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ReTraCE

Realising the Transition towards the Circular Economy

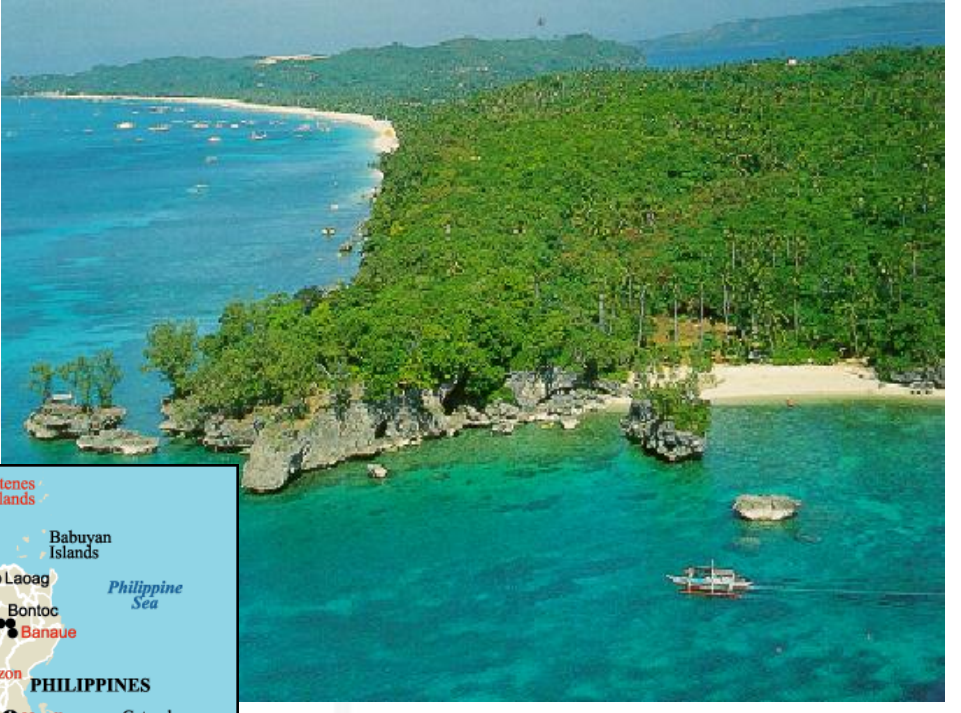
Circular Economy through Eco-Industrial Development

Read and Shared by

Anthony SF Chiu, Philippines
ReTraCE Advisory Board

1st ReTraCE Network School
Sheffield, 3-7 June 2019

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie European Training Networks grant agreement ReTraCE No 814247.




PHILIPPINES
Batenes Islands
Babuyan Islands
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Laoag
Philippine Sea
Vigan
Bontoc
Sagada
Banaue
San Fernando
Luzon
PHILIPPINES
Manila
South China Sea
Lubang Island
Catanduanes Island
Puraran
Lake Taal
Puerto Galera
Mayon Volcano
Mindoro
Viriato
Boracay Island
Samar
Panay
Tacloban
Iloilo City
Cebu
Palawan
Puerto Princesa
Chocolate Hills
Negros
Butuan
Sulu Sea
Mindanao
Zamboanga
Mt Apo 2954m
Davao
Lake Sebu
Sandakan
MALAYSIA
Sulu Archipelago
Suluwesi Sea
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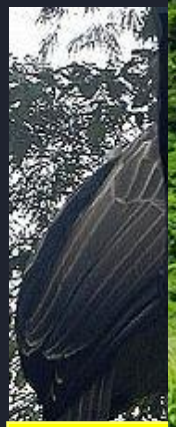

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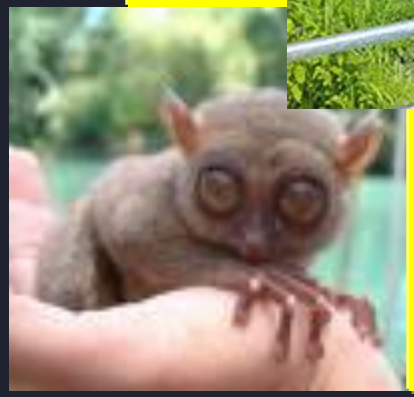
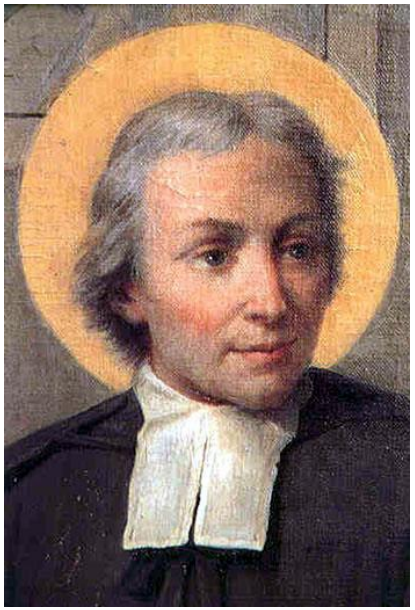


Tarsius syrichta

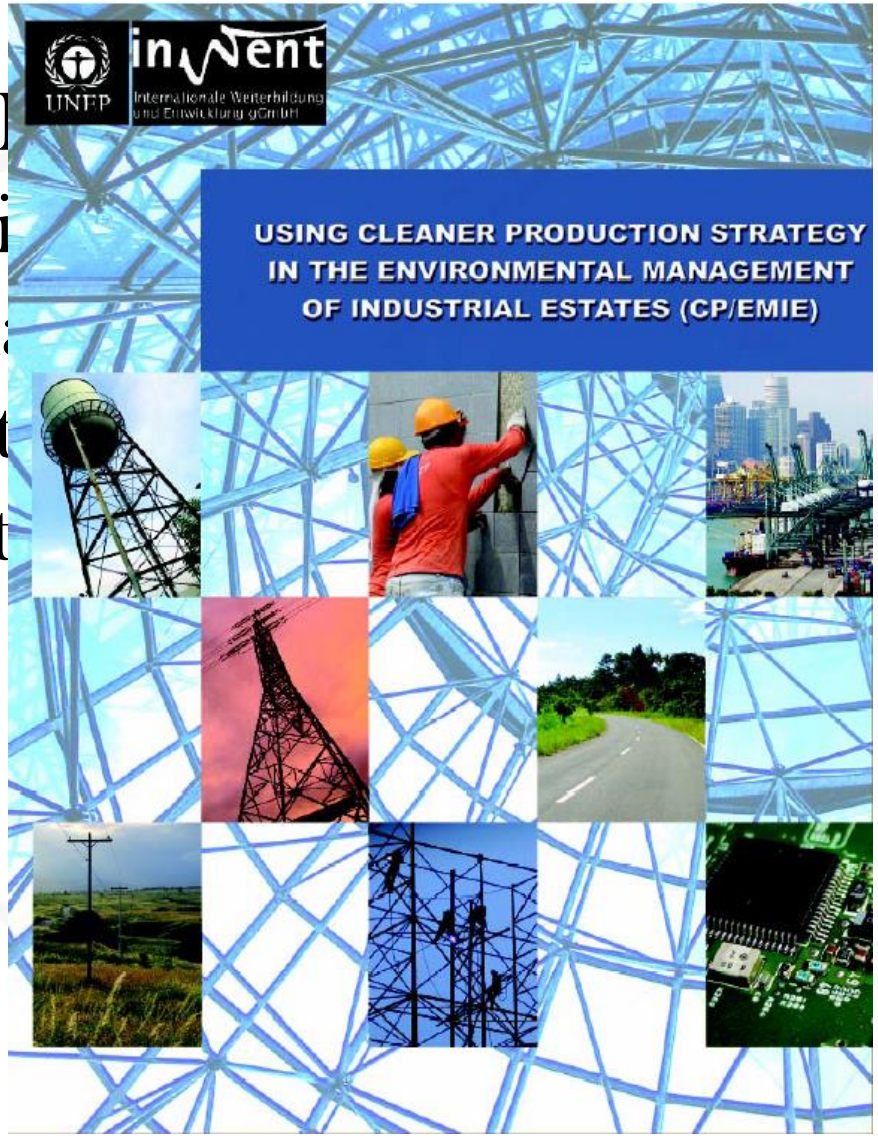
anthony.chiu@dlsu.edu.ph

Brothers of the Christian Schools – De La Salle in 80 countries



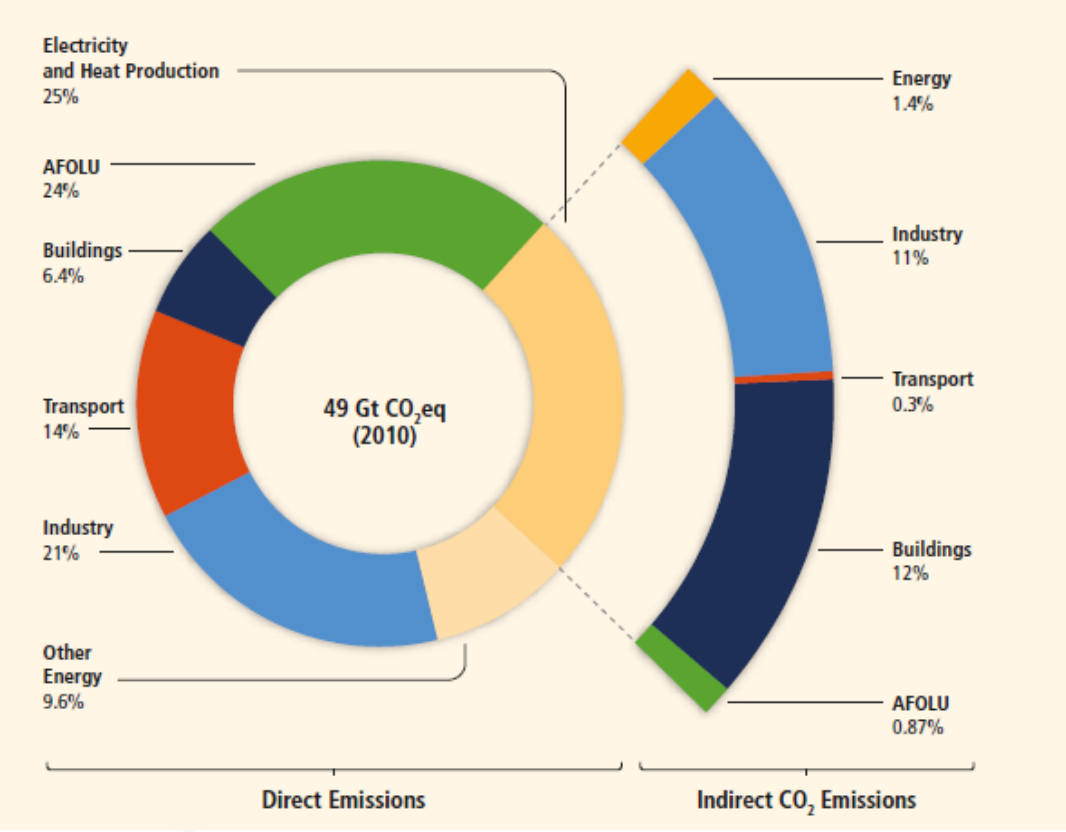
Anthony SF Chiu (life after 1995)

- 1995 – UNDP PRIM
  Ecology – EIP in Phili
  Vietnam, Sweden, Th
  Korea, Australia, Nort
  Northern Africa, Cent
  BRI .....



Anthony SF Chiu (life after 1995)

- 1995 – UNDP PRIME Project on Industrial Ecology – EIP in Philippines, C
China, Japan, Korea
America, Northern A
& BRI .....
- 1999 – 2019 UNEP
Chapter on Industry,
Productivity, EMA/I
RECP (MFA), Recyc
Material) Society, C
Marrakech Process,
etc.



