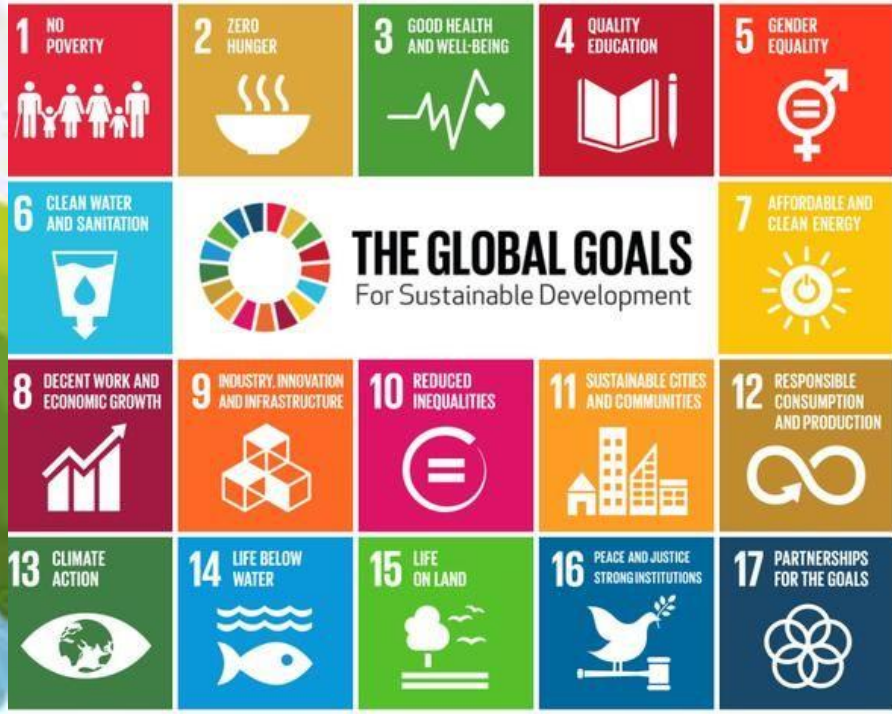



# Contribution of the 3Rs to achieving the Sustainable Development Goals – Science and Policy for the 2030 Sustainable Development Agenda



CSIRO

Presentation at the seventh Regional 3R Forum for Asia and the Pacific
Adelaide 2-4 November 2016

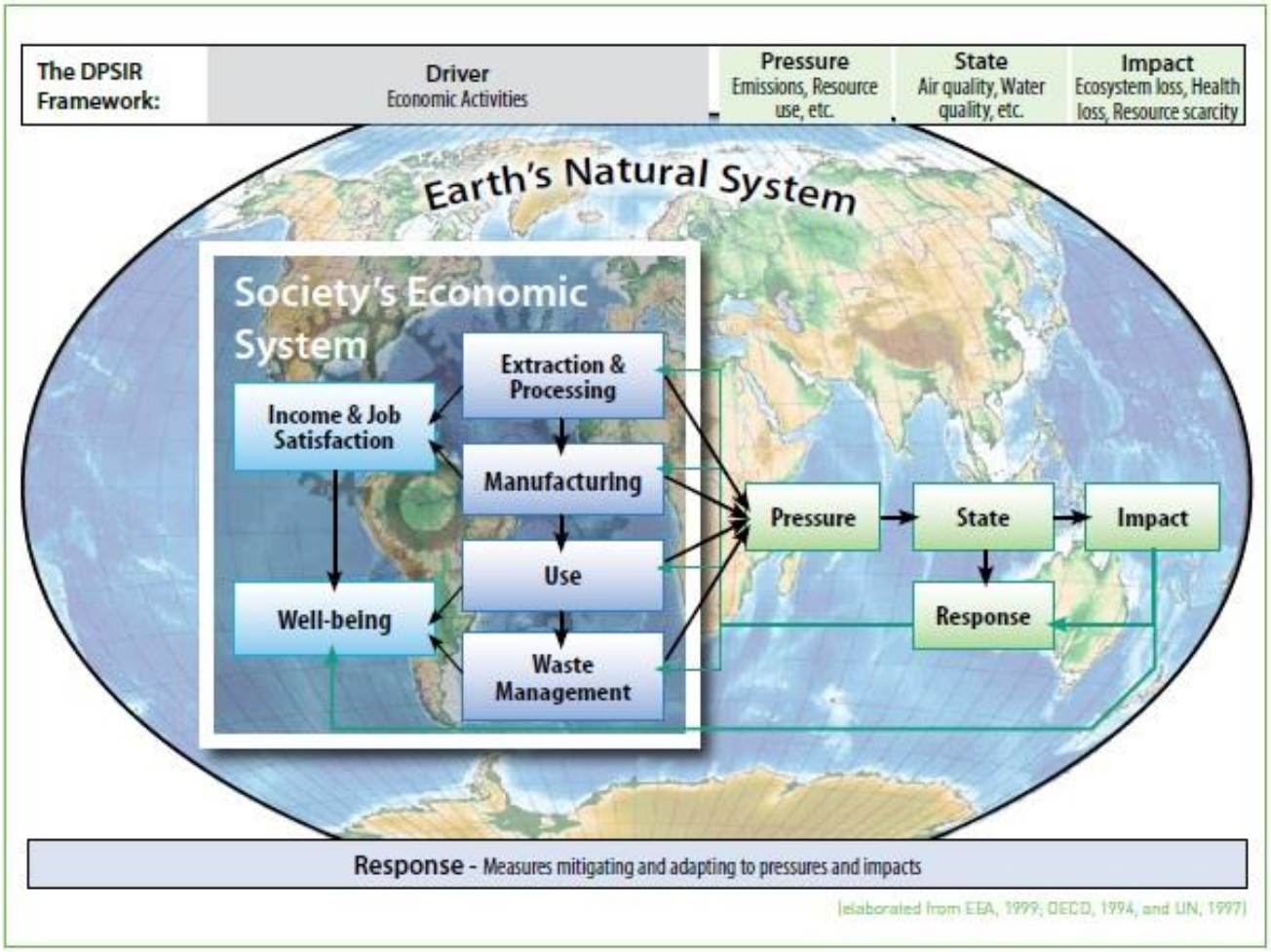
# Informing and supporting the Sustainable Development Goals

# 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

| | **Driving Forces** *Socio-economic and socio-cultural forces driving human activities* | **Pressure** *Stresses that human activities place on the environment* | **State** *The condition of the environment* | **Impact** *Effects of environmental degradation* | **Response** *Policy responses* |
|---|---|---|---|---|---|
| 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

