

Introduction to Sustainable Resources Management Center

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Missions

- Promoting Taiwan's sustainable resource management strategies so as to upgrade resource productivity.
- Applying MFA to develop sustainable production model and consumption patterns.
- Developing theories, strategies and tools which meet the abovementioned missions.

Objectives

Standardize procedure of MFA

Develop advanced tools of material flow and impact assessment

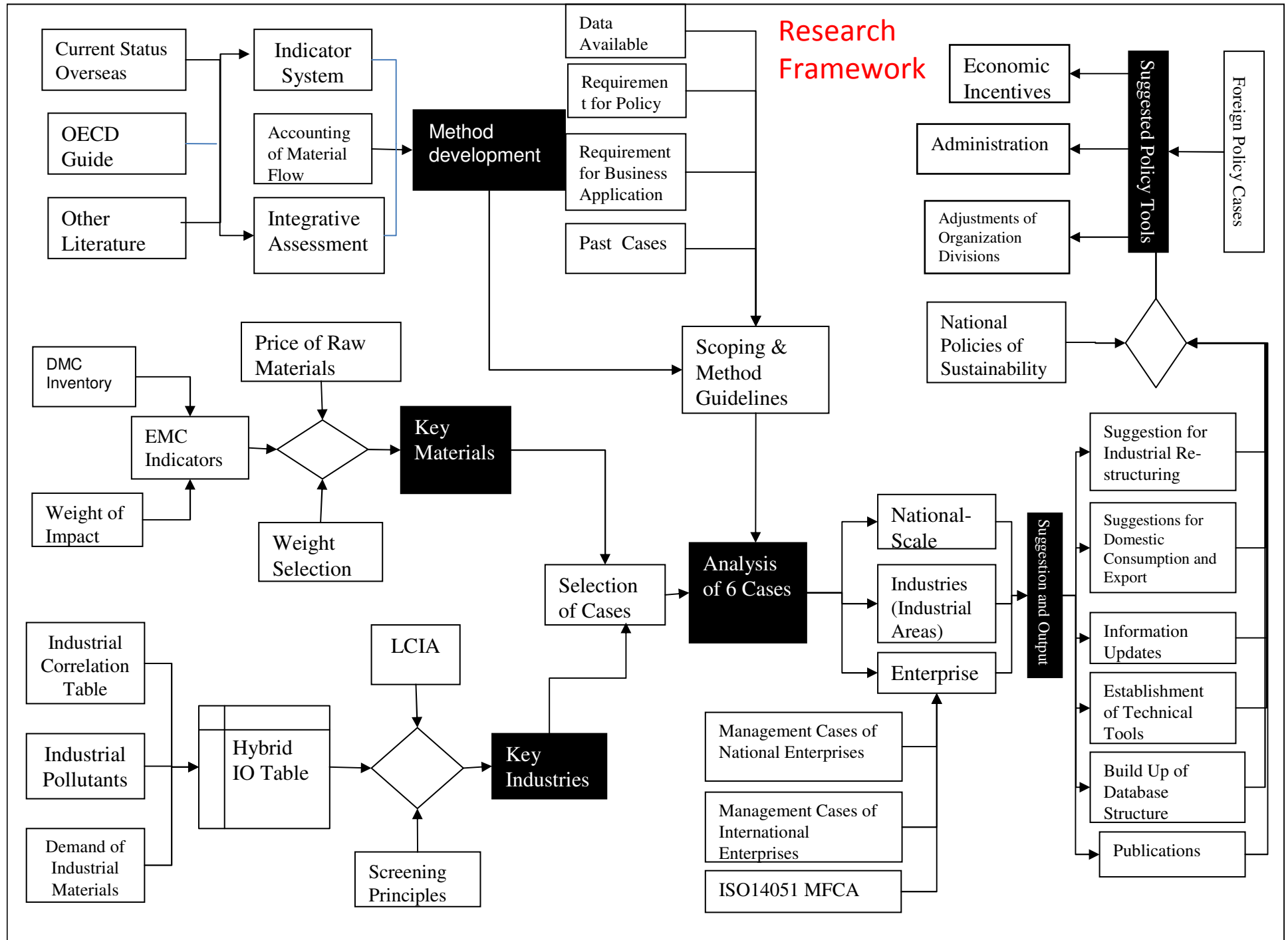
Identify suitable indicators and Monitor anthropogenic Metabolism

