Case Study***

## **MSW Management *in Taiwan***





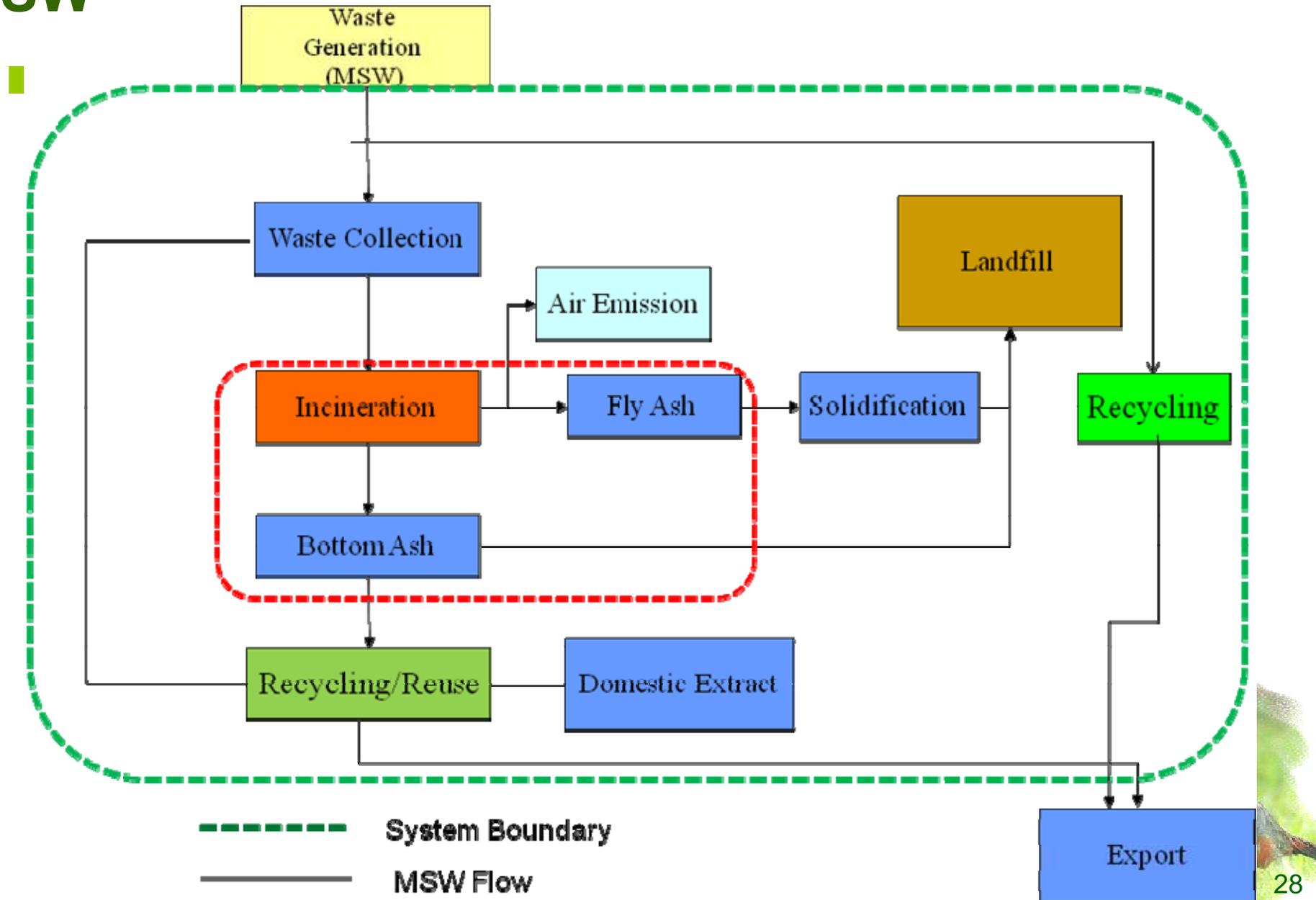
# MSW Management Towards SMM in Taiwan

- “Cradle to Grave”  
→” Waste Minimization” +  
“Resource Recovery”
- **“Cradle to Cradle” → “SMM”**