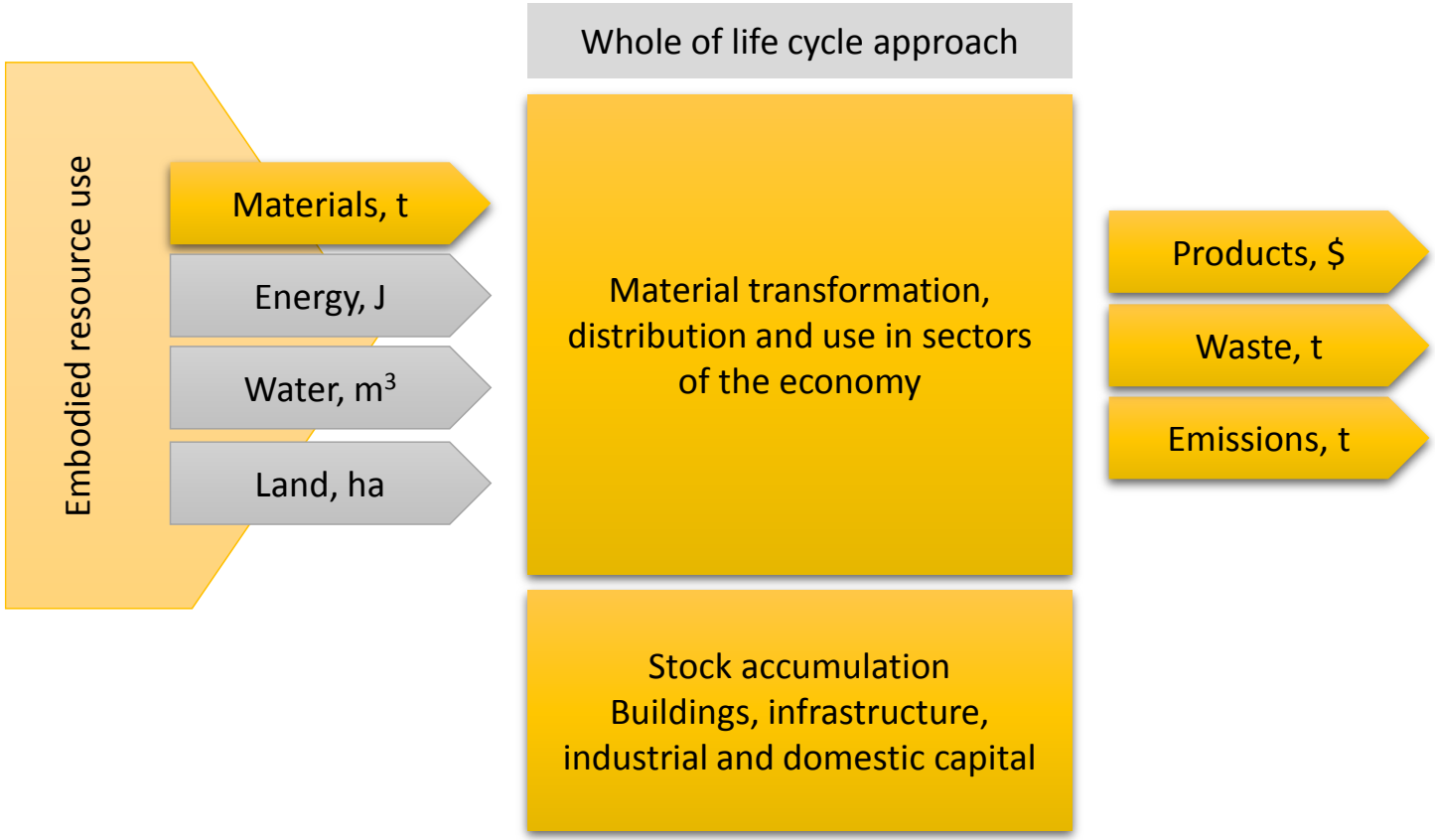
Drivers covered by existing economic and social statistics

# SCP, the 3R's and decoupling of economy, wellbeing and resource use waste and emissions

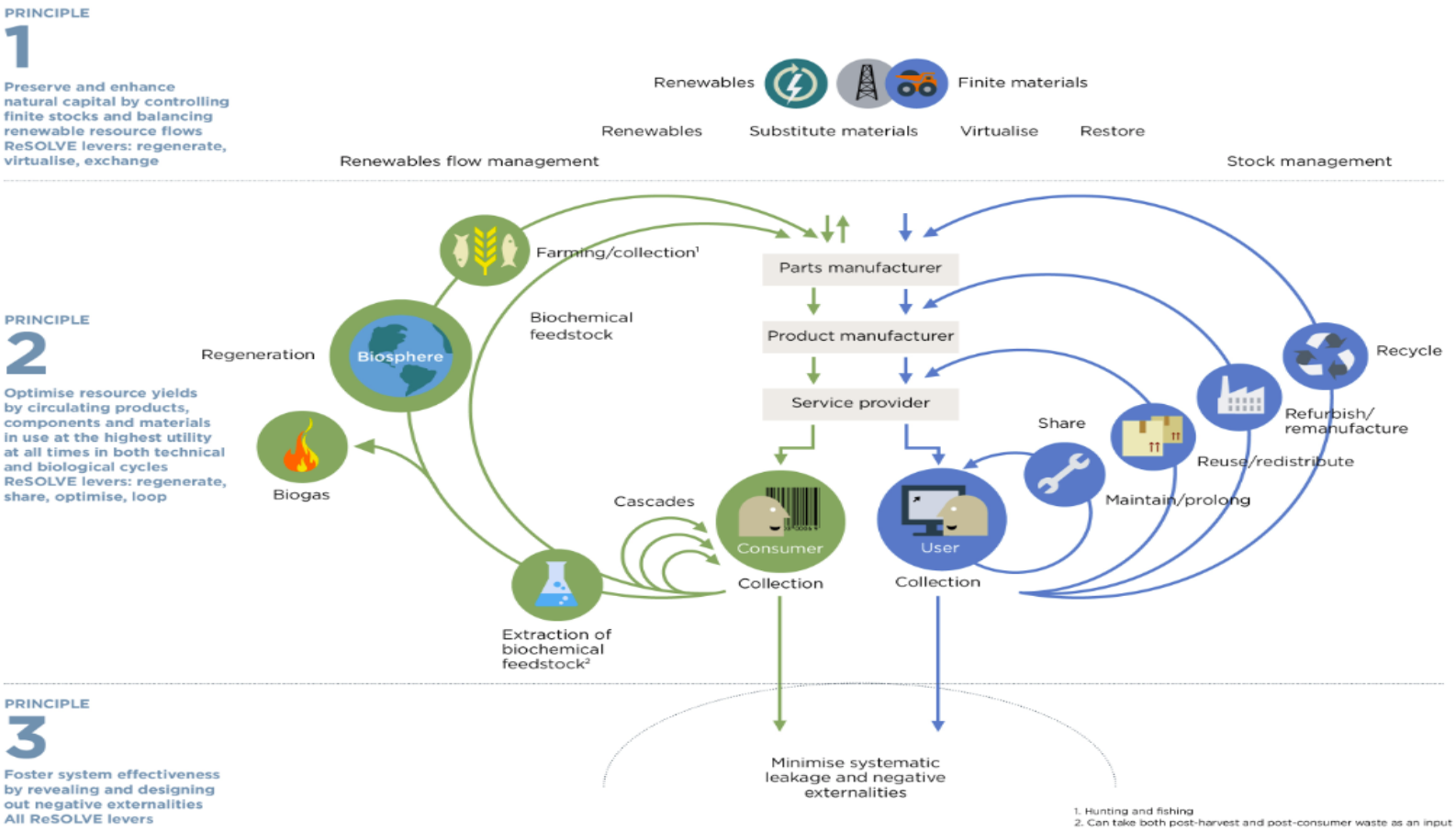
- **Sustainable Consumption and Production (SCP)** is the most efficient strategy to avoid trade-offs and create synergies to resolve the development and environmental challenges articulated in the SDGs.
- It is possible for **economic growth to continue while reducing natural resource use and environmental impacts** in relative or absolute terms;
- In the short term there are many cost-effective opportunities for greater resource efficiency that will offset wholly or partially any costs incurred in this decoupling;
- In the medium to long term decoupling will generate higher economic growth than would occur on current trends of inefficient resource use, environmental destruction and climate change.
- **The 3R's directly support SCP and enable decoupling across the whole supply chain.**

# Socio-economic metabolism

## Economy relies on a throughput of materials to create products and infrastructure with waste and emissions as unintended consequences