Perform and share case studies

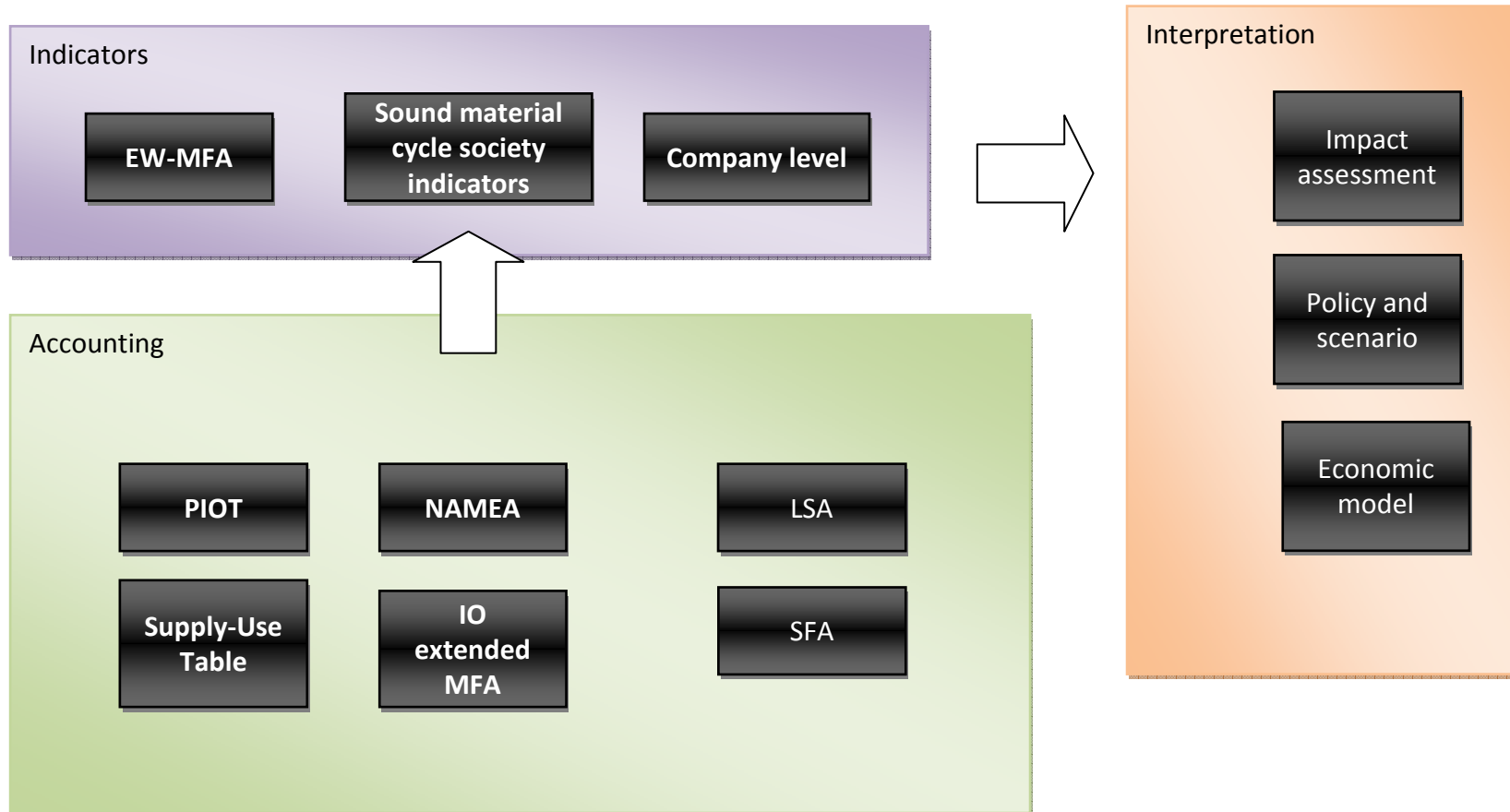
Establish MFA application database

Provide technical assistance for business to undertake resource management

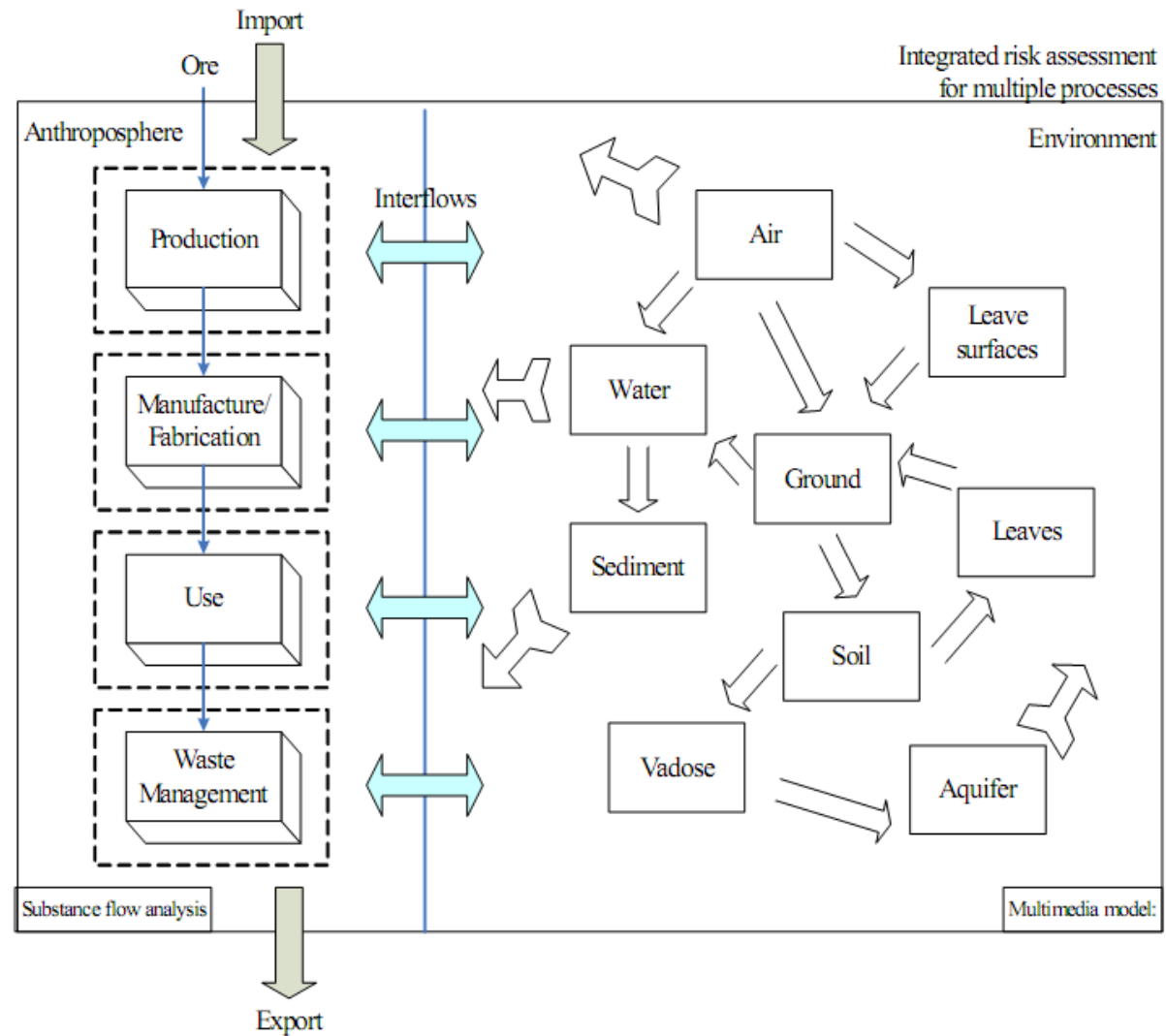
Evaluate and suggest policy for government