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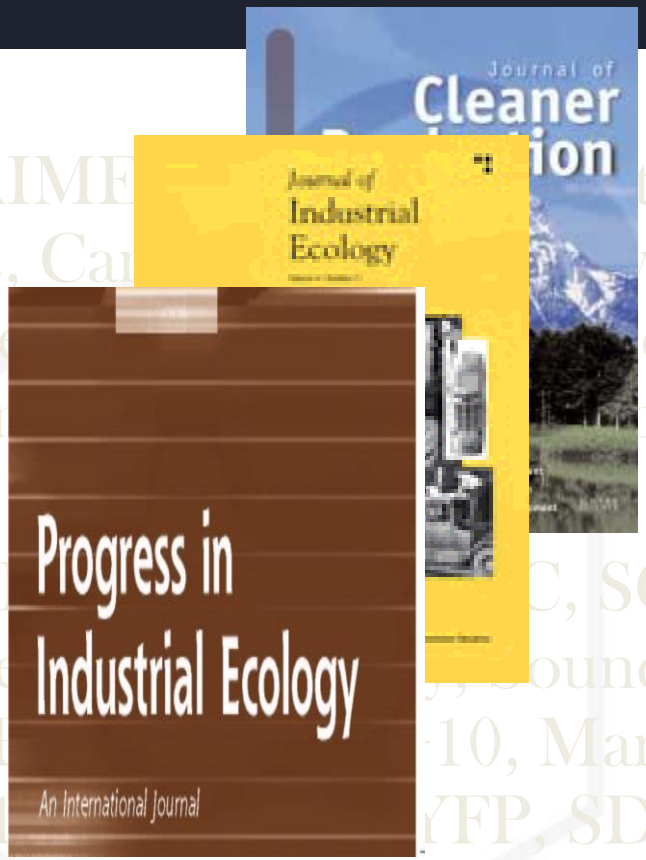

- 1995 – UNDP PRIME – trial Ecology – EIP in Philippines, Ca veden, Thailand, China, Japan, Kore d Latin America, Northern be, ISID 2013 & BRI ……
- 1999 – 2019 UN C, SCP, RECP, Eco-efficiency, Gre ound Material Society, Circular E 10, Marrakech Process, CSD 18/1 YFP, SDG, etc.
- DUT Inst Eco-Planning, ISIE & IFPR - JCLP, IJPE, RCR, PIE, JIE, JPIIE, ……

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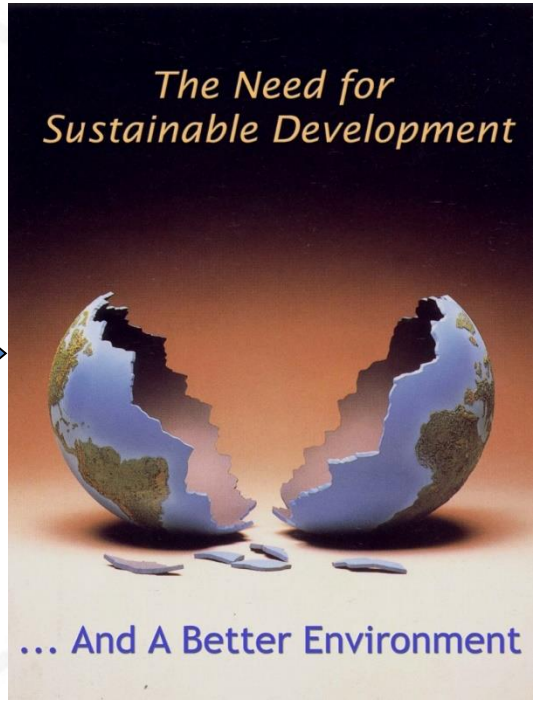
Outline

- Current Situation
- International Development
- EID Solutions
- Questions

WWF Living Planet 2016 Report

- The 2016 edition of the LPR highlights the tremendous pressure that humanity is putting on our planet.
- We are using 50 per cent more resources than the Earth can provide.
- By 2030, even two planets will not be enough.



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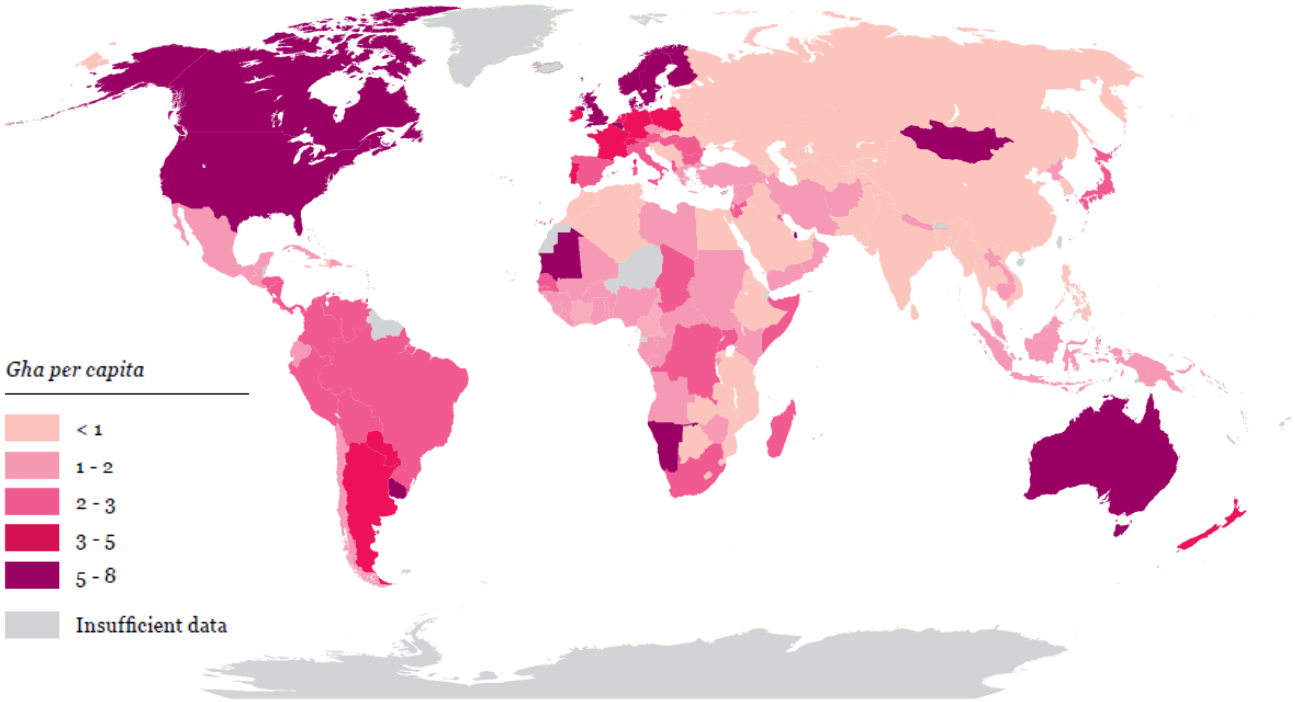
Eco Footprint 1961

Source : Living planet Report – WWW (2012)



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Eco Footpri

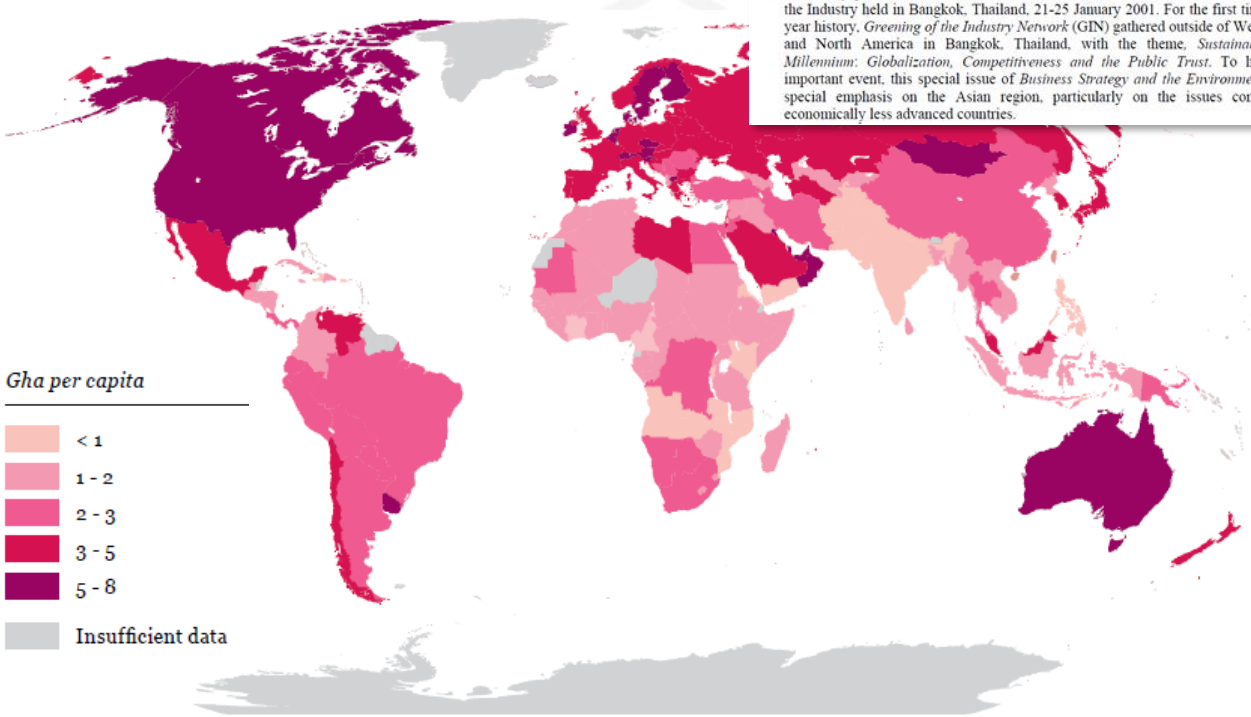
Lead Essay to Winter Issue 2002
Journal of Business Strategy, p.81-89

Managing Globalization for Sustainability in the 21st Century

Minna Halme, Jacob Park, and Anthony Chiu

This essay provides an overview of the 9th International Conference of the Greening of the Industry held in Bangkok, Thailand, 21-25 January 2001. For the first time in its ten-year history, *Greening of the Industry Network* (GIN) gathered outside of Western Europe and North America in Bangkok, Thailand, with the theme, *Sustainability at the Millennium: Globalization, Competitiveness and the Public Trust*. To highlight this important event, this special issue of *Business Strategy and the Environment* will place special emphasis on the Asian region, particularly on the issues confronting the economically less advanced countries.

Source : Living planet Report – WWF (2012)



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SDGs DIRECTLY DEPENDENT ON NATURAL RESOURCES

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What are SDGs?

- 17 ambitious goals: *to guide national policies for the next 15 years*
- 169 associated targets:
  - very general, aspirational and global, each government to set its own national targets guided by the global level of ambition but taking into account national circumstances.
- 230 global indicators: for global follow-up and review and not necessarily applicable in all national contexts.

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Stakeholders roles

ACTOR	ROLE
National Governments	Providing policy support, legal frameworks and financial resources for translating the Agenda goals into action
Regional & Local Governments	Working with local stakeholders to generate, promote and fund initiatives contributing to the realization of the goal of the Agenda within the national policy frameworks
Civil Society and NGOs	Playing a “checks and balance” role on processes and initiatives
International organizations	Promoting international cooperation and developing policy recommendations for guidance over the SDGs implementation; Assessing the state of the progress of current implementation efforts
Business Organizations	Central role, the new business models will generate fundamental changes in behavior necessary to achieve most of the SDGs
Academia/Research	Identifying problems and solutions, providing the scientific evidence and the bases for implementation models on scientific assumptions and innovation

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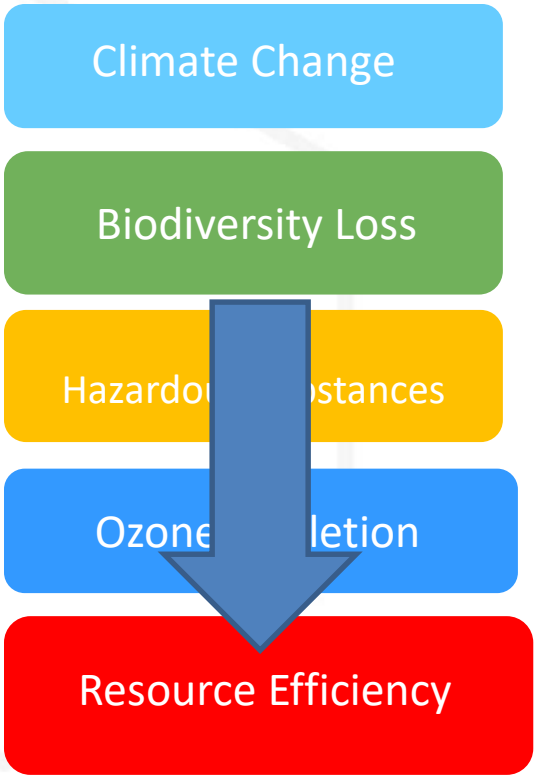
INTERNATIONAL POLICY NEEDS A SCIENCE BASE

The international resource panel was created in 2007 as a science-policy interface in responding to economic growth, escalating use of natural resources and deteriorating environment and climate change.



IPCC

IPBES

Assessments under the Basel Convention

Montreal Protocol's Scientific Assessments

International Resource Panel IRP

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THE WORLD WE LIVE IN

AND CHALLENGES WE ARE FACING

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20th CENTURY

THE GREAT ACCELERATION

- *Growth of population by a factor 3.7*
- *Annual extraction of construction materials grew by a factor of 34, ores and minerals by a factor of 27, fossil fuels by a factor of 12, biomass by a factor of 3.6*
- *Total material extraction grew by a factor of 8*
- *GHG emissions grew by a factor of 13*

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21st CENTURY

FACTS WE CAN NOT IGNORE

POPULATION

- *Population growth (2050 – 9.7 billion)*
- *Per capita consumption growth (McKinsey estimates up to 3 billion consumers moving from low to middle class consumption till 2030)*

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21st CENTURY

FACTS WE CAN NOT IGNORE

POVERTY AND SOCIAL INEQUALITY

- *Oxfam Report: 62 people own the same as half of the world and the richest 1% is more wealthy than the rest of the world)*
- *Nearly 800 million people are hungry, over 2 billion suffer from micronutrient deficiencies … while over 2 billion people are obese*

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21st CENTURY

FACTS WE CAN NOT IGNORE

ENVIRONMENT

- *60% of ecosystems already degraded or used unsustainably*
- *Increasing evidence of the climate change threat*
- *33% of soils is moderately to highly degraded due to erosion, nutrient depletion, acidification, salinization, compaction and chemical pollution*

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21st CENTURY

FACTS WE CAN NOT IGNORE

URBANISATION

- *Around 50% of urban fabric expected to exist by 2050 still needs to be constructed*
- *Between 2000 and 2030 it is estimated that developing countries would have added 400,000 km^2 of built-up urban area, equal to the world's built-up area in 2000*
- *In the three years period (2011-2013), China has used more cement than the USA during the entire 20th century*