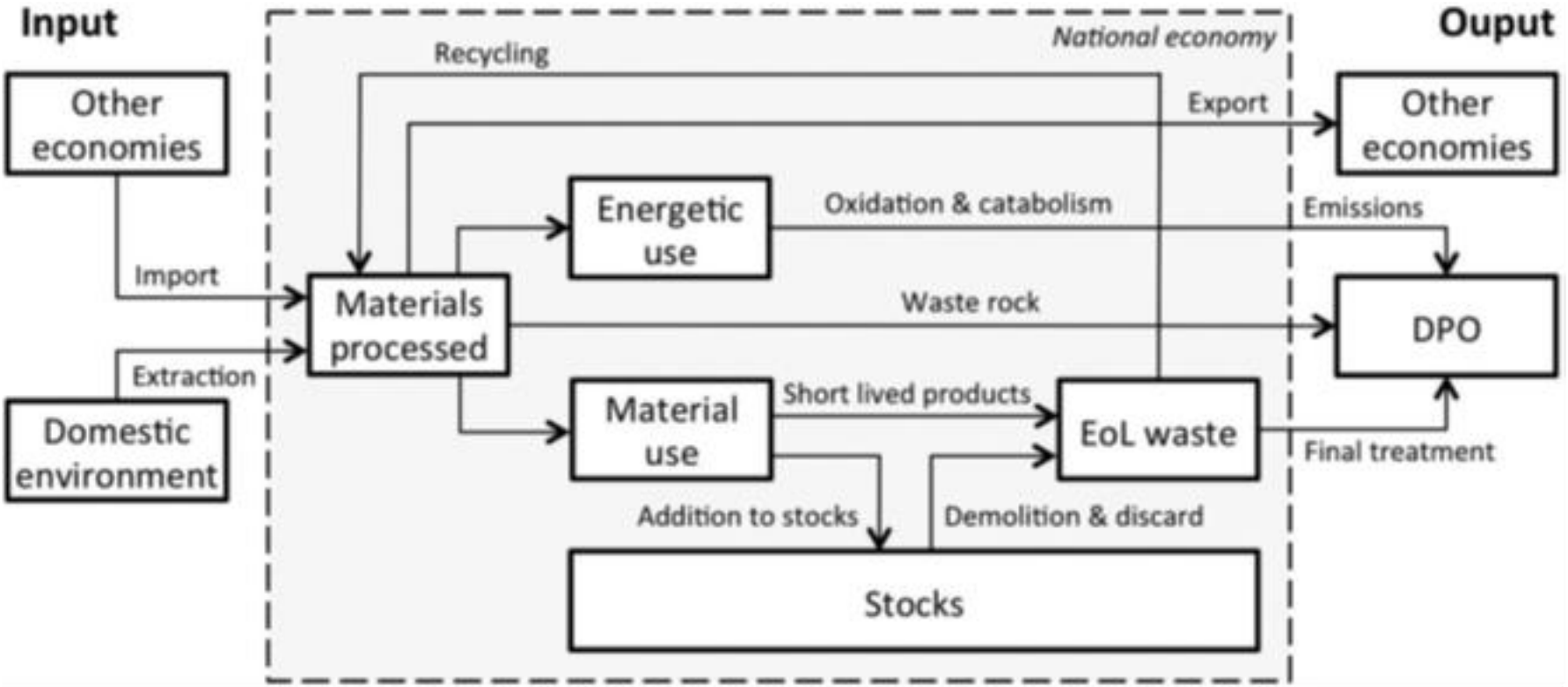


# Circular Economy Framework




Source: Ellen MacArthur Foundation; McKinsey Center for Business and Environment

# Framework for assessing the circularity of the economy




Source: Haas et al. 2015

# Environmental impacts of economic activities

| Problem | Mechanism | Pressures |
|---|---|---|
| Climate Change | $CO_2$, $N_2O$ and $CH_4$ | Energy consumption, land use, material flows |
| Acidification | $SO_2$, $NH_4$ and $NO_x$ | 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 |

# MF and RP indicators endorsed for SDG monitoring

- CSIRO assisted UNEP to get Sustainable Consumption and Production (SCP) goal into the SDG's
- CSIRO helped identify 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
- Planned indicator waste/capita and waste footprint/capita for target 12.5

# Global Material Flows and Resource Productivity

# 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

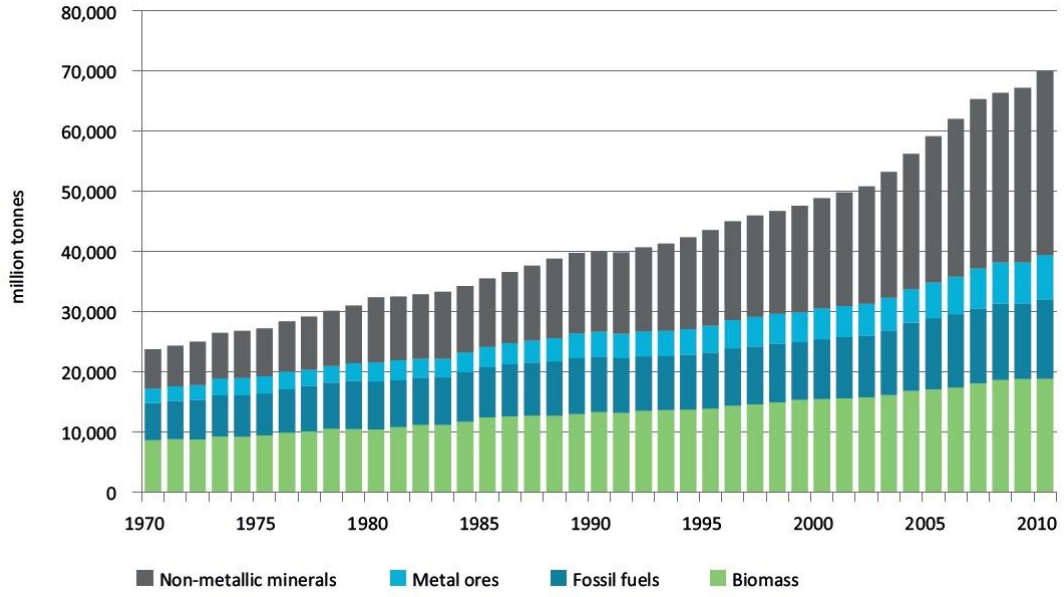



Figure. Global material extraction (DE) by four material categories, 1970–2010, million tonnes

