



# Global Material Flows and Resource Productivity

## An IRP assessment report

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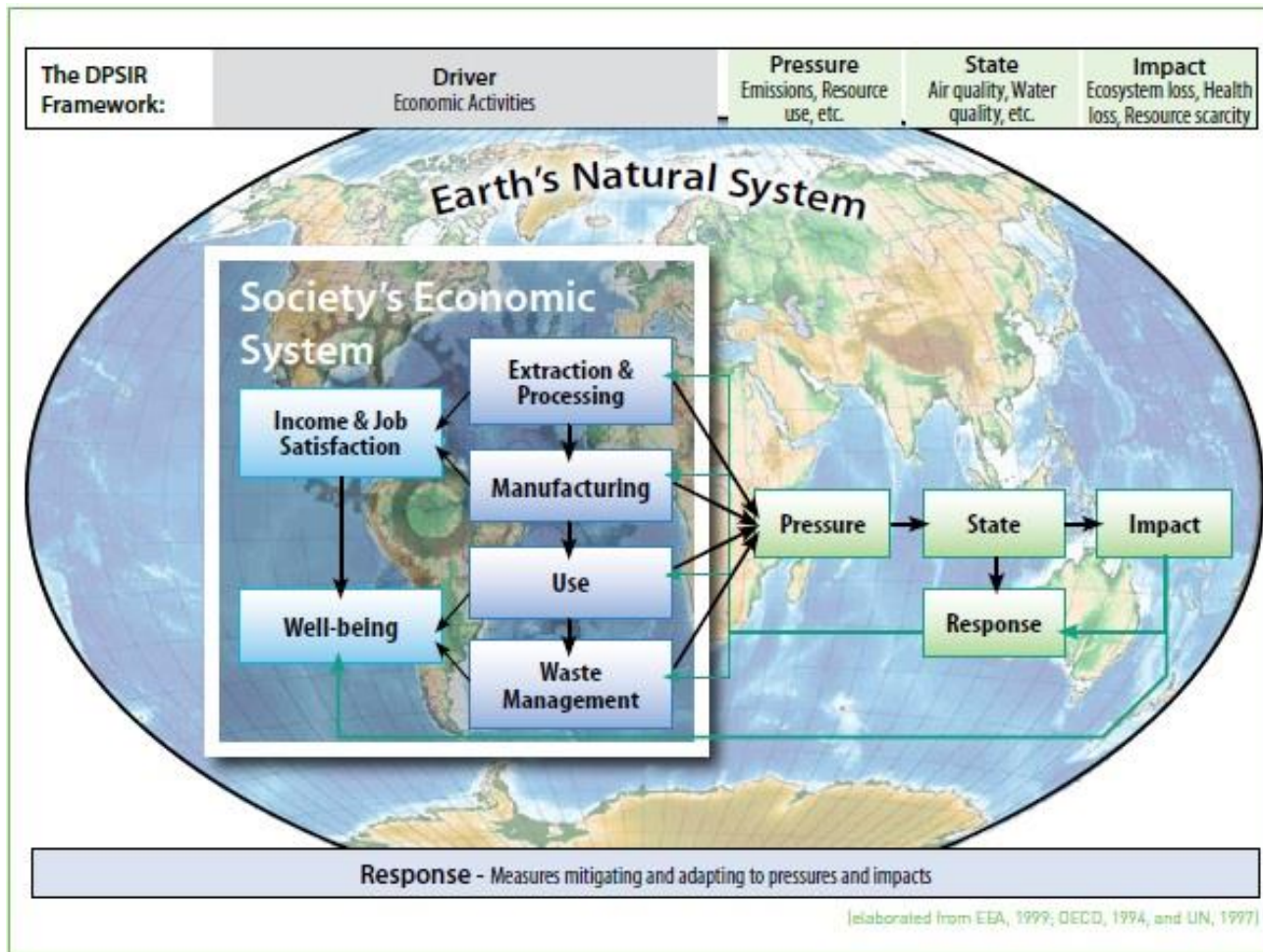
# Is Sweden the most sustainable country in the world?