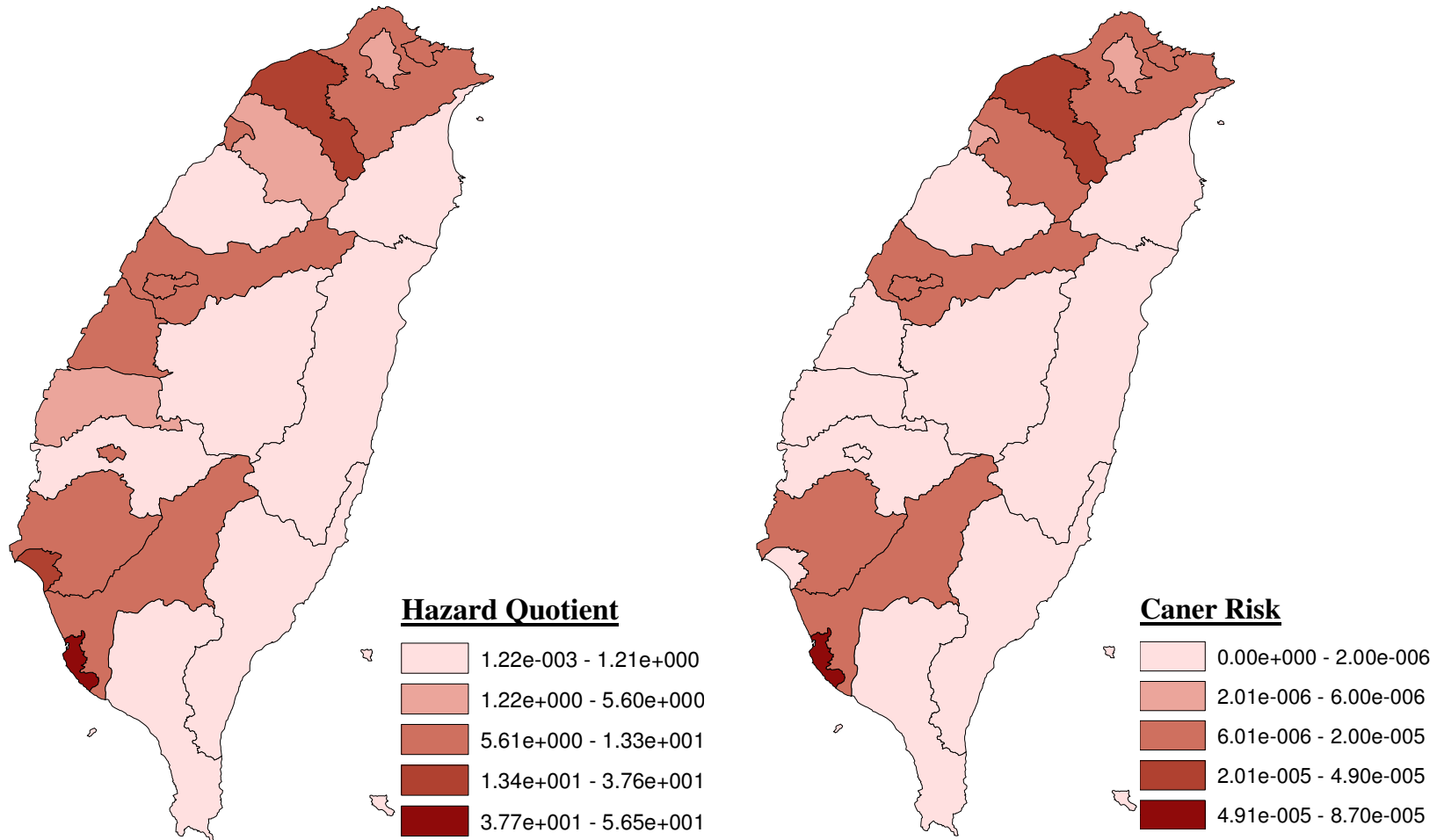
Method development and standardization



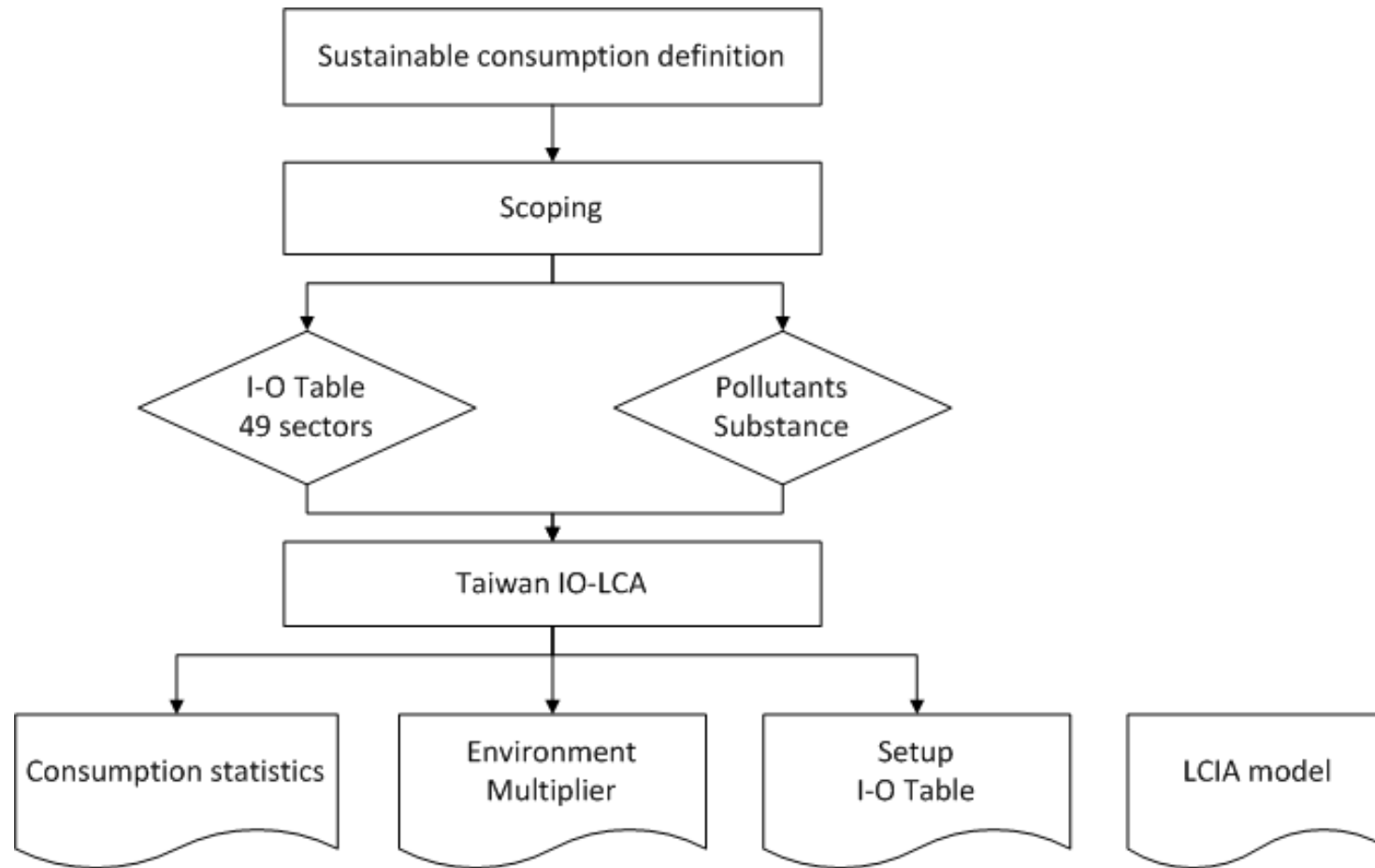
Substance-based Risk Assessment



Regional Risk Assessment of Chromium Based on MFA



Taiwan EIO-LCA analysis



Integration of a wide range of impacts

49 sectors\14 impacts	Global warming	Resource depletion	Human Health	Ozone depletion	Acidification ...	Impact indicator
Agriculture						
Industries						
Electronics						
Food production						
Chemical production						
Service ...						
Total Impact						

Inventory

TSP	PM ₁₀	SO _x	NO _x	NMHC	CO	Pb	BOD	COD	SS
CO ₂ eq	Water	Electricity	Dioxin	Pb	Cd	Hg	Coal	Oil	Natural Gas