Source: UNEP International Resource Panel 2016

# 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

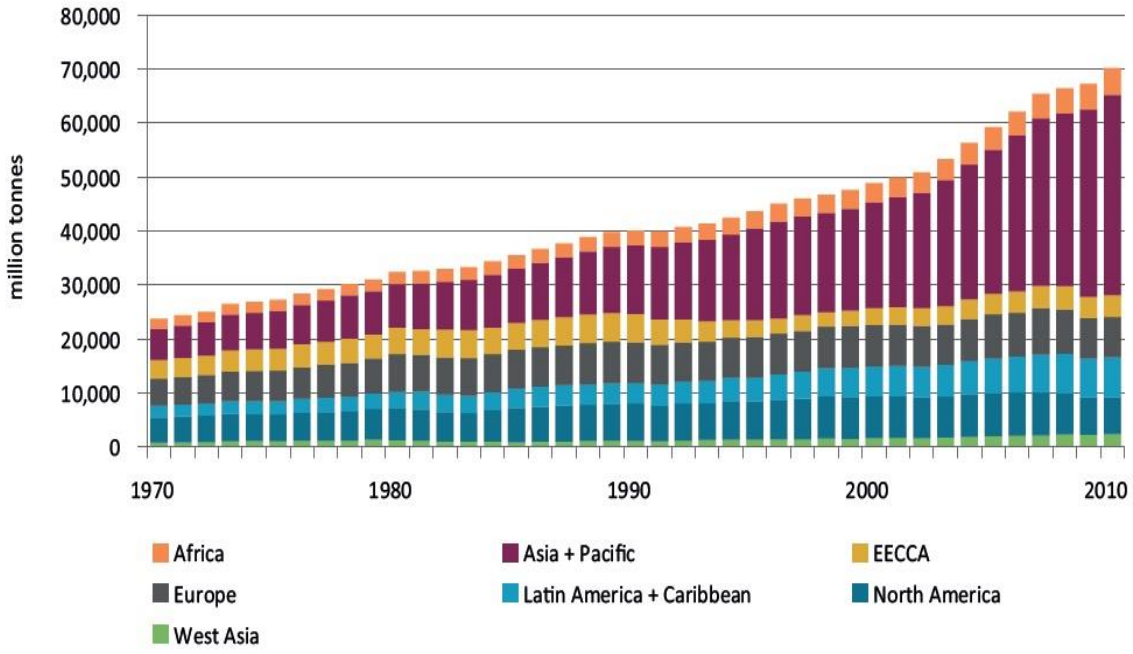



Figure. Domestic extraction (DE) by seven subregions, 1970–2010, million tonnes

Source: UNEP International Resource Panel 2016

# 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

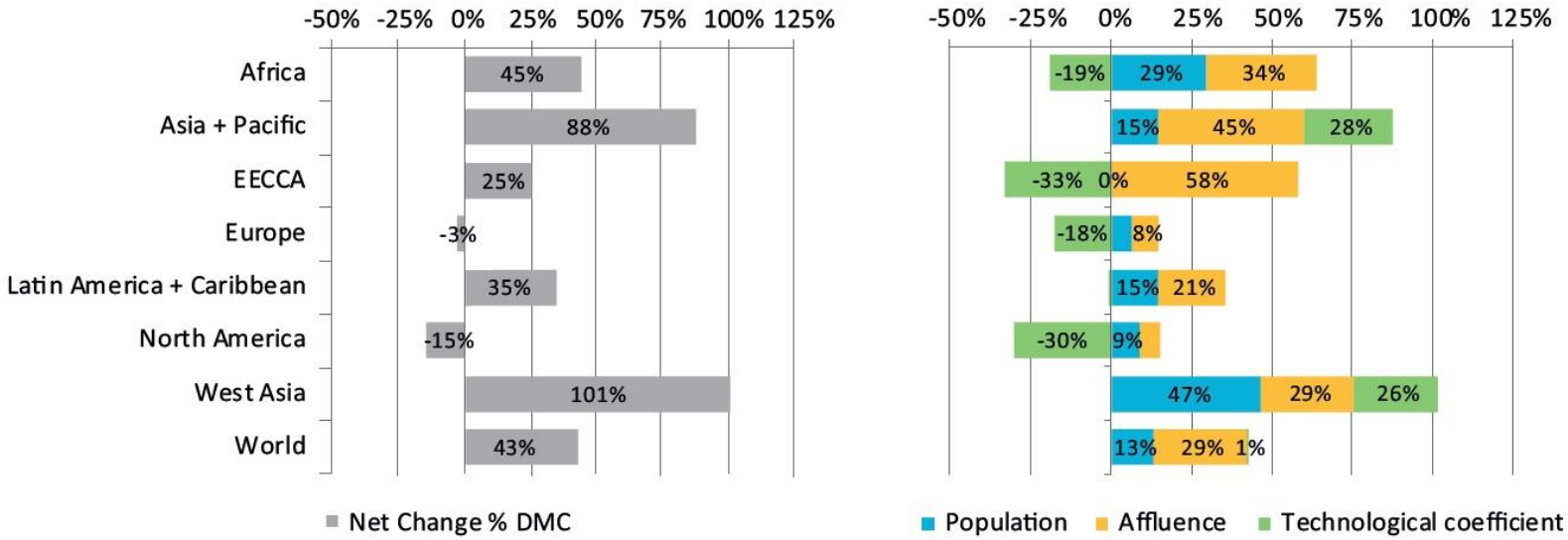



Figure. Drivers of net change in domestic material consumption between 2000 and 2010 for world regions: population, affluence, and material intensity

Source: UNEP International Resource Panel 2016

# 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

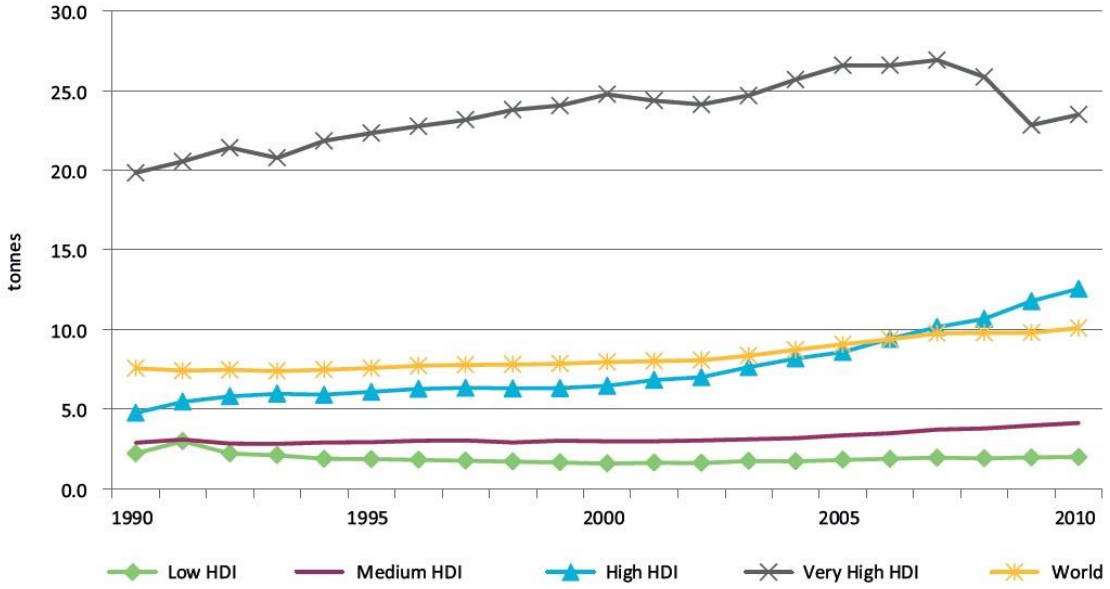
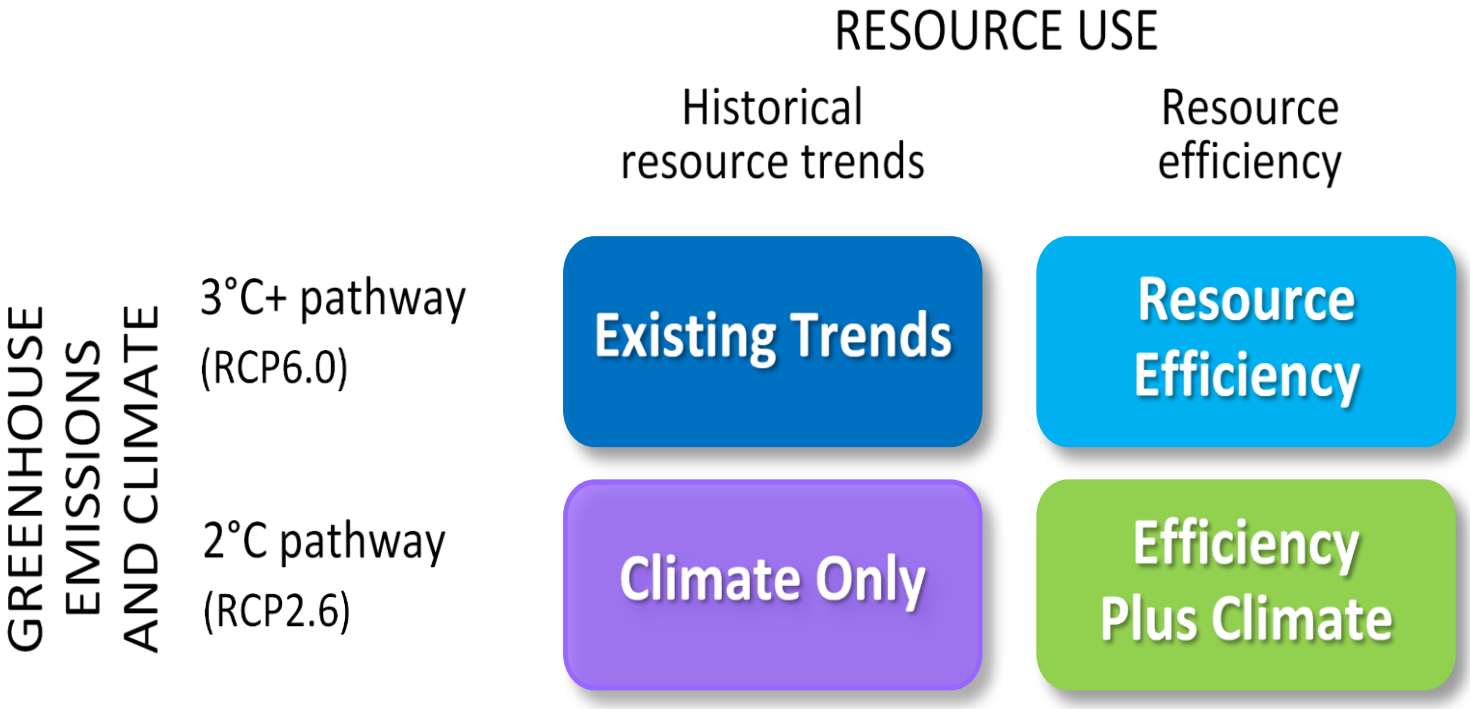