# Yes says SDG Index of SDSN

- Yes, according to the Sustainable Development Solutions Network (SDSN)
- Index highly correlated with GDP/capita and HDI
- Achieved in the absence of true environmental pressure indicators
- But: Sweden has very high material, energy, water and emission footprints

# DPSIR framework



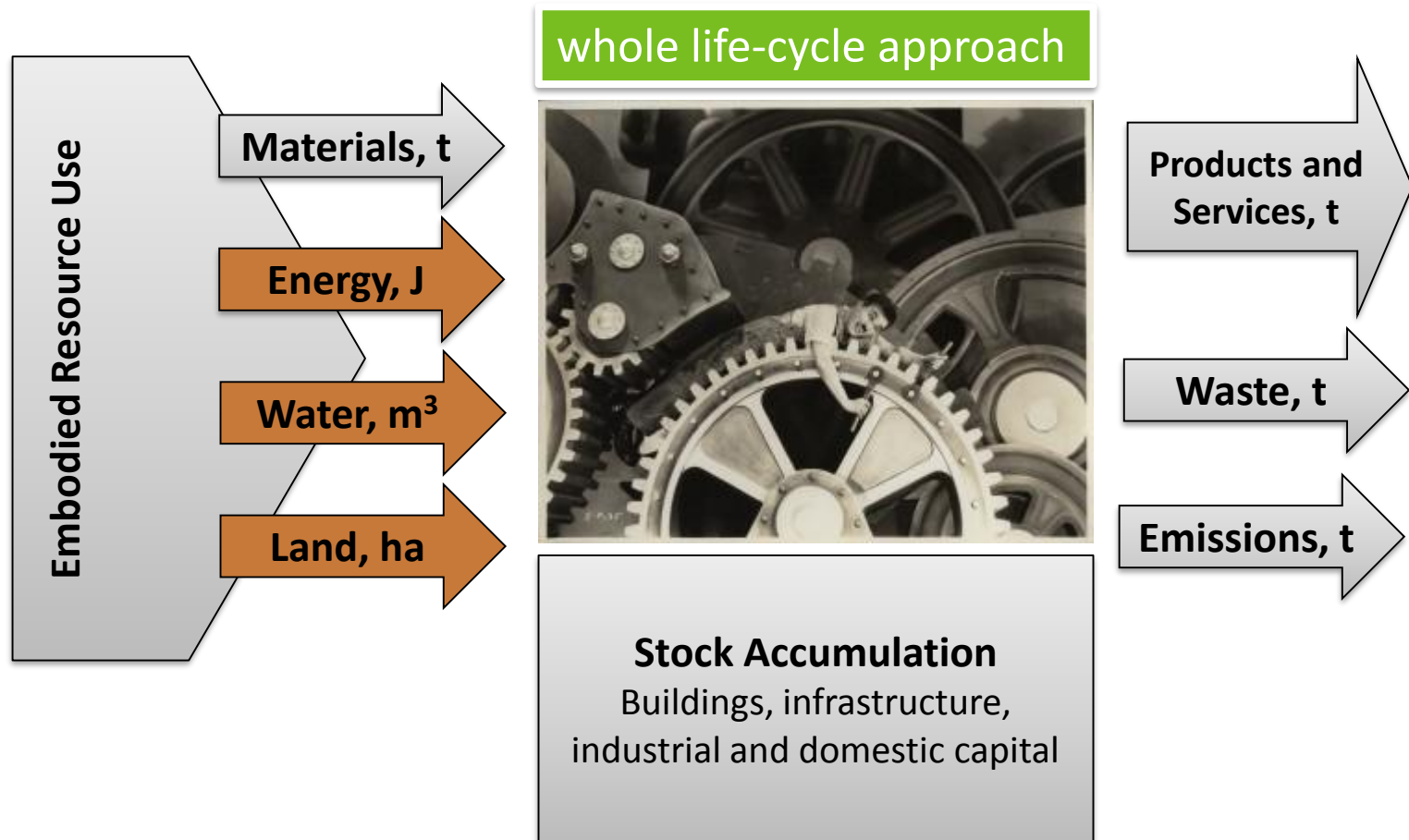
# SDG's in DPSIR framework

	<b>Driving Forces</b> <i>Socio-economic and socio-cultural forces driving human activities</i>	<b>Pressure</b> <i>Stresses that human activities place on the environment</i>	<b>State</b> <i>The condition of the environment</i>	<b>Impact</b> <i>Effects of environmental degradation</i>	<b>Response</b> <i>Policy responses</i>
Goal 1 'POVERTY'	□□□□			□	□□
Goal 2 'HUNGER'	□□□□		□		□□□
Goal 3 'HEALTH'	□□□□□□□□			□	□□□□
Goal 4 'EDUCATION'	□□□□□□				□□□□
Goal 5 'GENDER EQUALITY'	□□□□			□□	□□□
Goal 6 'WATER'	□□	□	□□		□□□
Goal 7 'ENERGY'	□	□			□□
Goal 8 'ECONOMIC GROWTH'	□□□□□	□			□□□□□□
Goal 9 'INFRASTRUCTURE'	□□□□	□			□□□
Goal 10 'INEQUALITY'	□□□□□				□□□□□
Goal 11 'CITIES'	□□□□		□	□	□□□□
Goal 12 'SCP'		□□□□			□□□□□□□□
Goal 13 'CLIMATE'					□□□□□
Goal 14 'OCEANS'		□□	□	□	□□□□□
Goal 15 'ECOSYSTEMS'			□□□□□	□	□□□□□□
Goal 16 'PEACE'					
Goal 17 'PARTNERSHIP'					

Trade-offs between drivers and pressures/impacts

Drivers covered by existing economic and social statistics

# Socio-economic metabolism



# Environmental impacts of economic activities

Problem	Mechanism	Pressures
Climate Change	CO <sub>2</sub> , N <sub>2</sub> O and CH <sub>4</sub>	Energy consumption, land use, material flows
Acidification	SO <sub>2</sub> , NH <sub>4</sub> and NO <sub>x</sub>	Energy consumption, land use
Eutrophication	Bio-accessible phosphorus and nitrogen	Land use
Biodiversity loss	Intensive agriculture and forestry	Land use, material flows, global trade
Soil erosion	Agricultural and forestry practices	Land use
Water protection	Industrial effluents and municipal waste water	Land use, energy consumption
Waste problems	Manufacturing and households	Material flows
Depletion of natural resources	Non-renewable and renewable	Material flows, energy use and land use
Health risks	Toxic substances	Biological activity

# The New UNEP IRP Material Flow and Resource Productivity Data Set

- 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. Direct and consumption-based material flow indicators for seven world regions and for individual countries, covering total usage, per capita use and material use per US\$.
- **Data is available at UNEP Live** <http://uneplive.unep.org/>
- The new information will **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



