University of Applied Sciences and Arts
Northwestern Switzerland

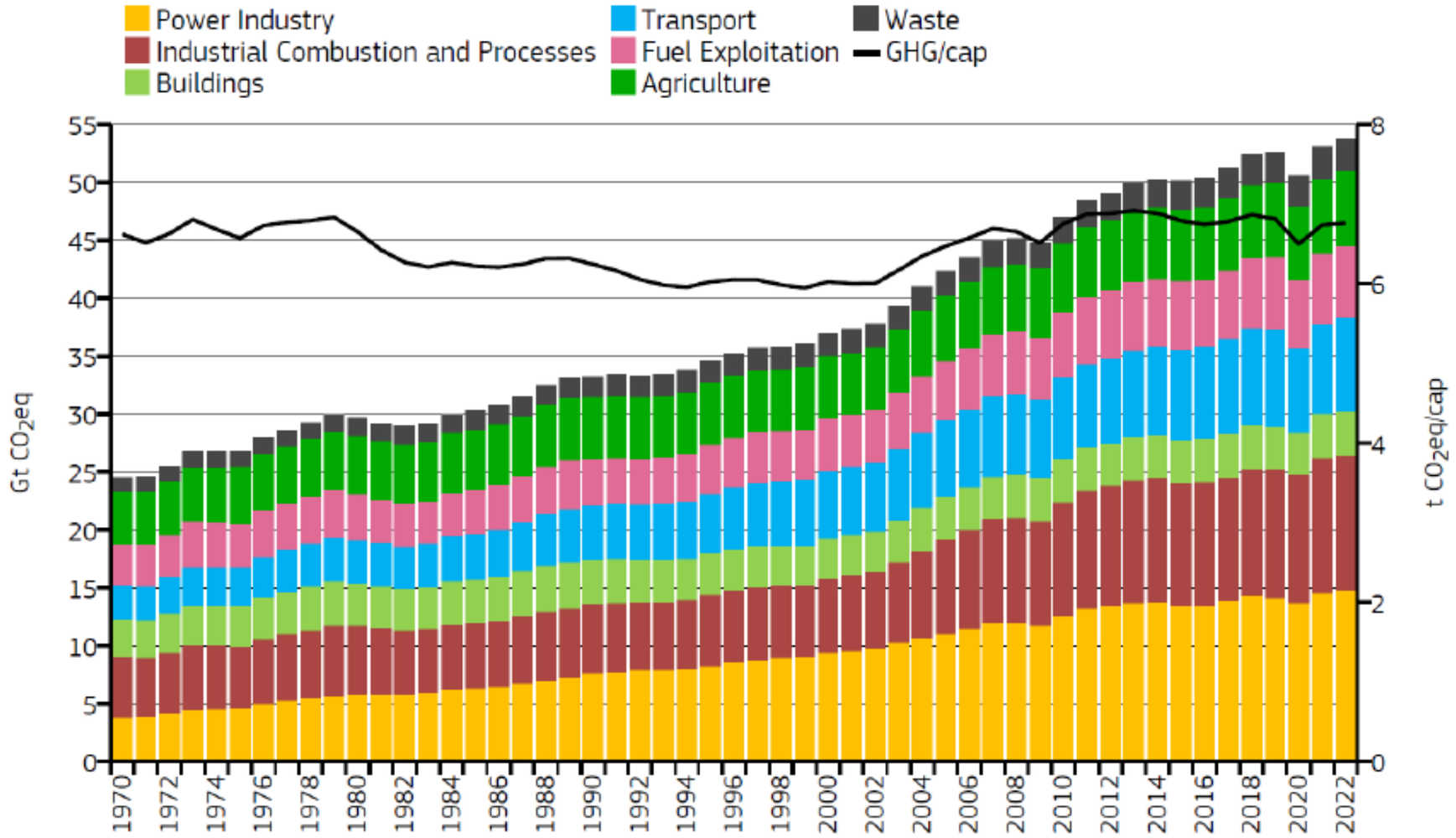
GEIPP
GLOBAL ECO-INDUSTRIAL PARKS PROGRAMME

Role and impact of Eco-industrial Parks for sustainable industrial development

Prof.em. Dr. Heinz Leuenberger

Content

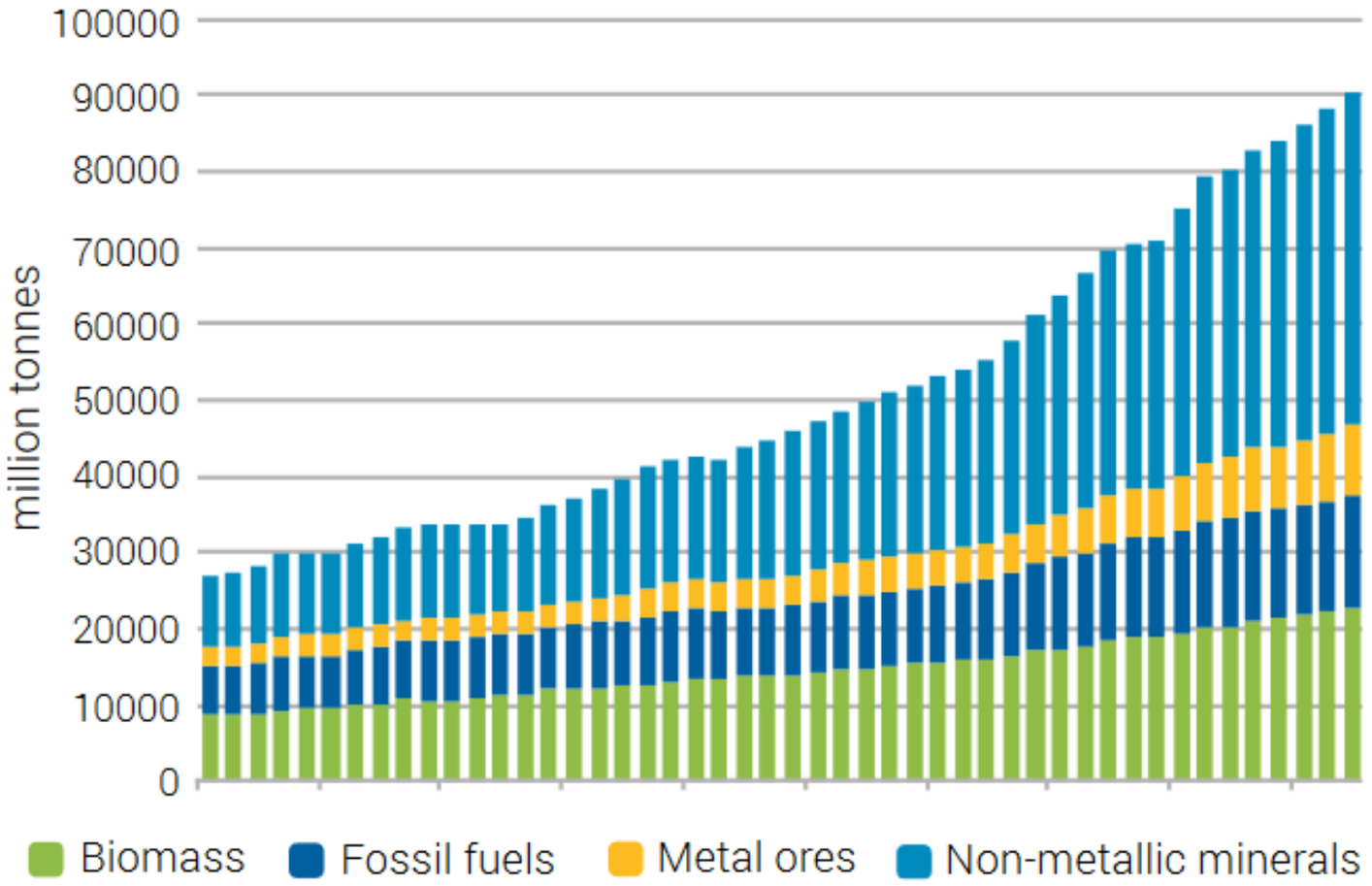
Global GHG emissions by sector (left axis, bars) and per capita (right axis, black line), 1970-2022 (in Gt CO2eq)



Source: JRC, 2023

JRC SCIENCE FOR POLICY REPORT,2023

Global resource extraction in 4 categories - development from 1970-2017



Source: IRP (2017). Assessing global resource use: A systems approach to resource efficiency and pollution reduction. Bringezu, S. et. al.

Global population has doubled and global economic activity (GDP) has grown fourfold since the 1970s, raising living standards and human well-being in many parts of the world.

The growing population and expanding global economy were fueled by a fast-growing material supply and extraction of primary materials, increasing pressure on land and water.