Figure. Per capita material footprint (MF) by HDI level, 1990–2010 (the HDI is a compound index on life expectancy, literacy and income)

Source: UNEP International Resource Panel 2016

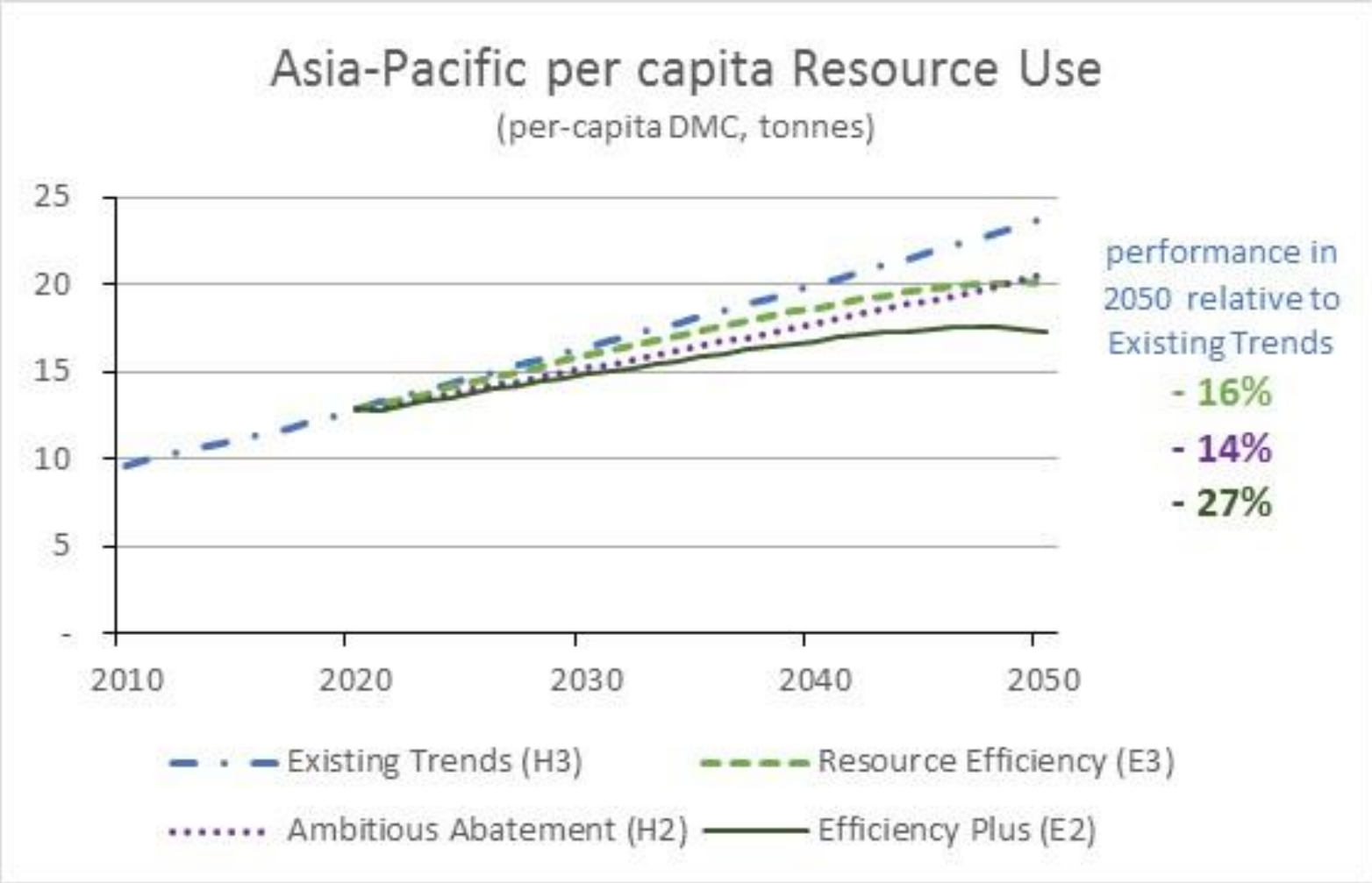
# Modelling of Resource Efficiency and Greenhouse Gas Abatement Policies