# 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

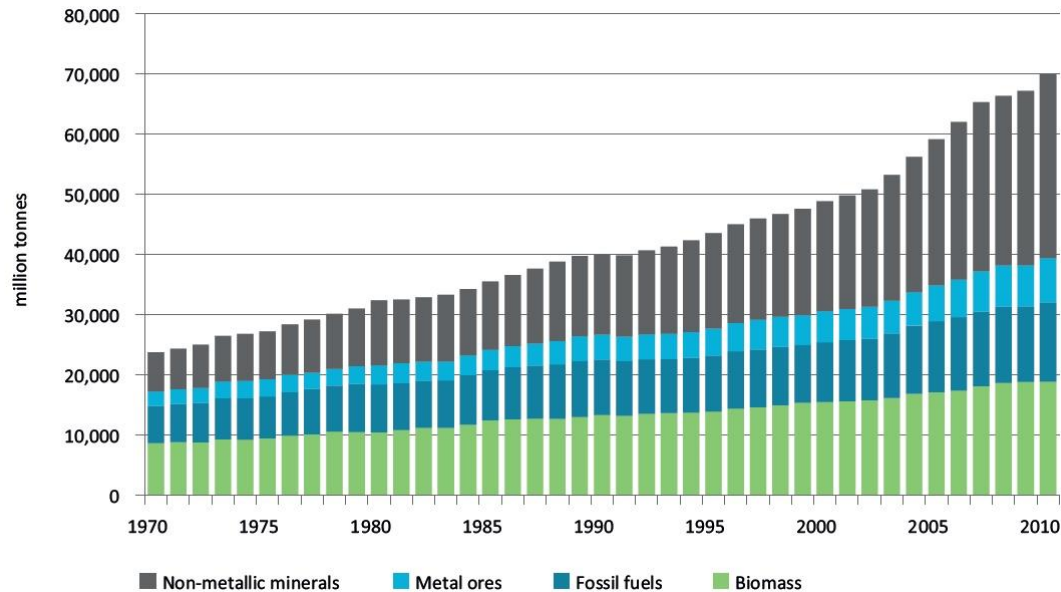


Figure. Global material extraction (DE) by four material categories, 1970–2010, million tonnes

# 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

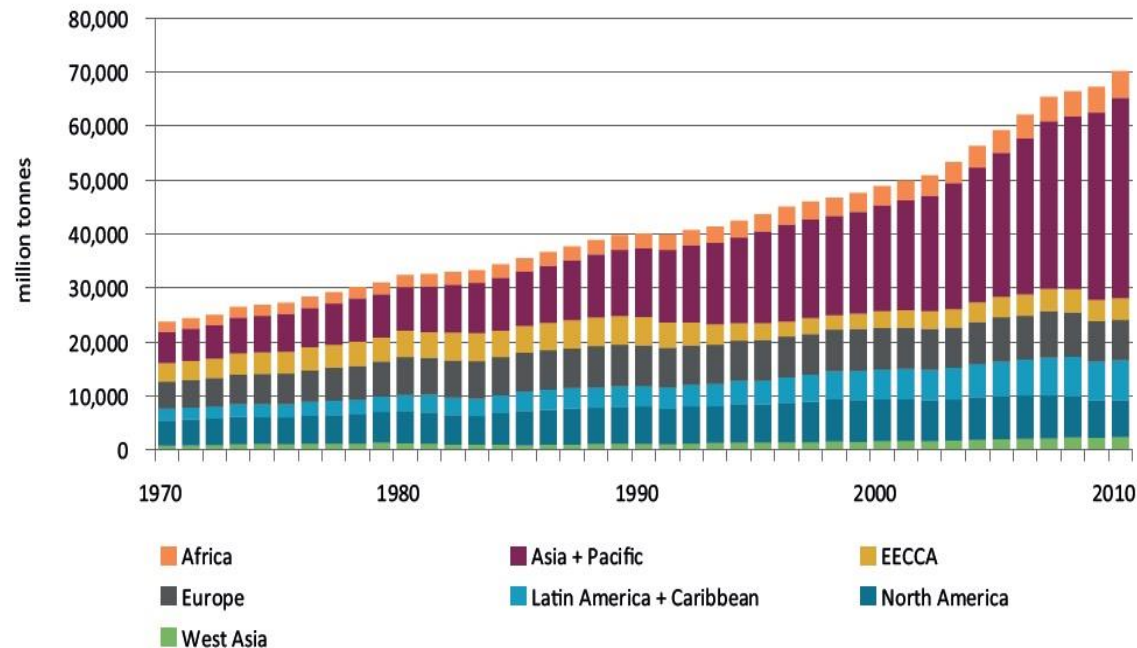


Figure. Domestic extraction (DE) by seven subregions, 1970–2010, million tonnes

# Trade in materials has grown dramatically

- Trade has grown faster than domestic extraction and direct trade in materials has expanded fourfold since 1970
- Per capita global exports of materials doubled from 0.8 tonnes per capita in 1970 to 1.6 tonnes per capita in 2010