# Regional Conceptual Material Flow Framework of MSW





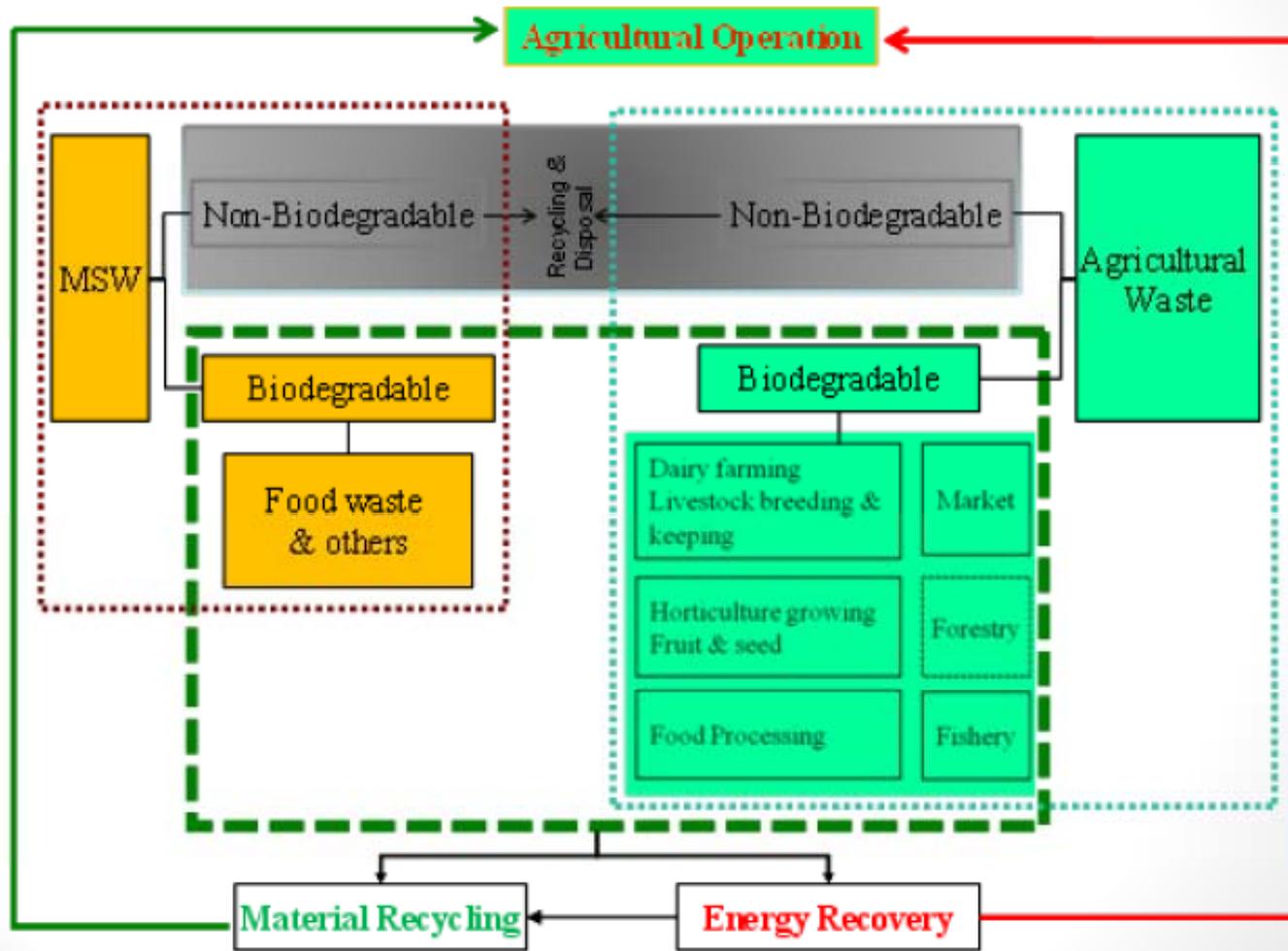
# Organic Waste Management Towards SMM in Taiwan

- “Cradle to Grave”  
→” Waste Minimization” +  
“Resource Recovery”
- **“Cradle to Cradle” → “SMM”**
- **Nutrients Recovery + Green Energy = SMM**

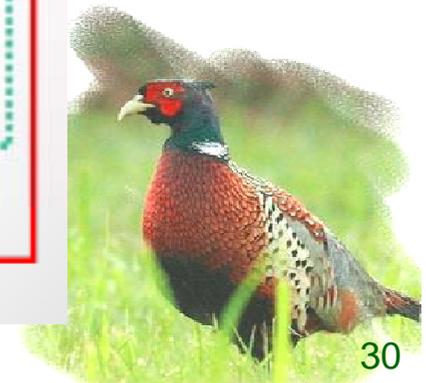




# Conceptual framework for an organic waste recycling system



Source: Su et al., 2011.





# Conclusion

- Waste management policies have been proved effective in a series of waste management initiatives in Taiwan.
- In the future, by collecting more data to establish the effectiveness of the framework, and designing a survey procedure, an evaluation method of the material cycle may build up a new methodology to approach sustainable materials management.
- SMM should promote environmental protection and preserve natural capital.





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# Thank You for Your Attention