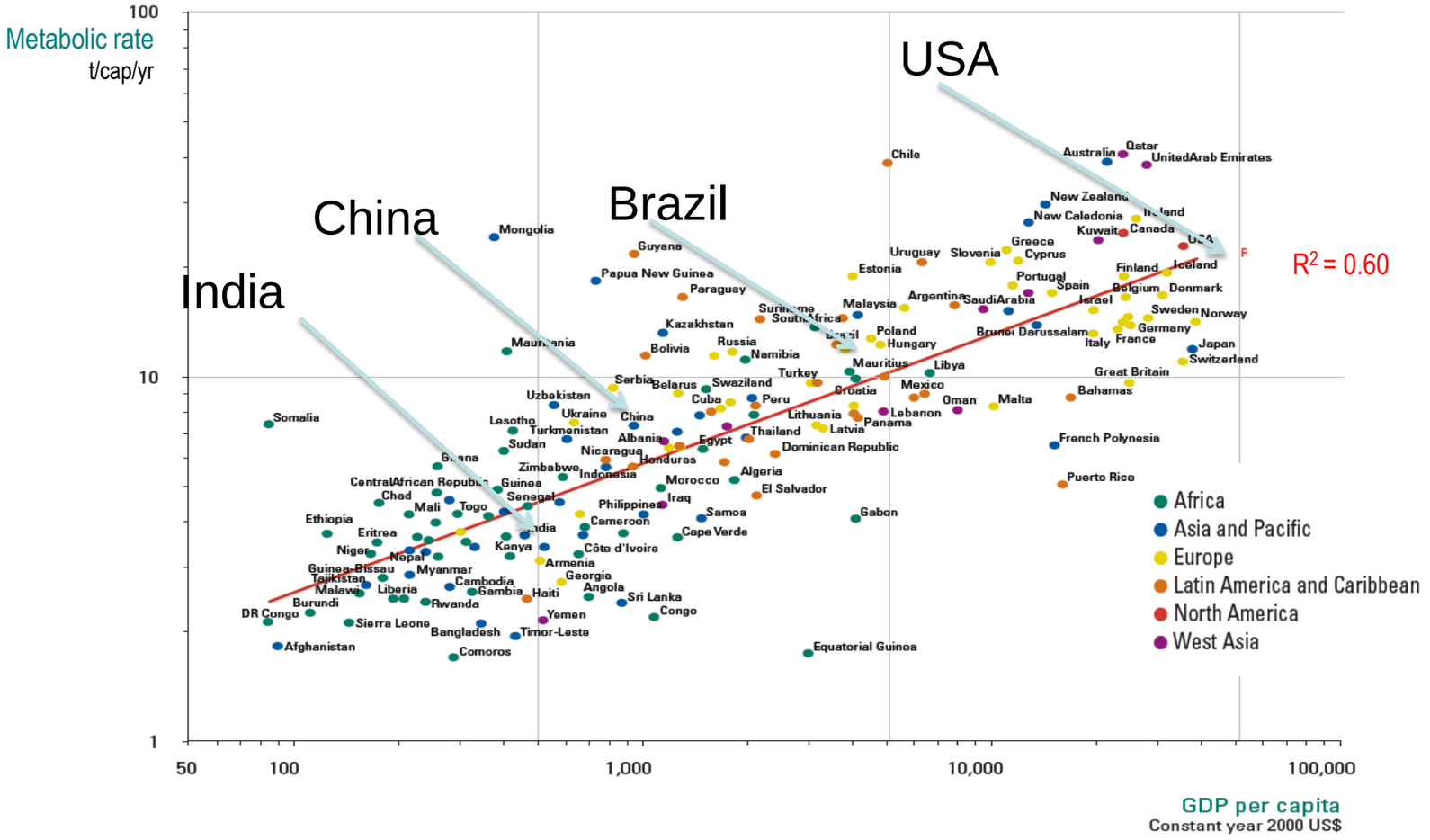
During the period 1970 to 2017, annual global extraction of materials grew from 27.1 billion tons to 92.1 billion tons (average annual growth of 2.6 per cent).

The global average of material demand per capita grew from 7.4 tons in 1970 to 12.2 tons per capita in 2017.

Global inequalities in material use have continued. The material footprint - a final demand-based measure of material use - attributes global material extraction to the point of final use. High-income countries consume27 tons of materials on average, which is 60 per cent higher than the upper-middle countries and more than thirteen times the level of the low-income group (at two tons per capita).

Material resource extraction more than doubles globally by 2060 under *Historical Trends*, with per capit resource use increasing from 12.2 tons to 18.5 tons per person.

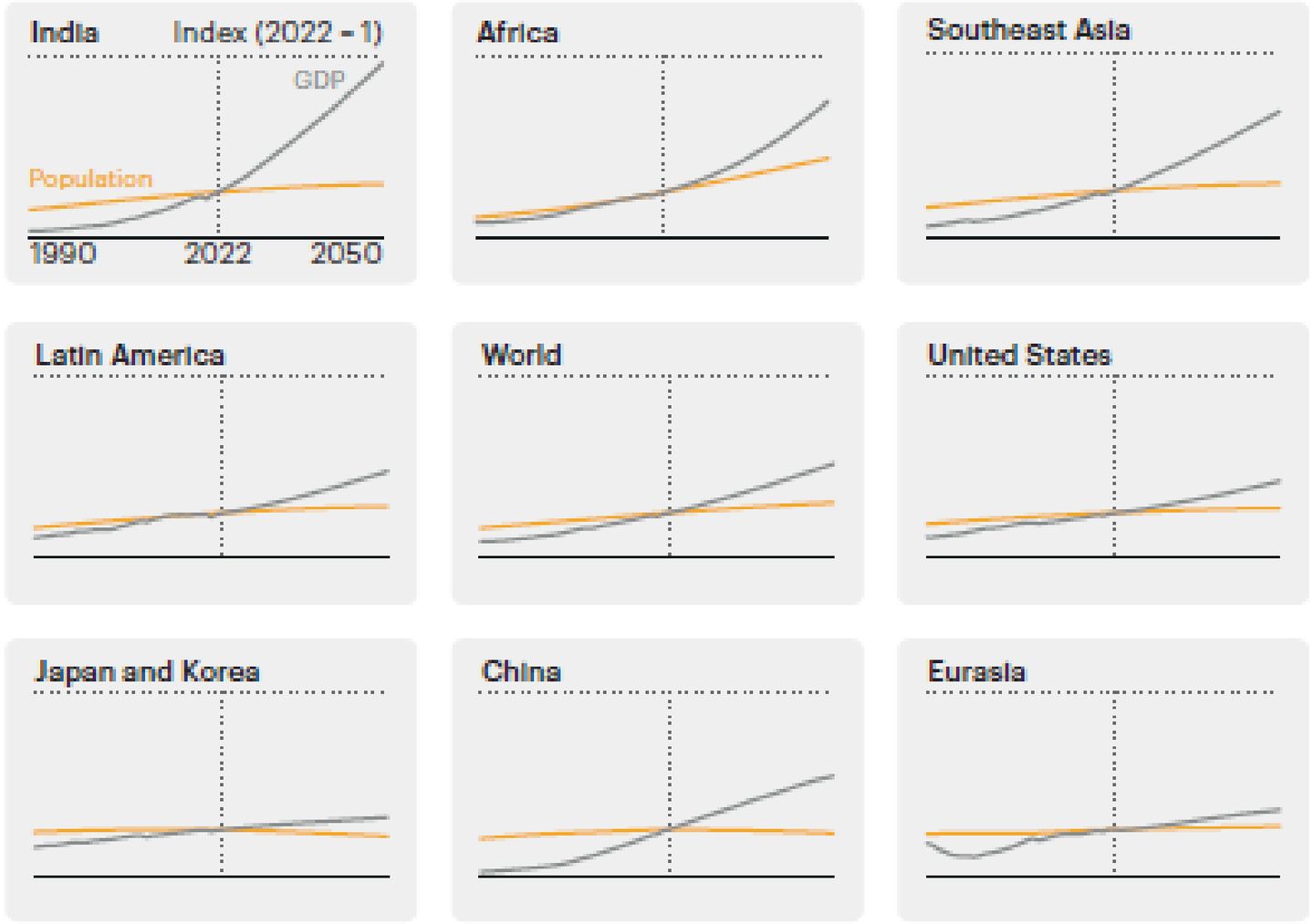
GDP Drives Resource Consumption



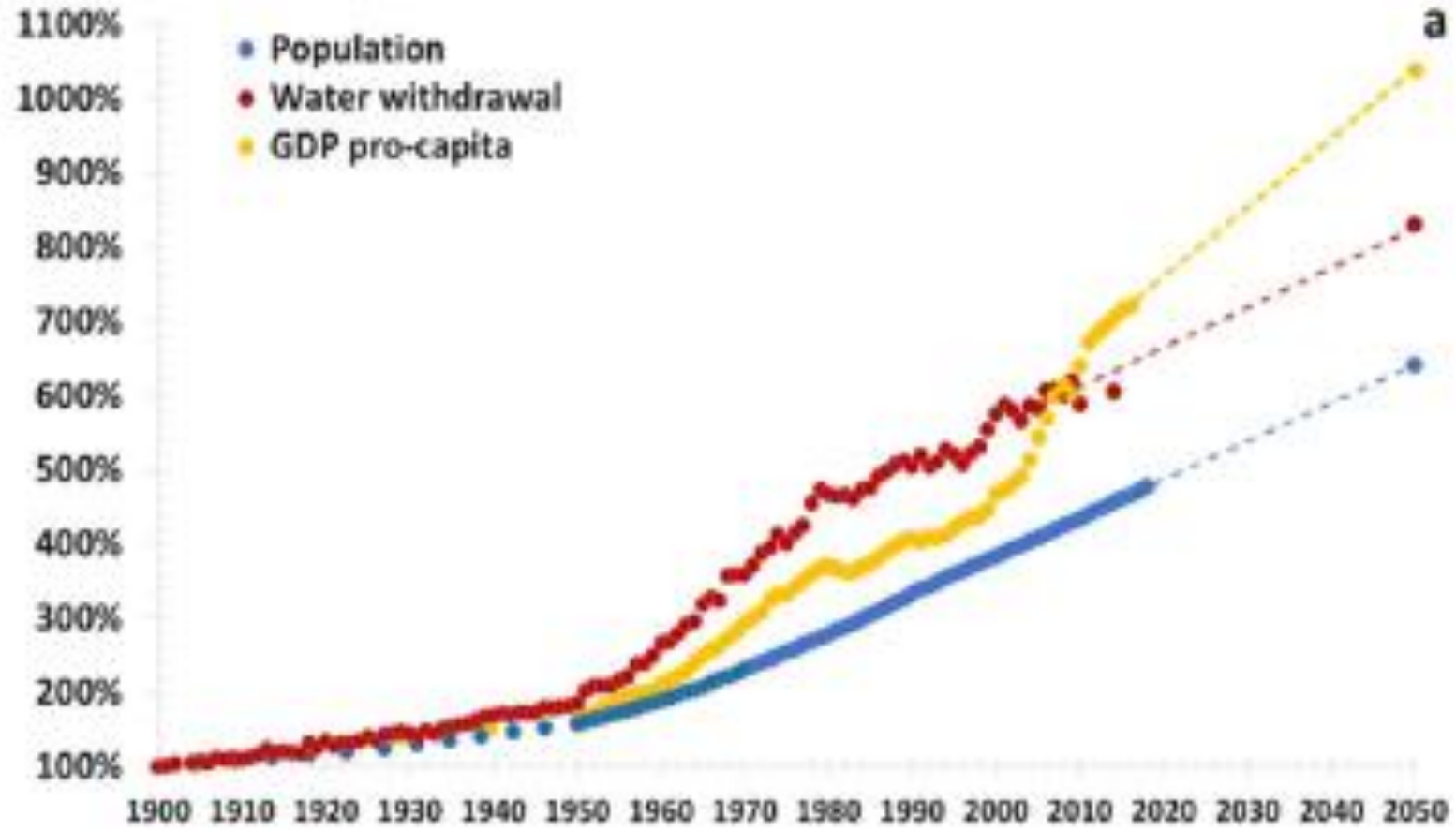
Source: International Resource Panel, *Decoupling Natural Resource Use and Environmental Impacts from Economic Growth,* United Nations Environment Programme (UNEP), Nairobi, 2011

Economic and population drivers

Economic and population growth are two key underlying forces for the outlook: the global economy is assumed to increase at an average of 2.6% per year to 2050, while the global population expands from 8 billion today to 9.7 billion in 2050.