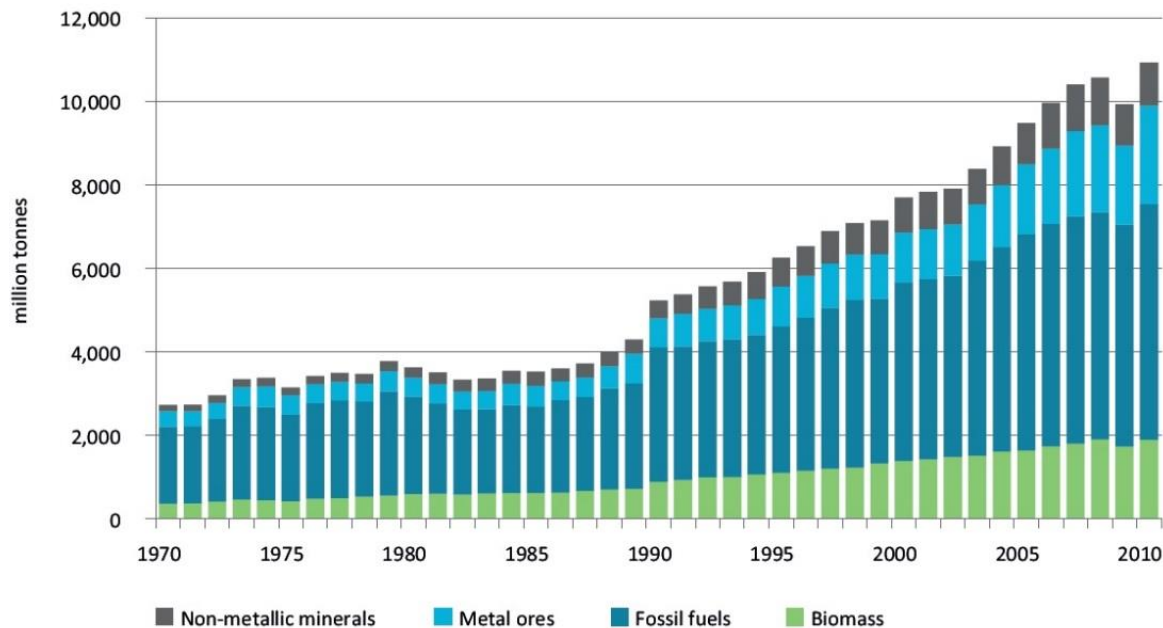


Figure. Global exports of materials by four material categories, 1970–2010, million tonnes

# Trade mobilizes primary materials extraction

- New indicator raw material equivalents of imports and exports show that trade mobilizes much greater amounts of materials than direct traded flows indicate
- In 2010, 30 billion tonnes of materials extracted globally were required to produce 10 billion tonnes of directly traded goods