# Scenarios for assessing resource and climate futures



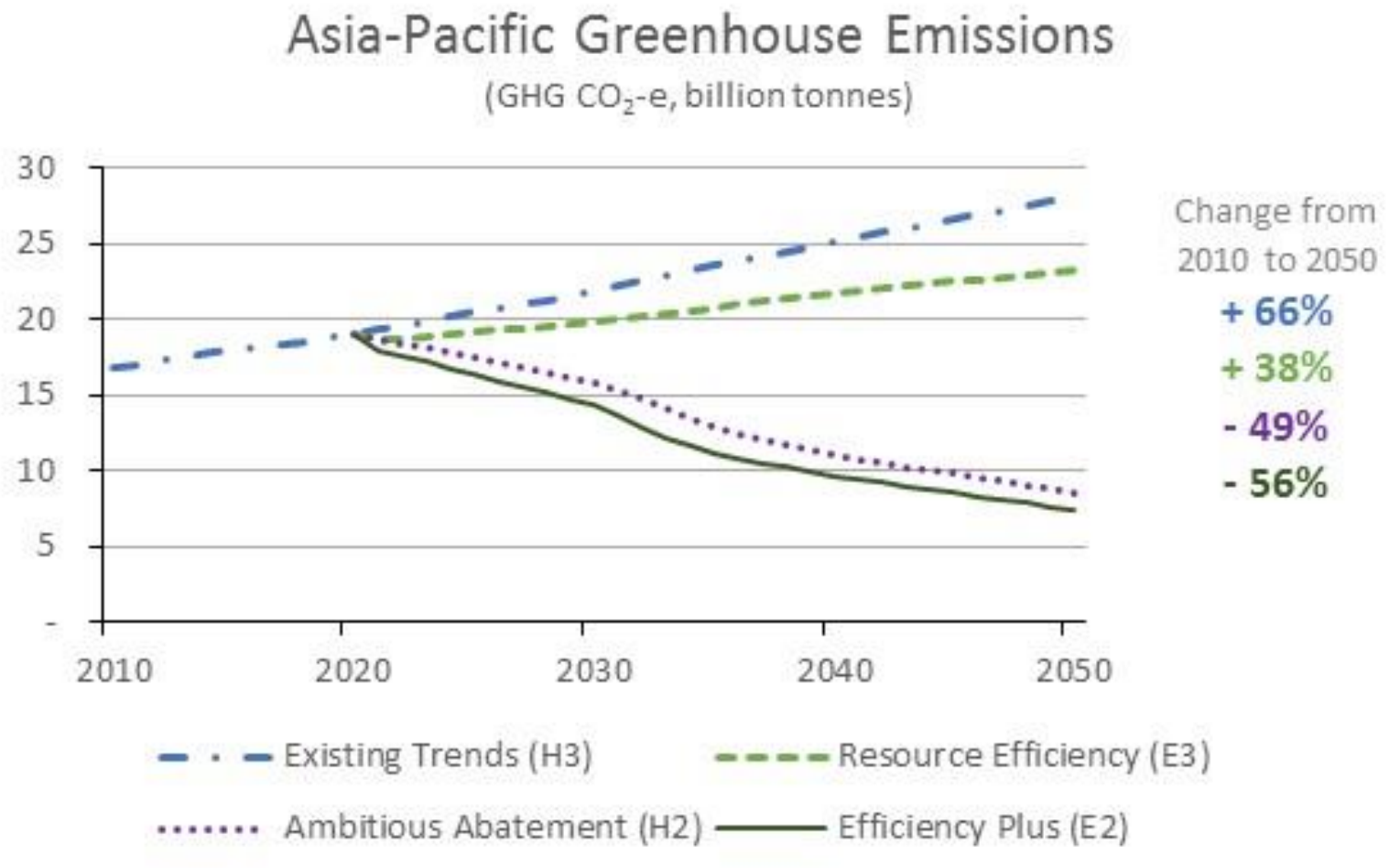

Source: Hatfield-Dodds et al. 2017

# Asia-Pacific resource efficiency and natural resource use



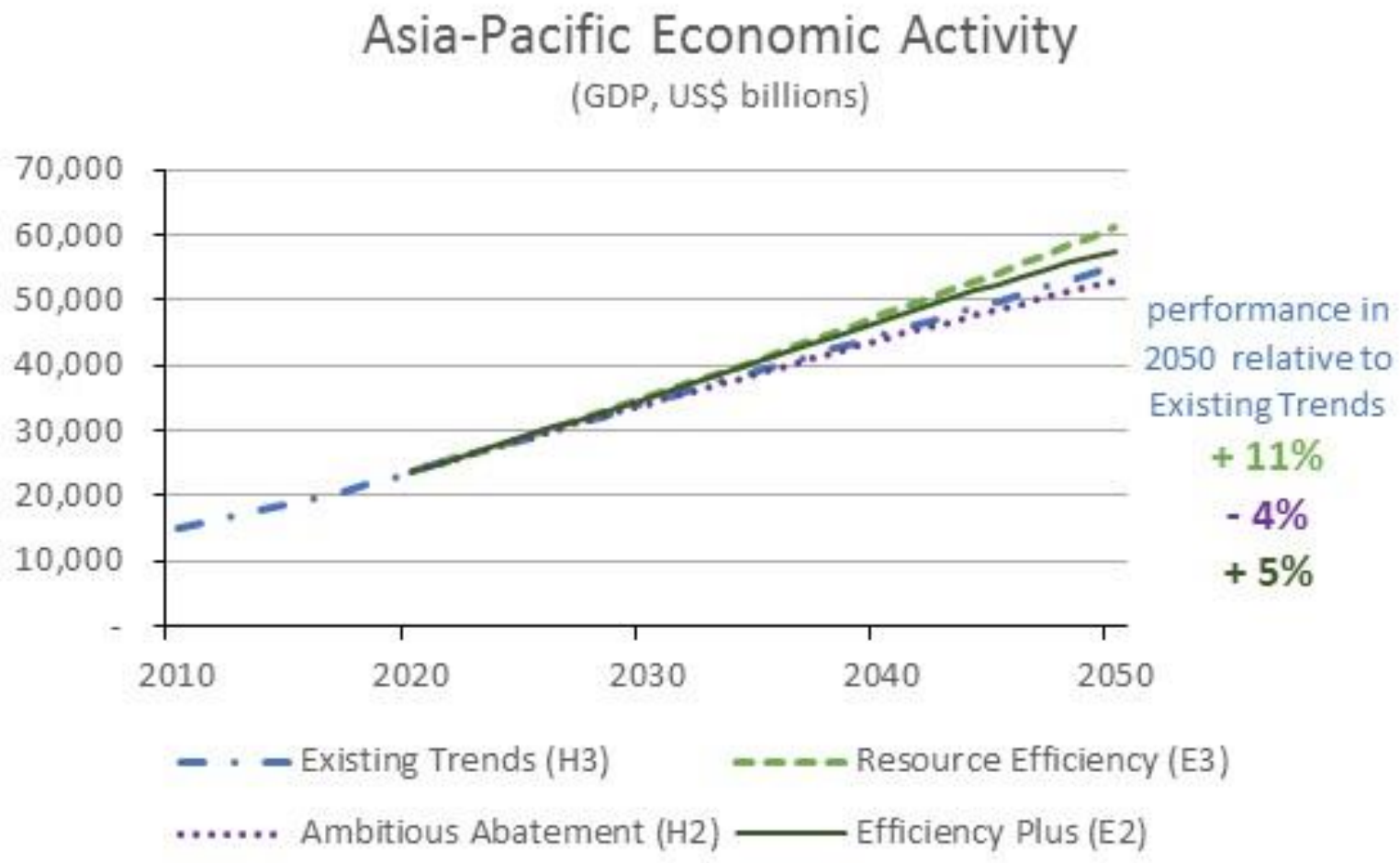

Source: Hatfield-Dodds et al. 2017

# Asia-Pacific greenhouse gas emissions



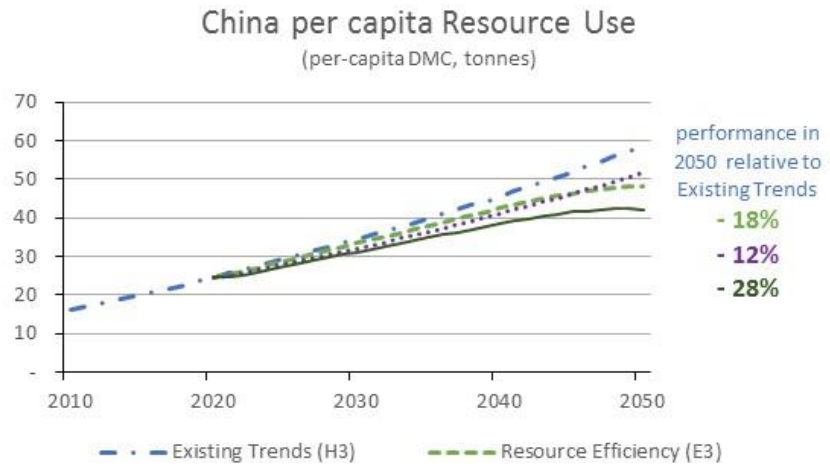

Source: Hatfield-Dodds et al. 2017

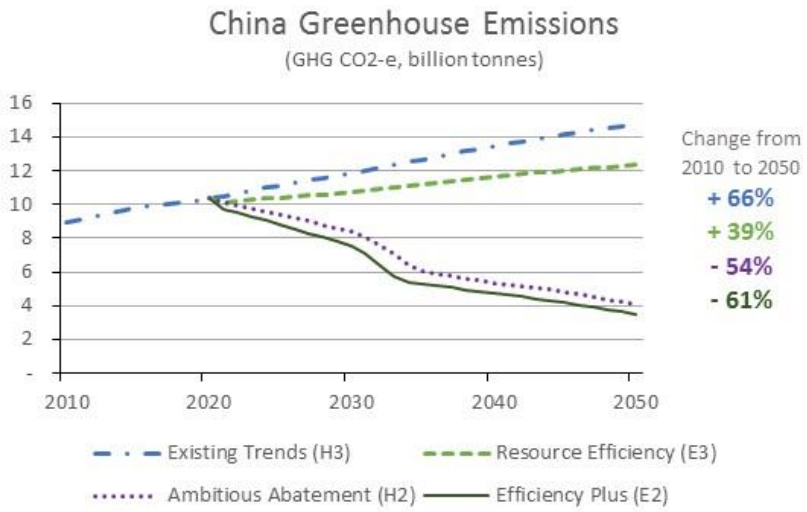
# Asia-Pacific economic performance and synergies