Water development



Reassessing the projections of the World Water Development Report

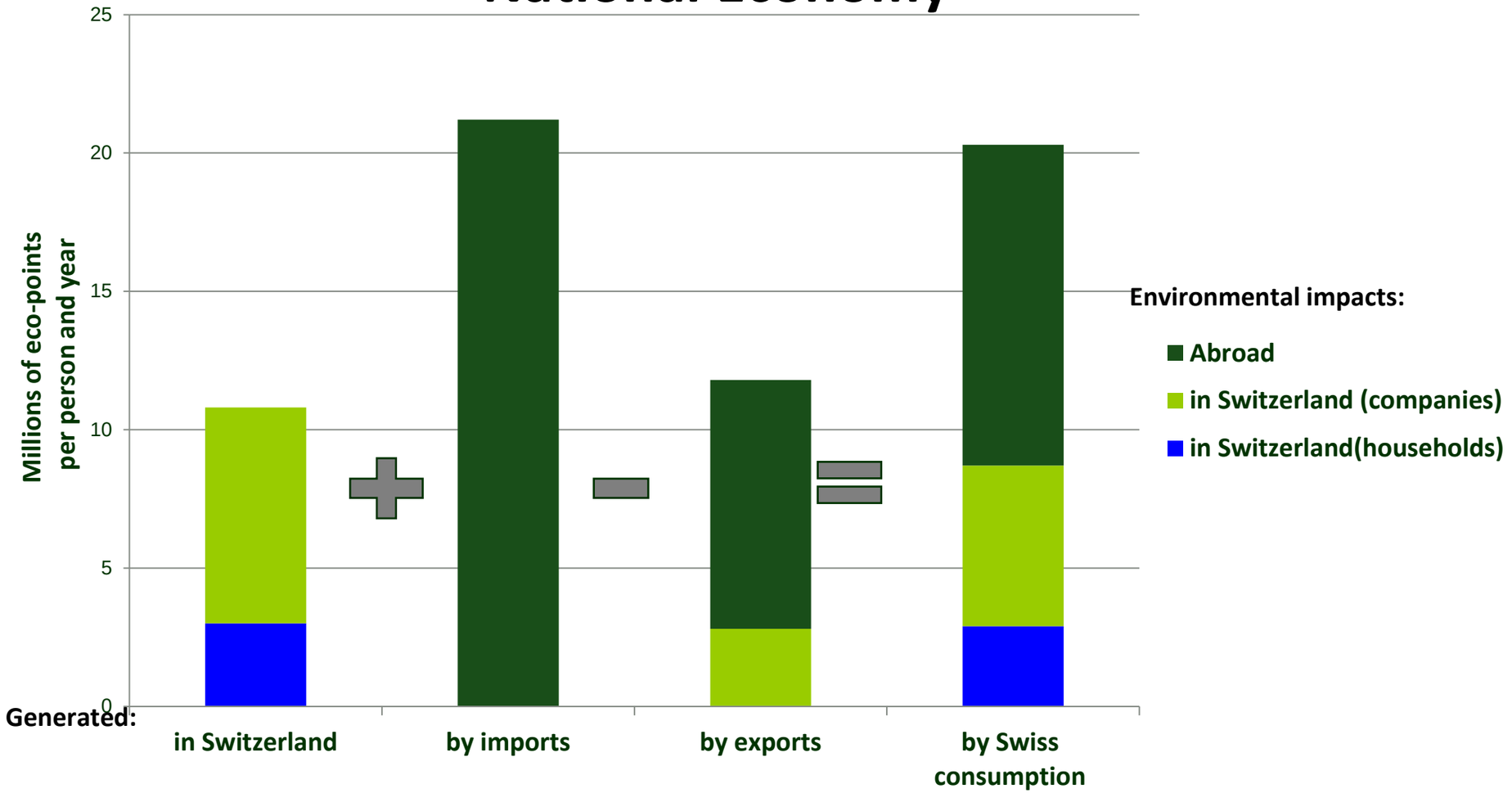
Alberto Boretti and Lorenzo Rosa

Global water use is likely to increase by 20 to 50 percent above current levels by 2050, with industrial and domestic sectors growing at the fastest pace.

Agriculture will remain the largest overall consumer of water, but the relative increase to 2050 is likely to be smaller than other sectors.

World water development report, UN 2018

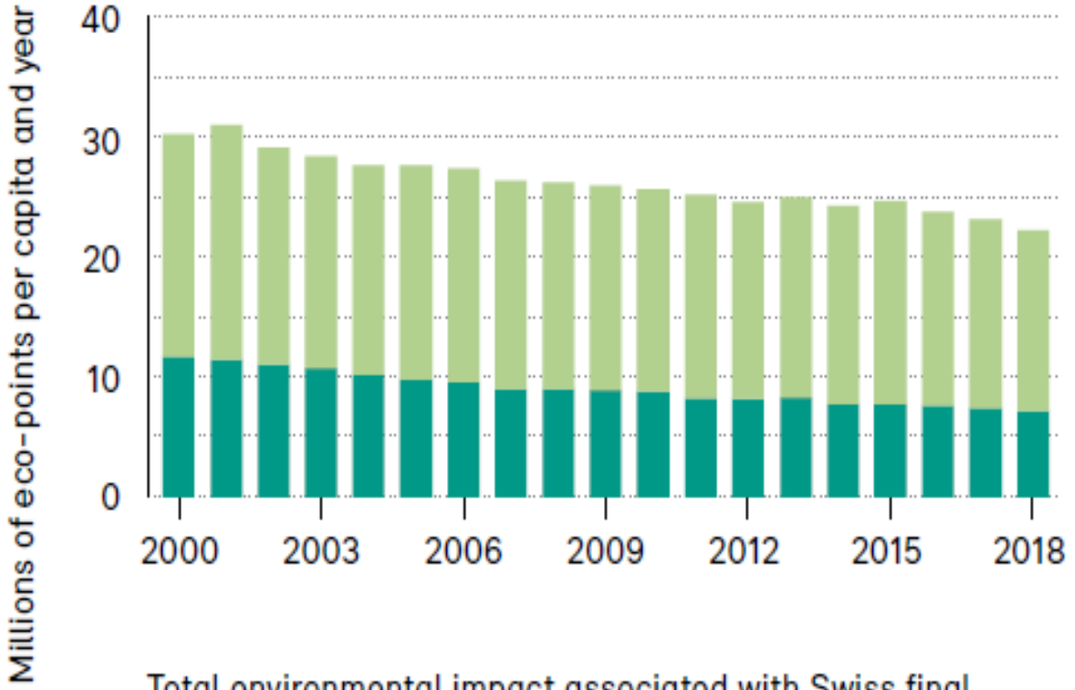
Environmental Impacts of Consumption and Production in the Swiss National Economy



Source: Jungbluth N., Nathani C., Stucki M., Leuenberger M. 2011: Environmental Impacts of Swiss Consumption and Production. A combination of input-output analysis with life cycle assessment. Federal Office for the Environment, Bern. Environmental studies

Environmental Impacts of Consumption and Production in the Swiss National Economy

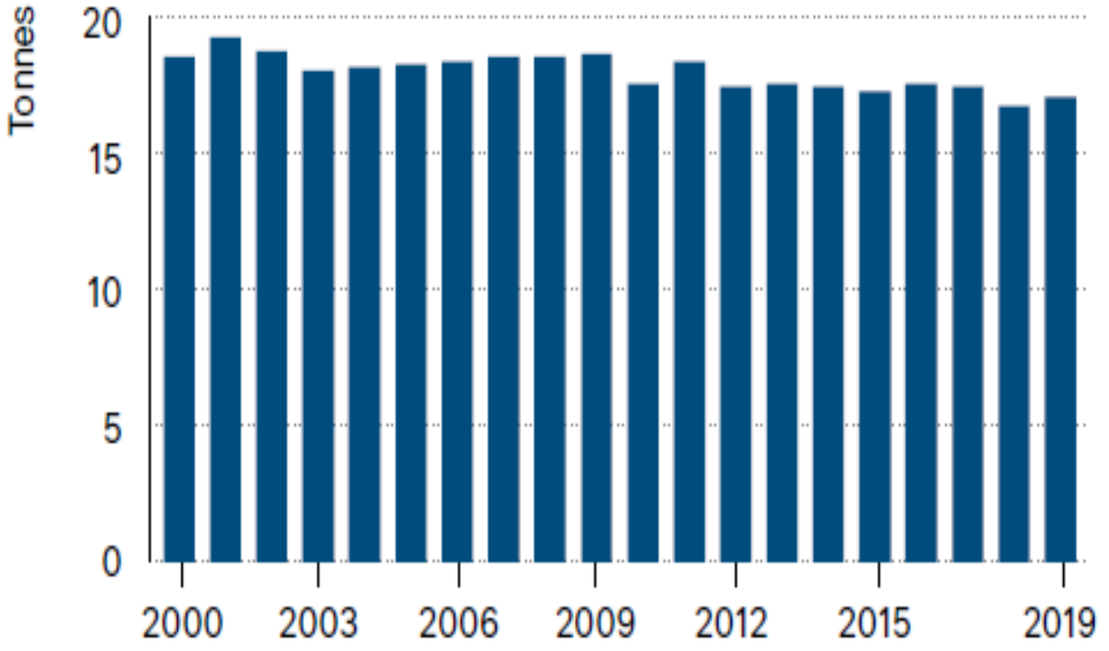
Total environmental impact footprint per capita



Total environmental impact associated with Swiss final demand: in Switzerland abroad

Source: EBP/Treeze 2022

Material footprint per capita



Raw material consumption (RMC) associated with Swiss final demand

FIGURE 2.16 Per capita material footprint by region, 1990, 2000, 2010 and 2017 (million tonnes)