Latest Update: GEO6 launched March 2019, Nairobi UNEA4

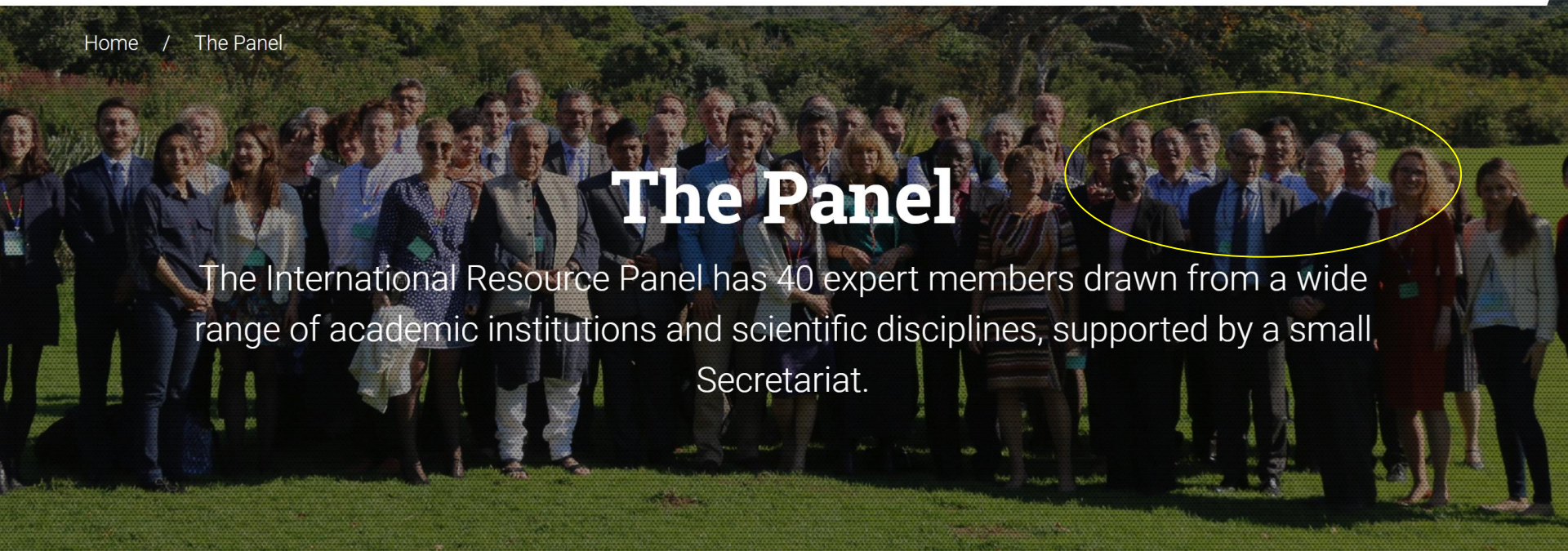
GEO6 GLOBAL ENVIRONMENT OUTLOOK | SUMMARY FOR POLICYMAKERS

UN environment United Nations Environment Programme

UN environment | International Resource Panel

Search

REPORTS & DATA THE PANEL NEWS & EVENTS



Home / The Panel

The Panel

The International Resource Panel has 40 expert members drawn from a wide range of academic institutions and scientific disciplines, supported by a small Secretariat.

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INTERNATIONAL DEVELOPMENTS

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The 2030 Sustainable Development Goals (SDG)

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Sustainable Consumption and Production / Resource Mgt

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- At the turn of the century, CP initiatives have been admitted as supply side and been successful to some extent in its pursuance;
- The rebound effect and recognition of SC as the other side of the same coin evolved UNEP/UNIDO focus to SCP; while UNIDO also embraced its industrialization mandate, integrated various CP-related works (CP, EE, etc.) into RECP;
- UNEP/UNIDO NCPC evolved to RECPNet;
- Since Rio+10, Marrakech Process took stage in identifying regional SCP priorities, while SDG consultation started as well;
- In CSD 18/19, 5 themes wherein the last but not the least is SCP, which seamlessly connect 18th/19th cycles to the Rio+20, The Future We Want;
- Rio+20 placed UNEP in the limelight with 10YFP;
- SDG 2015 launched with SCP as SDG12

Photo source: mexperience.com/mexicos-time-zones/

Time line on the Rise of SDG12 - SCP

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Sustainable Consumption and Production is the most efficient strategy to avoid trade-offs and create synergies to resolve the development and environmental challenges articulated in the SDGs.

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SDGs DIRECTLY DEPENDENT ON NATURAL RESOURCES

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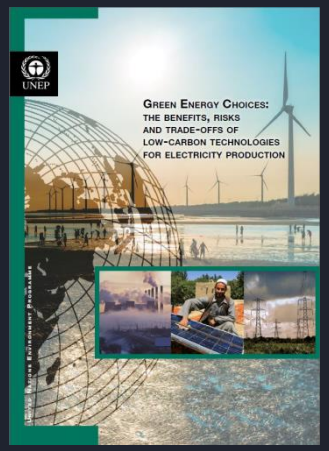
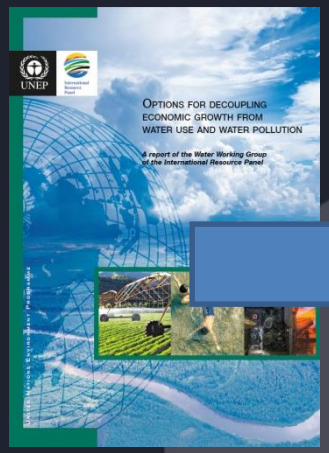
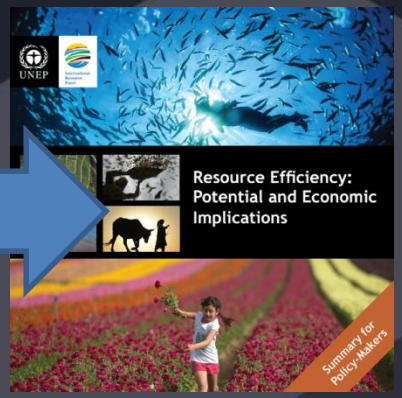
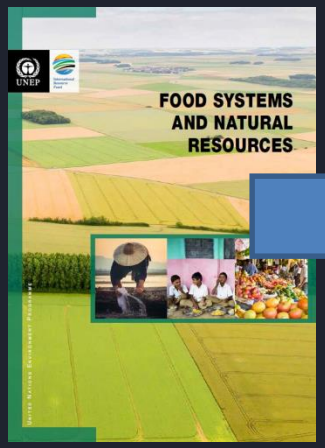
UNEP

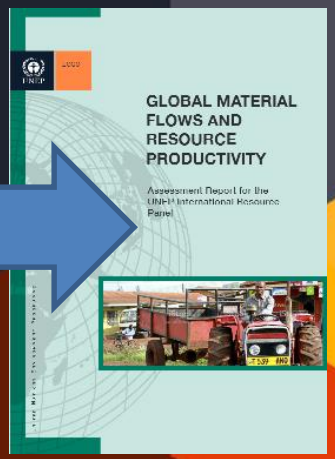
IN THE RECENT MONTHS …

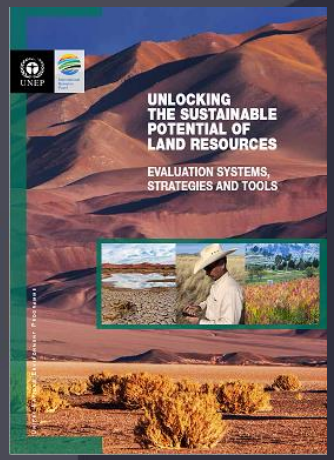












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THE NEW UNEP IRP MATERIAL FLOW AND RESOURCE PRODUCTIVITY DATA SET

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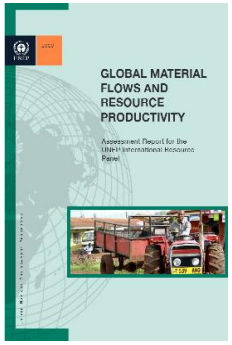
- *A coherent account of material use in the global economy and for every nation, complementary to the System of National Accounts*
- *A large data set covering 40 years (1970–2010) and most countries of the world.*
- *Presents direct and consumption-based material flow indicators, covering total usage, per capita use and material use per US$.*
- Information should help identify opportunities, risks and vulnerabilities related to the global supply of primary materials and show the potential for efficiency gains and reductions in material use in the global economy



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GLOBAL MATERIAL FLOWS AND RESOURCE PRODUCTIVITY (1970-2010)

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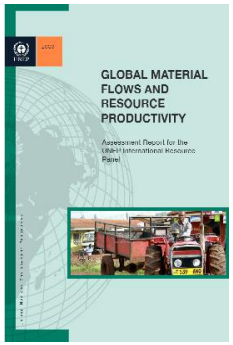
- *Consumption has been stronger driver of growth in material use that population growth*
- *Since 2000 material efficiency has declined - global economy needs more materials per unit of GDP. Production has shifted from material efficient countries to countries that have lower material efficiency*
- *The richest countries consume on average 10 times more materials as the poorest*
- *The level of well-being achieved in wealthy industrial countries cannot be generalised globally based on the same system of production and consumption*



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GLOBAL MATERIAL USE HAS ACCELERATED

- *Annual global extraction of materials grew from 22 billion tonnes in 1970 to around 70 billion tonnes in 2010*
- *Non-metallic minerals used in construction was the fastest growing group of materials*

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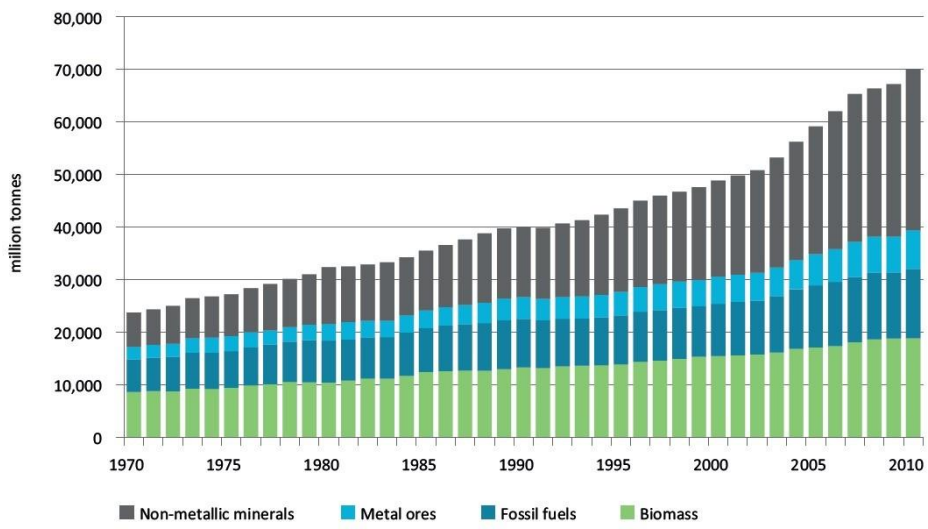

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Figure 1. Global material extraction (DE) by four material categories, 1970–2010, million tonnes

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MATERIAL EXTRACTION GREW UNEVENLY IN THE GLOBAL ECONOMY

- *Asia and the Pacific had the largest growth, especially China and Southeast Asia*
- *Growth in Asia and the Pacific reverberated in Latin America and Africa who supplied materials to Asia*

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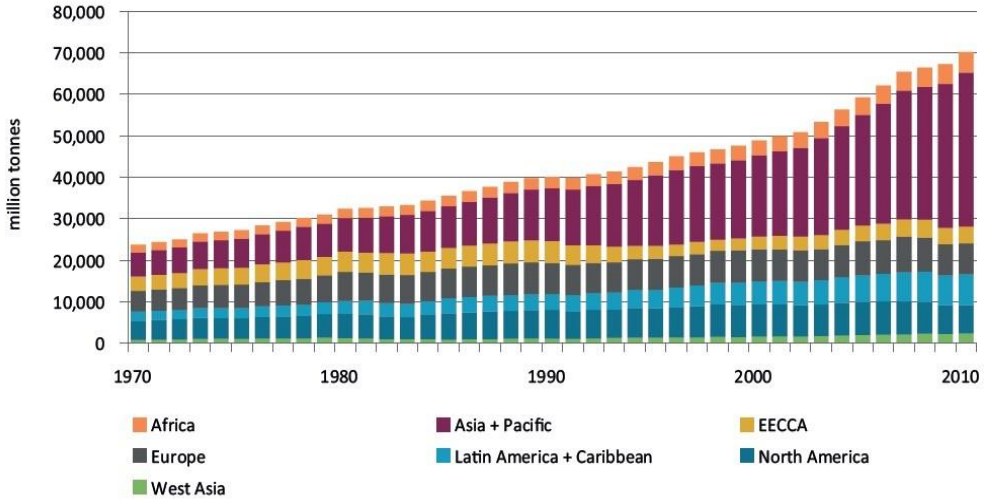

Figure 2. Domestic extraction (DE) by seven subregions, 1970–2010, million tonnes

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CONSUMPTION IS DRIVING GLOBAL MATERIAL USE

- *Growth in per capita income and consumption have been the strongest driver of growth in material use, even more important than population growth in recent decades*

