



SYSTEMIQ



International
Resource
Panel

*Efficiency and Responsibility
How to Manage the Transition
The Role of Materials*

*JANEZ POTOČNIK
Co-Chair International Resource Panel - IRP
Partner SYSTEMIQ
Member Club of Rome*

Nancy, 06th July 2023

Panel Co-Chairs:
Janez Potočnik and Izabella Teixeira

Steering Committee Co-Chairs:
Astrid Schomaker and Steven Stone

SCIENTIFIC PANEL

Internationally recognized experts on sustainable resource management;
Scientific assessments and advice, networks

Science-Policy Interface in the area of Resource Management

Head of Secretariat: Merlyn van Voore

UNE SECRETARIAT

Direction, procedures, support in development and implementation of assessments, outreach

STEERING COMMITTEE

Governments from developing and industrialized countries;
Strategic guidance, political support, regional synergies

Strategic Partners



Main Challenges

The diagnosis of the problem

Let's start the story in my home country Slovenia

Slavoj Žižek



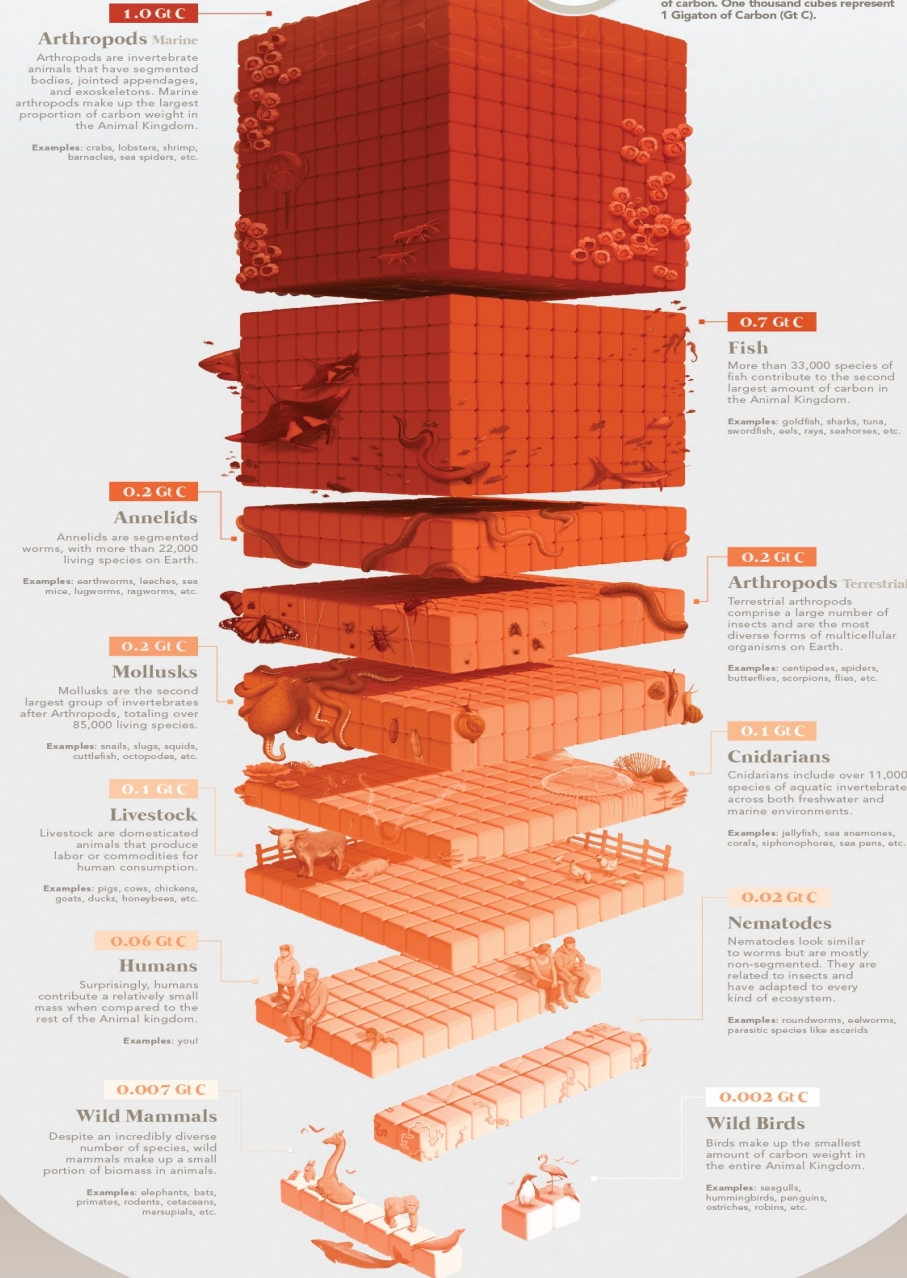
“It is clear that we are approaching the ecological and digital apocalypse ... but we should not loose nerves.”

*“Everything under heaven is in **utter chaos**; the situation is excellent.”*

The Biomass of Animals

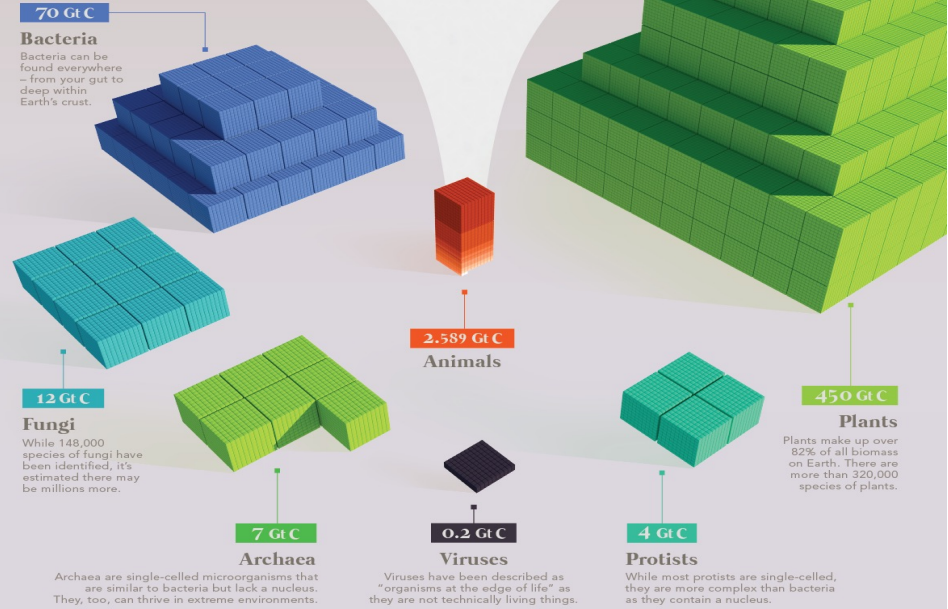
Biomass is measured by the amount of carbon an organism contains. Carbon is a primary component of all known life on Earth, used in complex biological molecules and compounds.

One cube represents 1 million metric tons of carbon. One thousand cubes represent 1 Gigaton of Carbon (Gt C).



*All other species, like reptiles and amphibians, contribute a negligible amount of carbon when compared to other animals.

Comparing All Biomass of Life on Earth



Humans make up approximately **0.01% of all biomass on Earth.**

SOURCE Bar-On, Y.M., Phillips, R., Milo, R., 2018. The biomass distribution on Earth. Proceedings of the National Academy of Sciences 115, 6506–6511. doi:10.1073/pnas.1711842115



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Biomass of Life Humans in Perspective

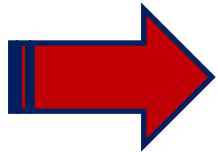
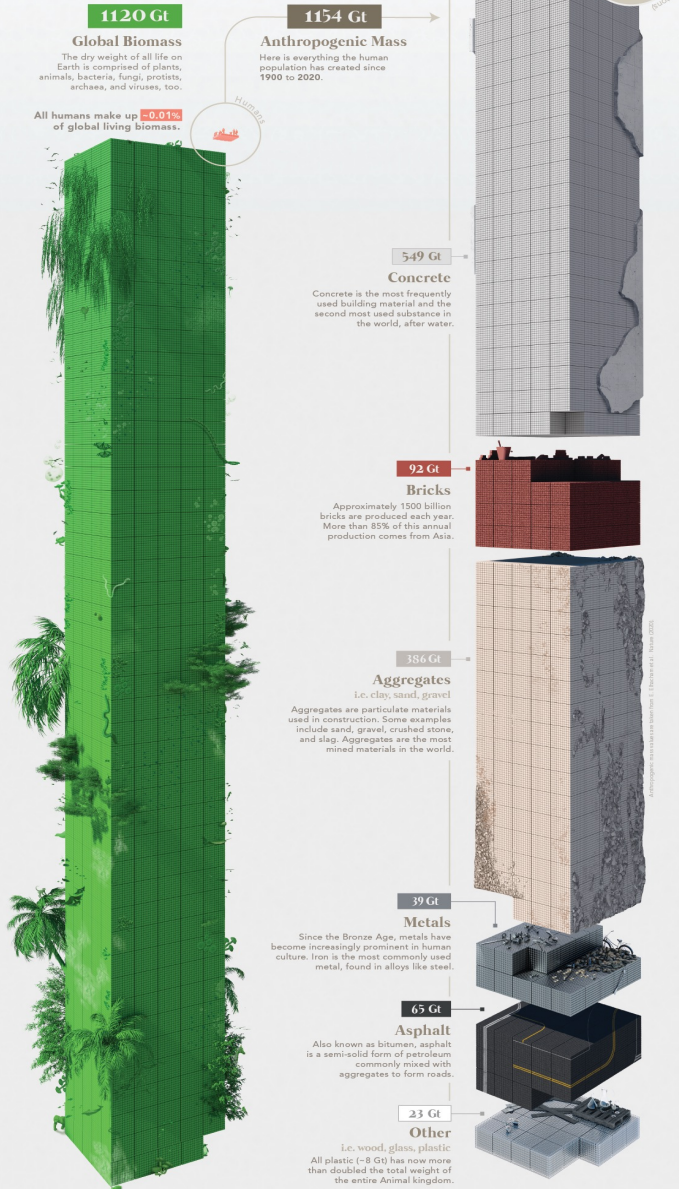
Source: Visualcapitalist.com

Visualizing the Scale of Anthropogenic Mass

Anthropogenic mass, or human-made mass, refers to the materials embedded within inanimate solid objects that are made by humans.

In 2020, the amount of anthropogenic mass exceeded the weight of all global living biomass.

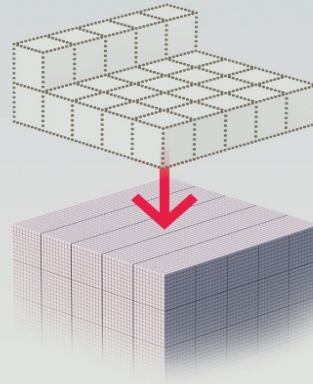
As humans continue to dominate Earth, questions surrounding our material output are increasing. We break down the composition of all human-made materials and the rate of their production.



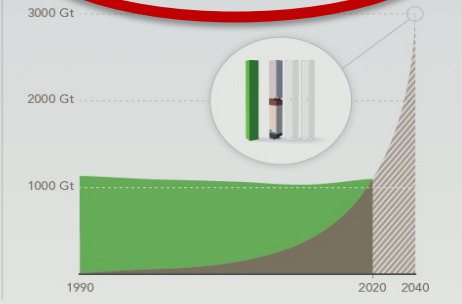
The Accumulation of Anthropogenic Mass

The current rate of accumulation for human-made mass is approximately **30 Gt of mass per year**.

This is equal to each person on Earth producing their own weight in human-made mass every week.



As accumulation rates increase, the amount of human-made mass is predicted to almost **triple the total amount of global living biomass by 2040**.



These trends highlight the alarming speed and volume in which human contributions are impacting the world.