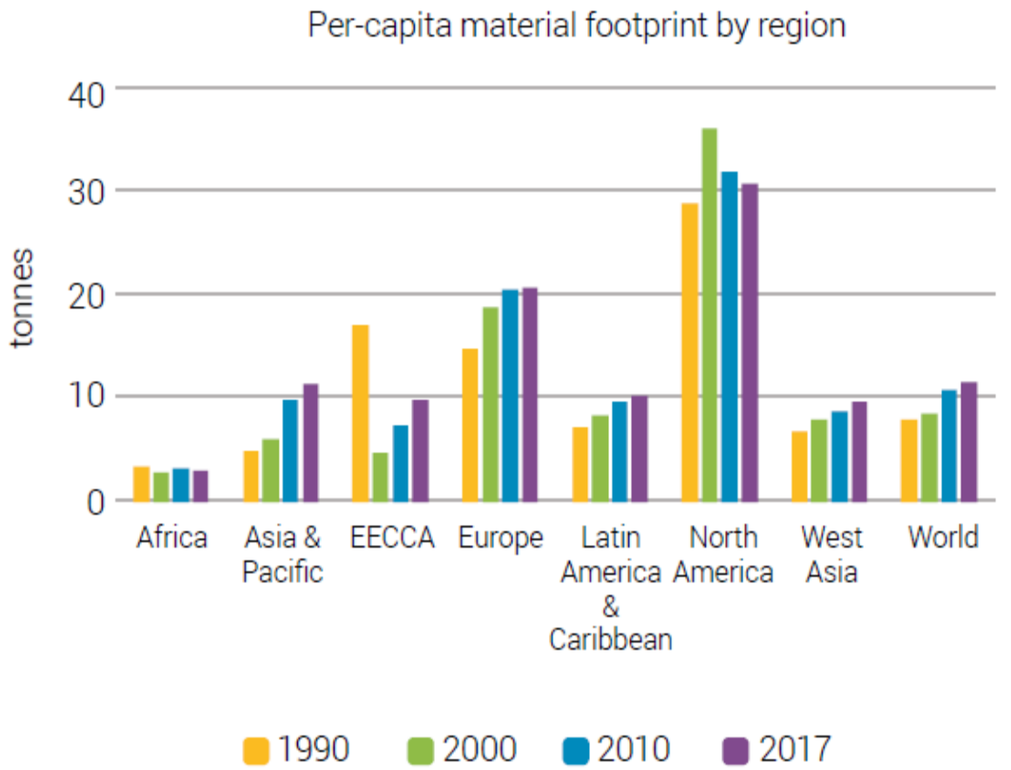
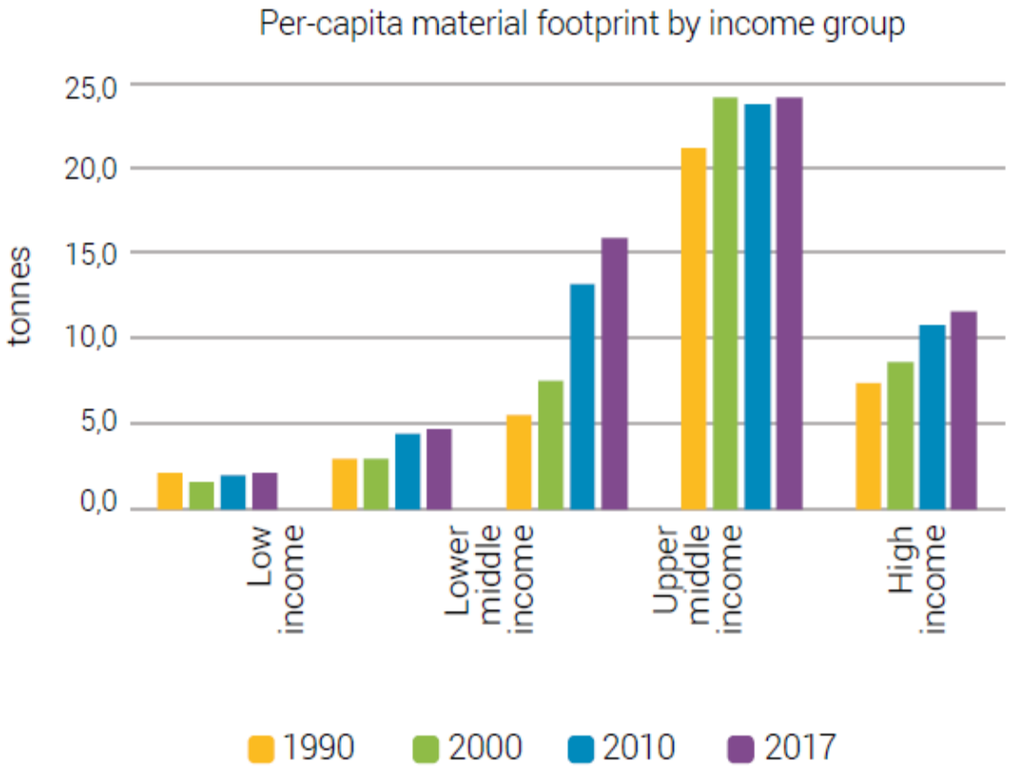


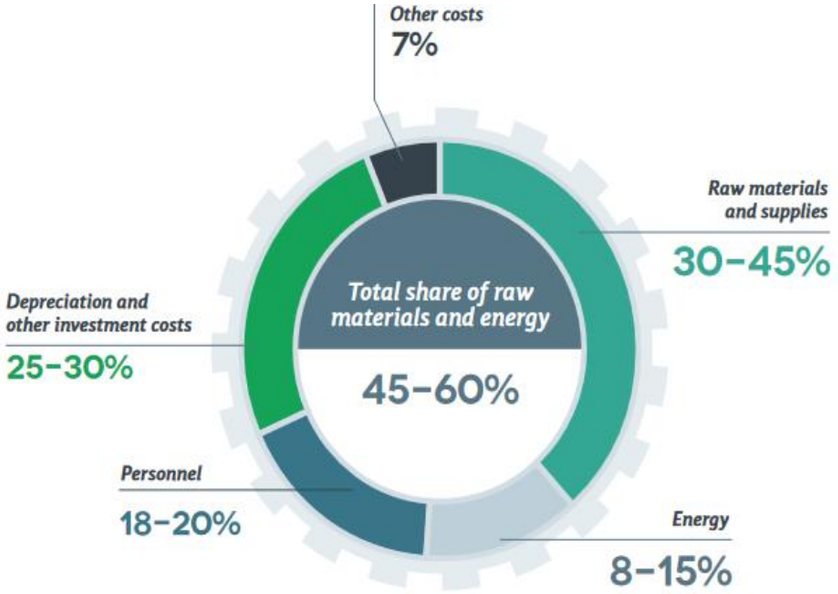
FIGURE 2.18 Per capita material footprint by income group, 1990, 2000, 2010, 2017 (tonnes)

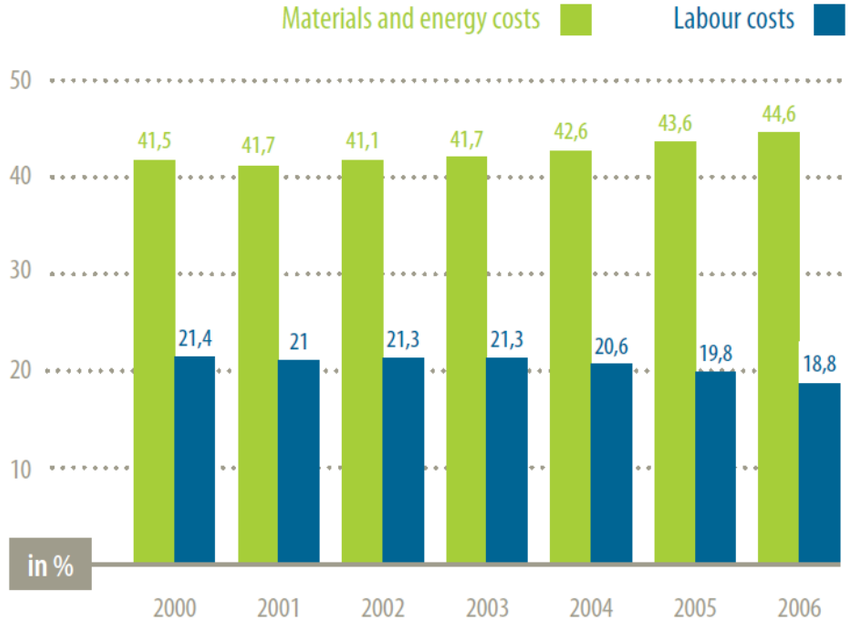


For example, the German Federal Environment Agency recognizes an order of magnitude of 5 to 8 tonnes per person annually as a target corridor for 2050, based on current thinking (see Bringezu, 2015), and supporting the precautionary principle and a limit to the amount of resources that may be extracted in the light of intra and intergenerational equity (German Federal Environmental Agency (UBA), 2015).

Resource Efficiency in Manufacturing

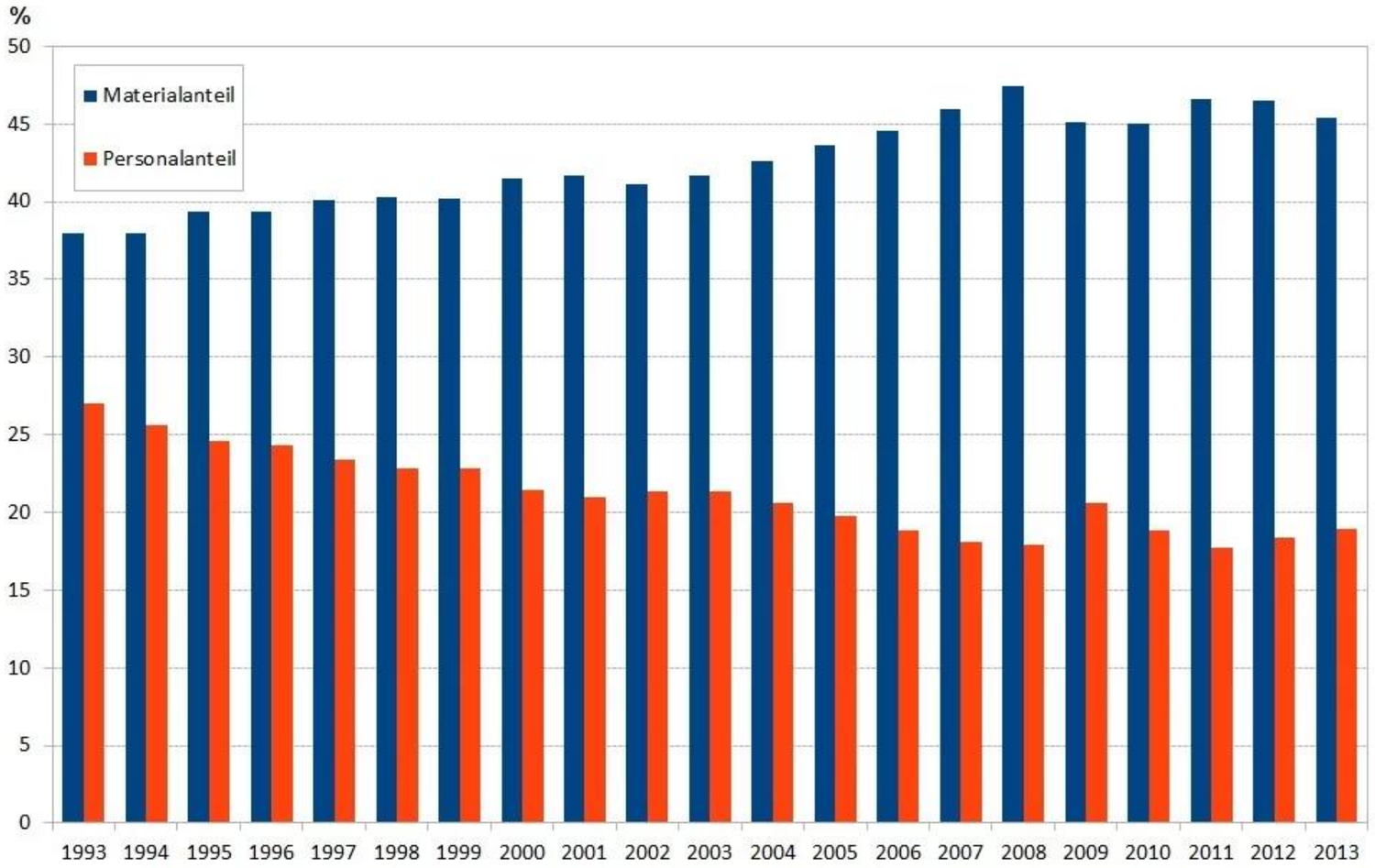
In a manufacturing company, materials can account for more than 50% of costs compared to personnel which accounts for less than 20%