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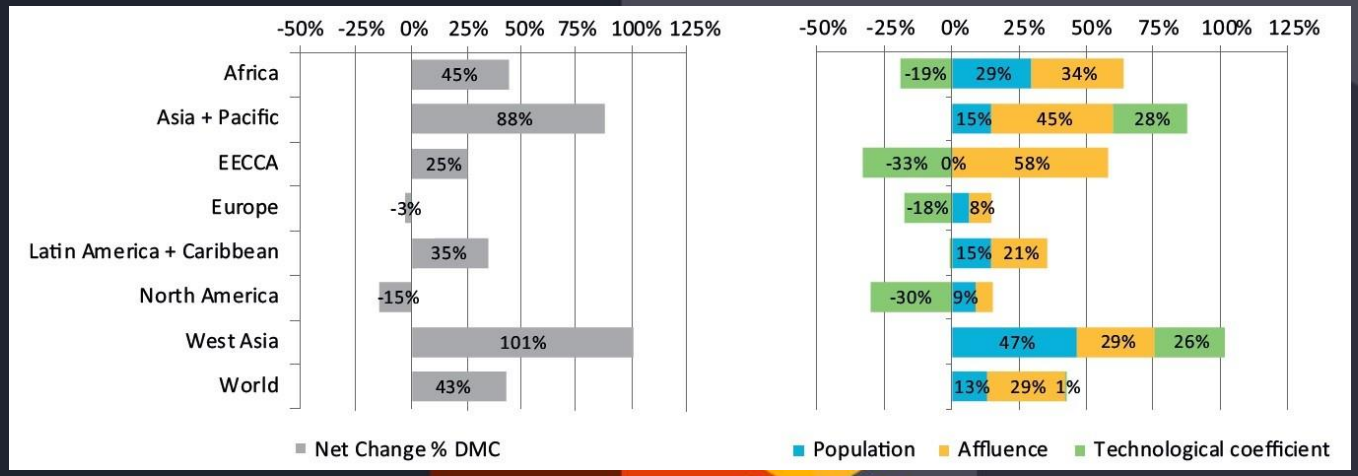

Figure 5. Drivers of net change in domestic material consumption between 2000 and 2010 for world regions: population, affluence, and material intensity

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RICHEST COUNTRIES CONSUME ON AVERAGE 10 TIMES THE MATERIALS AS POOREST COUNTRIES

- *Average material footprint of medium HDI countries has grown slowly over past two decades, reaching 5 tonnes per capita, while material footprint in low HDI countries has been stagnant for the past two decades at 2.5 tonnes per capita*

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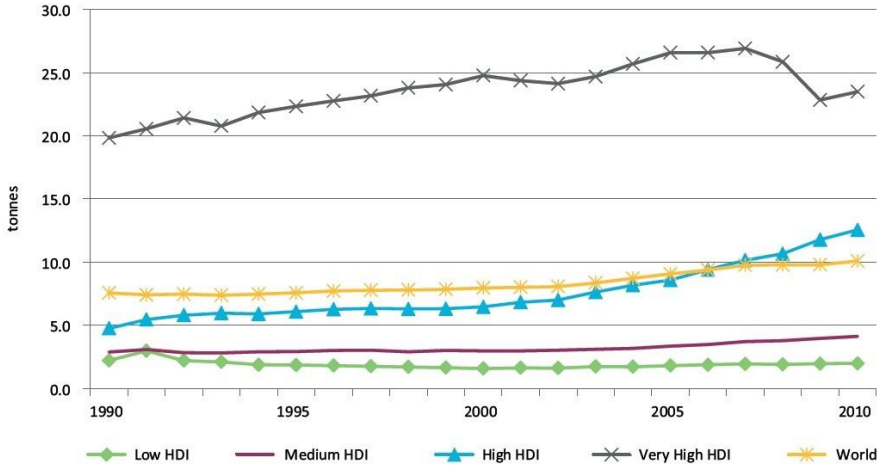

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Figure 8. Per capita material footprint (MF) by HDI level, 1990–2010 (the HDI is a compound index on life expectancy, literacy and income)

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OVERALL DECLINE IN MATERIAL EFFICIENCY

- *Global economy now needs more materials per unit of GDP than it did at the turn of the century*
- *This has been caused by large shift of economic activity from very material-efficient economies such as Japan, the Republic of Korea and Europe to the much less material-efficient economies of China, India and Southeast Asia*

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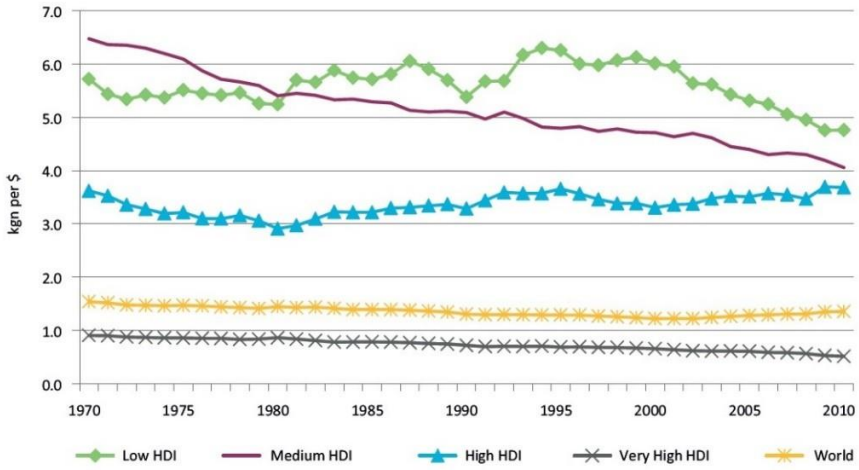

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Figure 7. Material intensity by development status and global material intensity, 1970–2010

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THE LEVEL OF WELL-BEING ACHIEVED IN WEALTHY INDUSTRIAL COUNTRIES CANNOT BE GENERALIZED GLOBALLY BASED ON THE SAME SYSTEM OF PRODUCTION AND CONSUMPTION

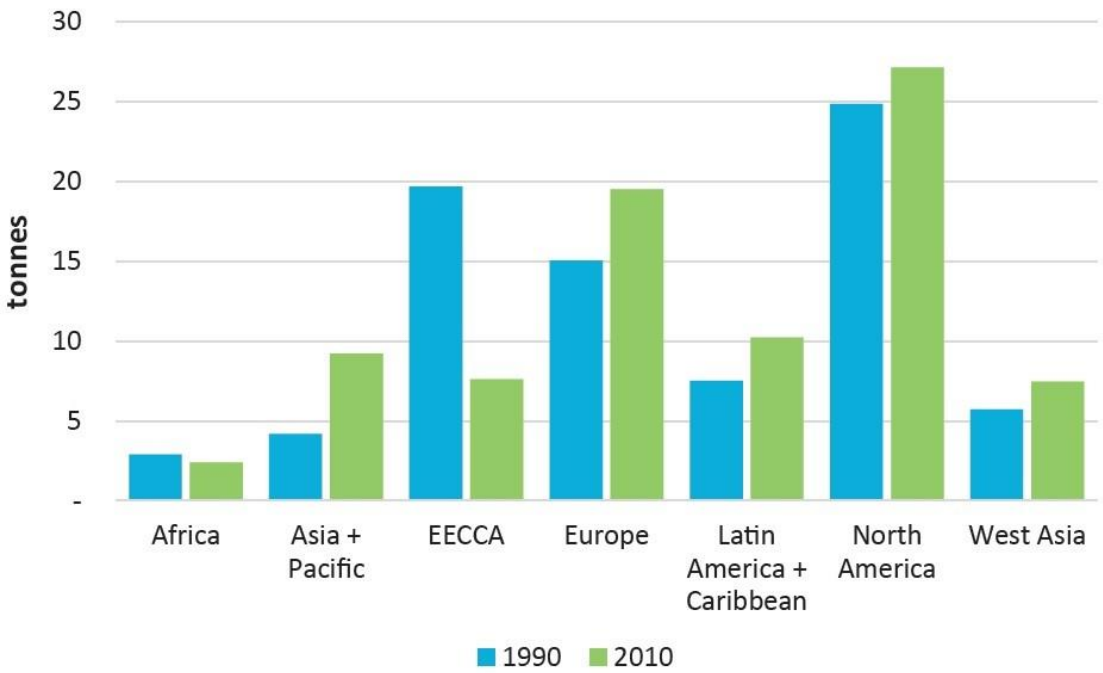

Figure 6. Per-capita material footprint (MF) by seven world regions, 1990 and 2010, tonnes

If current systems of production and provision for major services will not be changed, nine billion people would require about 180 billion tonnes of materials annually by 2050, almost three times today's amounts

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AND....

SOLUTIONS

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DECOUPLING IS THE IMPERATIVE OF MODERN ENVIRONMENTAL AND ECONOMIC POLICY

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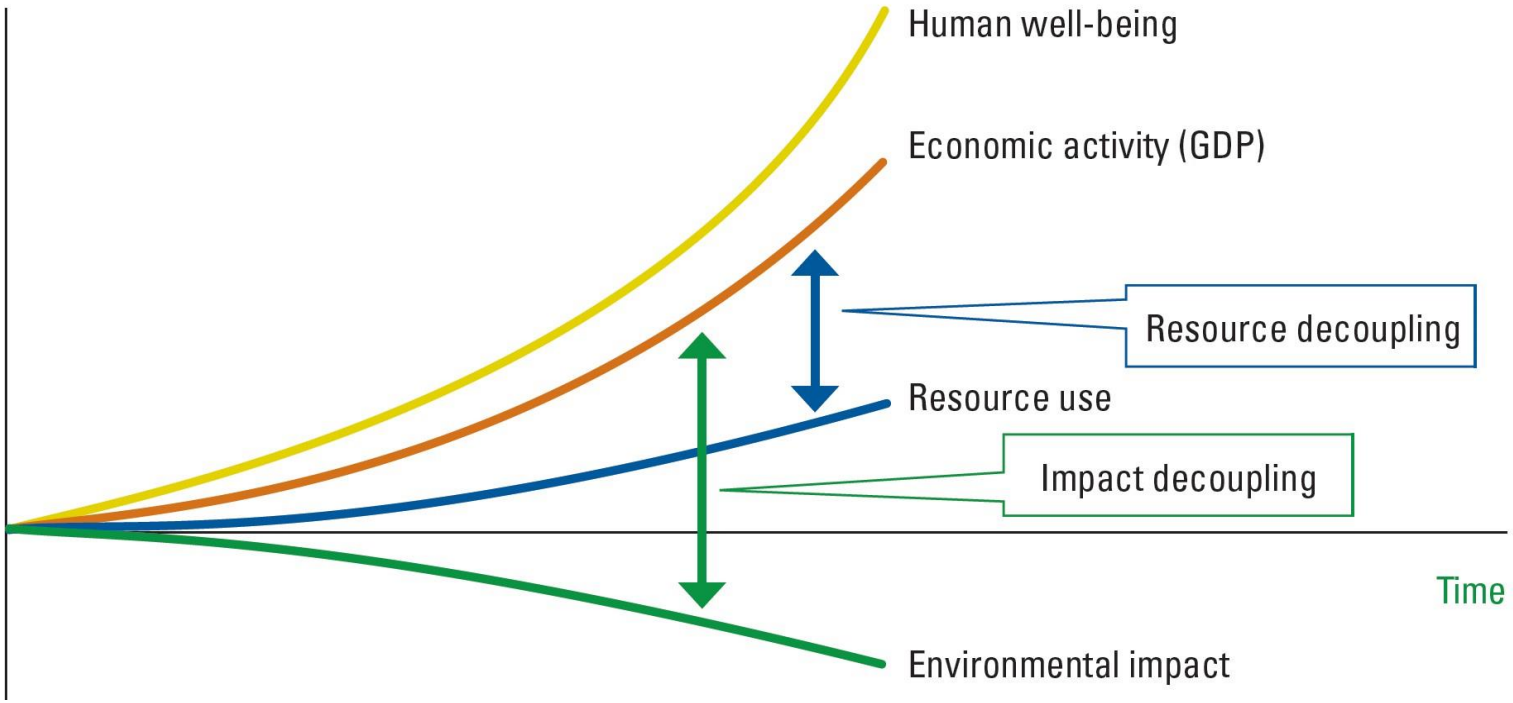

Eco-civilization, Sufficiency Economy, De-growth

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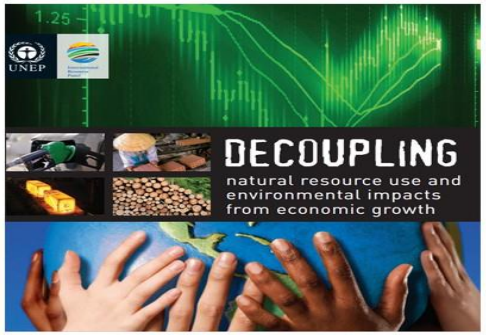

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- *Developed economies will need to adopt strategies that bring their resource consumption down to globally sustainable levels (ABSULUTE DECOUPLING)*

- *Developing nations must strive to improve resource efficiencies and cleaner production processes as their net consumption of natural resources increases for a period until they achieve a societally acceptable quality of life (RELATIVE DECOUPLING)*