SOURCE Elhacham, E., Ben-Uri, L., Grozovski, J., Bar-On, Y.M., Milo, R., 2020. Global human-made mass exceeds all living biomass. Nature 588, 442–444. doi:10.1038/s41586-020-3010-5

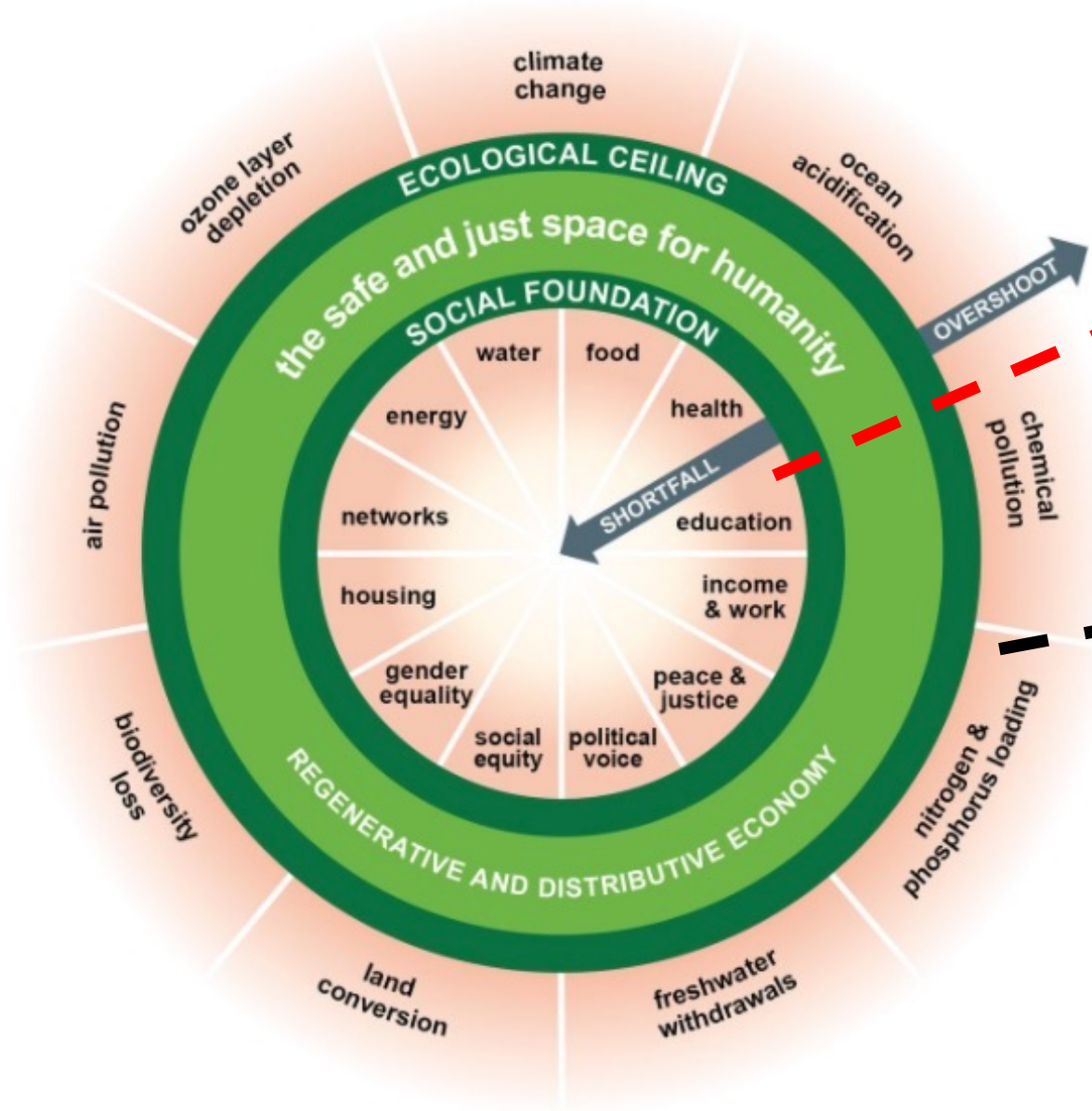


COLLABORATORS RESEARCH + WRITING Bruno Venditti | ART DIRECTION + DESIGN Mark Belan

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Source: Visualcapitalist.com

A compass for human prosperity

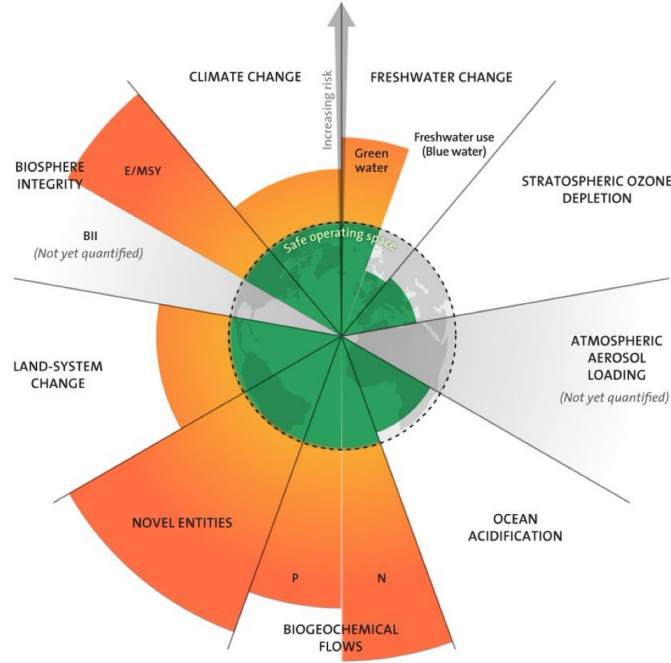
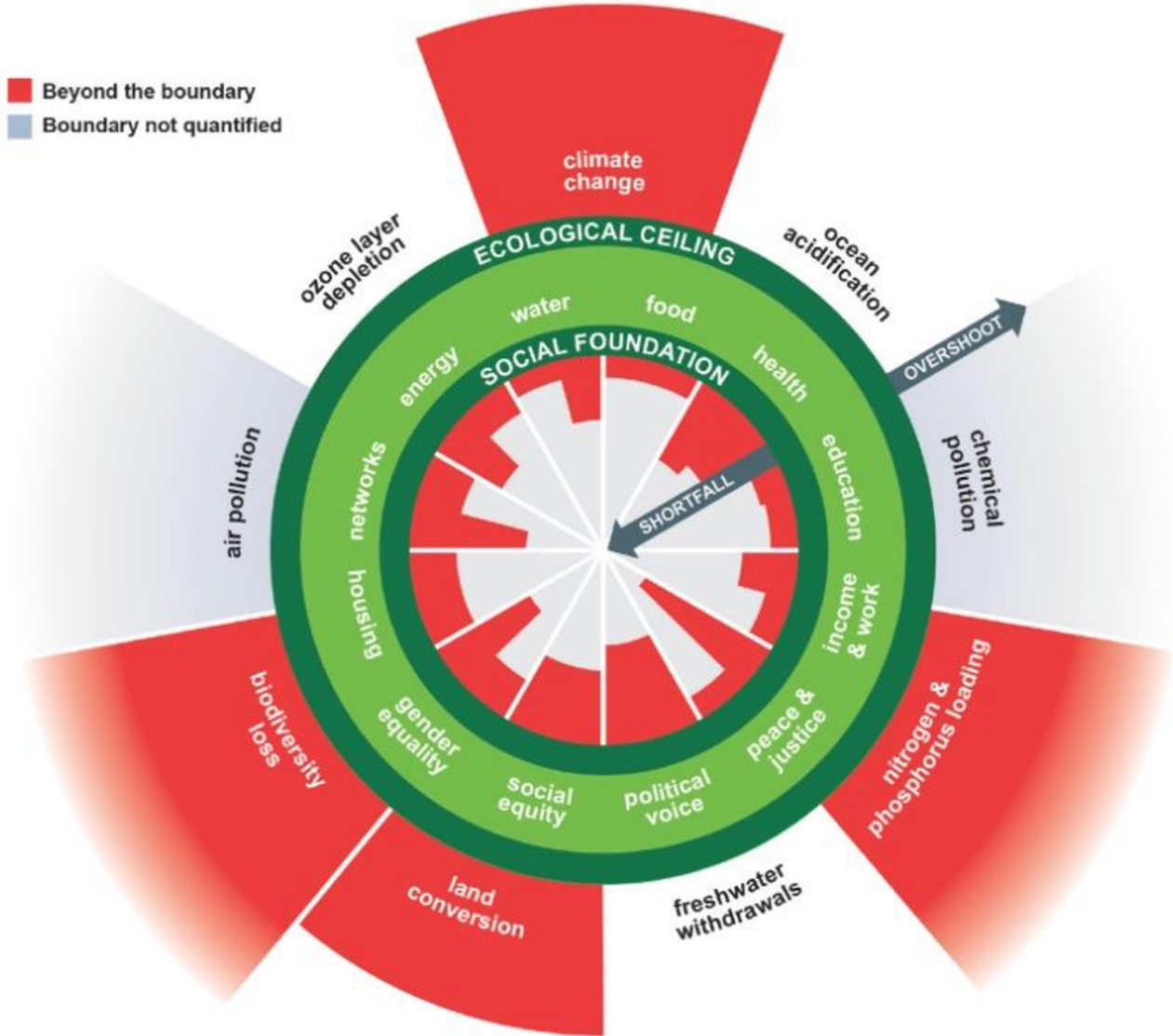


*Basis human needs
incl. minimum requirements
of resource supply*

*Outer limit by Planetary
Boundaries*

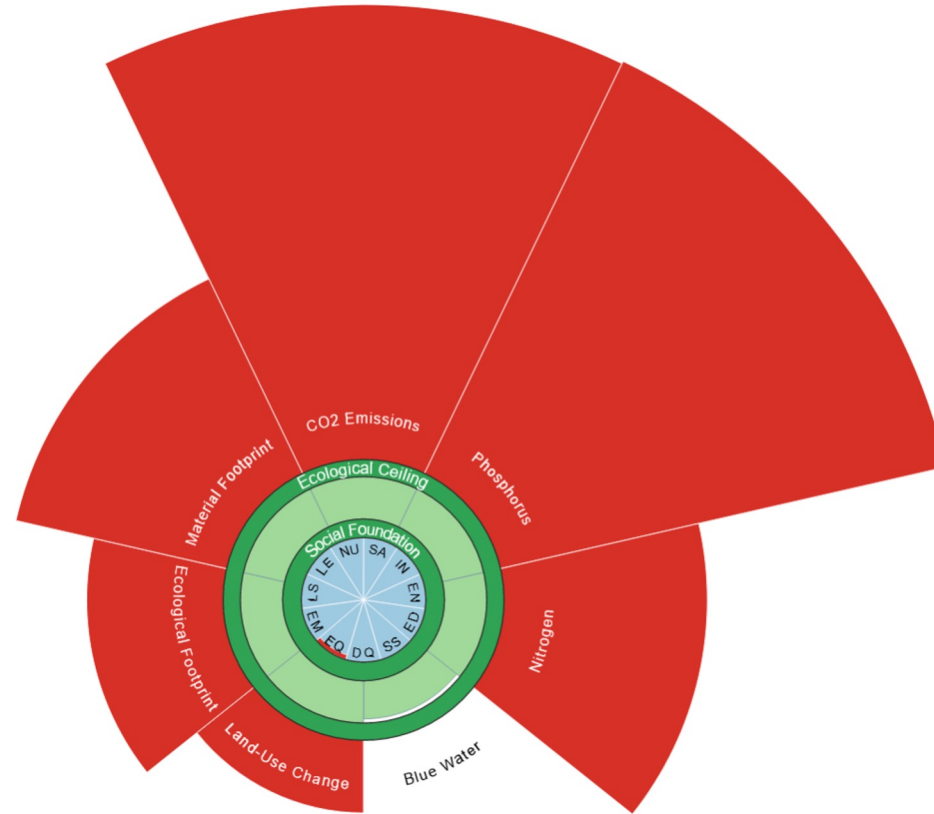
Adapted from Raworth 2017

Humanity is living far out of balance



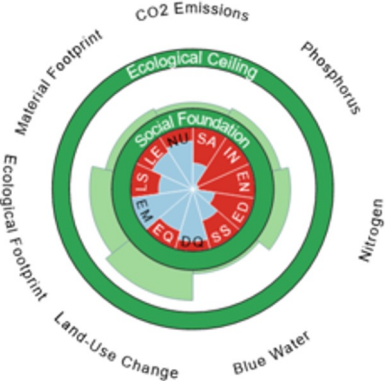
Source: Potsdam Institute for Climate Impact Research, 2022 reassessment