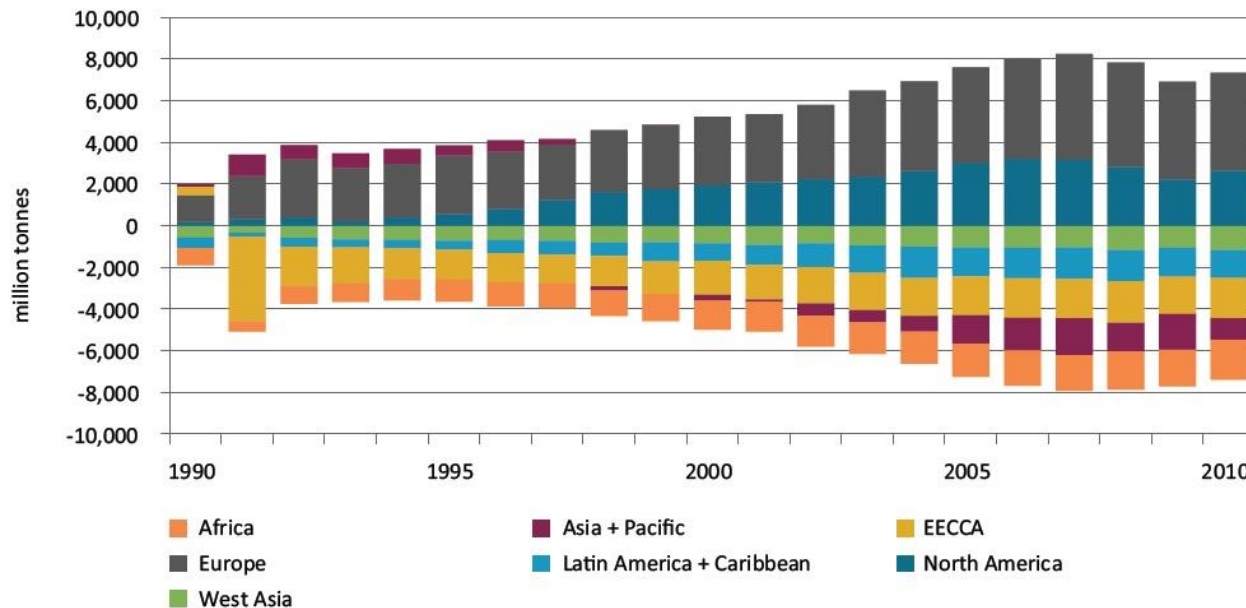


Figure. Raw material trade balance (RTB) by seven subregions, 1990–2010, million tonnes

# Consumption is driving global material use

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

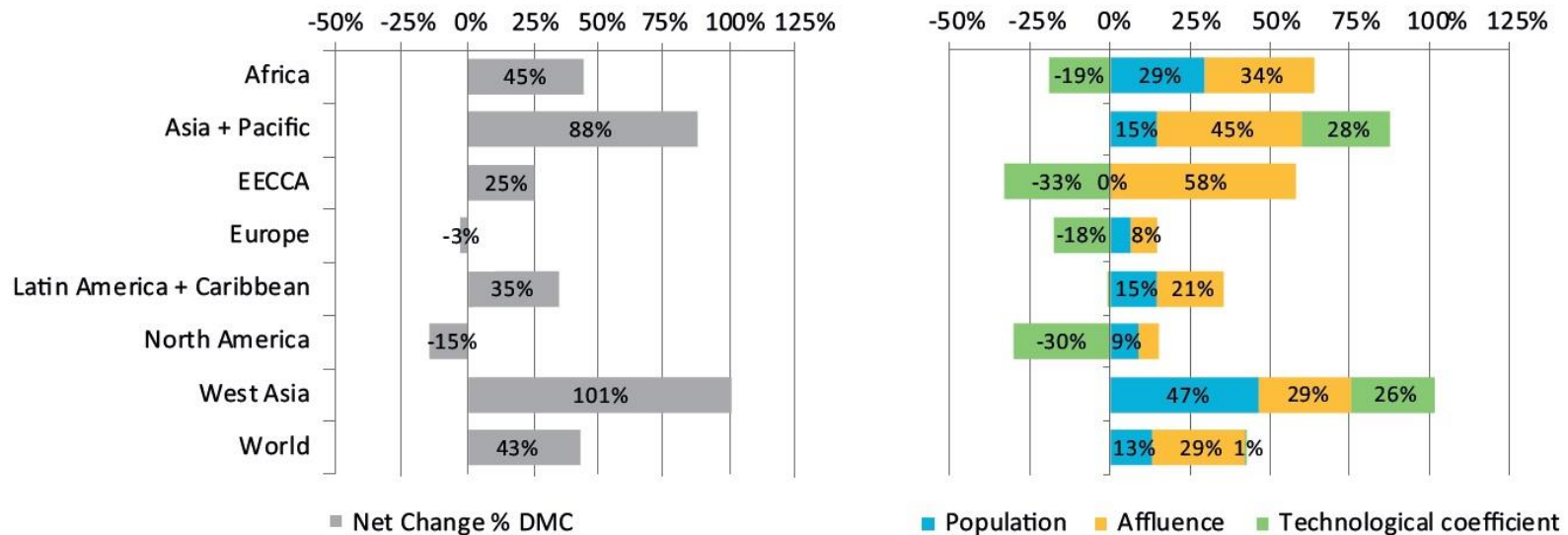


Figure. Drivers of net change in domestic material consumption between 2000 and 2010 for world regions: population, affluence, and material intensity

# The richest countries consume on average 10 times as many materials as the poorest countries

- The average material footprint of countries with medium levels of human development has grown slowly over the 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