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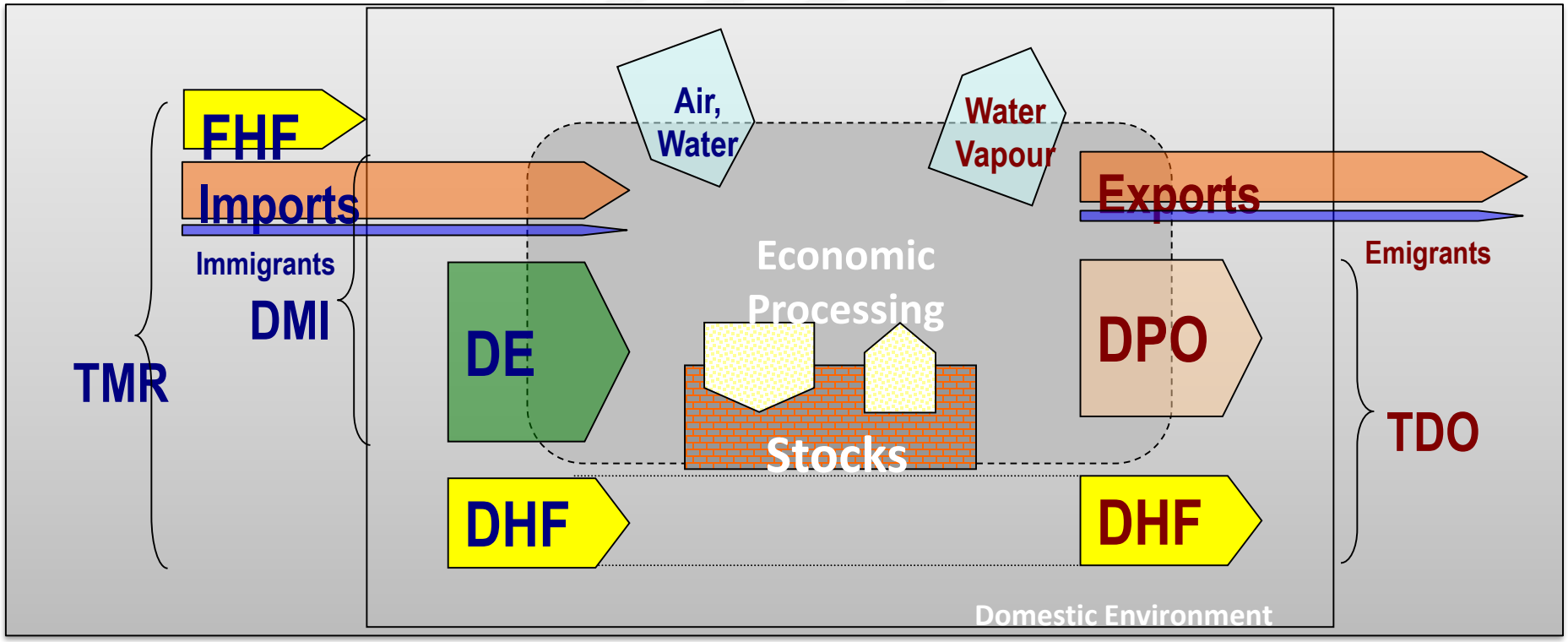
The Basic MFA Model



Source: WRI et al.,2000, 2016; Rapera, Chiu, et al.

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Energy Comparison

Geng, ISIE 2005

COUNTRY	JAPAN	ITALy	FRANCE	GERMANY	UK	US	CANADA	CHINA
Energy Consumption Per USD	1.00	1.33	1.50	1.50	2.17	2.67	3.50	11.5

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Comparisons between China and Other Countries

Countries	US	Canada	Japan	Australia
SO_2emission(kg/1000usdGDP)	2.3	3.7	0.3	4.7
NOx emission(kg/1000usdGDP)	2.7	2.9	0.6	5.5
Countries	France	**Germany**	**OECD**	**China**
SO_2emission(kg/1000usdGDP)	0.8	0.7	2.0	18.5
NOx emission(kg/1000usdGDP)	1.4	1.0	2.1	16.6

Geng, ISIE 2005

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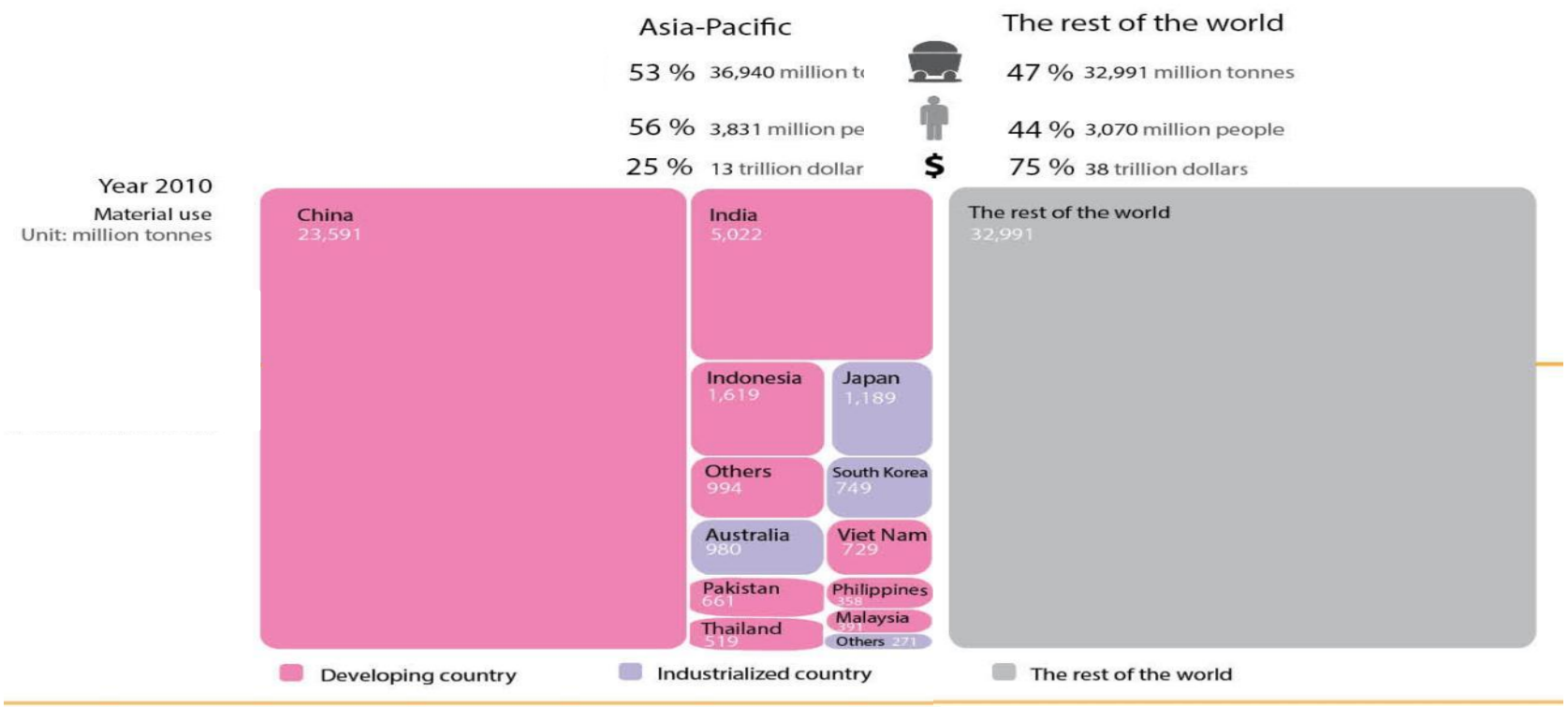
Resource use in Asia Pacific dominates global use…



Source: UNEP Janet Salem

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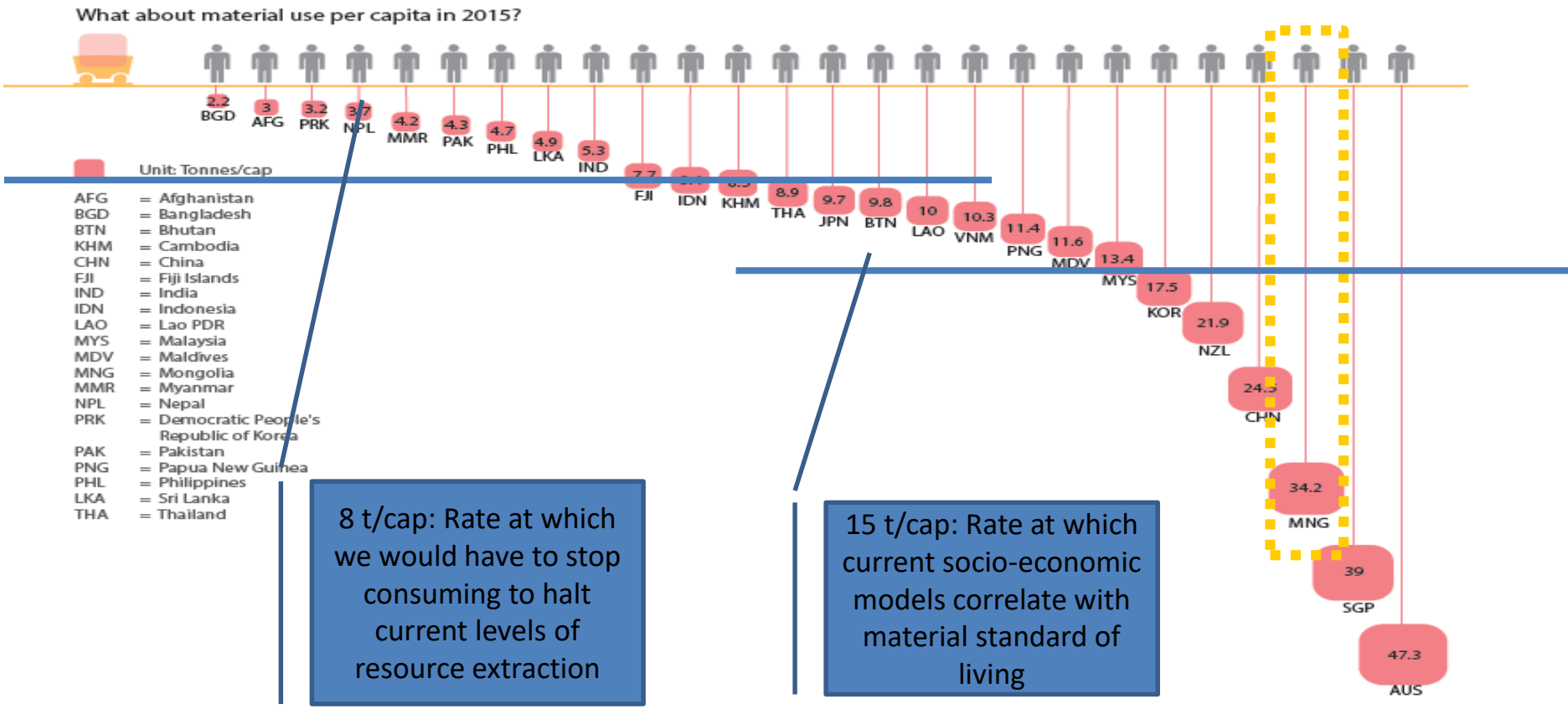
Material use per capita in 2015



Source: UNEP Janet Salem

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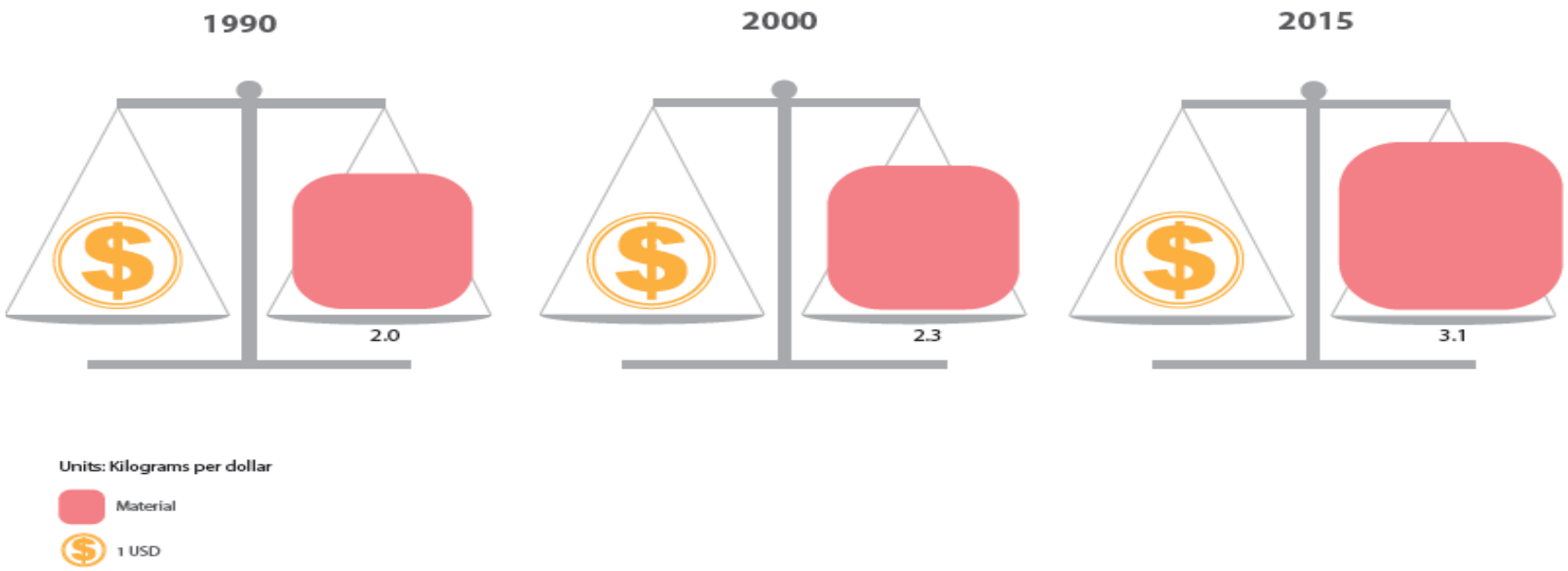
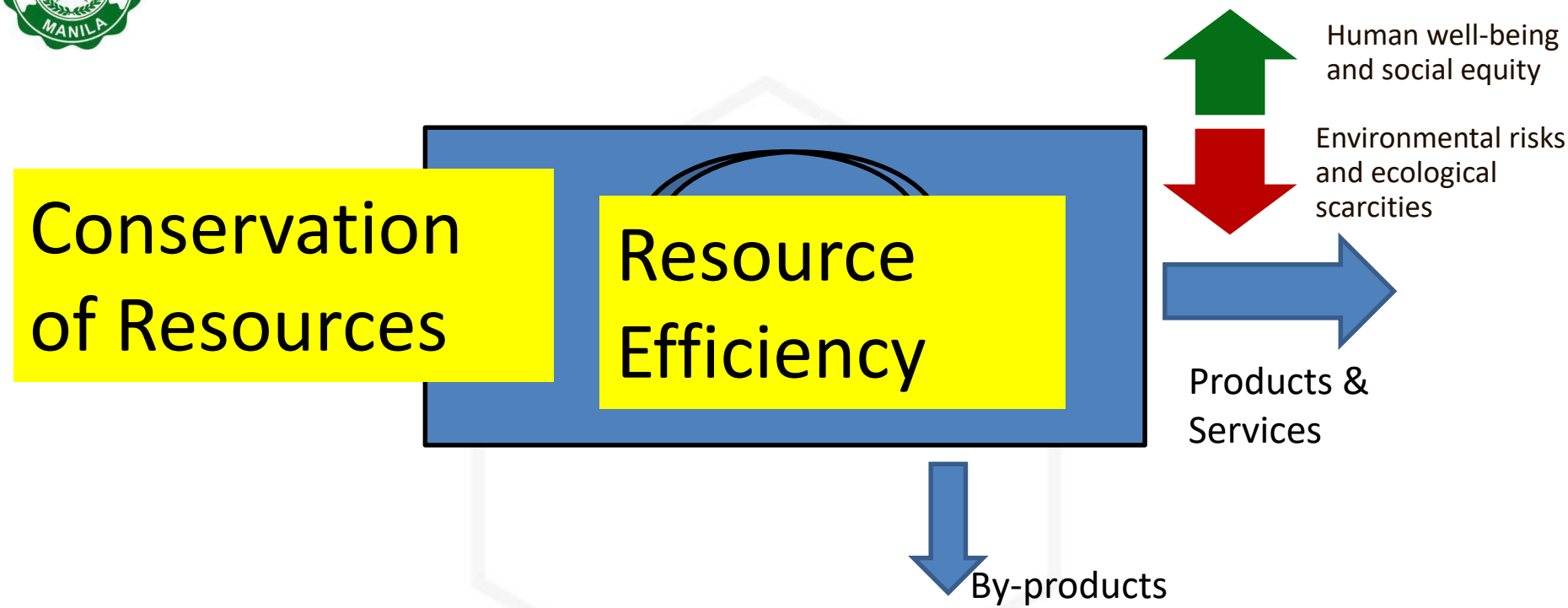
Increasing intensity of resource use in Asia Pacific