Divergent national contexts

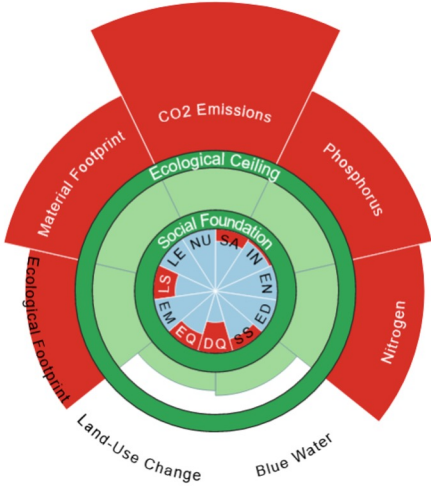


Divergent national contexts

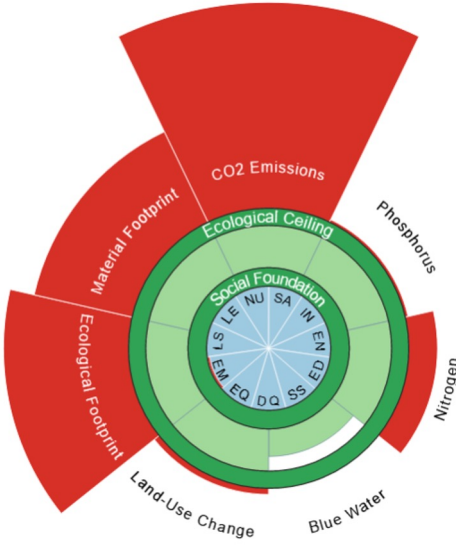
goodlife.leeds.ac.uk



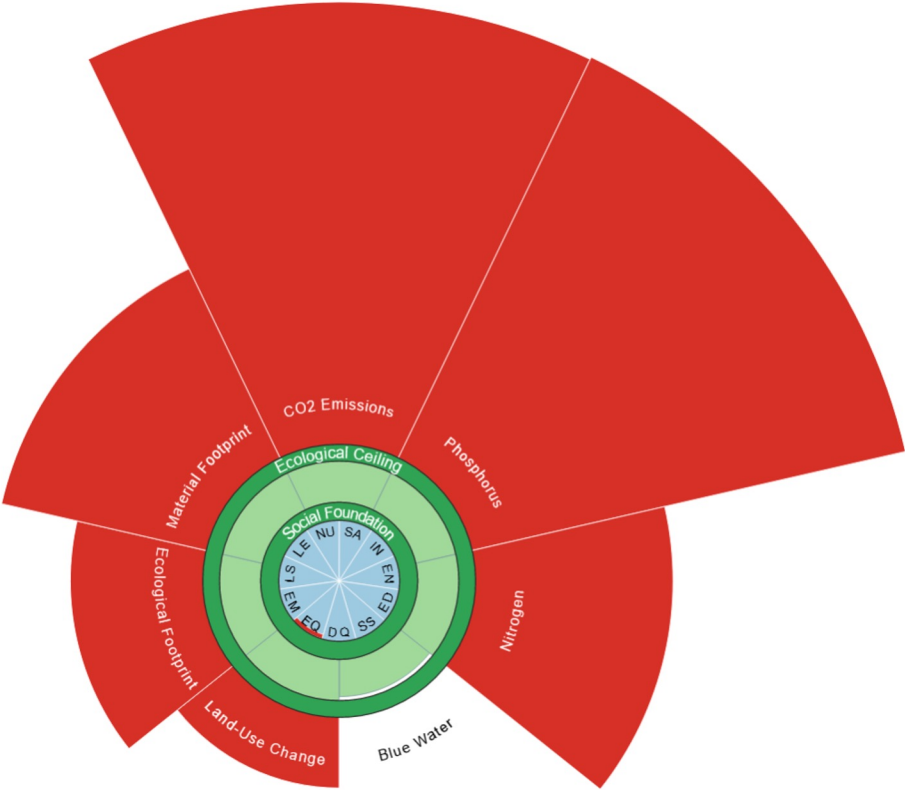
Malawi
\$1,000 pc



China
\$17,200 pc



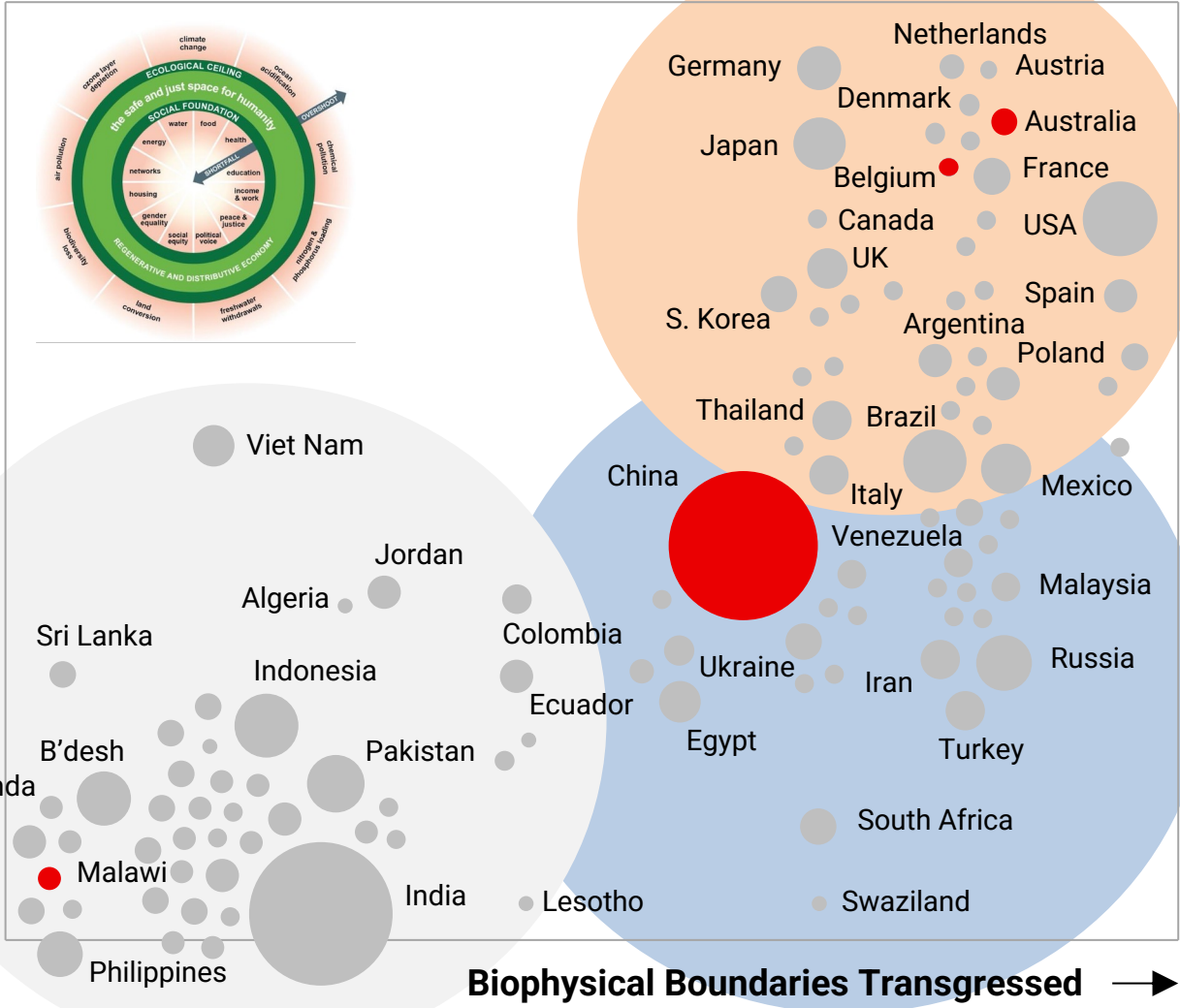
Belgium
\$54,000 pc



Australia
\$54,900 pc

Humanity's sweetspot

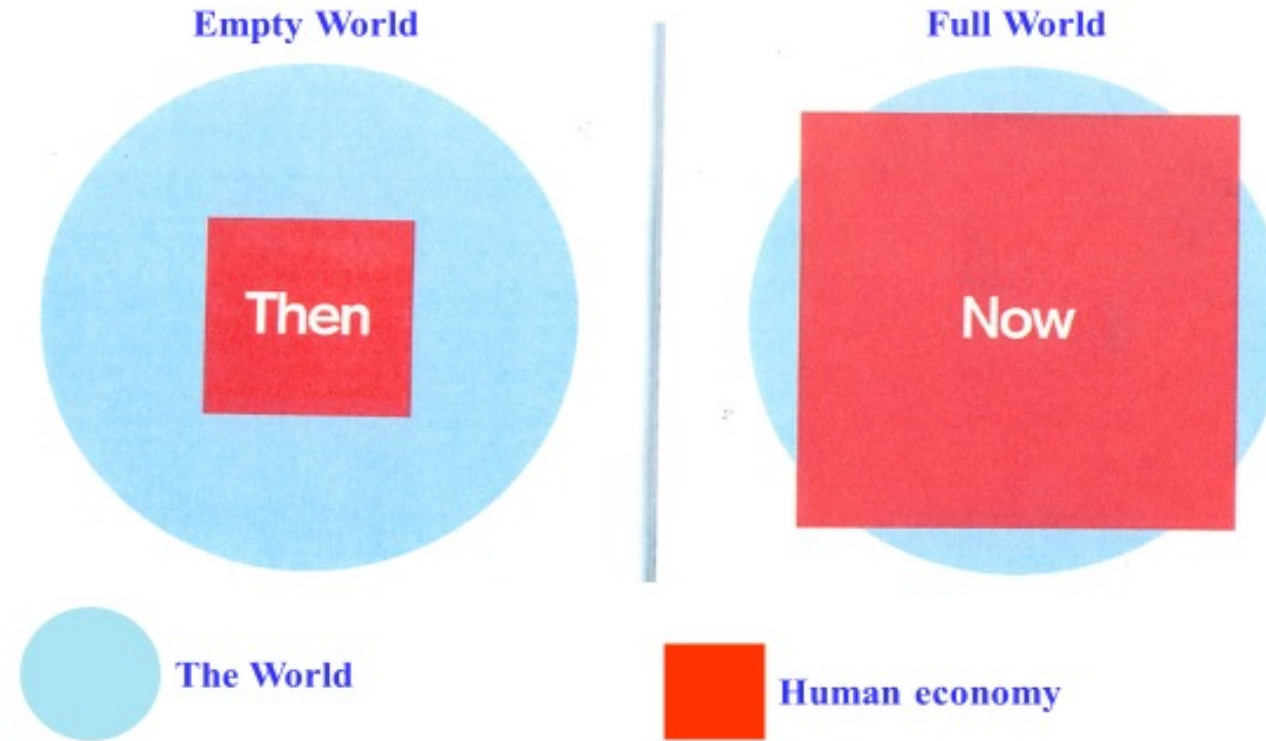
Social Thresholds Achieved →



Biophysical Boundaries Transgressed →

- colonialism*
- military power*
- trade & finance rules*
- resource extraction*
- climate-change impacts*

From “Empty” World to “Full” World



Source: Club of Rome: Simplified after Herman Daly

Labour and Infrastructure limiting factors of human wellbeing



Natural resources and Environmental sinks limiting factors of human wellbeing



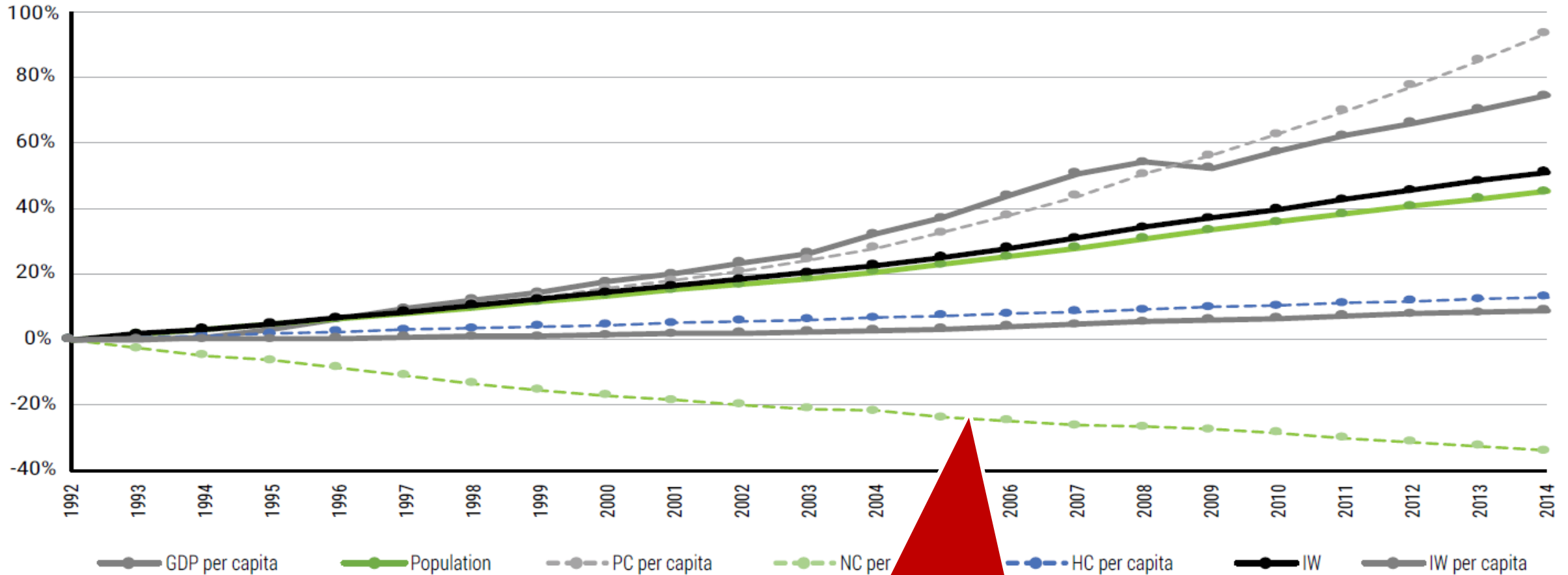
*For the first time in a human history, we face the emergence of a single, tightly coupled human **social-ecological system of planetary scope.***