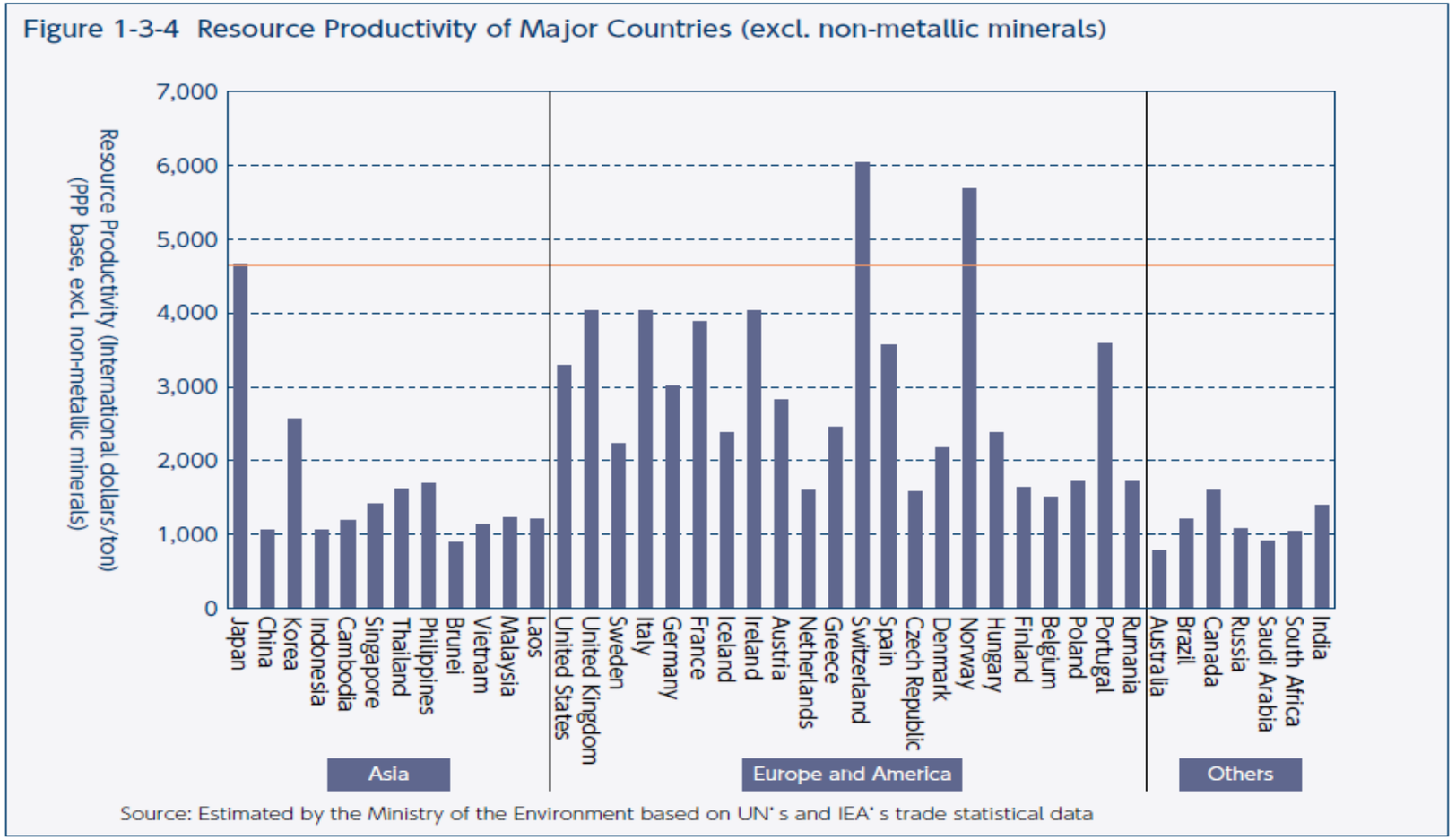


Source: Greenovate Europe (2012) “Guide to Resource Efficiency in Manufacturing”

Material versus Personal costs, Germany

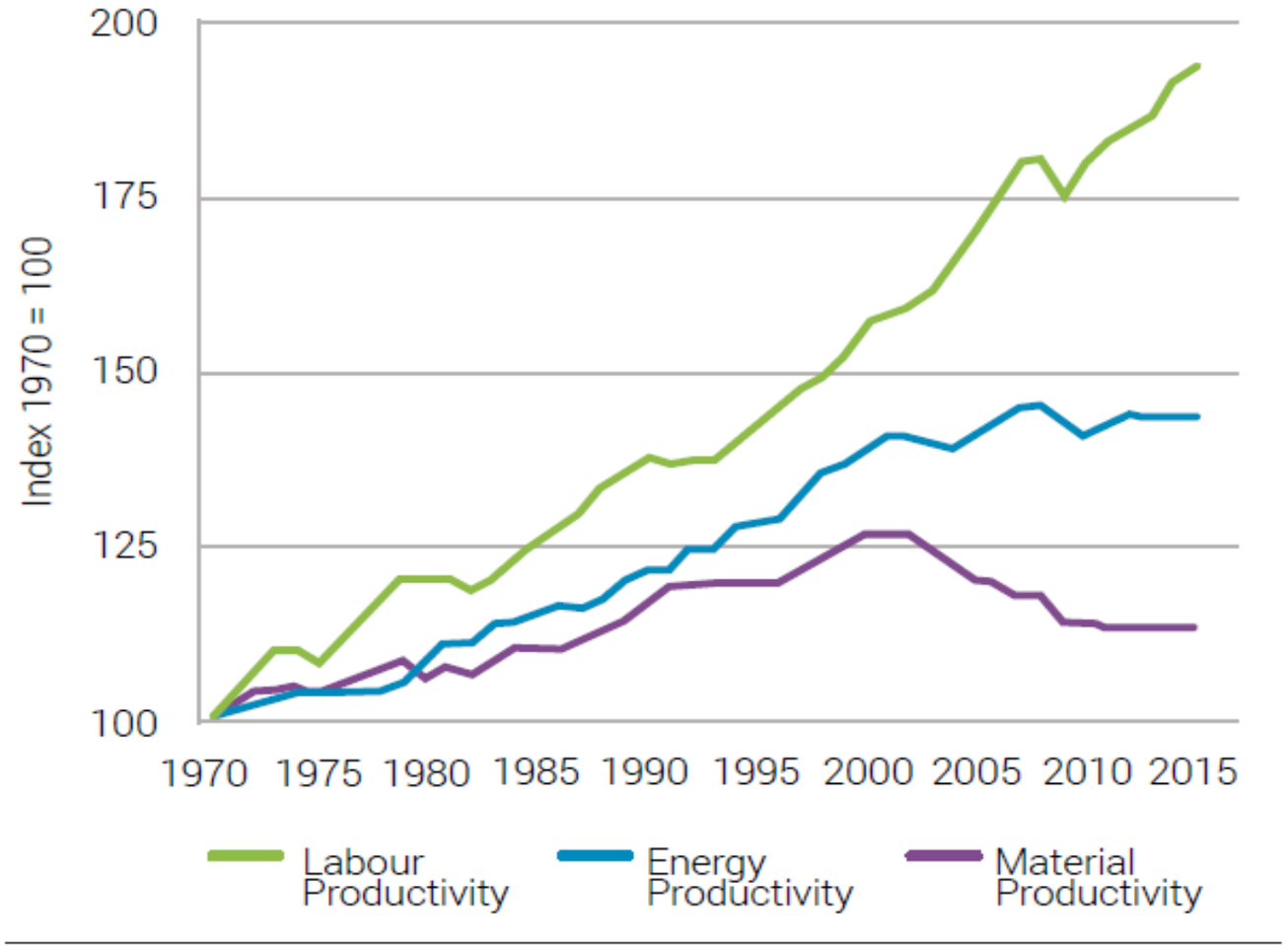


International comparison of resource productivity



Source: Annual Report on the Environment, the Sound Material-Cycle Society and the Biodiversity in Japan (2012)

FIGURE 2.4 Global material productivity compared to labour and energy productivity