Source: UNEP Janet Salem

Systems Thinking



Objectives:
to MAXimize output with MINimum input, and operating within the carrying capacity of the eco-system

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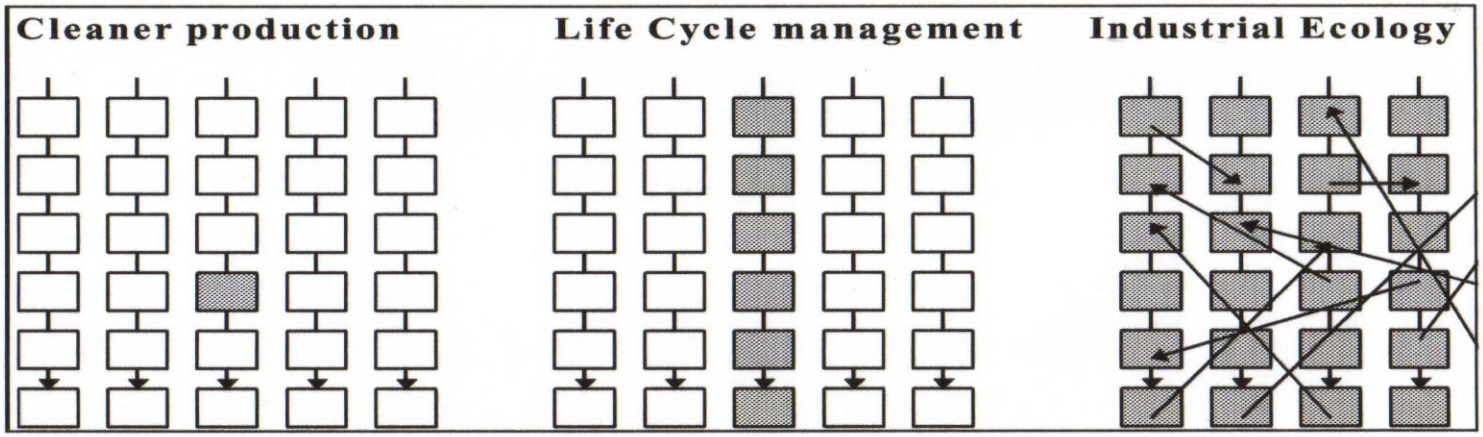
Systems Studies at Plant / Factory Level

IndEcol

NTNU
Norway

The systems approach



MICRO → Eco-efficiency versus Sustainability? ← MACRO

(anthonystchiu@yahoo.com)

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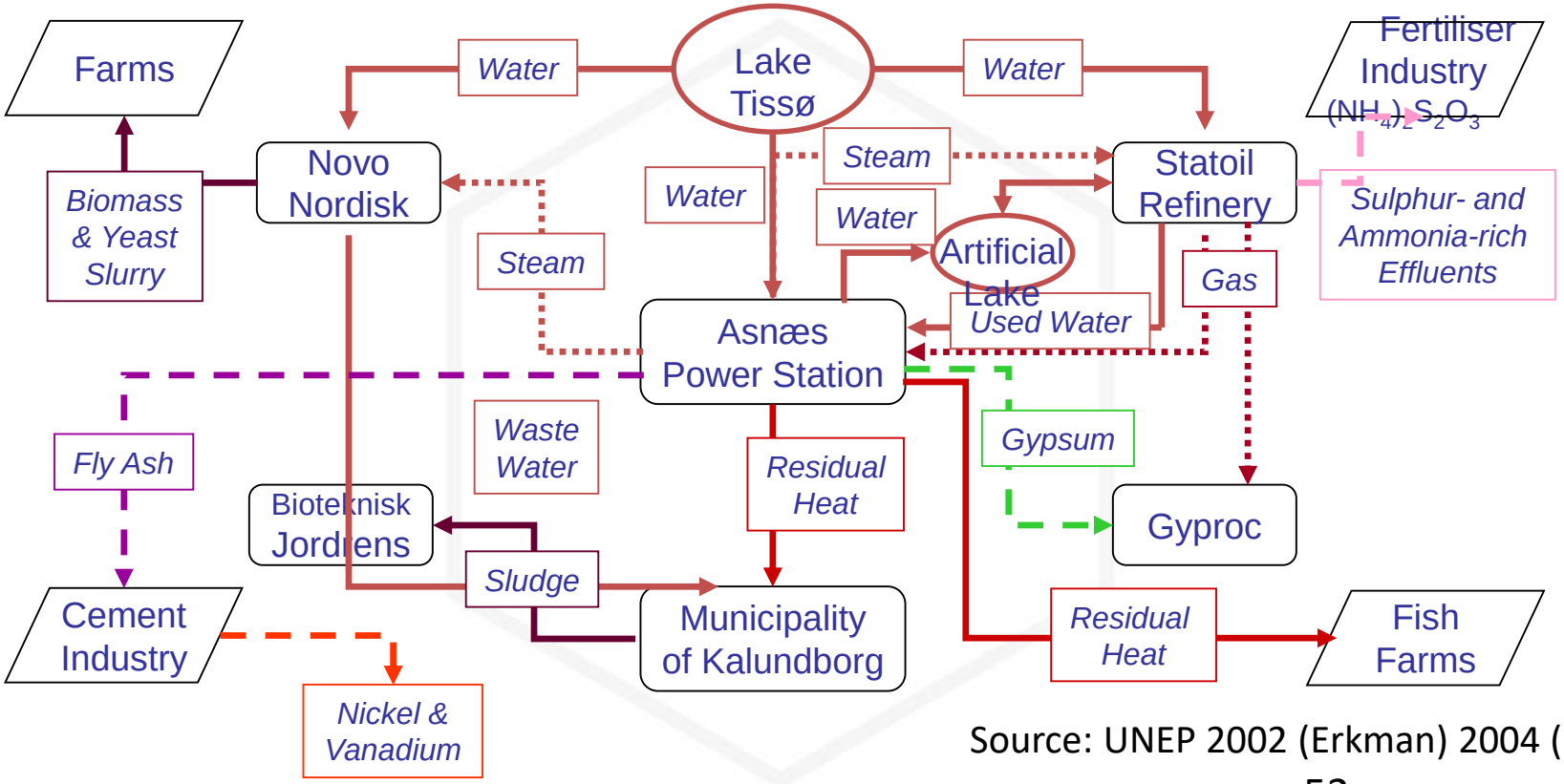
Kalundborg Industrial Symbiosis



Source: UNEP 2002 (Erkman) 2004 (Chiu)

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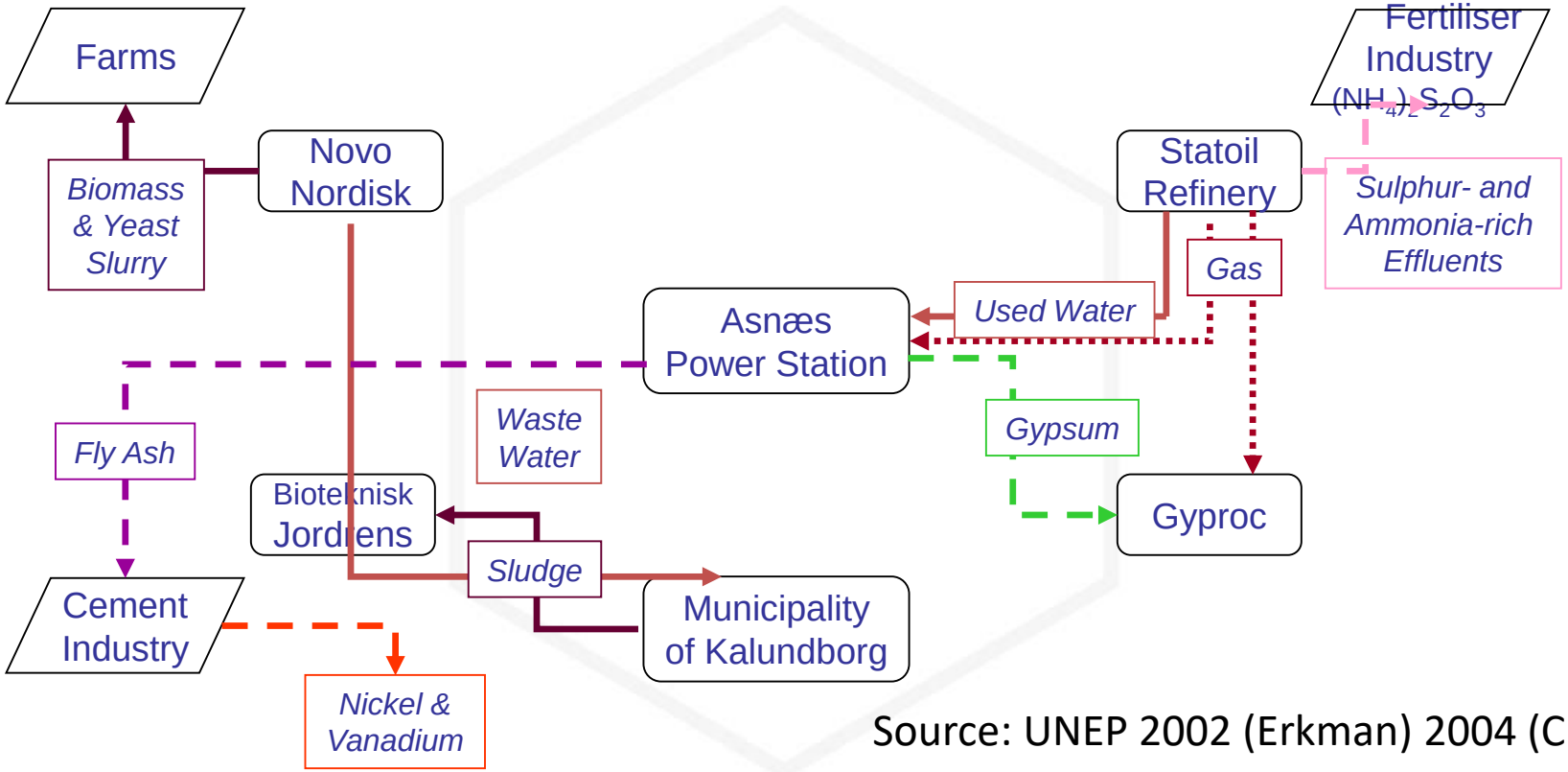
Kalundborg Industrial Symbiosis - Waste Flow



Source: UNEP 2002 (Erkman) 2004 (Chiu)