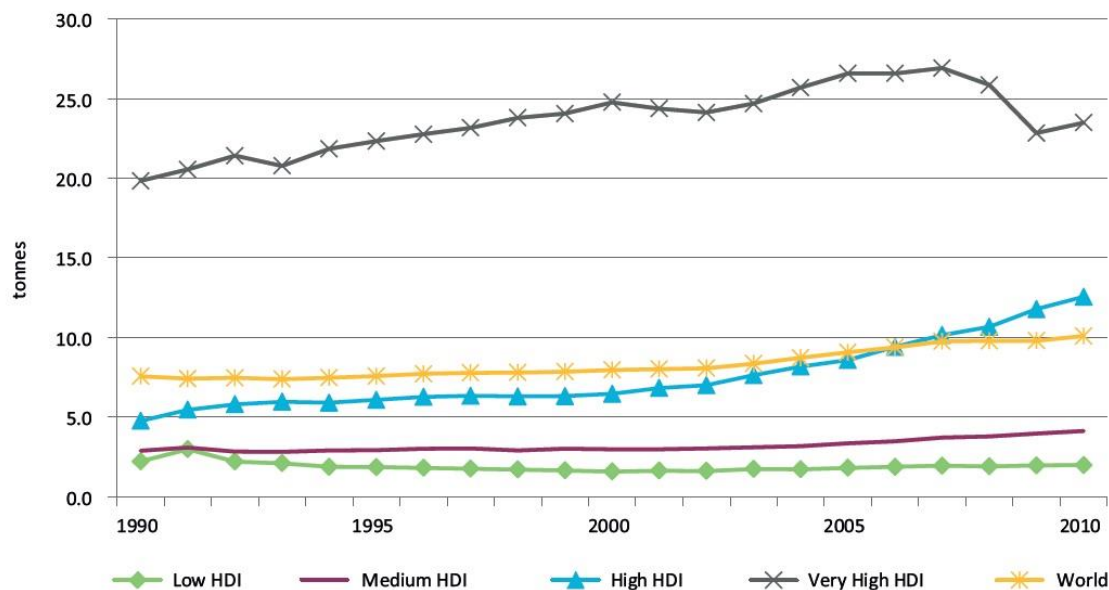


Figure. Per capita material footprint (MF) by HDI level, 1990–2010 (the HDI is a compound index on life expectancy, literacy and income)

# An overall decline in material efficiency

- The global economy now needs more materials per unit of GDP than it did at the turn of the century
- caused by a 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

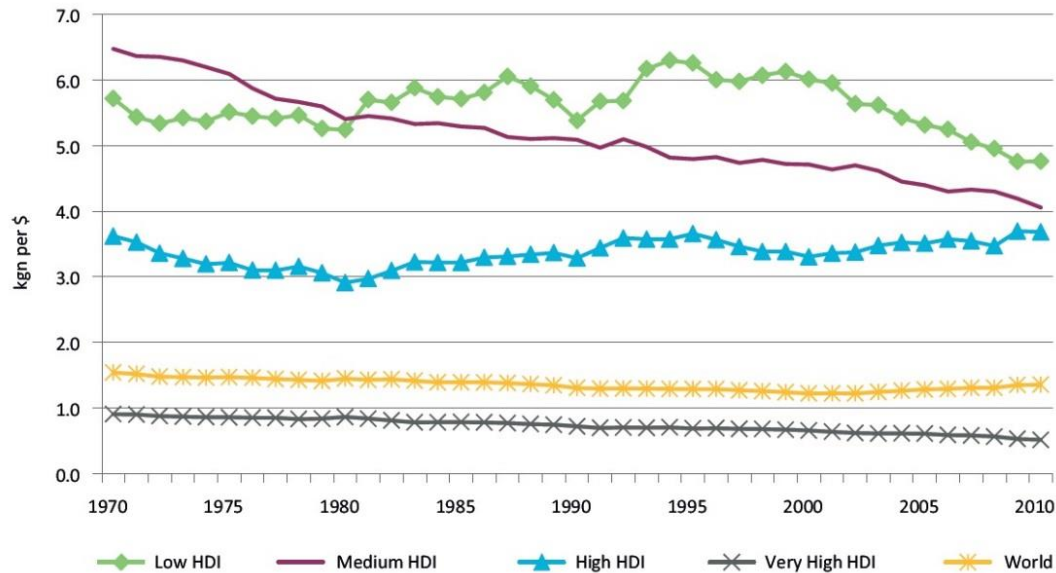


Figure. Material intensity by development status and global material intensity, 1970–2010