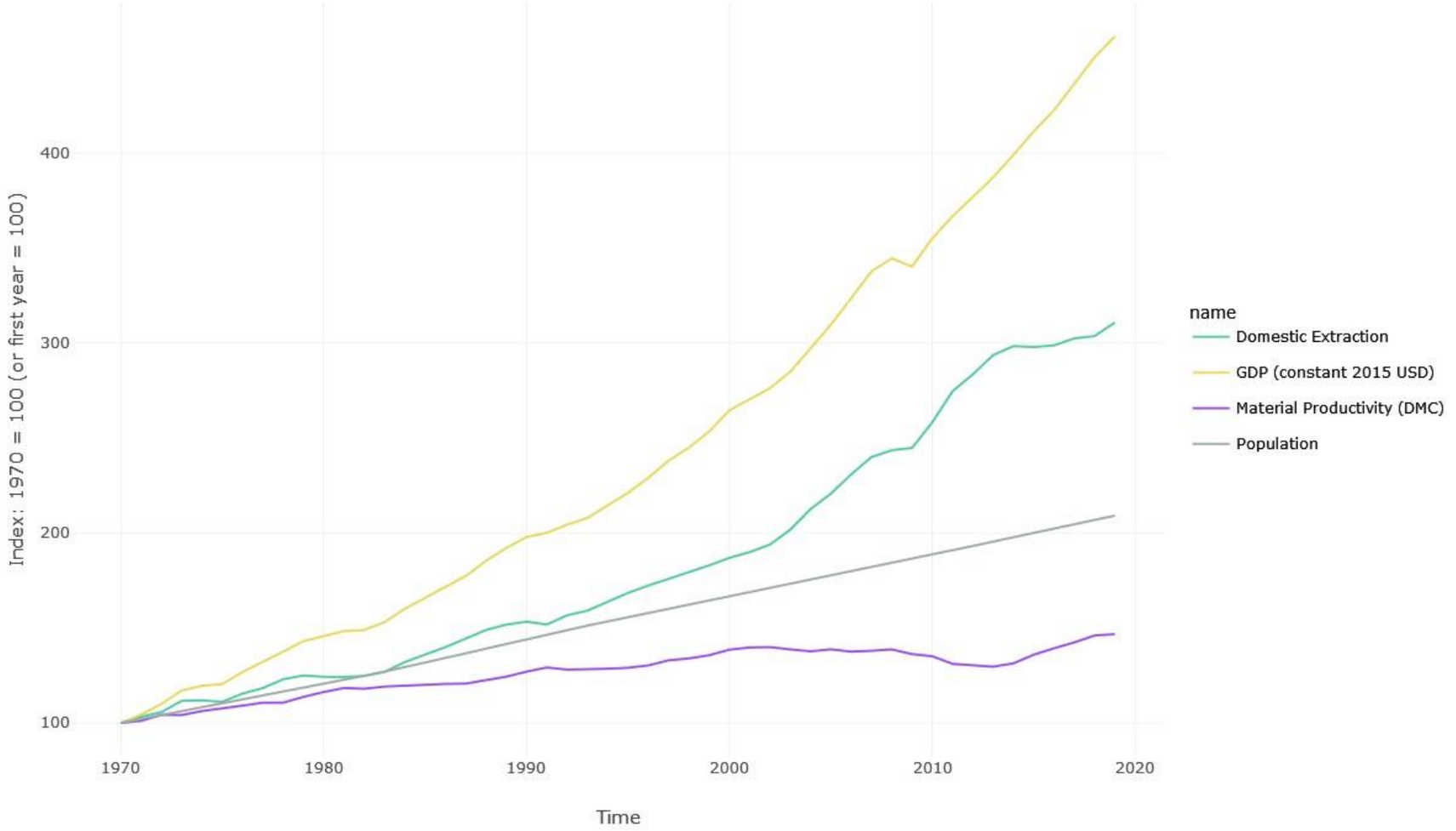
IRP (2017). Assessing global resource use: A systems approach to resource efficiency and pollution reduction. Bringezu, S., Ramaswami, A., Schandl, H., O'Brien, M., Pelton, R., Acquatella, J., Ayuk, E., Chiu, A., Flanegin, R., Fry, J., Giljum, S., Hashimoto, S., Hellweg, S., Hosking, K., Hu, Y., Lenzen, M., Lieber, M., Lutter, S., Miatto, A., Singh Nagpure, A., Obersteiner, M., van Oers, L., Pfister, S., Pichler, P., Russell, A., Spini, L., Tanikawa, H., van der Voet, E., Weisz, H., West, J., Wiijkman, A., Zhu, B., Zivy, R. A Report of the International Resource Panel. United Nations Environment Programme. Nairobi, Kenya.

- **Global material productivity (the efficiency of material use) has grown substantially slower than labour and energy productivity.**

- **Global material productivity started to decline around the year 2000 and has stagnated in recent years.**

- **Even though material productivity improved rapidly in both the old and new industrialized countries, the simultaneous shift in shares of global production away from economies that have a higher material productivity, to economies that have a lower material productivity explains how difficult it is to bring about a rapid improvement in global material efficiency.**

Comparison of flows/indicators in World in 1970-2019

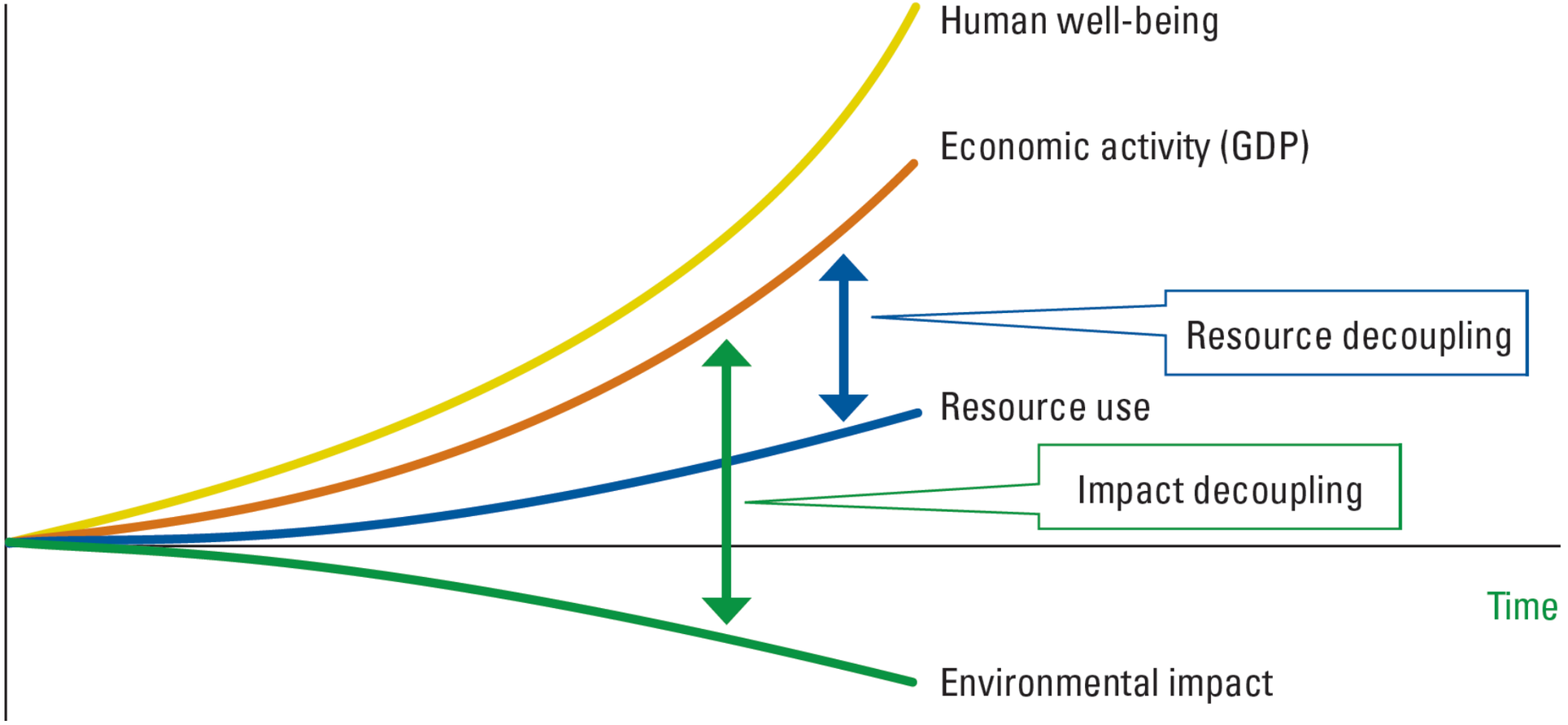


Reference-Disclaimer: WU Vienna (2022): Trends of material flows per country/region, 1970-2019. Visualisation based upon the UN IRP Global Material Flows Database. Vienna University of Economics and Business. Online available at: materialflows.net/visualisation-centre

Environmental impact of Material processing and consumption

- **Climate change, (Increasing material efficiency is a key opportunity to move towards the 1.5° C goal set by the Paris agreement.)**
- **Pollution (Air, surface and ground water, soil)**
- **Biodiversity loss**
- **Land degradation, deforestration**
- **Waste production**
- **Health**

TWO ASPECTS TO DECOUPLING GROWTH IN RESOURCE USE AND ENVIRONMENTAL IMPACTS



TWO ASPECTS OF DECOUPLING

- **RESOURCE DECOUPLING** HAPPENS WHEN RESOURCE PRODUCTIVITY IS IMPROVED AT A RATE THAT IS FASTER THAT THE ECONOMIC GROWTH RATE (INCREASED ECONOMIC VALUE AND A GREATER LEVEL OF WELL-BEING CAN BE CREATED BY USING THE SAME AMOUNT OF, OR LESS, RESOURCES)

- **IMPACT DECOUPLING** REFERS TO ACHIEVING MORE WELL-BEING AND (IF NECESSARY) ECONOMIC GROWTH WITH FEWER NEGATIVE ENVIRONMENTAL IMPACTS, OR INDEED, EVEN RESTORATION OF ECO-SYSTEM SERVICES (Resource extraction and processing make up about half of the total global greenhouse gas emissions and more than 90 per cent of land- and water-related impacts (biodiversity loss and water stress). If the rising trend in resource-related impacts persists, it will be difficult to achieve the goals of the Paris Agreement and the Sustainable Development Goals (including SDG 15.5 to halt biodiversity loss).