Municipal Solid Waste			Industry waste			Steel demand		Fossil fuel demand	

EIO-LCA in-depth discussion

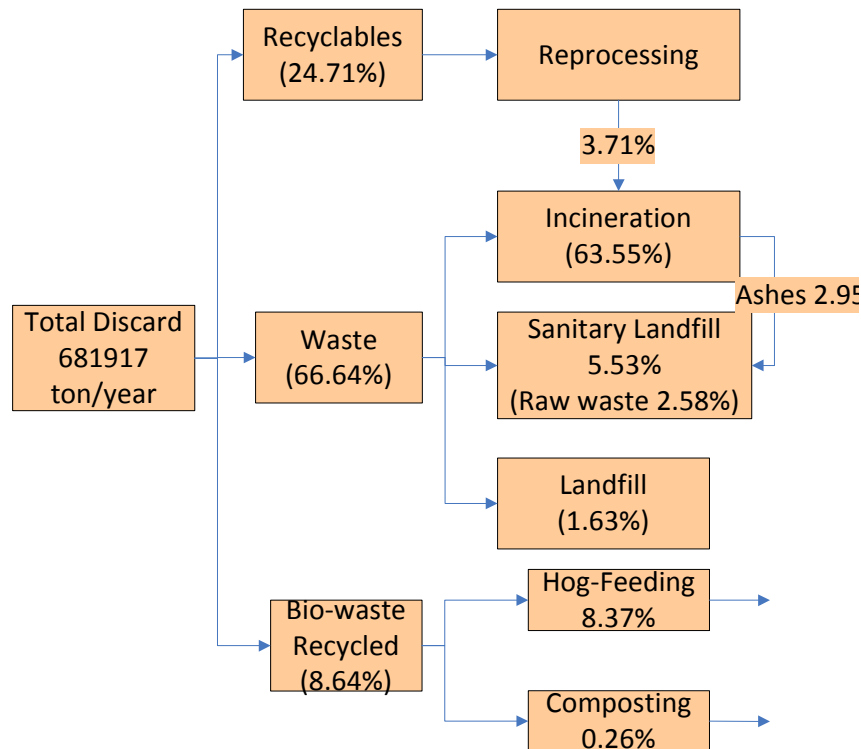
Impact by sector

- Emission / Unit Demand
- Impact / Unit Demand
- Impact from each sector
- Impact from household consumption
- Impact driven by import and export

Impact by sub-region

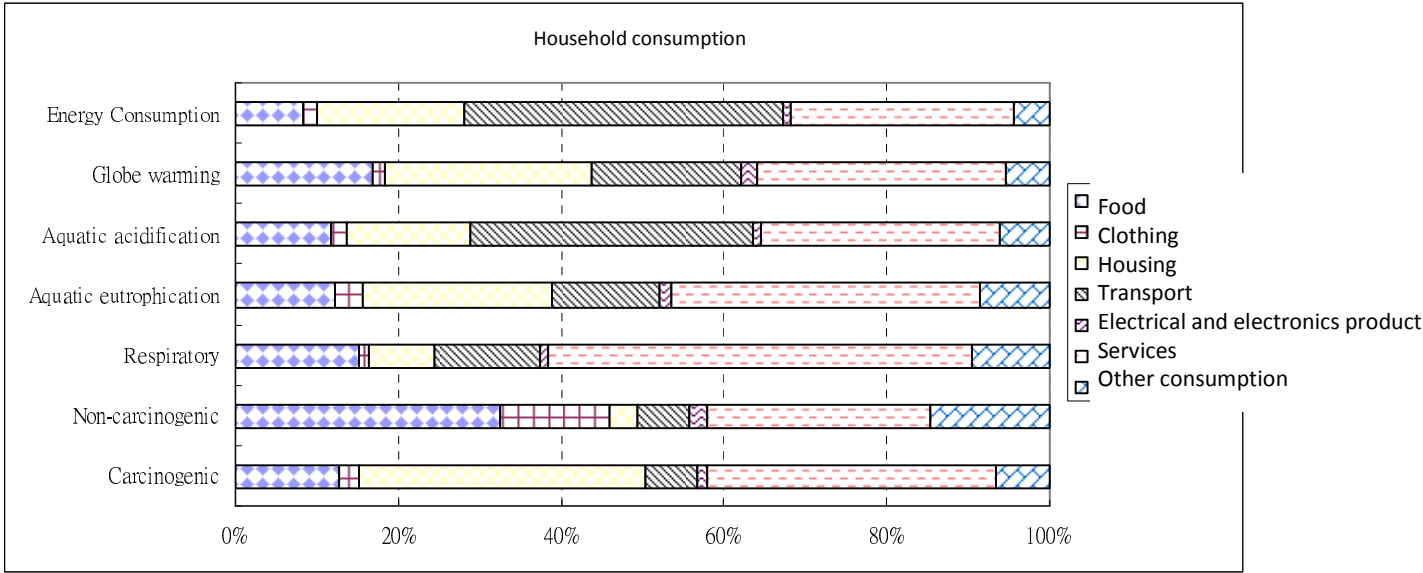
- Household demand induced impact over all counties
- Regional comparison of supply and environmental loading
- Scenario comparison of sustainable consumption
 - Sensitivity of consumption style on impacts
 - Impact by regional consumption behavior
 - Energy tax