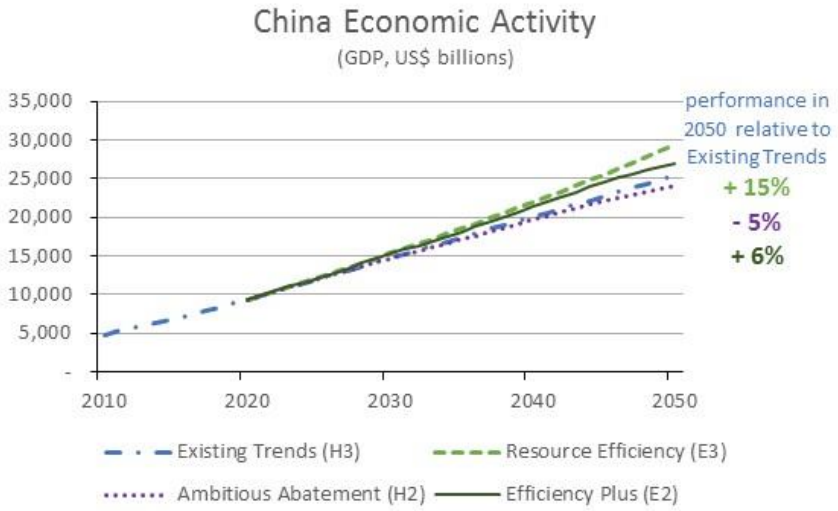



Source: Hatfield-Dodds et al. 2017

# Resource, climate and economic growth in China

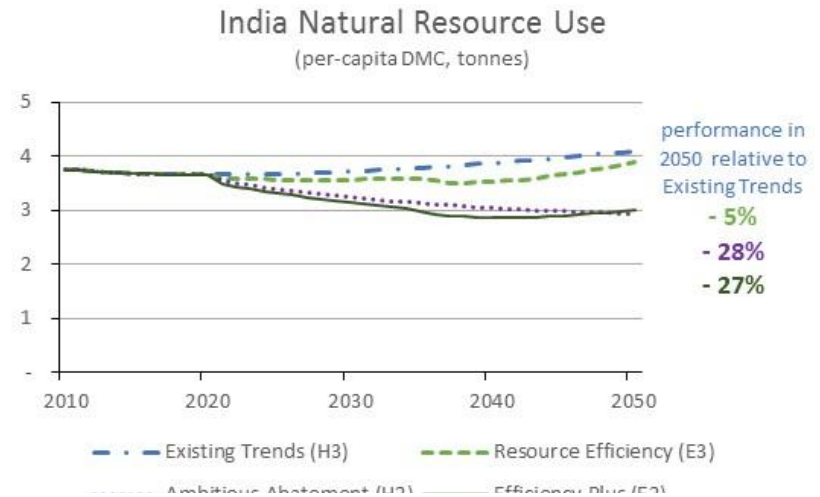


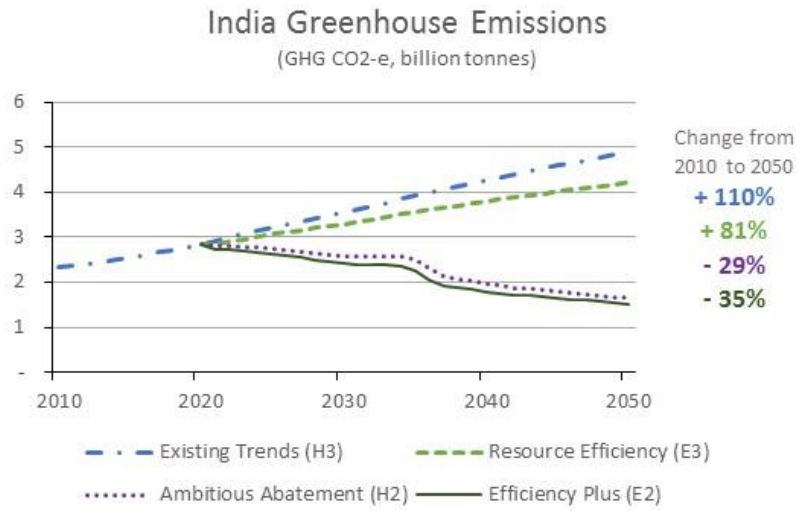



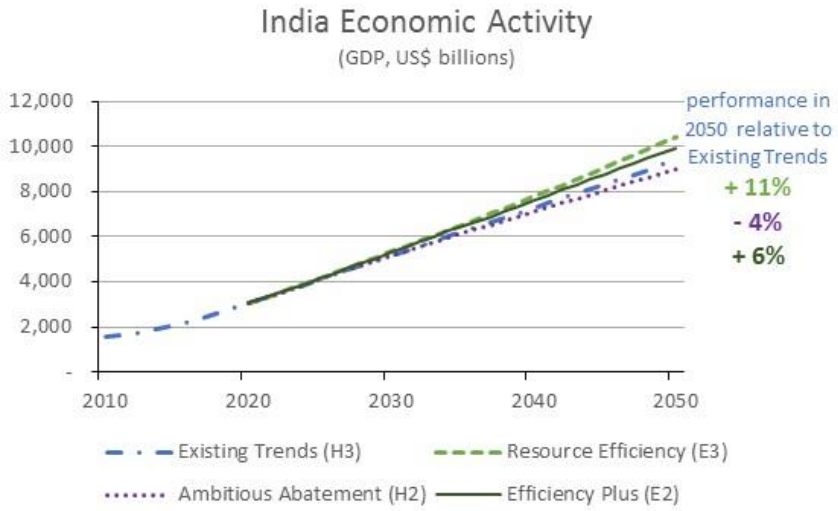




Source: Hatfield-Dodds et al. 2017

# Resources, climate and economic growth in India



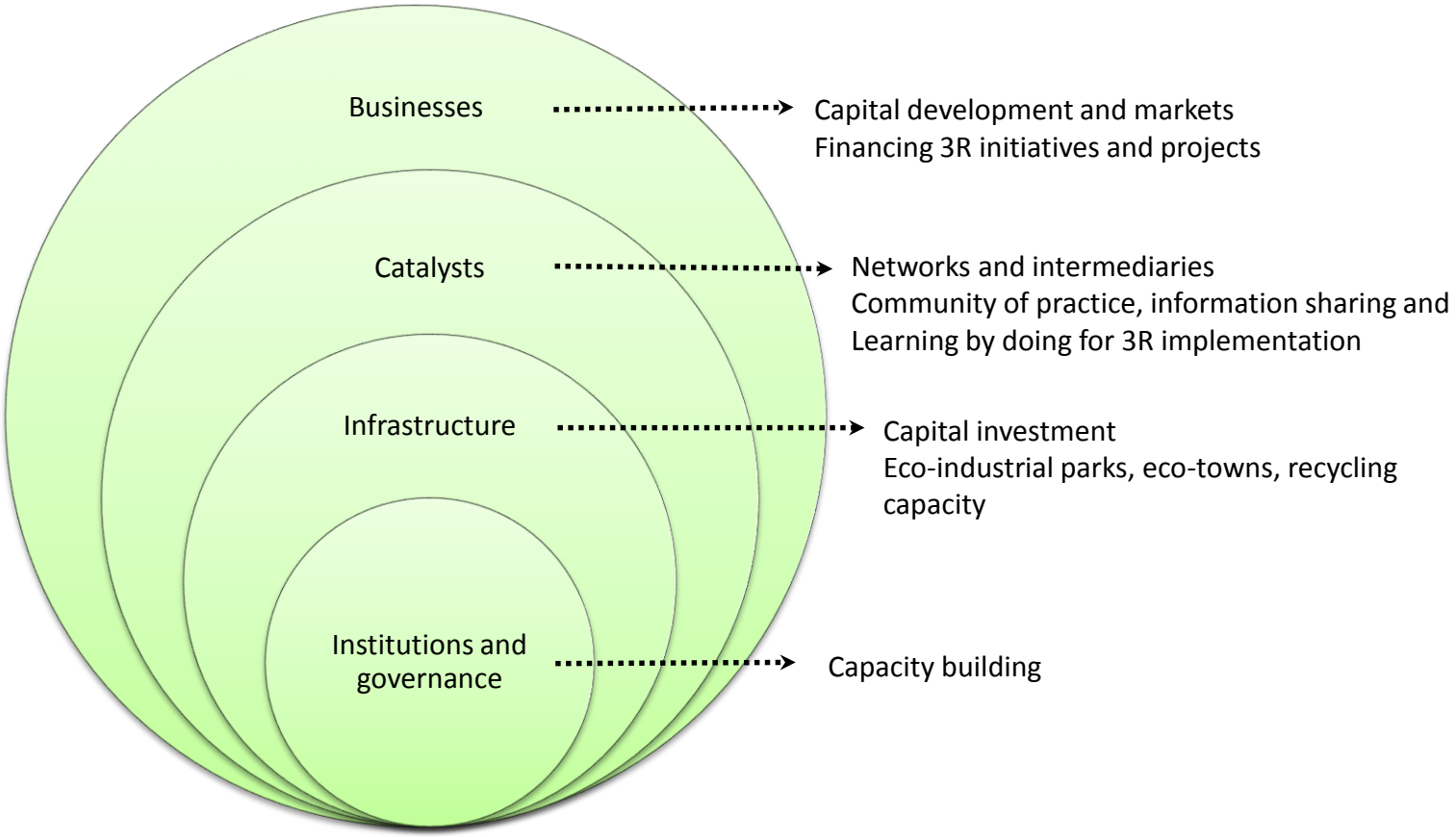

Source: Hatfield-Dodds et al. 2017

# Key findings

- substantial potential to achieve economically attractive resource efficiency, providing win-win outcomes that reduce environmental pressure while improving income and boosting economic growth in the Asia Pacific region
- significant co-benefits for climate mitigation
- projections can be treated as a reasonable minimum (or 'lower bound') estimate
- the level and mix of economic and environmental benefits achieved will depend on the detail of the policies and approaches implemented