- **STRATEGIES TO MITIGATE HARMFUL ENVIRONMENTAL IMPACTS**

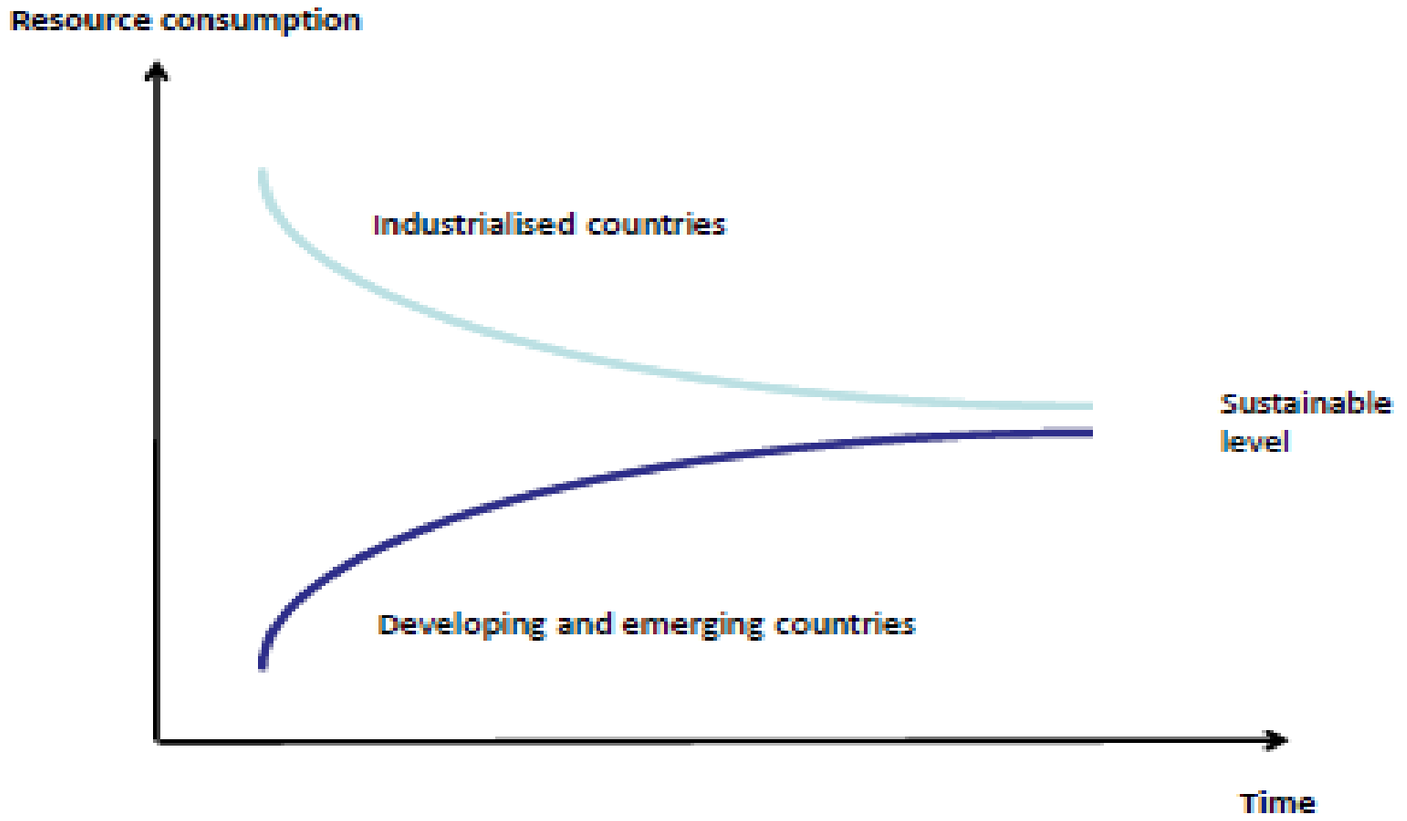
CAN INCLUDE:

✓CHANGING THE MIX OF RESOURCES USED THROUGH SUBSTITUTION OF MORE HARMFUL RESOURCES BY LESS HARMFUL ONES

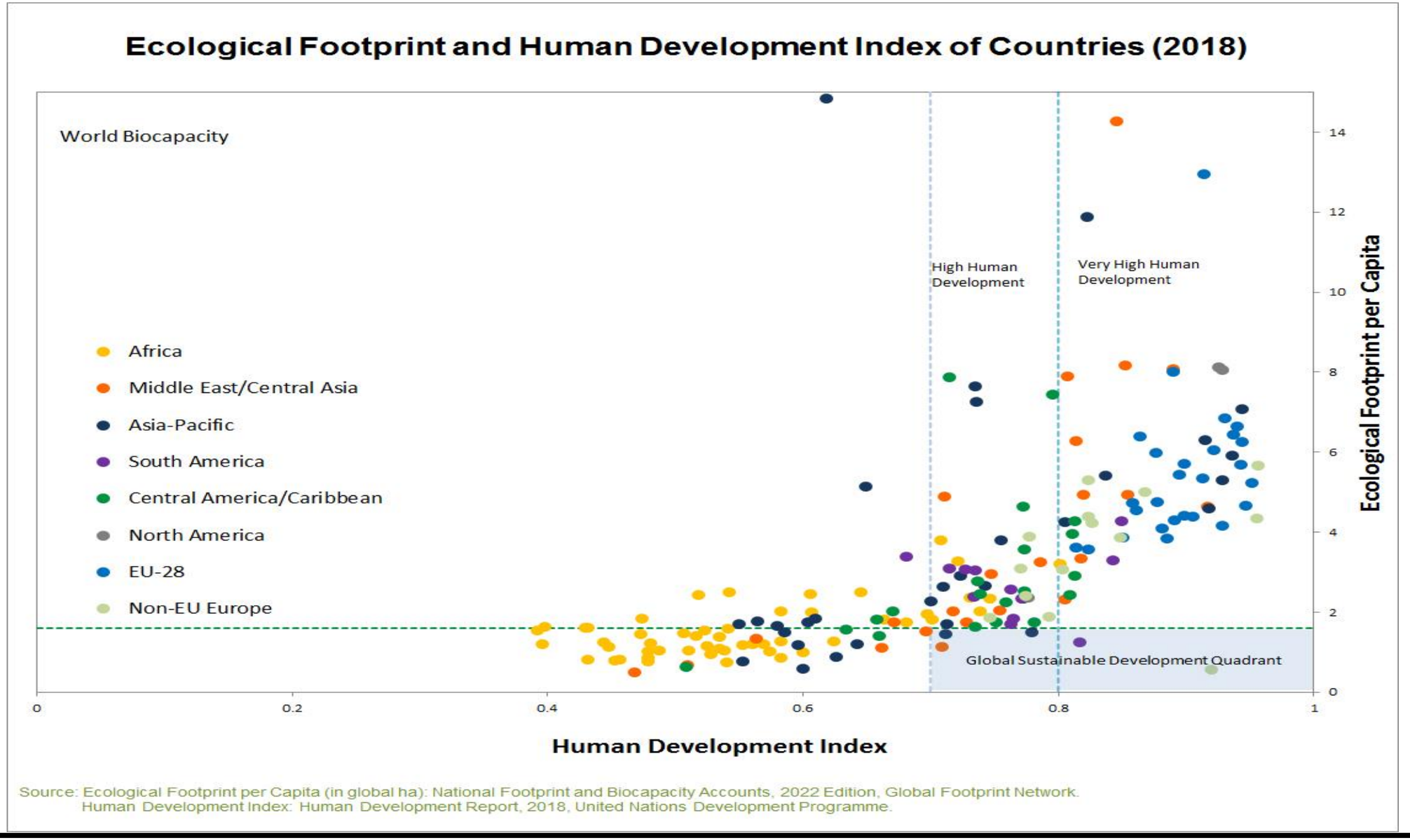
✓USING RESOURCES MORE EFFICIENTLY AND CAREFULLY THROUGHOUT THEIR LIFE CYCLE

✓REDUCING RESOURCE USE

Contraction and Convergence



Source: Seri, WRF, Davos, 2011

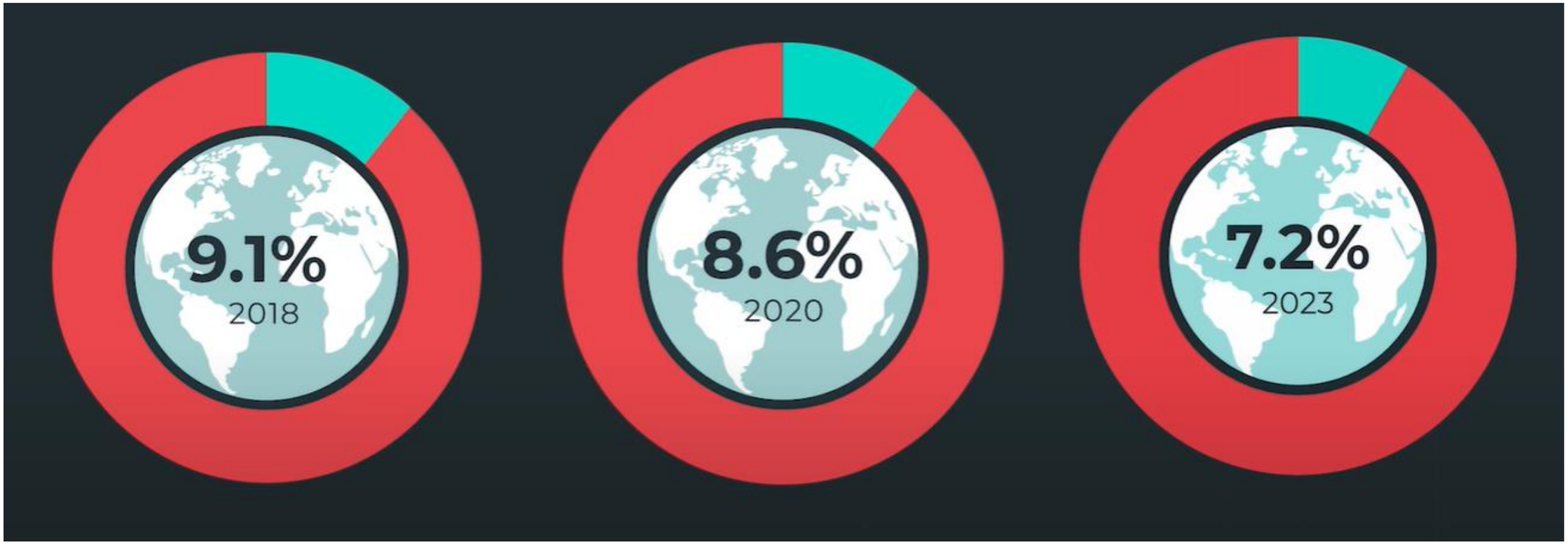

Ecological Footprint and Human Development Index of Countries (2018)
World Biocapacity
High Human Development
Very High Human Development
Africa
Middle East/Central Asia
Asia-Pacific
South America
Central America/Caribbean
North America
EU-28
Non-EU Europe
Global Sustainable Development Quadrant
Ecological Footprint per Capita
Human Development Index
0
0.2
0.4
0.6
0.8
1
0
2
4
6
8
10
12
14
Source: Ecological Footprint per Capita (in global ha): National Footprint and Biocapacity Accounts, 2022 Edition, Global Footprint Network.
Human Development Index: Human Development Report, 2018, United Nations Development Programme.