TWM-LCA model



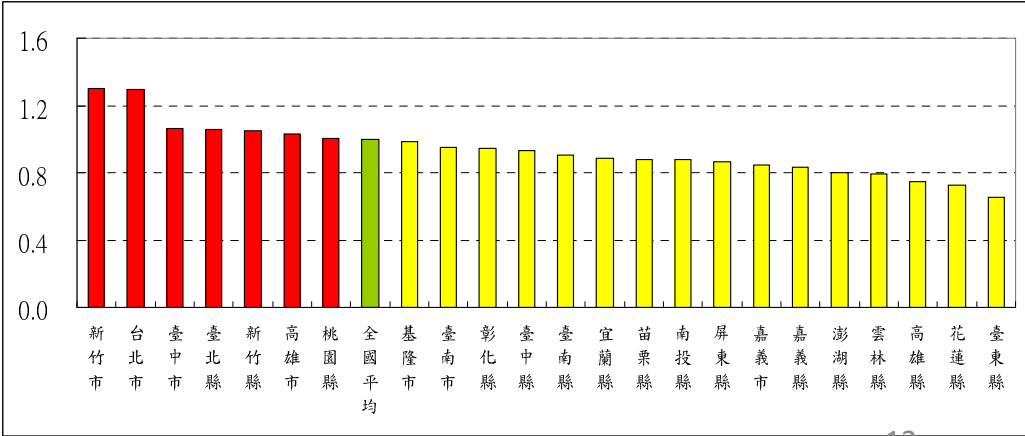
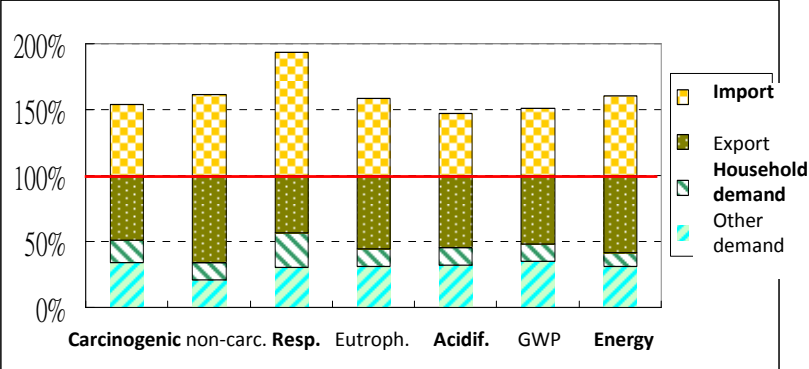
Impact Categories		Category Indicator	Characterization Model
Human toxicity	carcinogenic	kg-eq Bezene _{air}	CalTOX with local parameters
	noncarcinogenic	kg-eq Toluene _{air}	
Respiratory		kg-eq PM2.5 _{air}	TRACi
Photochemical oxidation		kg-eq NOX _(air)	TRACi
Aquatic ecotoxicity		kg-eq 2,4-D _(water)	TRACi and IMPACT2002+ localized
Terrestrial ecotoxicity		kg-eq 2,4-D _(soil)	
Aquatic eutrophication		kg-eq PO ₄ ⁻	IMPACT2002+
Aquatic acidification		kg-eq SO ₂	IMPACT2002+
Global warming		kg-eq CO ₂ into air	IPCC(2001)
Ozone layer depletion		kg-eq CFCs-11 _(air)	Latest value from WMO
Energy consumption		MJ	CED by Ecoinvent
Mineral extraction		MJ surplus	Ecolindicator 99