- attention will be required to develop and test a smart and practical package of resource efficiency measures

# Policy options for 3R solutions

# The 3R's in regional development



# Hood's 1983 *Tools of Government* conceptual framework

## Organisation, treasury, authority, nodality

Organisation to **do things**: core of policy making, legislation

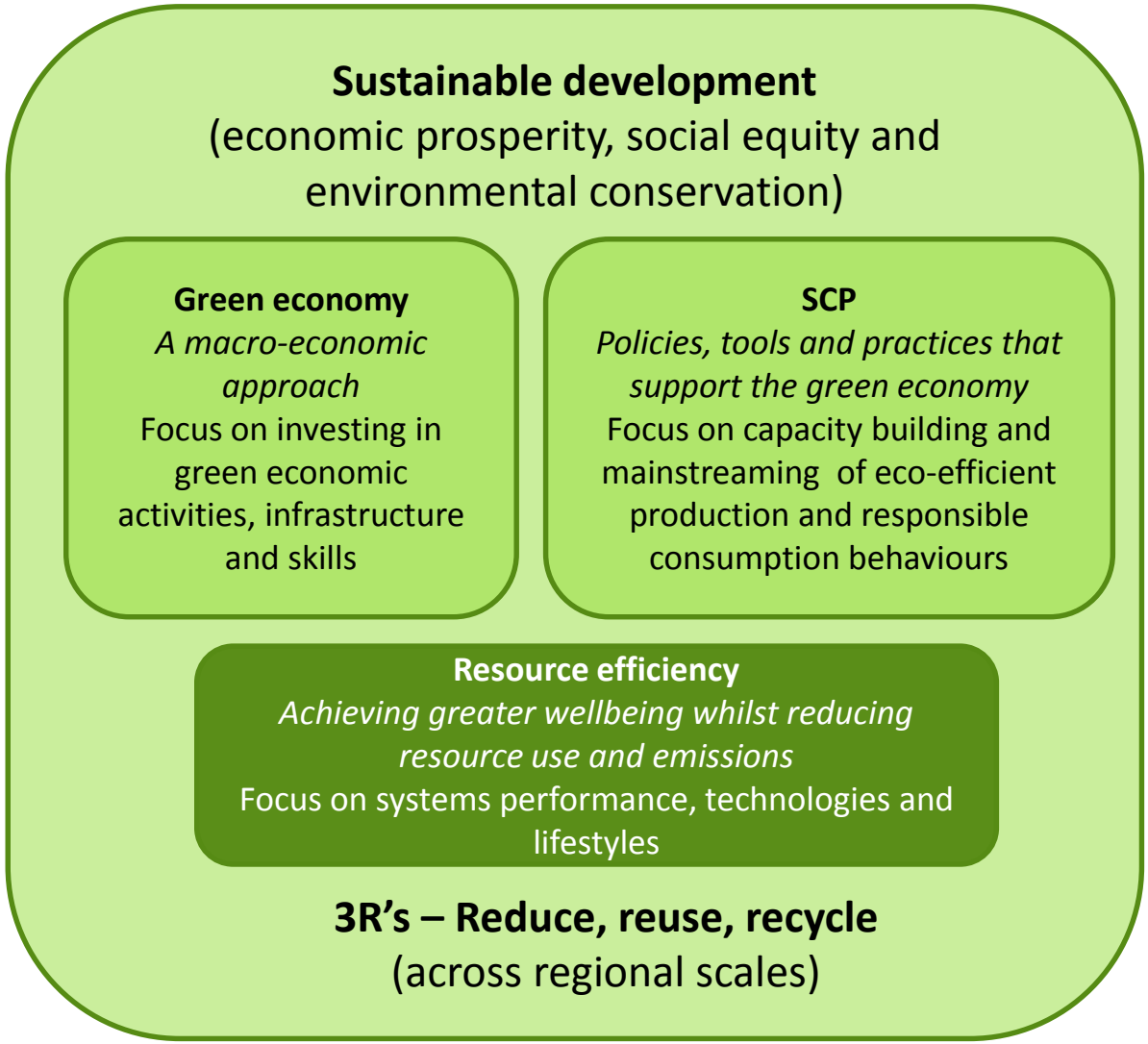
Using its **treasury to buy things**: buying services and products, financing of research programs

Using its authority **to say things:** contribute to the formation of discourse and public opinion

Using its centrality to **bring things together**: contribute to problem framing

**Sustainability policy** is characterized by complexity, contestation, uncertainty and sometimes ignorance

# Policy responses for resource efficiency and waste minimization



# Thank you

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