*We are more **interconnected** and **interdependent** than ever.*

*Our individual and collective **responsibility** has enormously increased.*

Inclusive Wealth (IW) Index (and its components) evolution - 1992 to 2014

Source: Inclusive Wealth Report 2018



IW – Inclusive Wealth

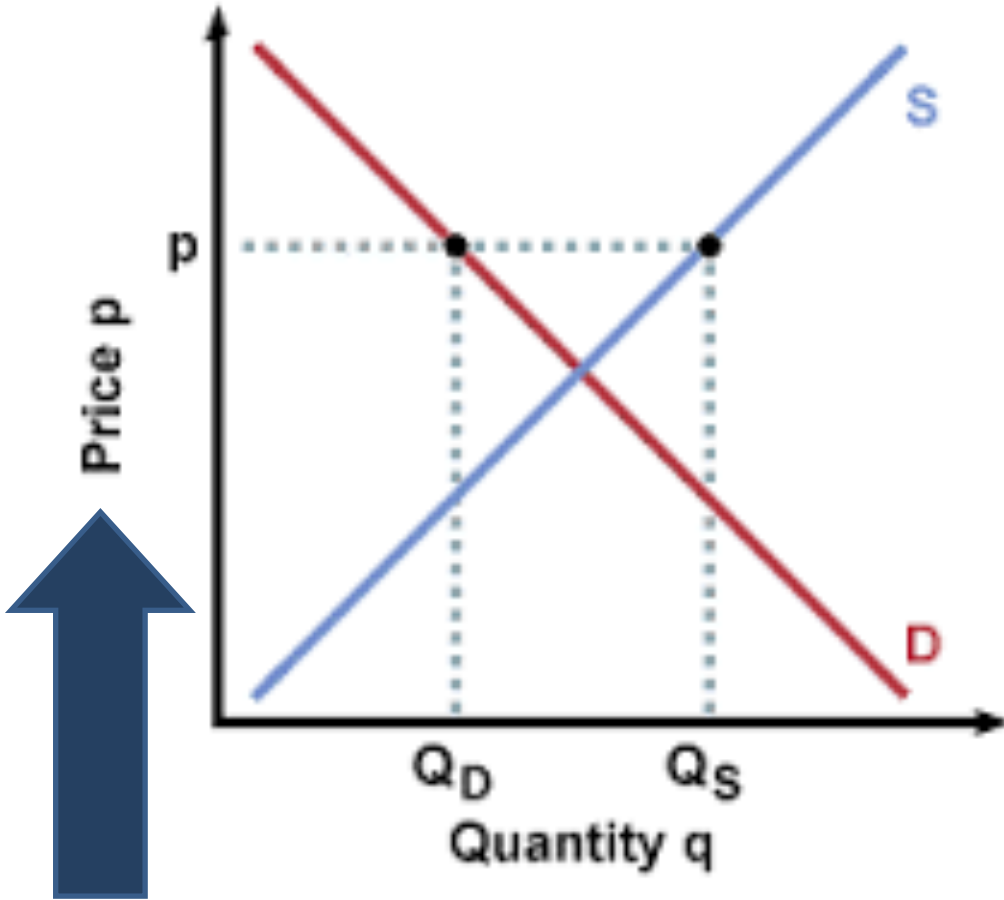
PC – Production capital

HC – Human capital

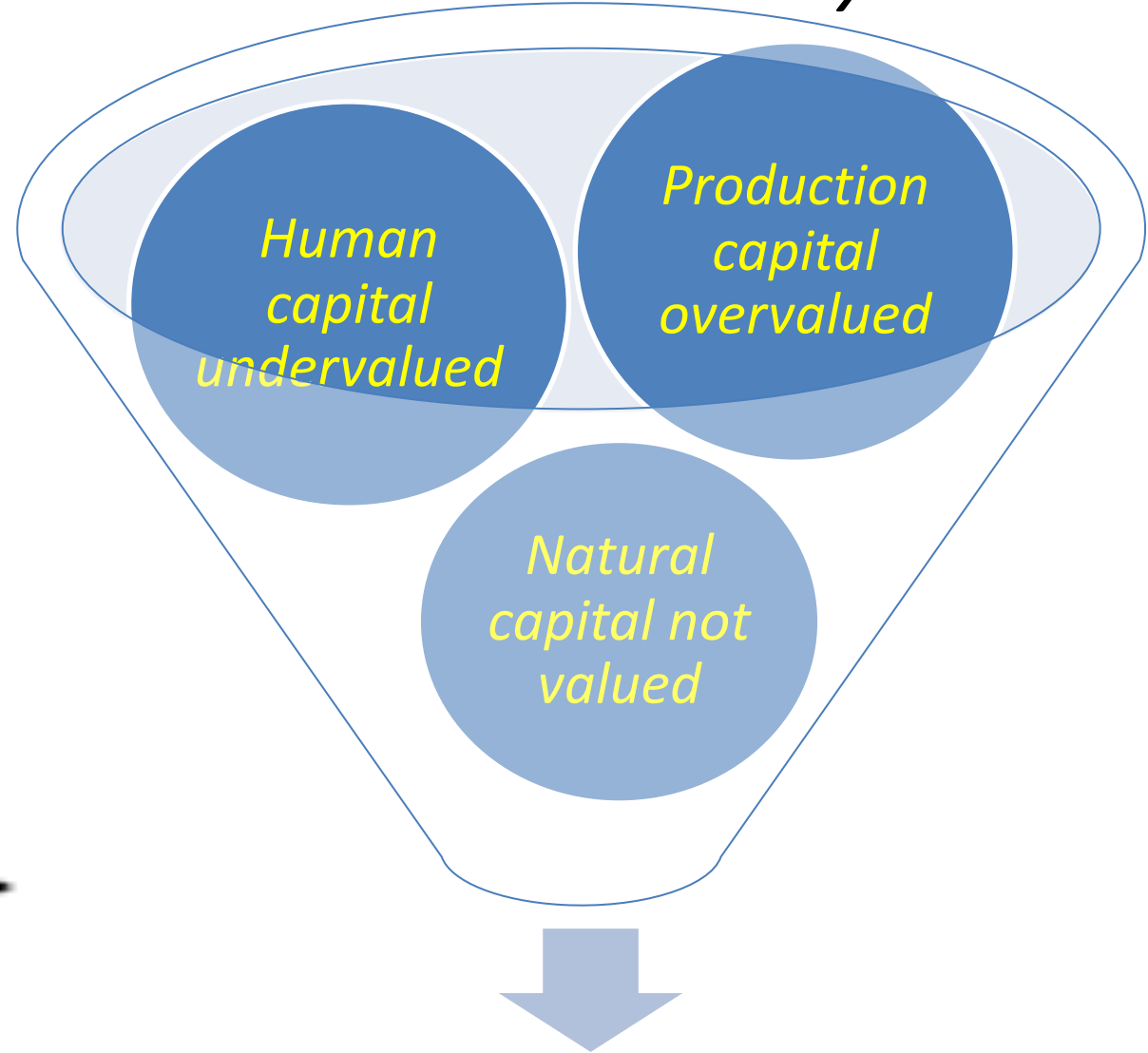
NC – Natural capital

Growth of GDP in the past decades has been achieved at the cost of depleting natural capital and indebting future generations

*Producers/Consumers
Rational Behaviour*



Market Economy

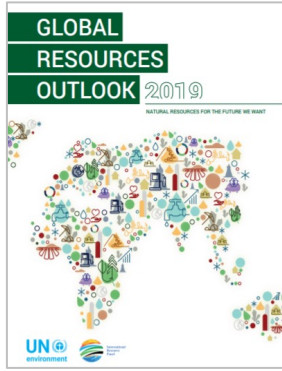


*Economic, social and environmental
(in)balance*

Extraction and Processing of Resources
Drives triple Planetary Crisis
Material Use Trends and Impacts

Natural Resources:

Provide the foundation for the goods, services and infrastructure that make up our current socio-economic systems



Biomass

Biomass (wood, crops, including food, fuel, feedstock and plant-based materials)



Fossil fuels

Fossil fuels (coal, gas and oil)



Metals

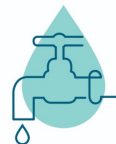
Metals (such as iron, aluminum and cooper...)



Non-metallic minerals

Non-metallic minerals (including sand, gravel and limestone)

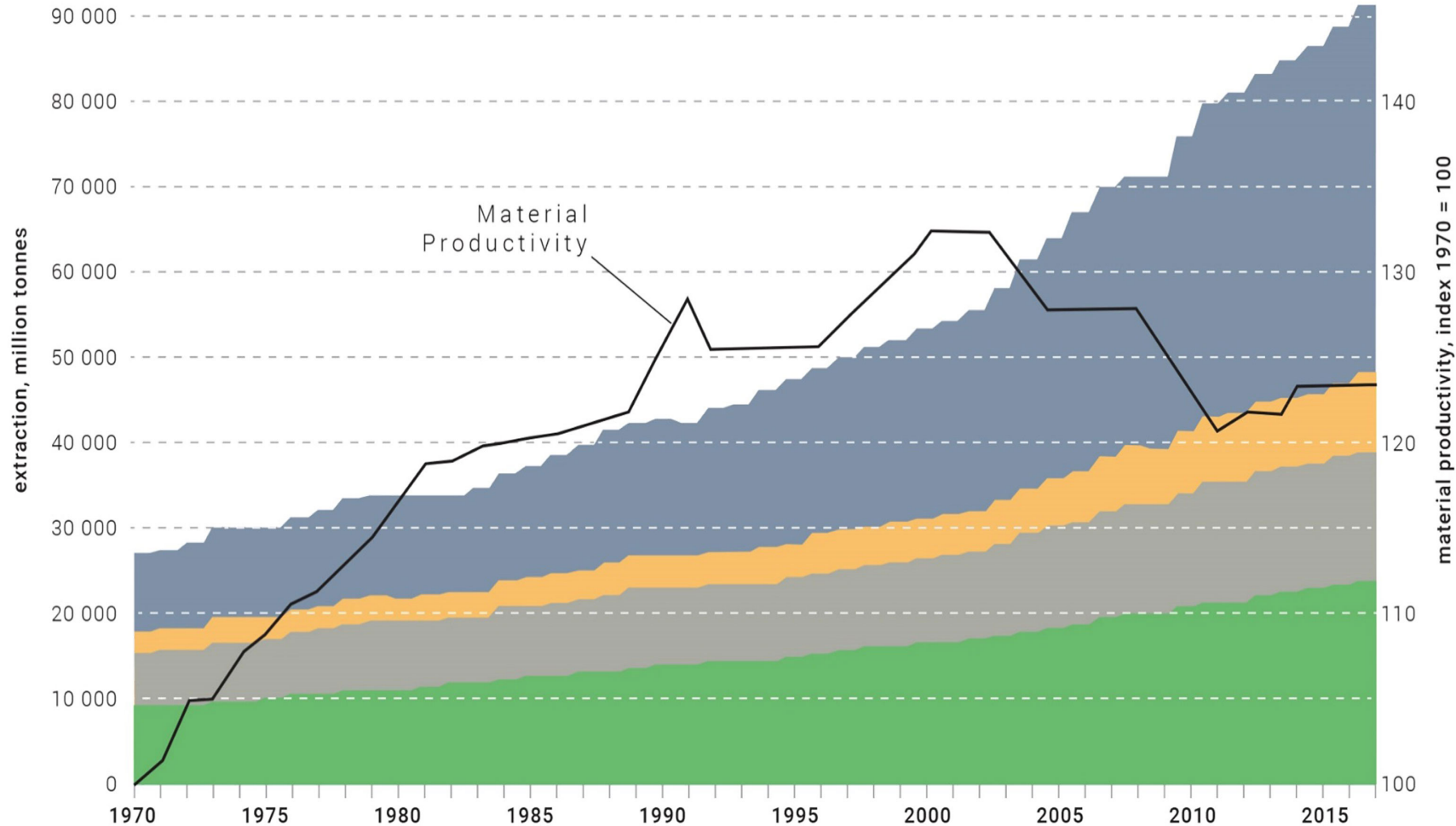
Materials
Extracted from
earth



Water and Land







Global Material Use, Demand per capita and Material Productivity in the years 1970-2017



Global material use has more than tripled since 1970

Global material demand per capita grew from 7.4 tons in 1970 to 12.2 tons per capita in 2017