Consumption style analysis

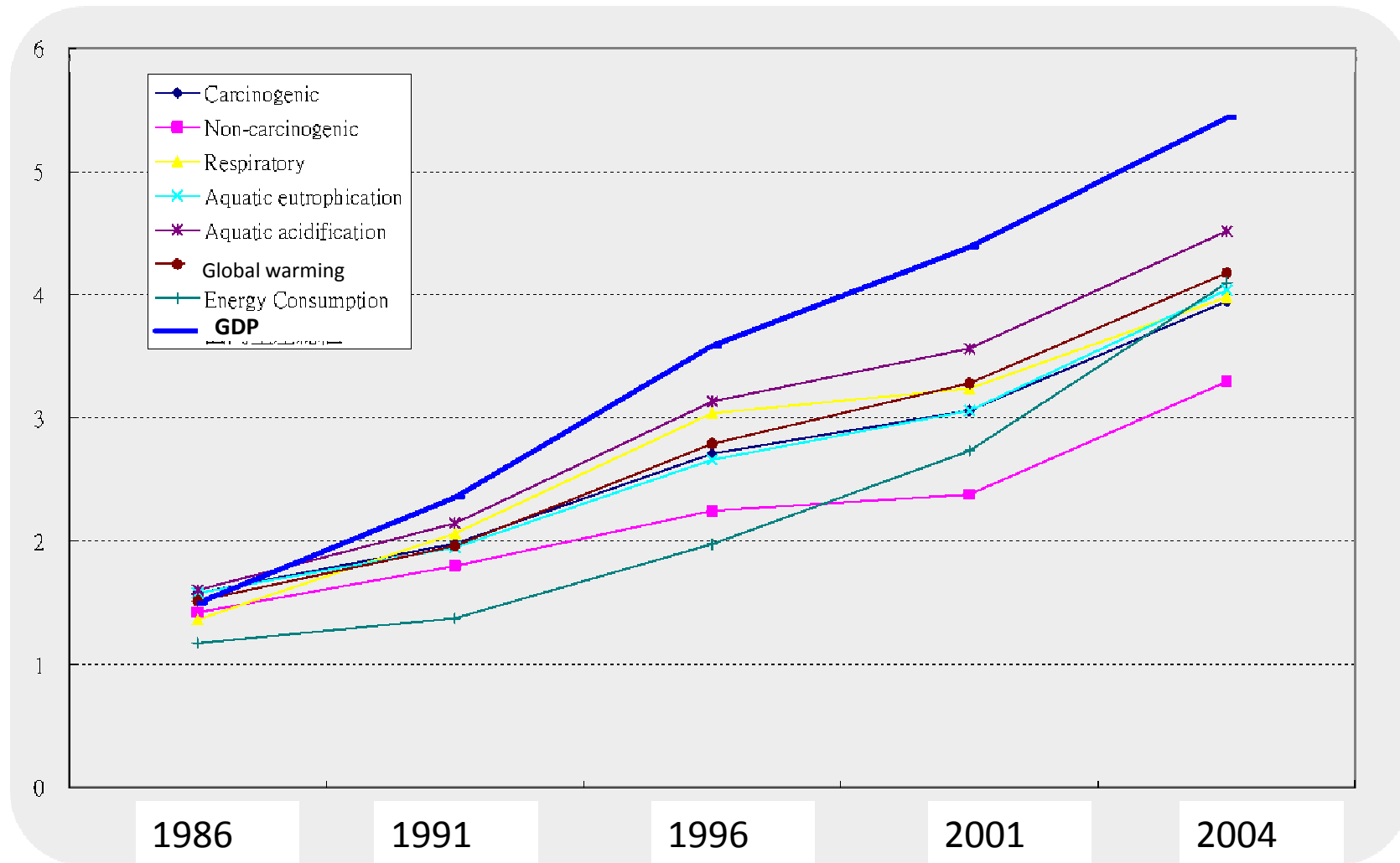


Consumption based impact for each region

Impact due to import and export

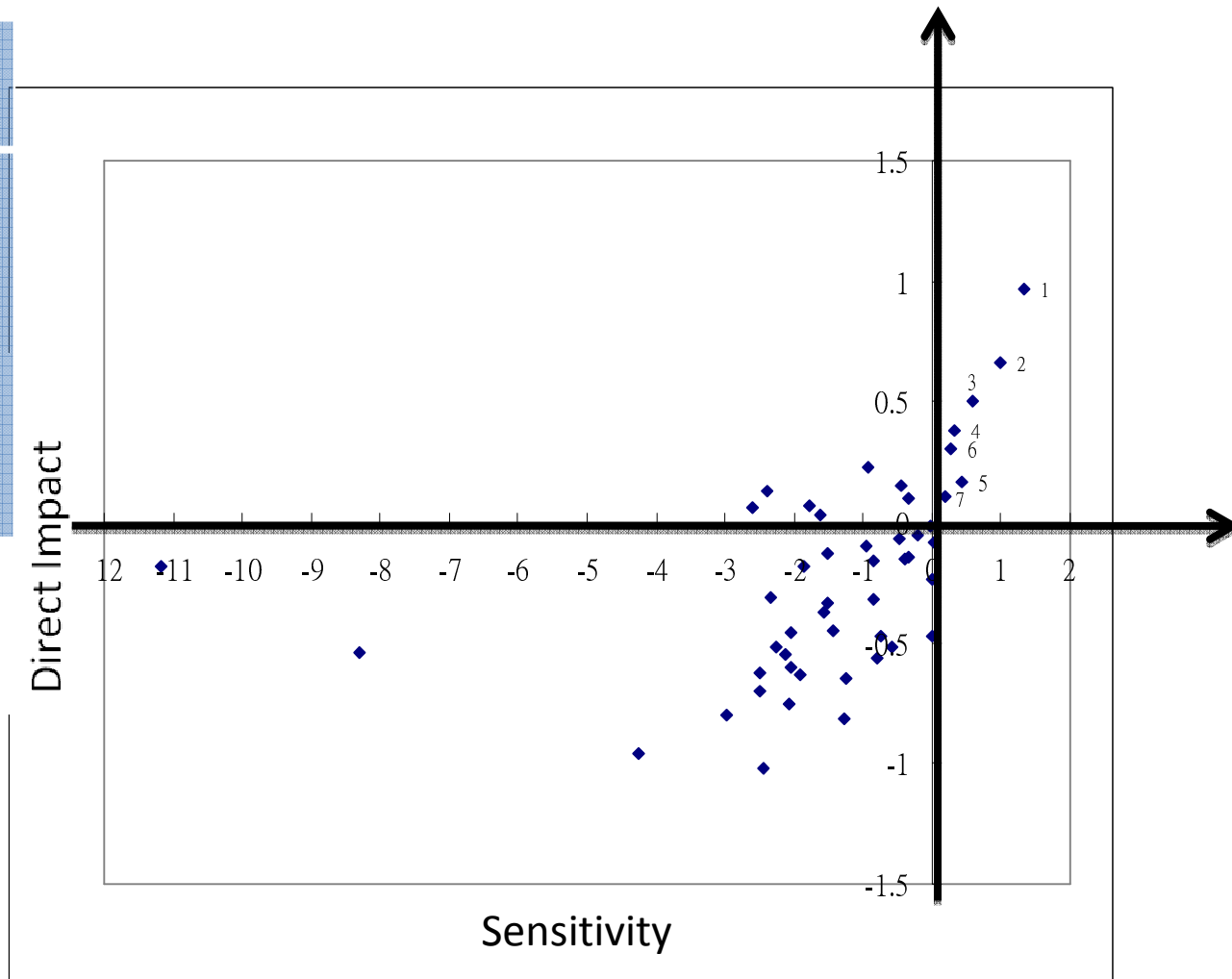


Little Decoupling of GDP & Impact



Direct and Indirect Impacts of sectors

2 nd quadrant		1 st quadrant	
1.	Synthetic fiber	1.	Electricity
2.	Plastic	2.	Mineral product
3.	Metal product	3.	Steel
4.	Construction	4.	Textile
5.	Public construction	5.	Other metal
		6.	chemical