Resource efficiency in the 2030 Agenda for Sustainable Development

Green Industry concept-Sustainable industrial development

Greening of Industries *Helping enterprises improve resource productivity and environmental performance*	***Creating New Green Industries*** *Establishing new operations delivering environmental goods and services*
▪ Efficient use of materials, energy and water ▪ Reduction of wastes and emissions ▪ Safe and responsible management of chemicals, renewable raw materials ▪ Phasing out toxic substances ▪ Substituting fossil fuels with renewable energy sources ▪ Product and process redesign, Green Chemistry ▪ Implement a Circle Economy ▪ Improve social and economic performance of a company	▪ Reduce, reuse and recycle (3R) industries ▪ Pollution control technology and equipment ▪ Renewable and energy-efficient technologies ▪ Waste management and resource recovery ▪ Environmental advisory and analytical services

Present circularity is not only low, its even decreasing



Source: The Circularity Gap Report 2023

Role of Eco Industrial Parks in Greening existent industries

Eco Industrial Parks can play a significant role in greening Industries, mainly in:

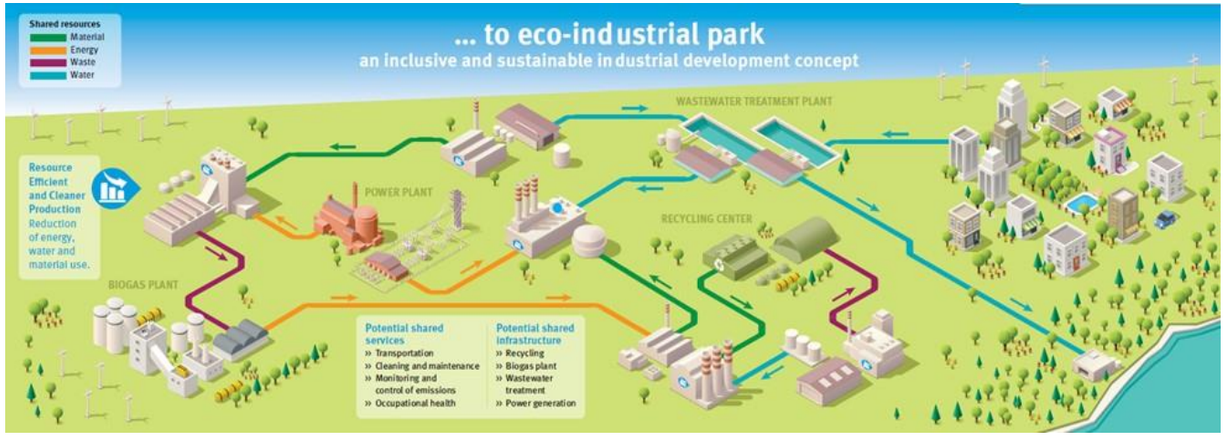
- **Increasing resource efficiency on a company level, on a park level, on a regional level and on an industrial sector level**
- **Reducing waste and emissions (water, air), phasing out toxic chemicals, promoting Green chemistry, improve safe chemicals management**
- **Using renewable raw materials and producing renewable energy,**
- **Can help to improve biodiversity**
- **Implementing/promoting a Circular Economy**
- **Improve occupational Health and safety**
- **Apply good social and economic practice**

What is an Eco-Industrial Park?

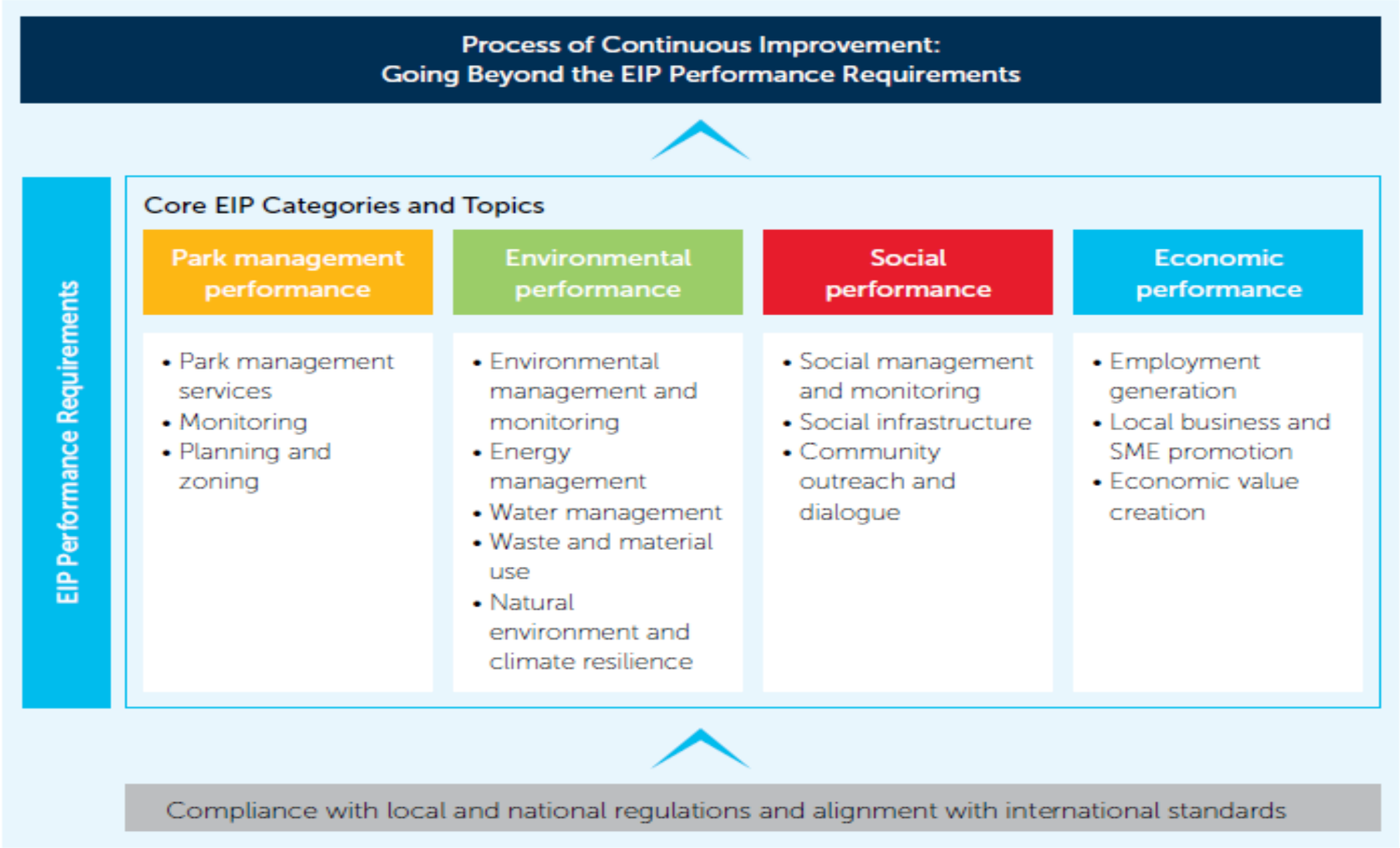
”A community of manufacturing and service businesses located together on common property. Member businesses seek enhanced environmental, economic, and social performance through collaboration in managing environmental and resource issues.

By working together, the community of businesses seeks a collective benefit that is greater than the sum of individual benefits each company would realize by only optimizing its individual performance.”

(Lowe, 2001)



In short, the EIP concept is about creating
more resource-efficient and cost-effective industrial parks
which are more competitive, attractive for investment and risk resilient.


Process of Continuous Improvement:
Going Beyond the EIP Performance Requirements
EIP Performance Requirements
Core EIP Categories and Topics
Park management performance
Environmental performance
Social performance
Economic performance
• Park management services
• Monitoring
• Planning and zoning
• Environmental management and monitoring
• Energy management
• Water management
• Waste and material use
• Natural environment and climate resilience
• Social management and monitoring
• Social infrastructure
• Community outreach and dialogue
• Employment generation
• Local business and SME promotion
• Economic value creation
Compliance with local and national regulations and alignment with international standards

Resource efficiency

- **Process level**
- **Individual company level (Resource efficient and Cleaner Production)**
- **Industrial park level, (Industrial symbiosis)**
- **City and Regional level**
- **Industry sector level, (Textile, Steel, Pulp and Paper)**
- **Country level, (for example: Manufacturing, Transport, Agriculture, Power sector)**

Summary

- **Natural Resource consumption is far too high and not sustainable at all**
- **Most of the countries consume too much natural resources**
- **Developed countries must significantly reduce their resource consumption, developing countries should increase their resource efficiency to make sure to stay below the sustainable resource consumption threshold**
- **Natural resources and energy cost account between 40 to 60 % of the production costs**
- **Eco Industrial parks are one important tool to achieve a much higher resource efficiency(material, water, energy) and a better social and economic performance**
- **Eco industrial parks can help to reduce waste, water and air pollution, can improve biodiversity and reduce land degradation and can have a significant contribution in reducing CO2 emissions**
- **Resource efficiency is an important tool to increase the economic performance of a company**
- **To implement Eco industrial parks in a country it needs a clear and coherent strategy and vision**
- **A policy with well and clear defined requirements and standards are needed, contradictions in laws must be removed**
- **A transparent, fast and coherent application and approval process must be in place**
- **Incentives (financial, marketing, applied research, training, logistic) support the implementation of Eco Industrial parks in a country**

Literatur

- Global Resources outlook, Natural Resources for the Future we want, International Resource Panel, UNEP, 2019
- Assessing Global resource use, A systems approach to resource efficiency and pollution reduction, International Resource Panel UNEP, 2017
- Resource Efficiency:, Potential and Economic Implications, International Resource Panel, UNEP, 2017
- OECD, Towards a more resource-efficient and circular economy, the role of the G20, A background report prepared for the 2021, G20 Presidency of Italy
- UNEP (2016). Global Material Flows and Resource Productivity. An Assessment Study of the UNEP International Resource Panel. H. Schandl, M. Fischer-Kowalski, J. West, S. Giljum, M. Dittrich, N. Eisenmenger, A. Geschke, M. Lieber, H. P. Wieland, A. Schaffartzik, F. Krausmann, S. Gierlinger, K. Hosking, M. Lenzen, H. Tanikawa, A. Miatto, and T. Fishman. Paris, United Nations Environment Programme.
- Greenovate Europe, Resource Efficiency Potentials of Manufacturing Industries, 2013
- Greenovate Europe, Guide to resource efficiency in manufacturing, 2012
- Decoupling natural resource use and environmental impacts from economic growth, International Resource Panel, UNEP, 2011
- Decoupling 2, Technologies, Opportunities and Policy Options, International Resource Panel, UNEP, 2014
- Green Growth Knowledge Partnership (GGKP), Green industry platform, https://www.greenindustryplatform.org
- UN World water report 2018-2023
- The Rise of the Impact Economy, UBS, Mai 2023
- GHG Emissions of all world Countries, JRC Science for policy report, 2023
- Material flows.net, The material flows analysis portal, www.wu.ac.at/en/ecolecon/research/global-resource-use/

Thank you for your attention!