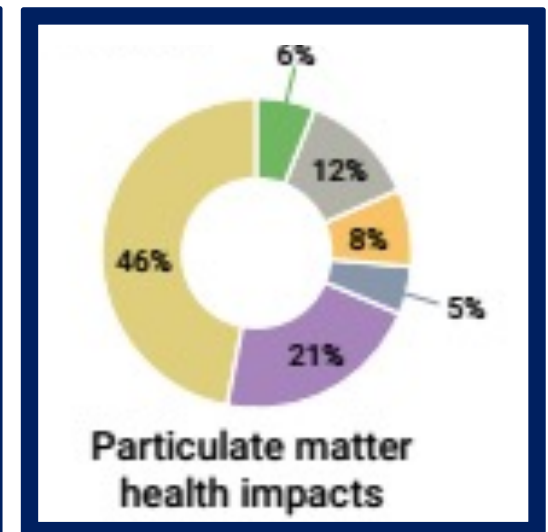
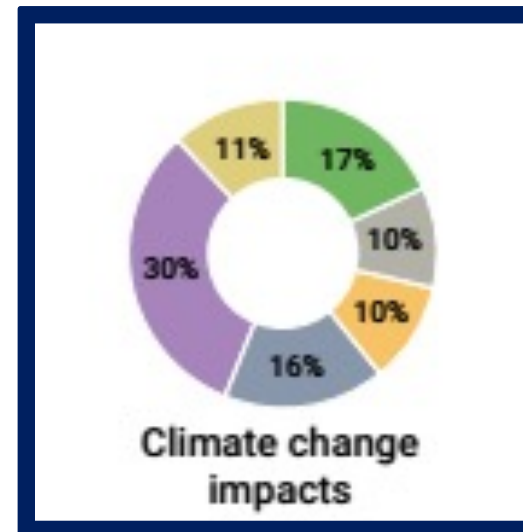
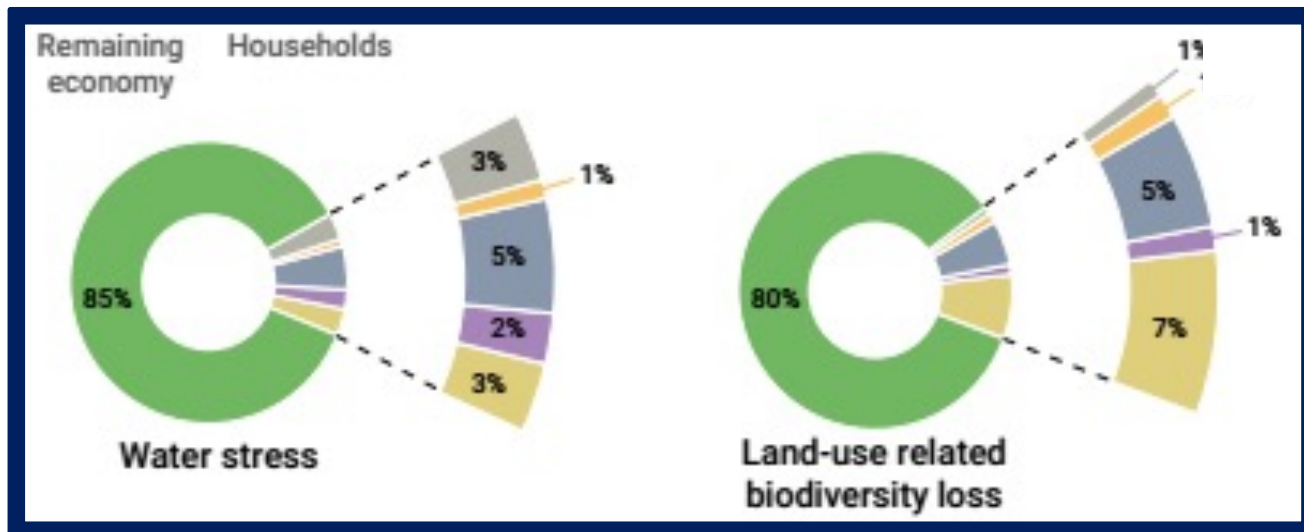
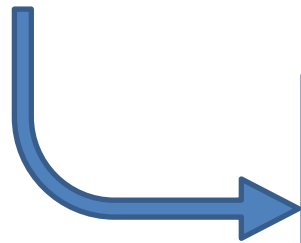
Material productivity started to decline around 2000 and has stagnated in the recent years

-  Non-metallic minerals
-  Metals
-  Fossil fuels
-  Biomass

Extraction and Processing of Natural Resources Drives all Aspects of the Triple Planetary Crisis

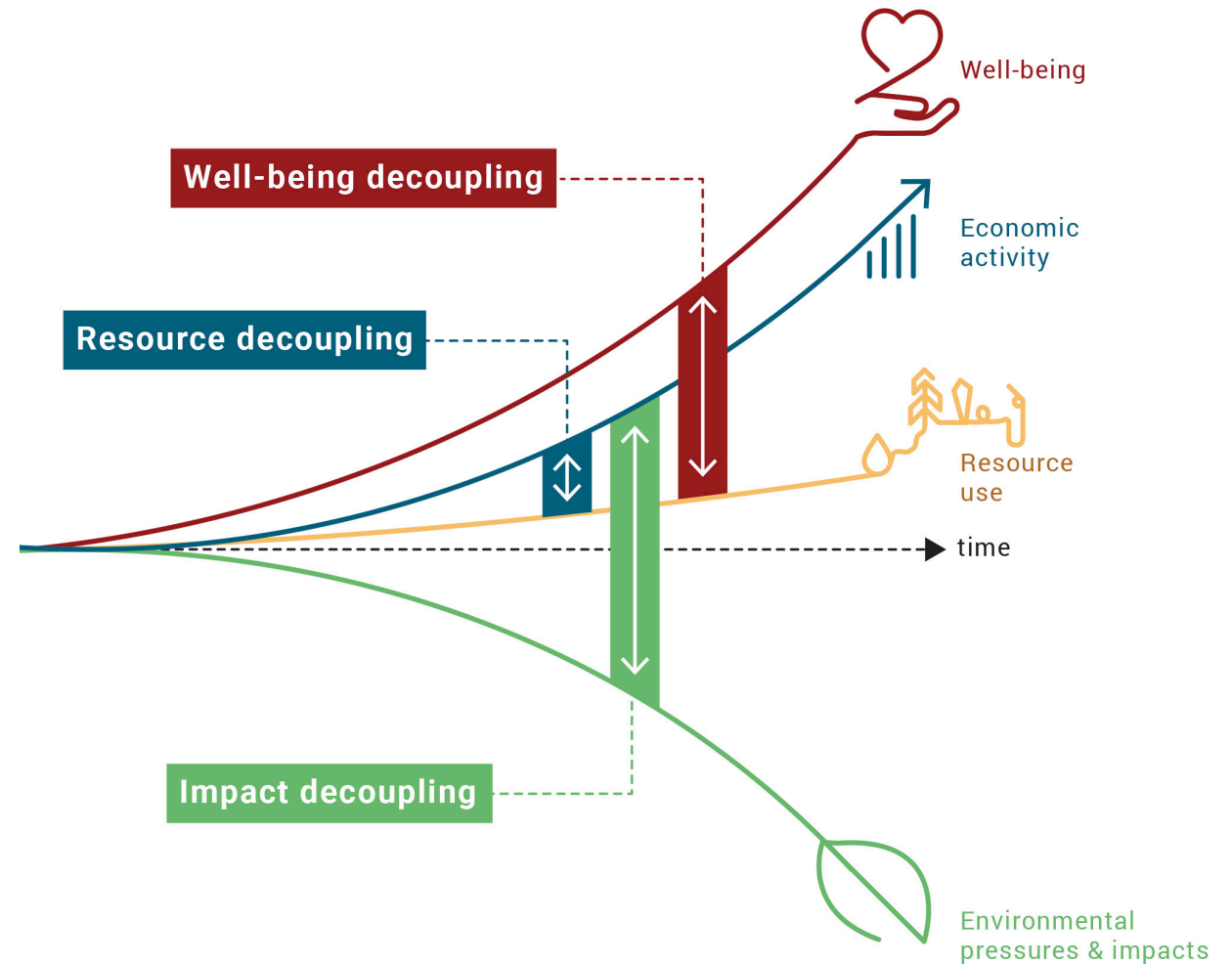
Environmental impacts of materials in the value chain in extraction and processing phase

90% of global land related biodiversity loss and water stress
50% of global climate change impacts
1/3 of air pollution health impacts



If current trends would continue, global material consumption is predicted to double by 2060

Decoupling

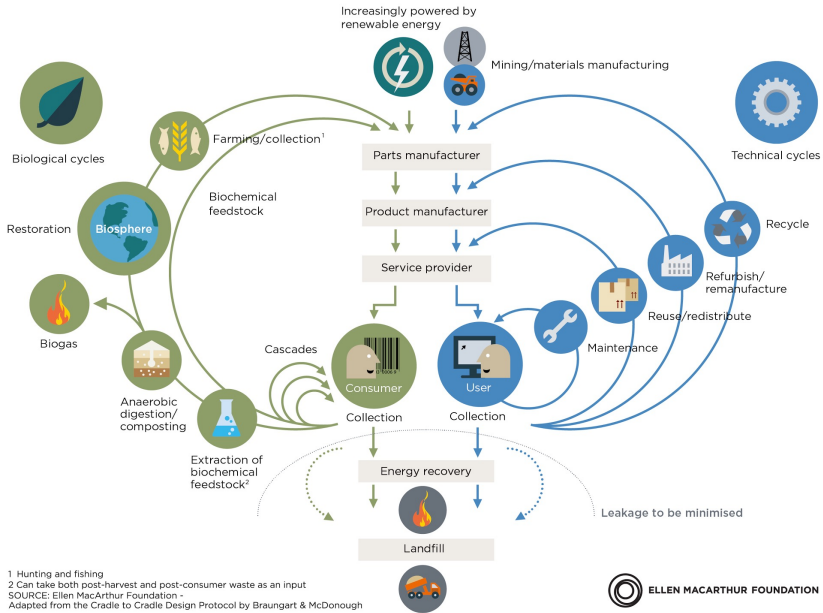


Solutions do exist ...

System Change Based on Circular Economy

Some basics ...

CIRCULAR ECONOMY - an industrial system that is restorative by design



Circular economy should be seen as an *instrument for delivering decoupling of economic growth from resource use and environmental impacts in practice, as well as a part of the bigger picture of economic, societal and cultural transformation needed to deliver the EGD and SDGs*

The first dimension is often overlooked...

Resource Efficiency ↑

Dimensions	
1 <i>BETTER: Minimise product need through better system design</i>	<i>Refuse and Rethink strategies</i>
2 <i>LEANER: Optimise product design</i>	<i>Reduce strategies in manufacture and use</i>
3 <i>LONGER: Maximise lifespan of products and its parts</i>	<i>Reuse, Repair, Refurbish, Remanufacture, Repurpose and Recycle strategies</i>
4 <i>CLEANER: Minimise waste and pollution</i>	<i>Recovery strategies</i>

Often overlooked, but crucial for effectiveness



From Product Maximisation to Providing Human Needs

It is not not about owing it is about using

We do not need cars

...

We need mobility

We do not need light bulbs

...

We need light

We do not need chairs

...

We need to sit

We do not need refrigerators

...

We need chilled and healthy food

We do not need CDs

...

We want to listen to the music

We do not need pesticides

...

We want healthy plants



Main question often-overlooked to be addressed

*How to meet human
needs in most
energy and resource
efficient way?*



<https://edistaffing.com>

Main Blind-Spots

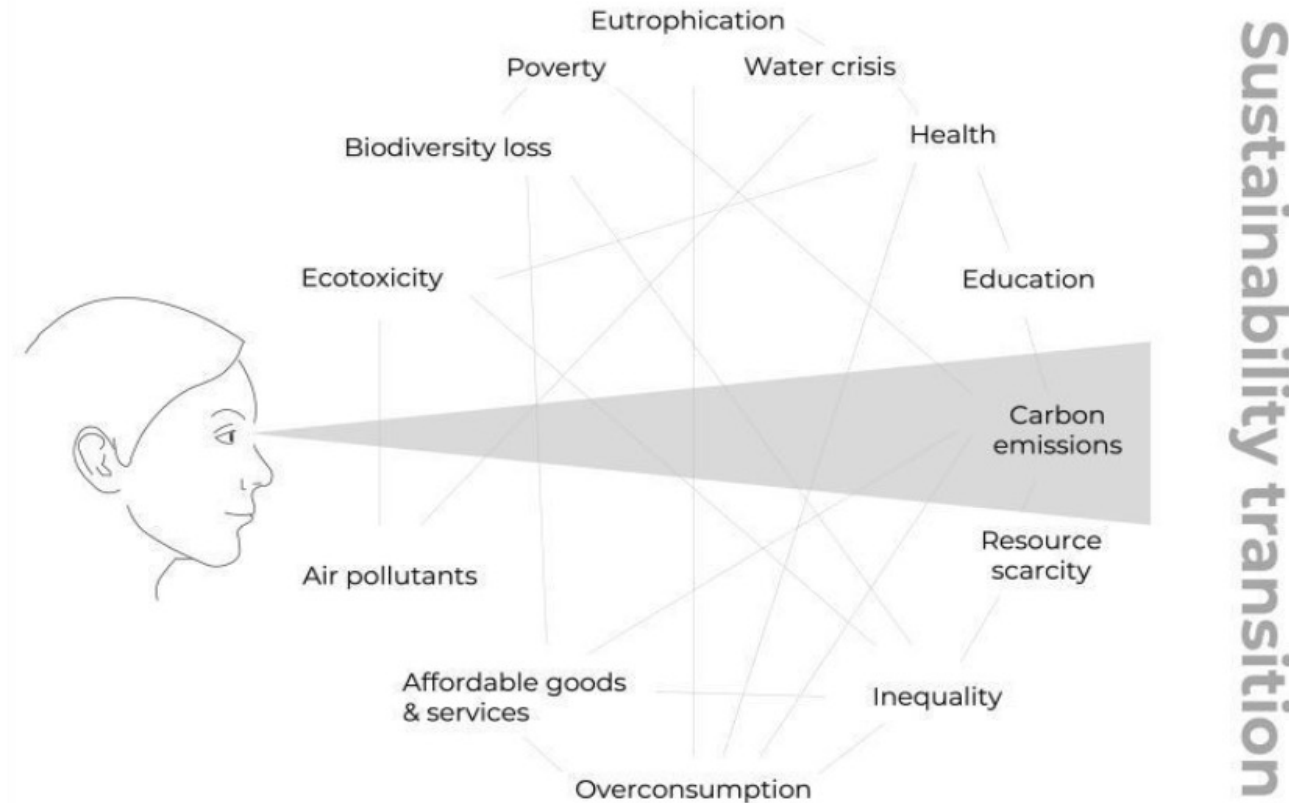
Climate Change in Focus

1

Lack of Holistic System approach

Public leaders lack capacity or knowledge of how to translate system change visions into their concrete policies/investment structures which ends in conflicting policy logics that hinder real transformation