Case studies

Previous examples

Cadmium

Chromium

Arsenic

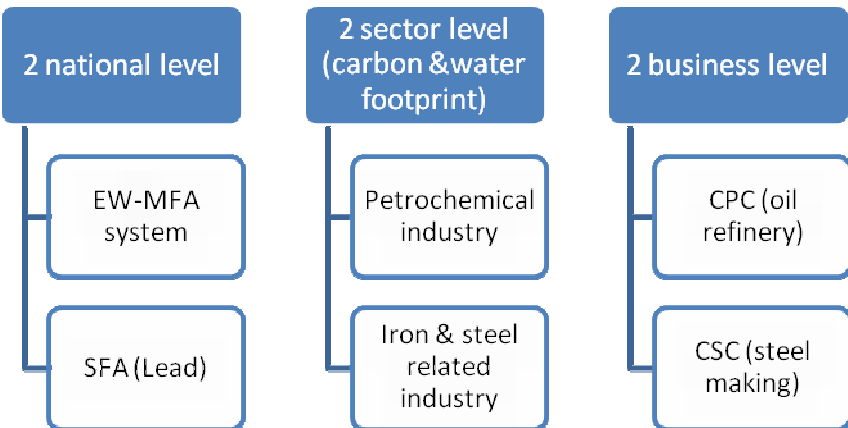
Dioxins

Petrochemical industry

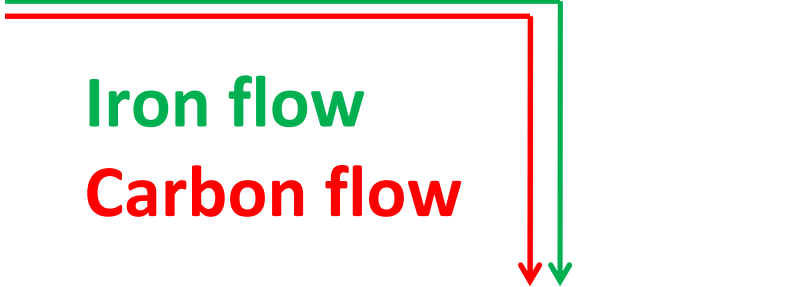
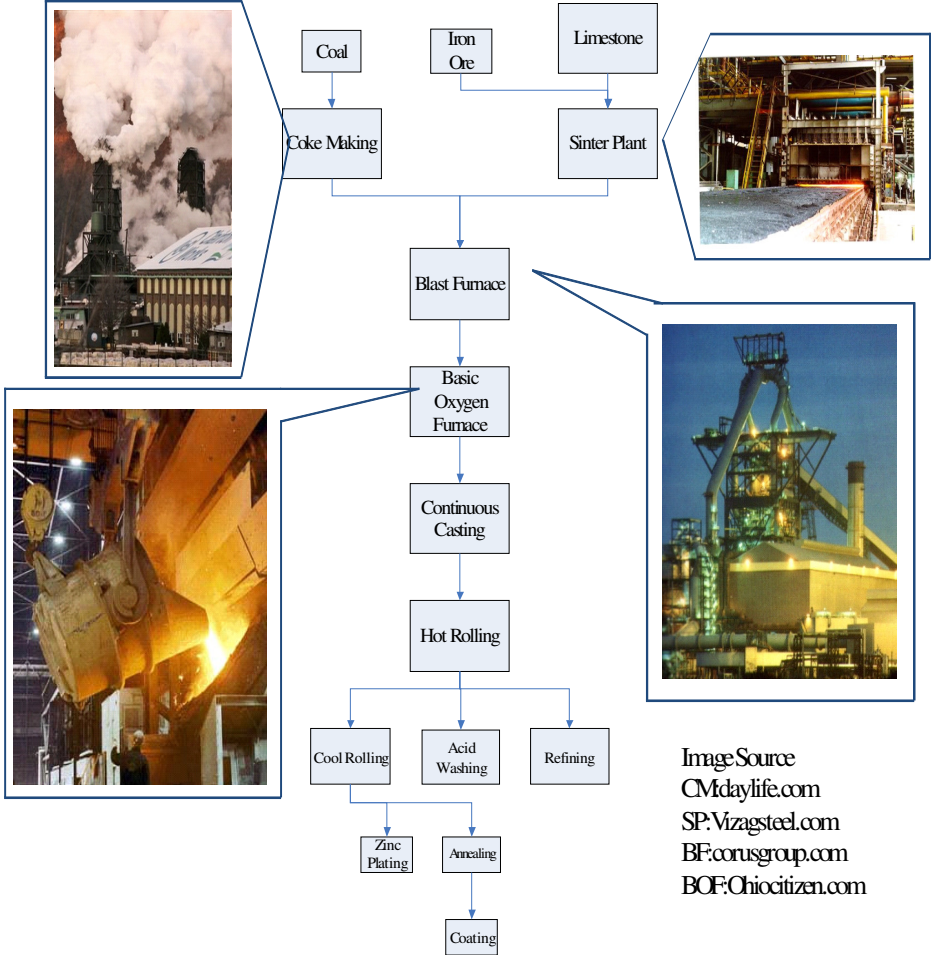
Aggregates

Iron & steel

Work in the future

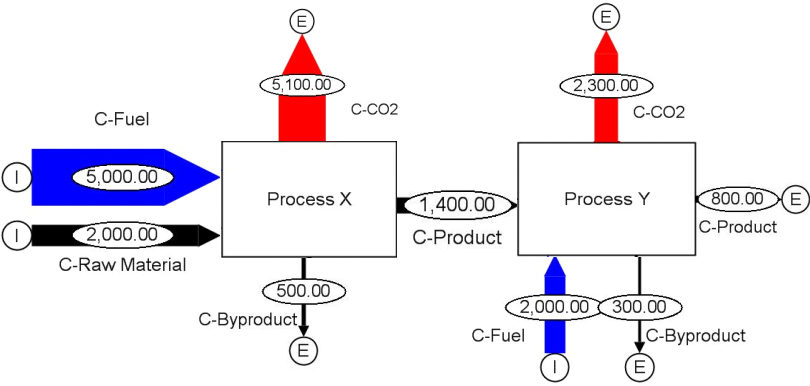


Case study with China Steel Corporation (CSC) in 2010



Example, carbon

- A systematic assessment of the **flows** and **stocks** of materials within a system defined in space and time
- $C_{input} = C_{Product} + C_{CO_2}$ (Mass Balance)