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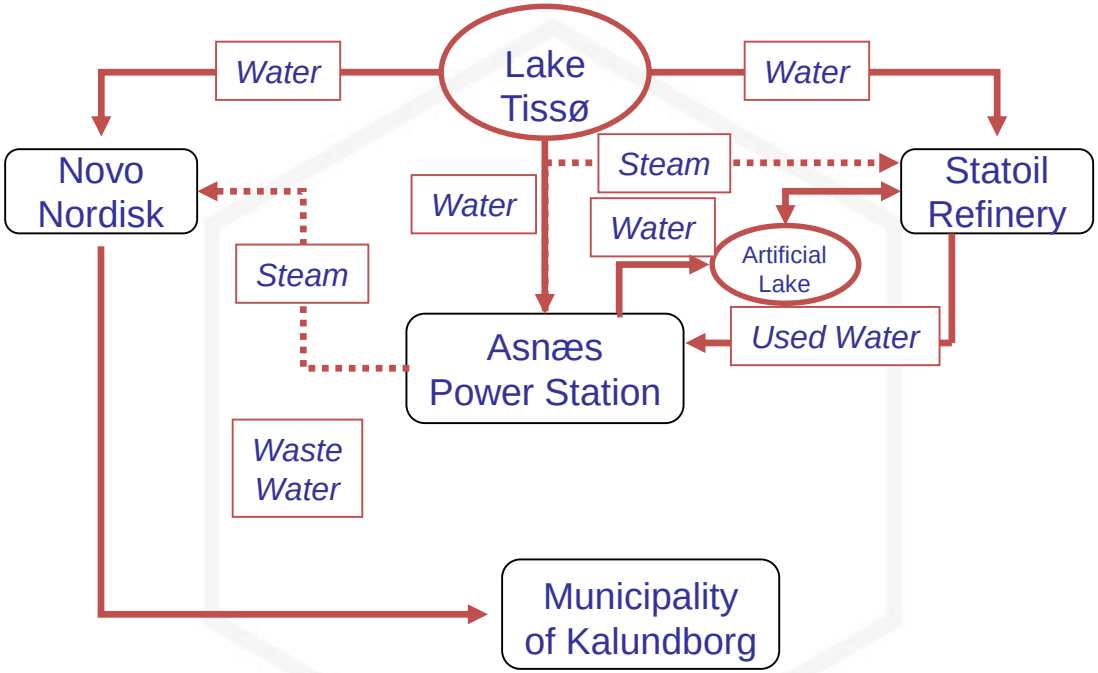
Kalundborg Industrial Symbiosis - Water Flow



Source: UNEP 2002 (Erkman) 2004 (Chiu)

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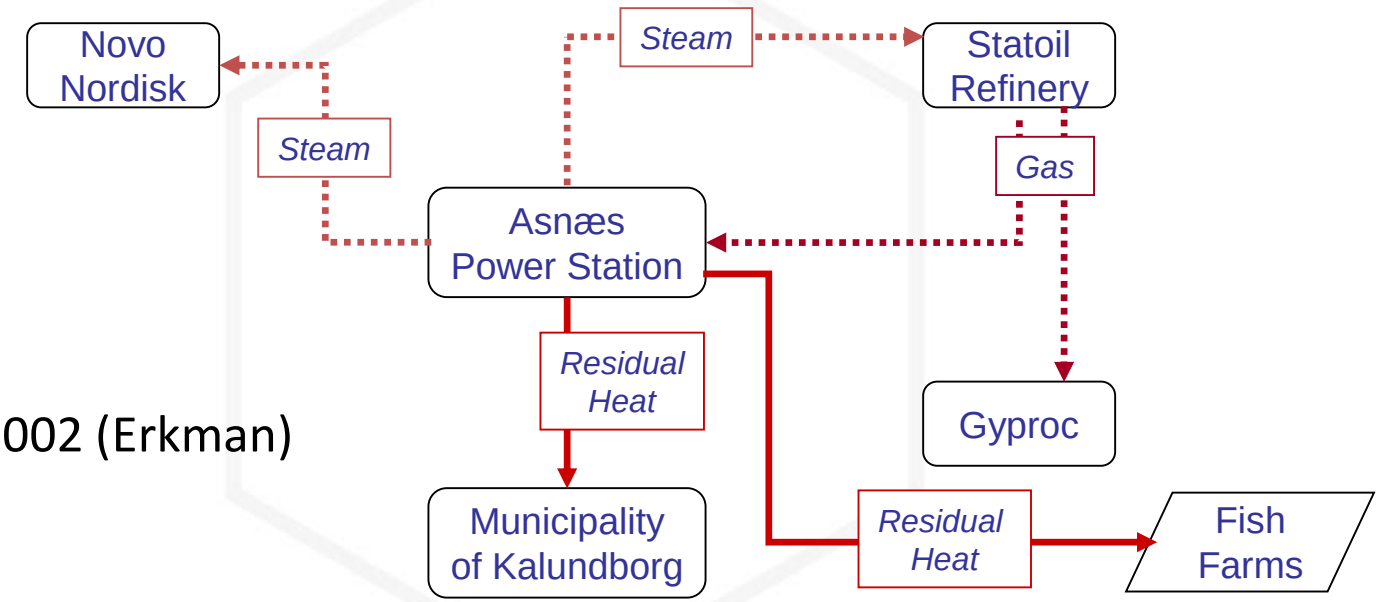
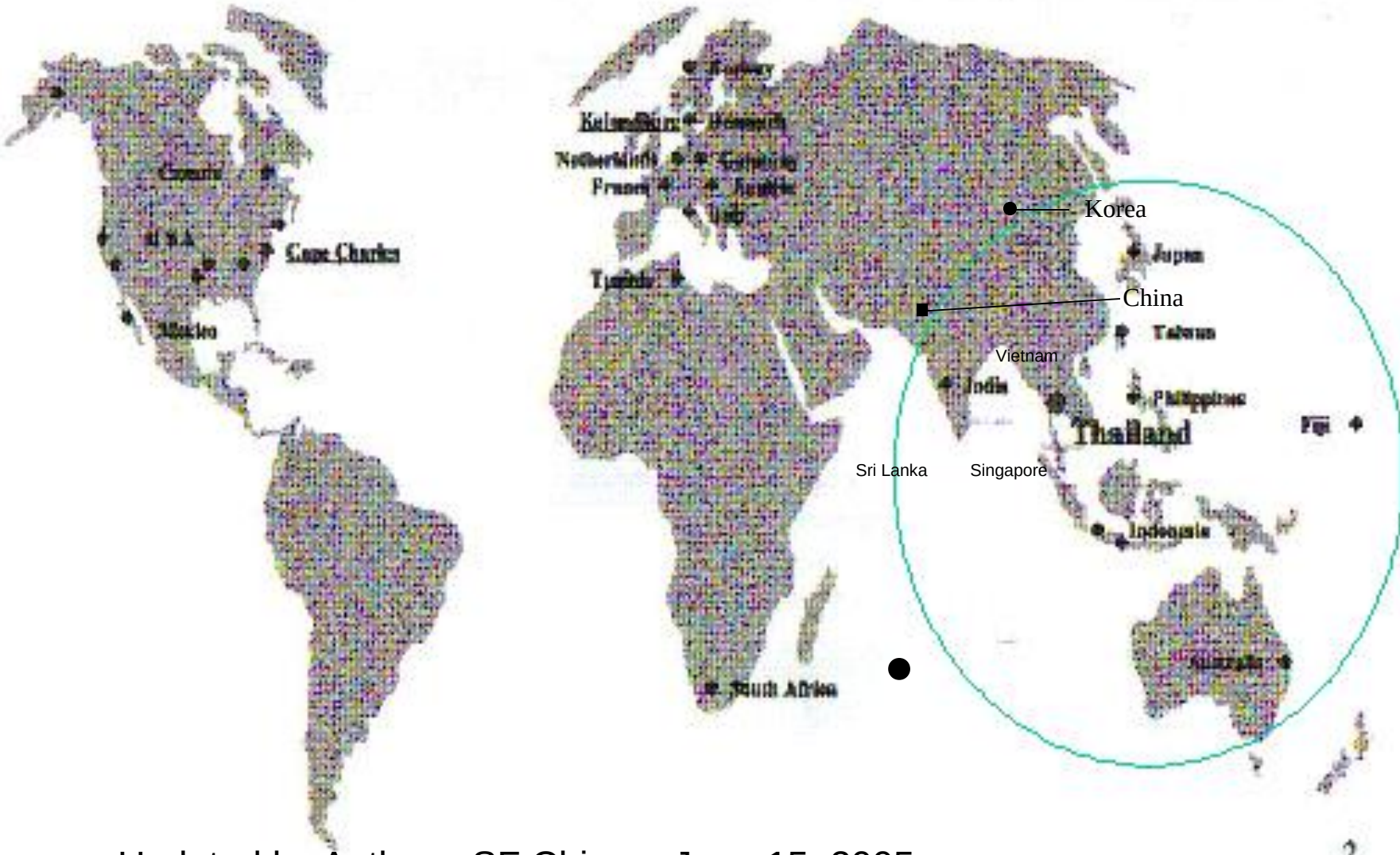
Kalundborg Industrial Symbiosis - Energy Flow



Source: UNEP 2002 (Erkman) 2004 (Chiu)

Eco- Industrial Initiatives Worldwide



Source: Updated by Anthony SF Chiu on June 15, 2005

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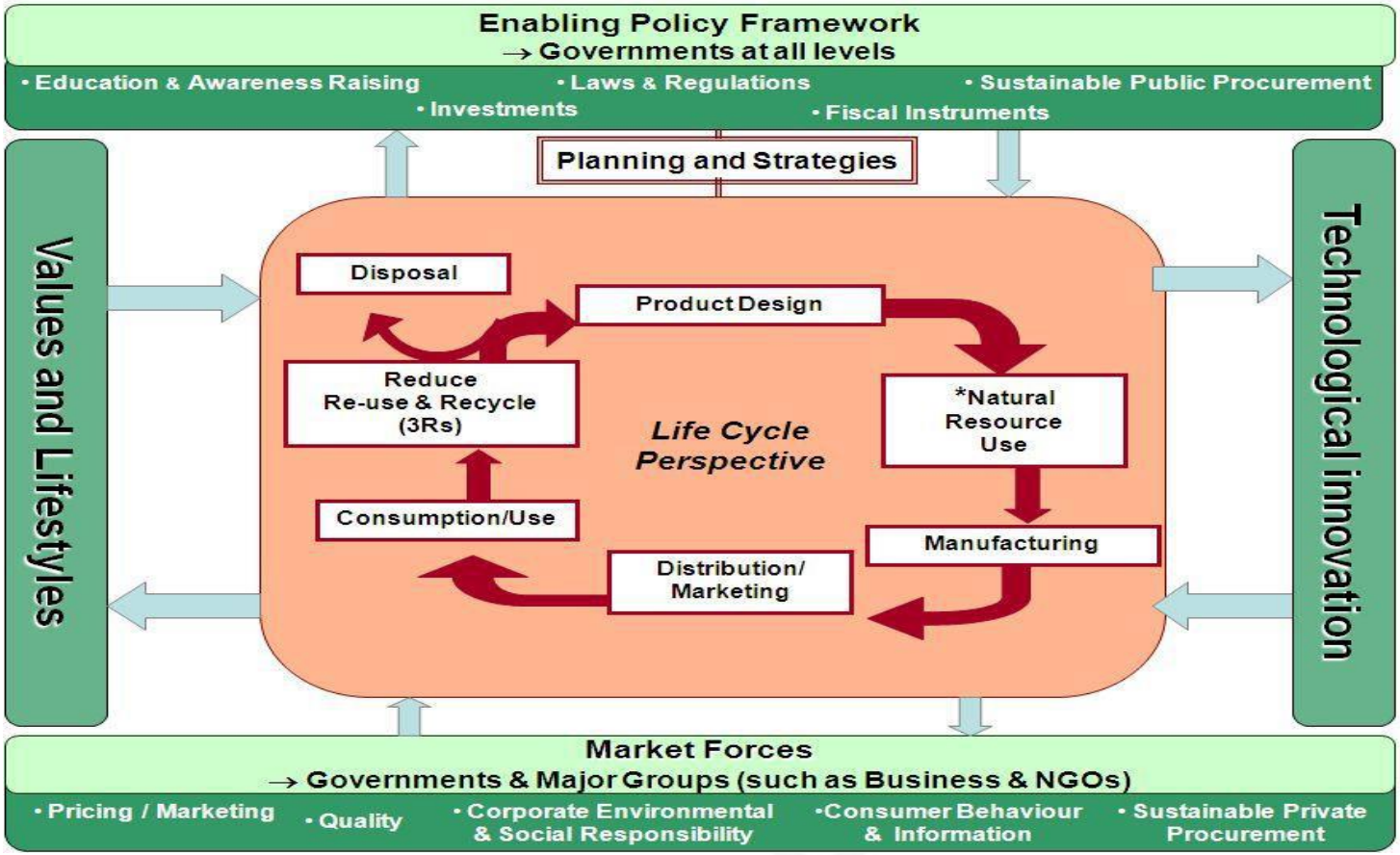
Marrakech Process



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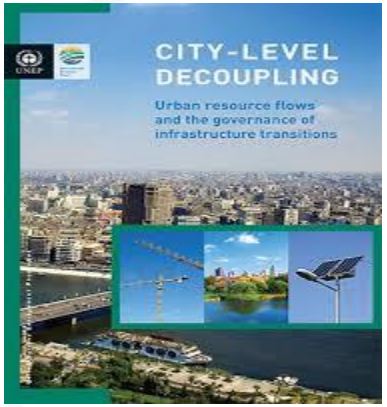
SUSTAINABLE CONSUMPTION & PRODUCTION

URBANIZATION

- Infrastructure
- Transportation
- Housing
- Food system
- Clothing



- IRP CITIES DECOUPLING
- IRP REFURB

10YFP

- Sustainable Public Procurement
- Consumer Information
- Sustainable Tourism
- Sustainable Lifestyle and Education
- Sustainable Buildings and Construction
- Sustainable Food Systems