We need to extend the optic and potential policy options beyond the currently prevailing energy supply



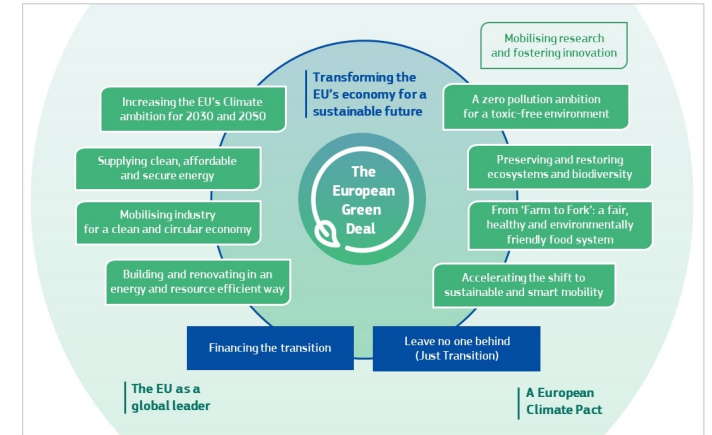
This leads to trade-offs and future lock-ins rather than synergies and potential multiple-benefits ▸ and resilient economy and society

2

Lack of Drivers and Pressures Perspective

Policy attention does not focus on the roots of the problem and address the drivers and pressures. It lack focus on natural resource use and management, as well as on market signals leading consumers and producers' behaviour.

European Green Deal - In its most quoted paragraph, we can find the targets »of reaching no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use.«



Attention is mainly given to the goal related to no net emissions of greenhouse gasses, while decupling is somehow set aside, rarely mentioned.

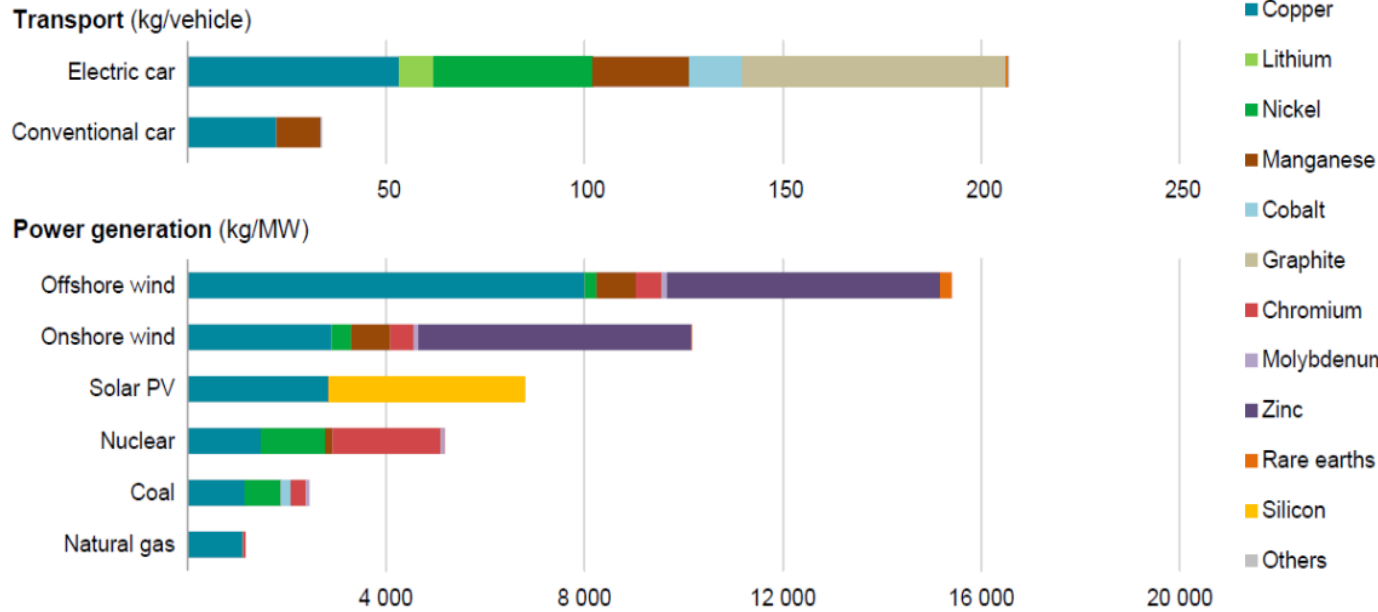
It is only recently getting more attention, but again only in the context of the need to reach the no net GHG emissions target, due to the acknowledgment that success of energy transition depends on securing the access to increased critical material needs.



Transition to net zero GHG target is materials demanding on the supply (energy production), and on demand (energy use) side



Minerals used in selected clean energy technologies



Electric vehicles use close to ten times the material of conventional cars – using at least eight different critical material types, compared to just three for conventional cars.

Reaching net zero by 2050 will require about six times today's critical mineral use in 2040.

And even meeting today's under-ambitious national climate plans would require more than doubling of critical minerals we are using today.

Notes: kg = kilogramme; MW = megawatt. Steel and aluminium not included. See Chapter 1 and Annex for details on the assumptions and methodologies.

An effective solution to mitigate CRM Risks has 3 indispensable pillars



1

Improve virgin CRM supply

LEANER

Land efficient mining methods

CLEANER

*Minimize chemical inputs
Electrify mining machinery
Secure and clean tailings*



2

Improve circularity directly for CRMs and CRM including products

BETTER More intensive use of energy installations and batteries

LEANER Lean design of energy infrastructure

LONGER Reuse/repair of solar PV, storage systems etc

CLEANER; Reduced CRM waste: better collection and recycling at EOL



3

Improve CE efficiency of energy intensive systems to reduce need for CRMs in the first place

BETTER system design

LEANER products making up systems

LONGER product use

CLEANER products through recycled, alternative material use and EOL collection

Most current solutions focus on Pillars 1+2

The EU CRM Act

“...streamline Strategic Projects in mining, extraction, and recycling. [...]. Member States are responsible for circularity efforts and promoting material efficiency

Pillar 1

US strategy on CRM

“...prioritizes a Made in America Supply Chain, with investments in domestic production for critical minerals and materials.”

Pillar 1

G7 Strategy

The G7 ministers prioritize strengthening critical minerals supply chains for a net-zero economy with high ESG standards and human rights. “...aiming for efficient international recovery, capacity building, and research for sustainable alternatives.”

Pillar 1

Pillar 2

*There are multilateral and national strategies on managing the supply chain risks of CRM but **too little focus on environmental impacts, and missed opportunities to reduce demand through systemic circular economy strategies***



Confusing Market Signals

- *Current market signals on our markets, are leading to systemic social and environmental imbalances - Food shopping centre example. Our short-term rational behaviour is leading to a long-term irrational “Charming mass suicide” (Arto Paasilinna novel title).*
- *Ambitious policies face an uphill battle to implement incentives and regulations to change our production and consumption patterns. **Sending policy signals one way, and market signals the other**, is creating confusion (not to mention intense lobbying by companies that fear the loss of profitable markets). It’s time to stop signalling to producers that destroying natural capital is free of charge. Time to stop contradictory messages to consumers, who still routinely pay more for food with a low environmental impact, instead of the reverse.*

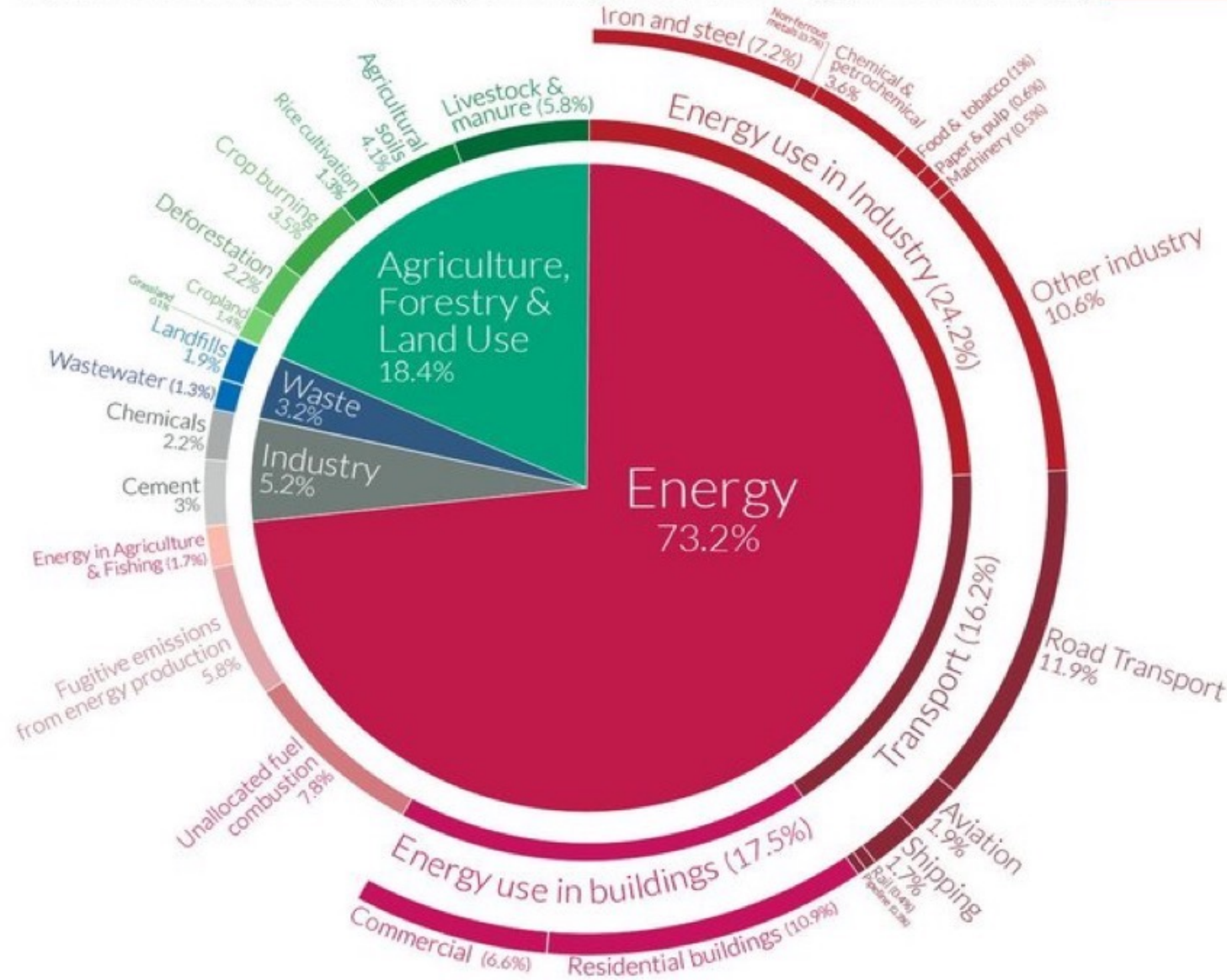
Lack of Demand Side Focus

Policy attention is mainly given to the supply side of the economy, to the cleaning of the existing economic system - lacking the attention to the demand side which is leaving out an important solutions potential and questions of responsibility and equity.

Global greenhouse gas emissions by sector



This is shown for the year 2016 – global greenhouse gas emissions were 49.4 billion tonnes CO₂eq.



Why is energy so important, and why it is even more important to look beyond the energy?