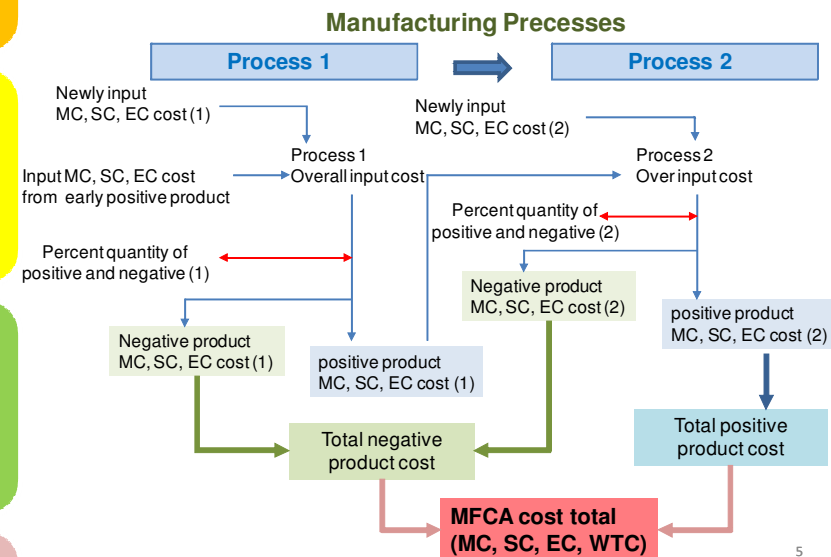
CSC Project Objectives

Implementing the inventory of iron/carbon input & output for whole steel production process units.

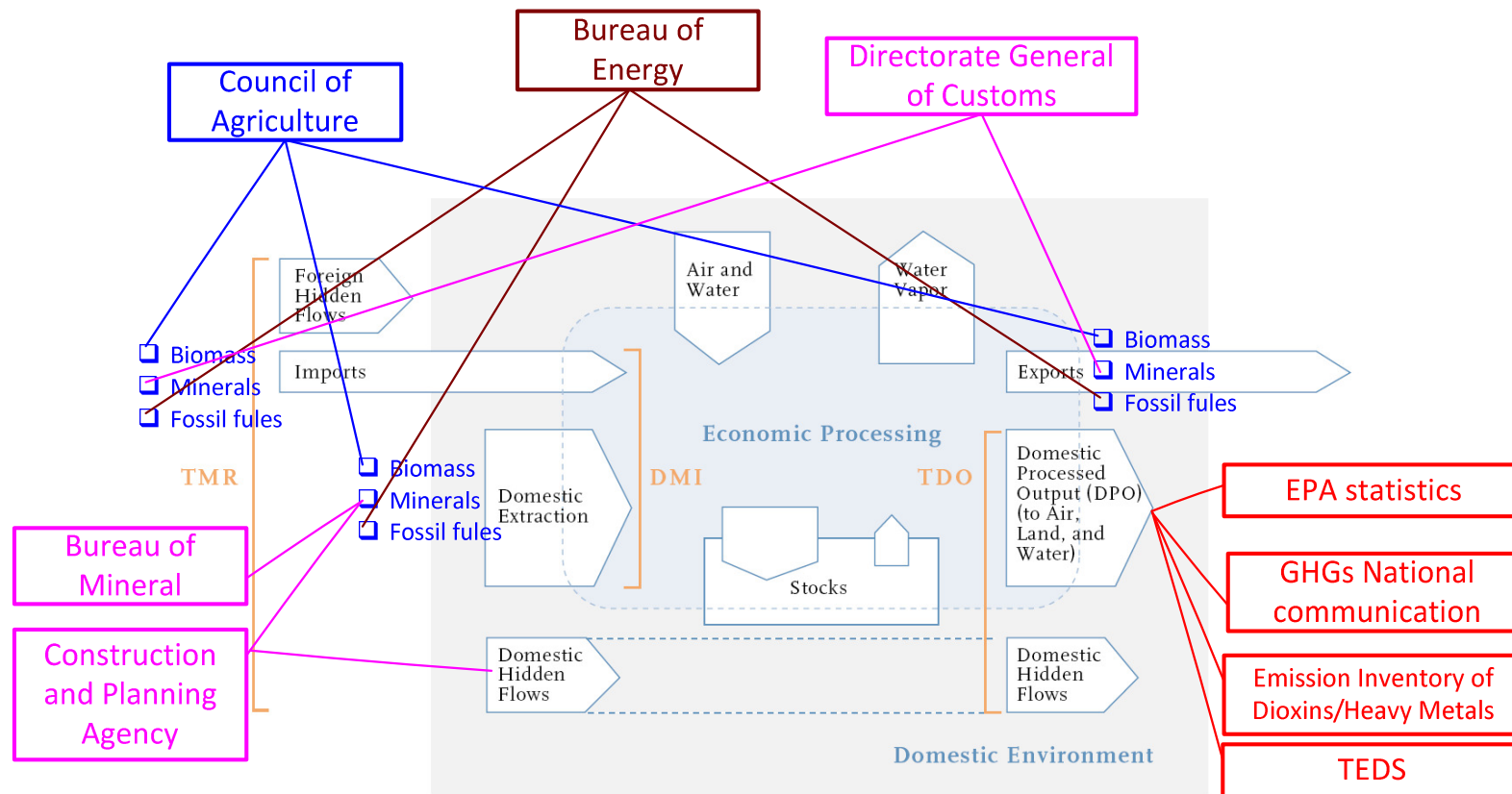
Establishing the iron/carbon flow

Evaluating the MFCA (Material Flow Cost Accounting) applied in CSC.

Supplying the policy suggestion for improving resource productivity or reducing environmental impact for CSC future.



Database



TMR (Total Material Requirement)=DMI+Domestic Hidden Flows+Foreign Hidden Flows

DMI (Direct Material Input)=Domestic Extraction+Imports

NAS (Net Additions to Stock)=DMI-DPO-Exports

TDO (Total Domestic Output)=DPO+Domestic Hidden Flows

DPO (Domestic Processed Output)=DMI-Net Additions to Stock-Exports

Policy and management suggestions



Thanks for your attention