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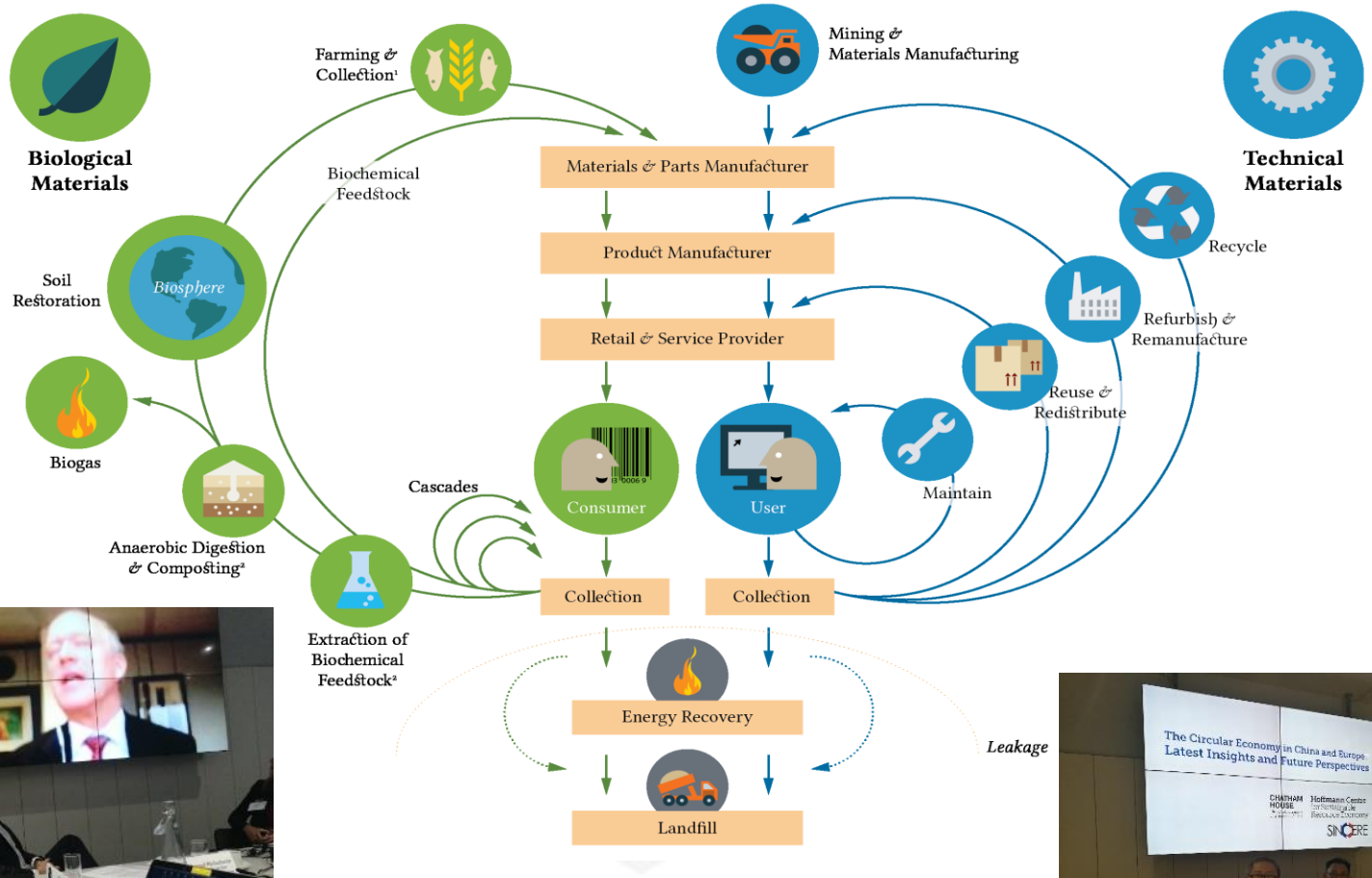
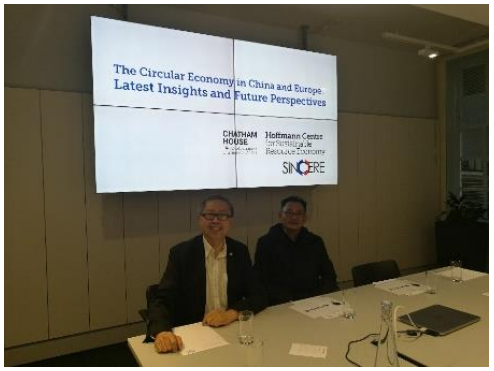
Circular Economy (C2C)

Elleen

MacArthur Fdn





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TO CONCLUDE …

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WE HAVE TO FIX A BROKEN COMPASS

(PAVAN SUKHDEV)

NEW ECONOMIC MODEL BASED ON SCP INTEGRATING ALL THREE PILLARS OF SUSTAINABILITY IS

- ***NECESSARY***
- ***AND UNAVOIDABLE***

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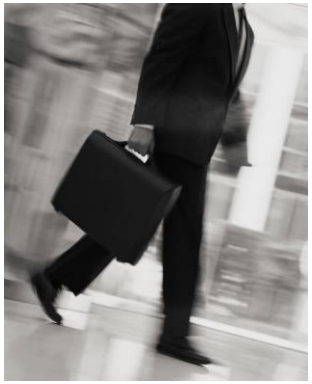
MARKETS

CANNOT ENSURE EFFICIENCY IN THE ALLOCATION AND USE OF RESOURCES …



- *If prices do not reflect the true value and costs of resources,*
- *If rewards to capital are disproportionate to other inputs (finacial capital is overvalued, human capital is undervalued and natural capital in many cases not valued at all),*
- *If managers on annual contracts are induced to make short term investment decisions overly influenced by bonuses based on short term share price, if …*

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Better regulation

is not about less regulation, it is about creating the conditions for confidence to invest in technologies for the markets of the future

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NECESSARY CONDITIONS

1. ***SCP SHOULD BE PRIORITY OF THE GOVERNMENT (NOT ONLY ENV):*** *Defined in the strategic documents, supported by indicators, monitoring, reporting and linked to the core economic policy decisions.*

2. ***ALL ECONOMIC POLICIES SHOULD BE SYSTEMATICALLY ADJUSTED:*** *Beyond GDP, natural capital accounting, corporate sustainability reporting, tax policy, state aid, public procurement, product design, use of banking potential, R and D and innovation, investments in infrastructure, education, consumers awareness, new business models, support to SMS, etc.)*

3. ***ACTIVE DIALOGUE WITH ALL STAKEHOLDERS IS NECESSARY:*** *Transition is only possible if we actively involve those loosing in the process of transition*

SCP Roadmap: Mission Accomplished?

10-Year Framework of Programmes on SCP

Energy, Water, Climate, Basic Needs…

Journal of Cleaner Production 17 (2009) 1237–1240

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journal homepage: www.elsevier.com/locate/jclepro

Introduction to the special issue on Advances in Life-Cycle Approaches to Business and Resource Management in the Asia-Pacific Region

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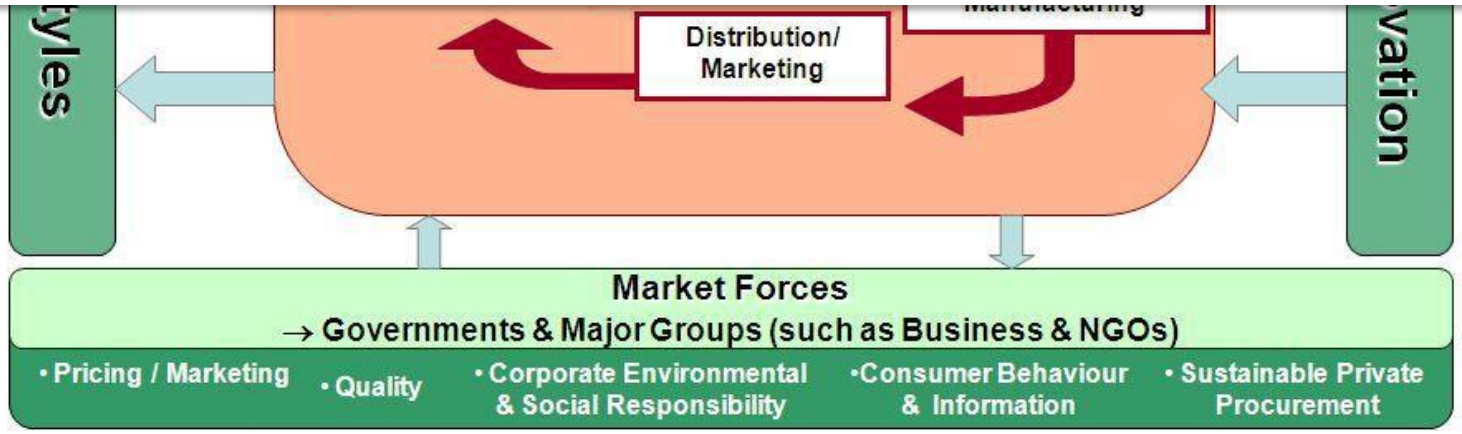
[b] Environmental Policy, Toyota Motor Corporation Australia, Australia
[c] Industrial Ecology Group, Université de Lausanne, Lausanne, Switzerland



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SCP Push-Pull Scenario

SUPPLY

Eco-design
Green Procurement
Circular Economy
RECP
LCA
Technology Progress
Policy Options

DEMAND

Lifestyle
Marketing ads
'Mesolimbic Dopaminergic Reward System'
Human needs
Human wants
Human desires

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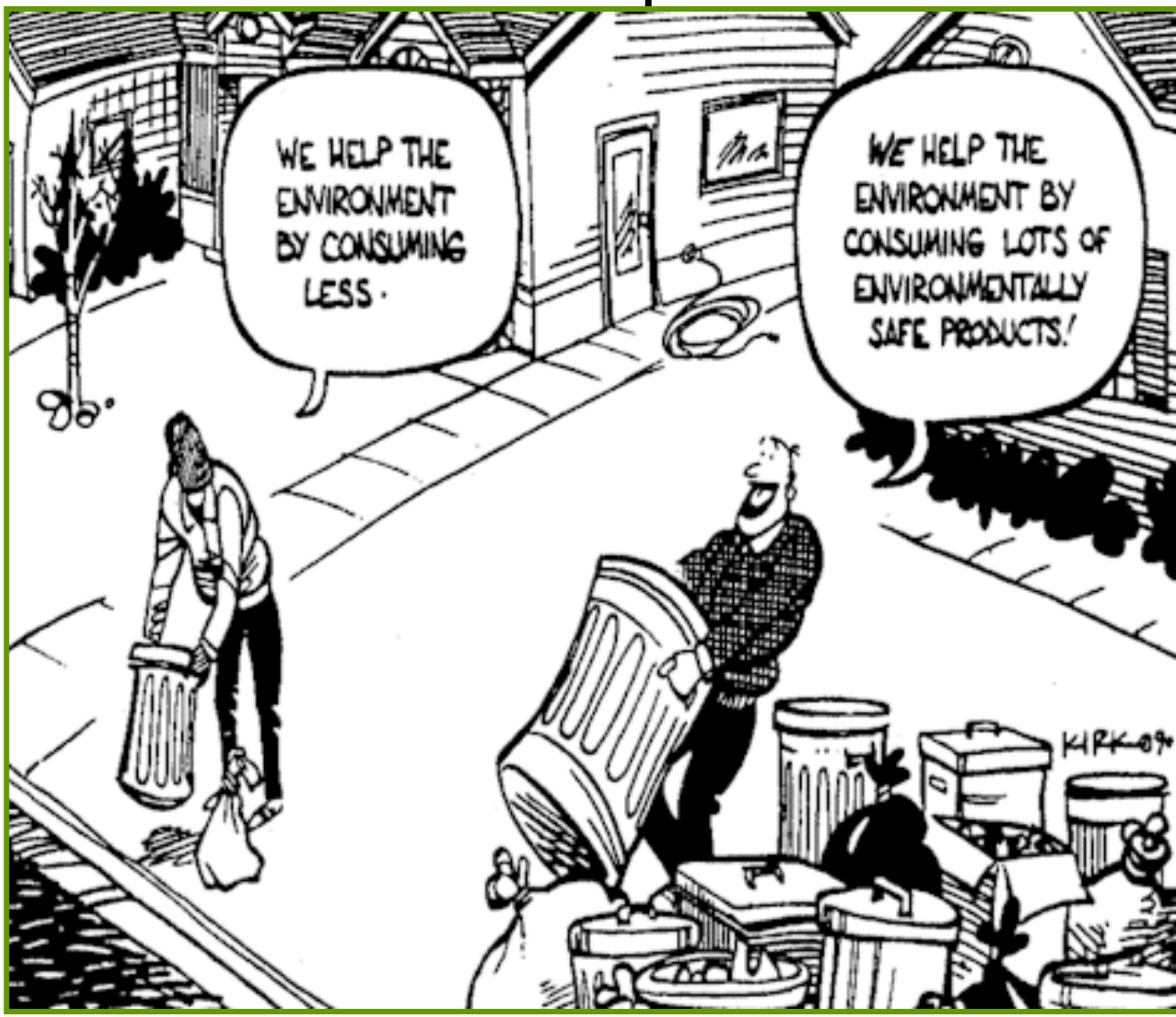
Green vs Sustainable Consumption



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International Resource Panel

Thank you for listening!

Dr. (Anthony) Shun Fung Chiu

University Fellow, Professor, and Research Fellow
JM Reyes Professorial Chair of Industrial and Mechanical Engineering
Don Antonio Cojuangco Professorial Chair of Industrial Technology
De La Salle University, Philippines

Member, Philippines Delegation to UN Summits
Member, Pollution Adjudication Board (2004-2016), Philippines
Regional Executive for Asia Pacific, UNEP-UNIDO RECPNet
Technical Adviser, UNEP-UNIDO Green Industry Platform
Member, United Nations International Resource Panel

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Some photos and animation may be obtained from google searched websites

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