- *To unpack the standstill in our climate efforts and make them effective, to start closing the existing gap among high-income and low-income countries, we must **stop ignoring the inherent wastefulness of our production and consumption systems**, in particular in high-income countries. **For example**, it would be in vain to decarbonize the production of steel, as important as this is, if it is used to produce under-used cars and houses, which contribute to traffic and property market bubbles, but not to real social prosperity.*
- *Efficiency policies should be complimented by **sufficiency policies**. We should start looking how to integrate **material and consumption footprints** in NDC's structure and logic.*

*If we want to avoid
extinction of elephants
in nature ...*

*we must extinct
elephants in our rooms*



[Source: Hop distance - The elephant in the room ...blogs.bmj.com](https://blogs.bmj.com)

IRP Global Resource Outlook 2024
Towards Sustainable and Equitable World
Major Methodological Novelties



Looking at Resource Use through Provisioning Systems - Systems Delivering Essential Human Needs

- *We must shift away from the prevailing resource wasteful economic approach based on maximising the output of sectors, simplistically defined by GDP, towards an economy that is efficiently meeting human needs and optimise human wellbeing. The current logic is both ethically and ecologically unsustainable.*
- *This would also allow and incentivise the cross-sector innovation and shifts to a more future-fit business models leading to the reduction of resource use and deliver multiple benefits for people and planet.*

Mobility related example: Economic sector approach leading to a resource intensive economy and production model

A 'Glasgow Breakthrough' was announced on *road transport* aiming for zero emission vehicles to be the new normal, accessible, affordable, and sustainable in all regions by 2030.



**UN CLIMATE
CHANGE
CONFERENCE
UK 2021**

IN PARTNERSHIP WITH ITALY

System change in road transport means less and more efficient traffic, for more value, and less environmental/health impacts



Five Levers for Sustainable Car-Based Transport

*Reduce demand
for car-based
transport*



- *Reduce overall mobility need* (e.g., through remote work)
- *Modal shift* from cars to foot, bike, & public transport
- *Higher utilization of vehicles* through sharing

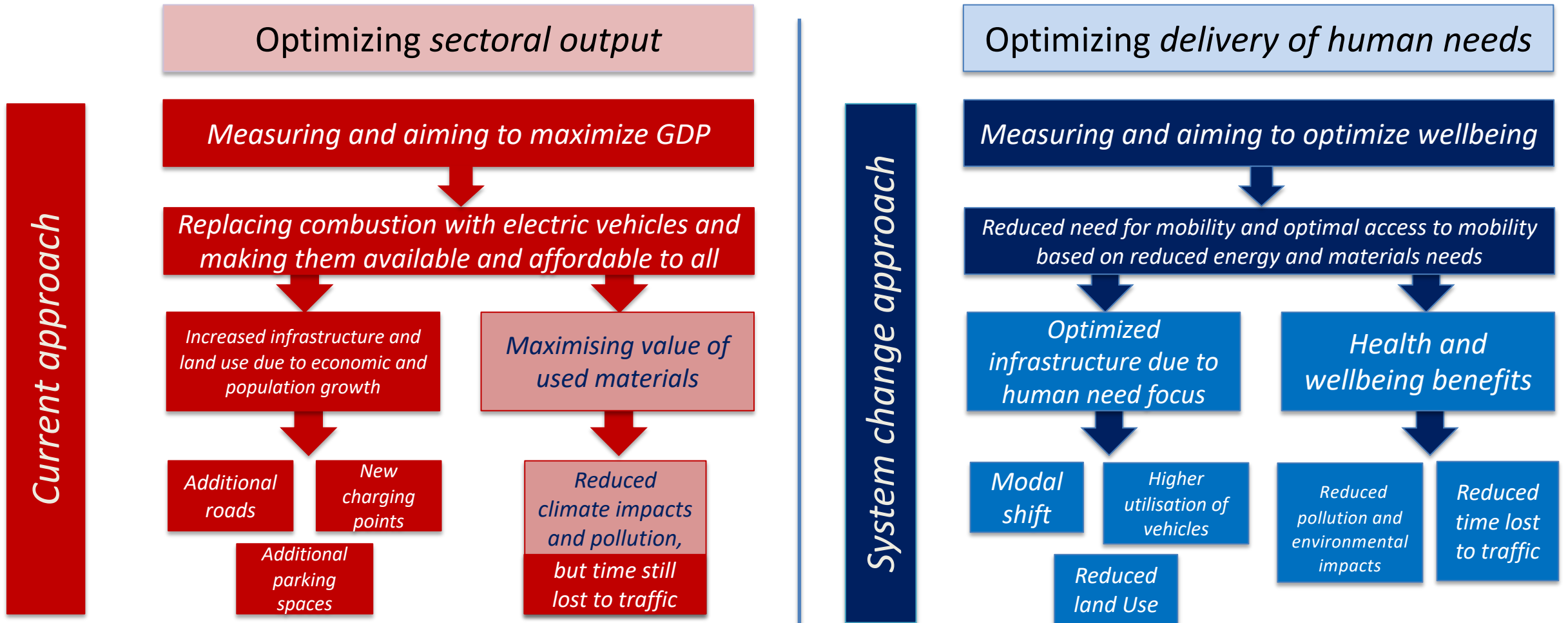
*Ensuring remaining
vehicles are as
sustainable as
possible*



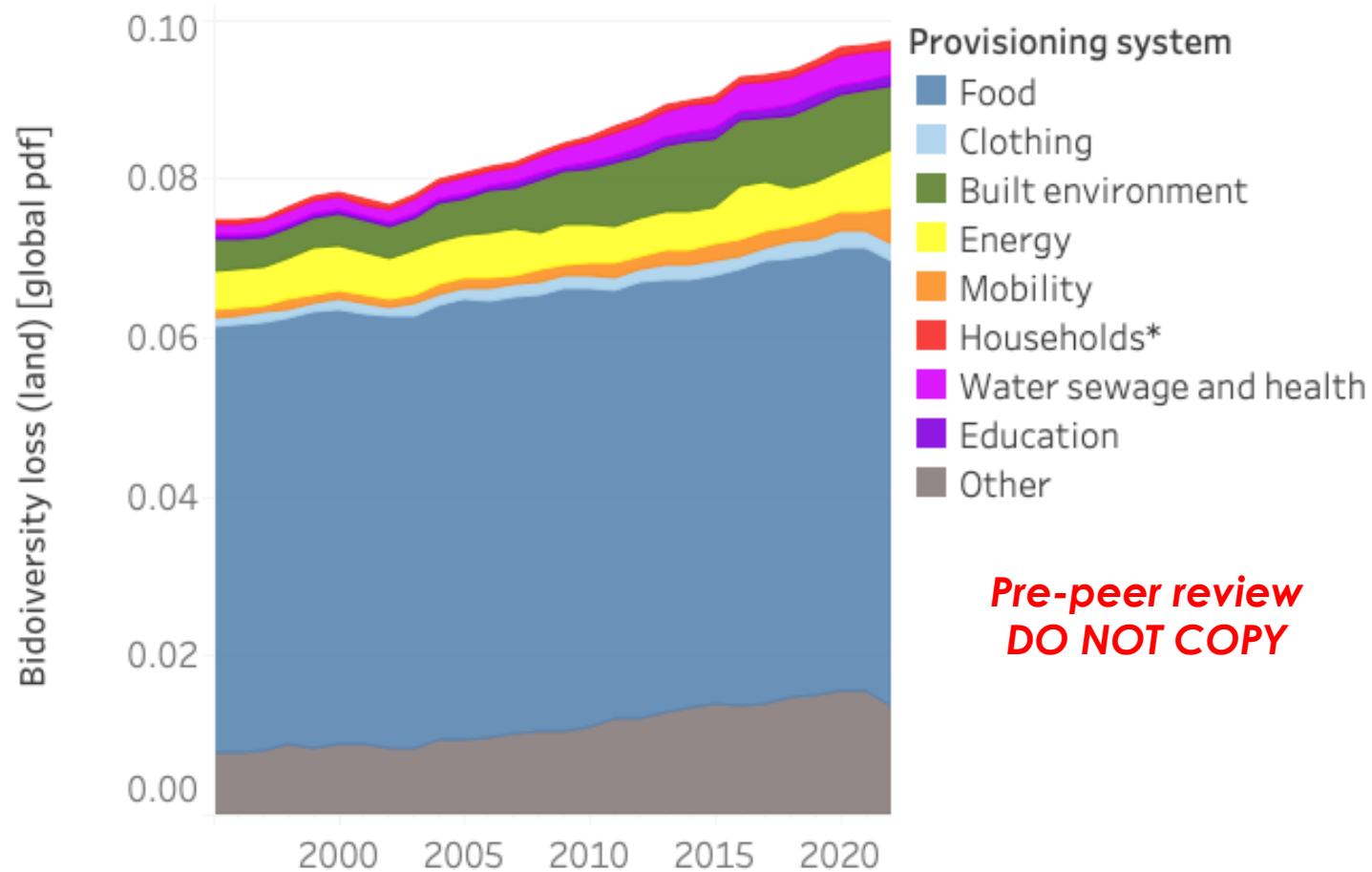
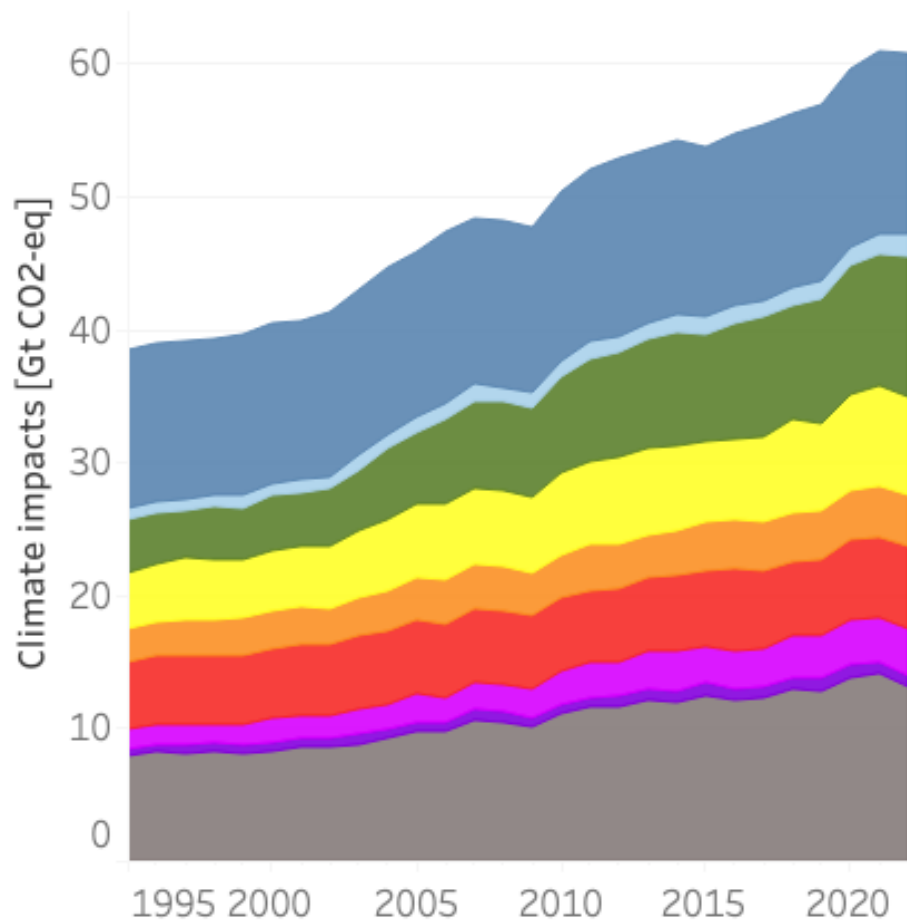
- *Electrification* based on renewable energy
- *Circularity*, maximizing value of used materials

Systems change logic deploys the whole sustainability potential and unlocks societal co-benefits

Example: optimizing the automotive sector OR mobility system



Five provisioning systems with most environmental impacts we're focusing on are Food and nutrition, Mobility, the Built Environment, Water and Sanitation, and Energy