## The level of well-being achieved in wealthy industrial countries cannot be generalized globally based on the same system of production and consumption

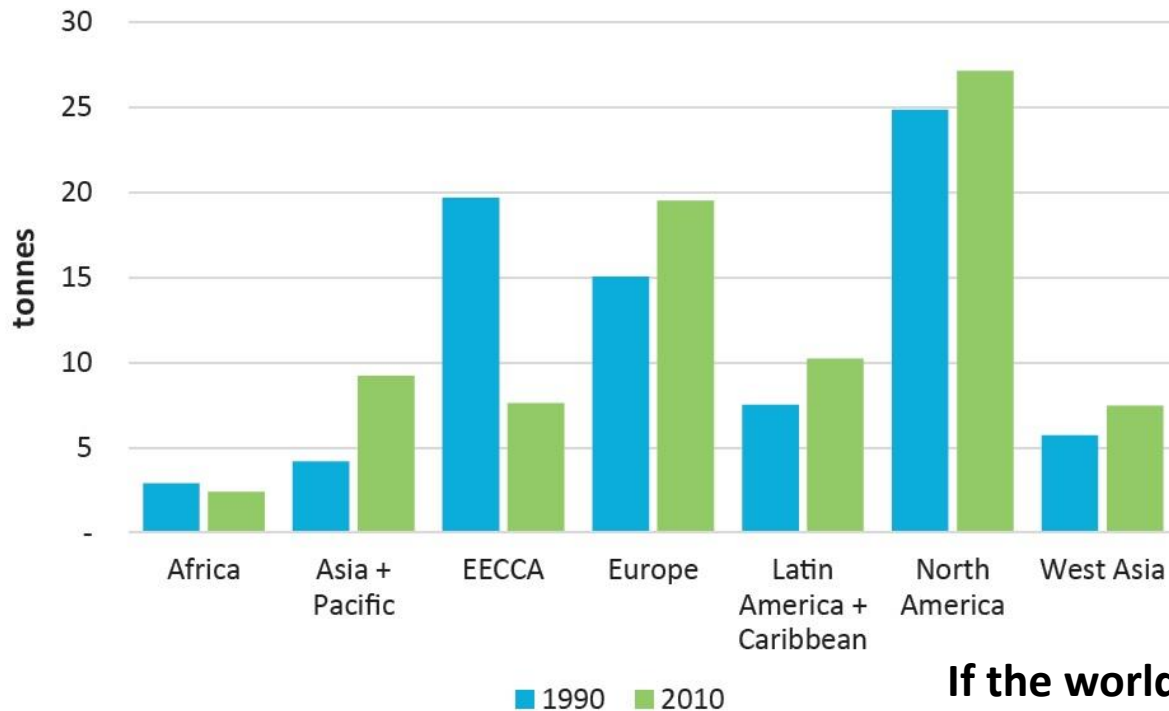


Figure. Per-capita material footprint (MF) by seven world regions, 1990 and 2010, tonnes

**If the world would implement similar systems of production and provision for major services – housing, mobility, food, energy and water supply – nine billion people would require about 180 billion tonnes of materials annually by 2050 (Schandl et al. 2016), almost three times today's amounts.**



# MF and RP indicators endorsed for SDG monitoring

- IRP dataset provides indicators for targets 8.4 'resource efficiency of consumption and production' and 12.2 'sustainable management of natural resources'
- DMC/GDP and MF/GDP indicators for target 8.4
- DMC/capita and MF/capita indicators for target 12.2
- IRP plans indicator waste/capita and waste footprint/capita for target 12.5

# Data base update and institutionalisation of material flow accounts

- Updating the Global Material Flow and Resource Productivity data set (2011-2017)
- Extending the data set (waste and emissions, closing the balance)
- Data underpins the first IRP regular report
- Policy guidance for indicator interpretation and use
- Global UN methods manual
- Capacity building in countries
- Applying modelling capability to explore decoupling and decarbonization policies

# Thank you

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