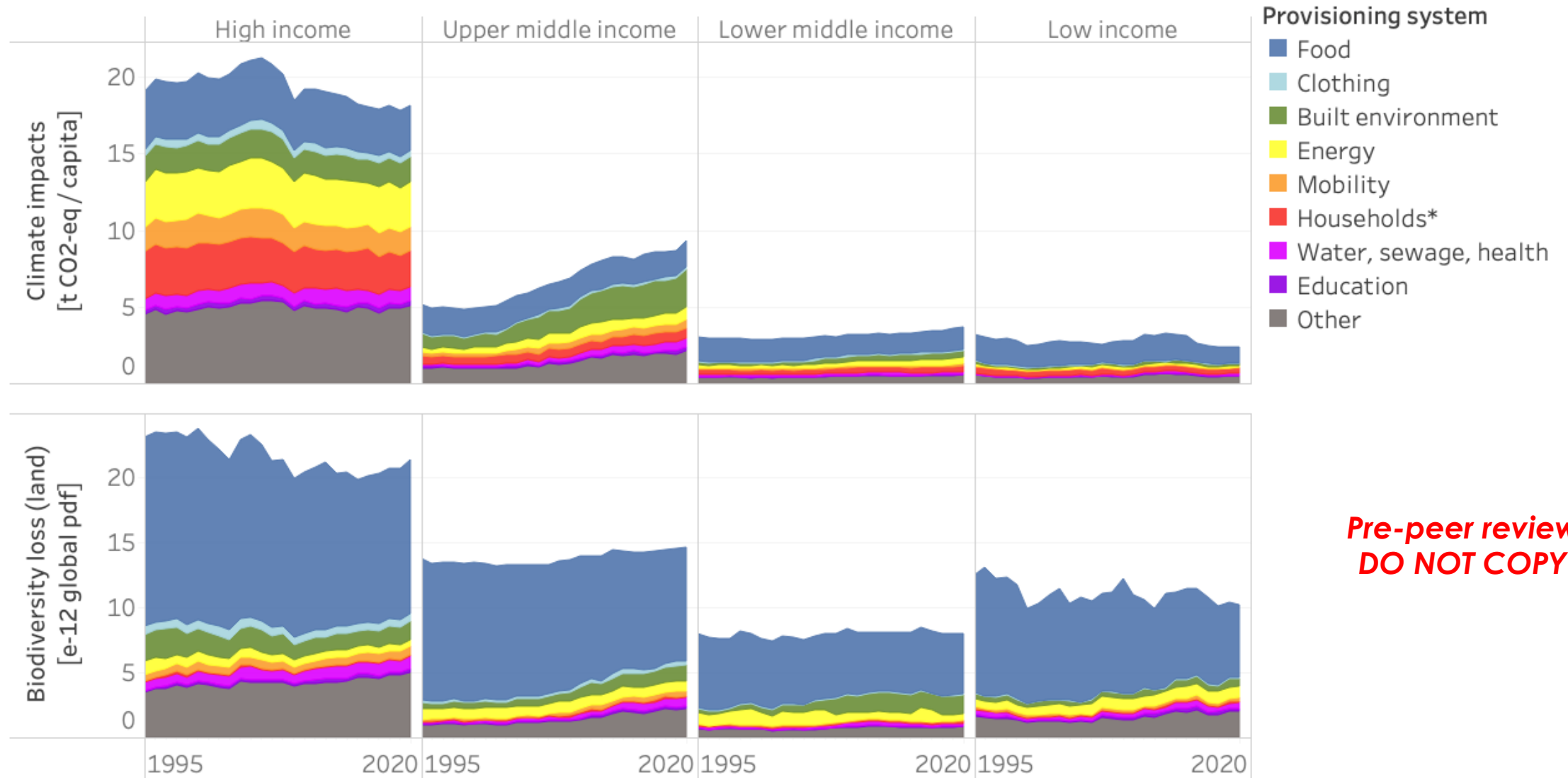


II.

Complement supply with demand side - Connecting resource use to equity and justice related implications

- *High-income countries* have benefitted most, and have driven the planetary crisis, while emerging and developing economies hold least responsibility, and are facing the worst impacts. The World Inequality Lab in recently published 2023 Climate Inequality Report showed that the top 10% of global emitters are responsible for 50% of global carbon emissions. This is not just a country-level story: the *highest consumers everywhere are responsible*.
- In high-income countries *absolute decoupling* should be the aim, whereas, in low and some middle-income countries, where additional resource use is still needed to meet people's basic wellbeing needs, we should aim at *relative decoupling*.

Impacts of need-delivery in high-income countries compared to the impacts in other income groups



**Pre-peer review
DO NOT COPY**

III.

Modelling Scenarios Capturing the System Change Dimension

- *Modeling results are not predictions, but illustrations of ‘what if’ effects.*
- ***Historic Trends scenario** explores the consequences of continued historical trajectories of resource production and consumption, including current improvements rates in resource efficiency as well as production methods.*
- ***Context Scenario** explores likely future if we pursue current policies and raised ambition on supply-side resource efficiency - traditional, sector-siloed, technical resource efficiency measures impact without fundamentally changing consumption patterns of provisioning systems*
- ***Towards Sustainable Prosperity Scenario** explores a sustainable path for global resource use if we would do a systemic shift to provisioning systems from both a supply and demand side and consumption perspective*

IV.

Responses Chapter

We need multilateral alignment on how to institutionalise resource use in our systems of Governance, Finance, Trade and Across Business

Governance: *Acknowledge the resource-specific implications of existing governance arrangements and targets and strengthen cooperation – collective resilience*

Finance: *Internalize hidden costs into resource pricing, use public money for public interest, stop subsidizing unsustainable resource use, incorporate resource risk and dependency into regulation of private finance and central bank mandates*

Trade: *Incorporate the impact of resource use into trade agreements, border adjustment taxes and mandatory due diligence; enable producer countries to capture a larger share of resource value*

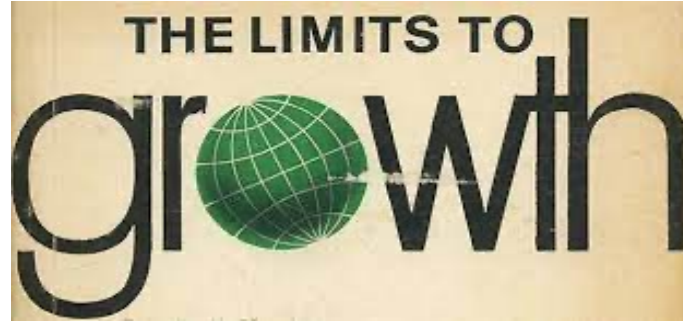
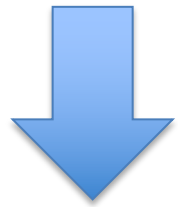
Business models: *(Re)organize production to use less energy and resources, invest in and monitor effectiveness of circular business models based on everything-as-a-service and extended producer ownership*

To Conclude

*Science is Clear and Change is Unavoidable
Towards the World of GRO 2024*

The World has Changed

1972



*Population on the Planet
3.8 billion*

2022

The Growth of Limits
*Climate Change,
Pandemics, Biodiversity
Loss, Security Threats ...*

*Population on the Planet
8 billion*

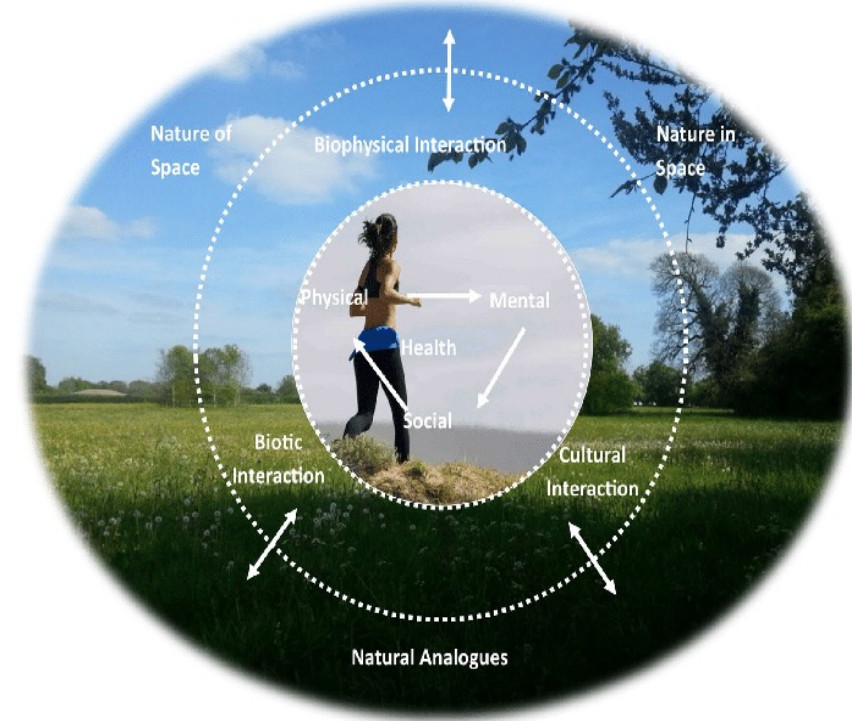
*To make the GRO 2024 vision implementable
some basic shifts would be needed:*



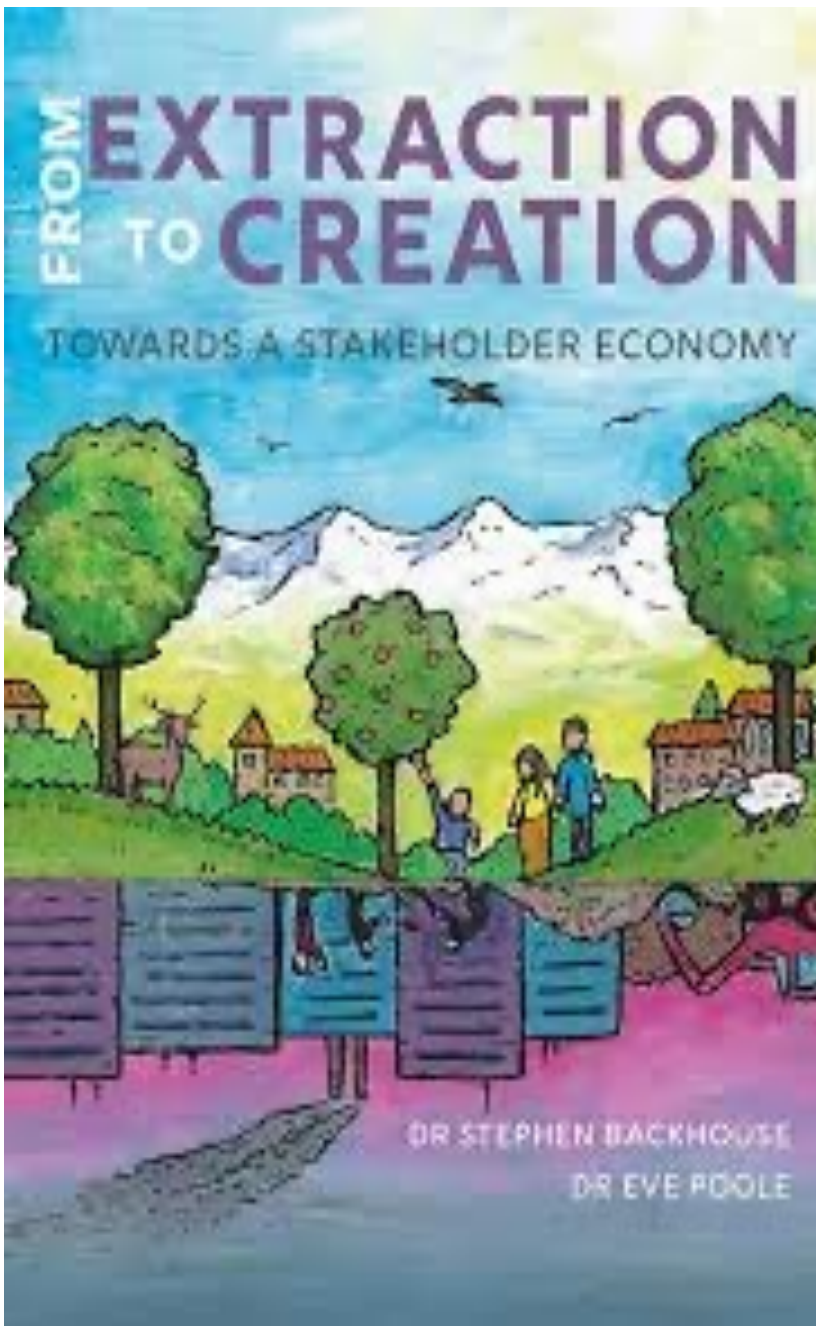
1

*From Humans in function of economic success and development to an economy in function of delivering human needs
We must set the order right!*

2



From economy considering Humans as external/superior to Nature to an economy acknowledging that we are embedded with Nature
Destroying Nature is destroying ourselves!



3

From extraction-based production to a creation-based production

We should stop stimulating extraction based economic success and reward responsible, innovative, creative ways of meeting human needs!



4

From an egoistic, short-term based interests' governance structures and logic to cooperation and sharing sovereignty.

We must improve our collective resilience. We need a convincing intergenerational pact!



This System Change Transformation is also in the Interest of the Business

Global Risks Report 2023

Top 10 Risks

"Please estimate the likely impact (severity) of the following risks over a 2-year and 10-year period"



2 years



10 years



Risk categories

■ Economic ■ Environmental ■ Geopolitical ■ Societal ■ Technological



It is getting green !!!

*Taking pain-killers to remove the acute pain
do not heal chonical diseases ...
rather hides them and make them worse*

*The future of many related to materials
is on the safe side ...*

- *The population growth and the needs for reaching a decent level of wellbeing in low- and middle-income countries.*
- *Demand for is growing despite all sustainability efforts, or better even because of them, in particular in energy related transition.*

But it is on the safe side only if ...

- *With our collective efforts, we will be keeping also the planet and humanity on the safe side ... system change is a must!*
- *Thus, you should be proactive and avoid being spotted as critical from sustainability perspective ... avoid the situation energy sector (transition) is currently facing.*

This Transformation is not only about Environmental Sustainability

*Access to and use of natural resources have been in the human history **closely related to the level of the achieved wellbeing, but also to stability, security, conflicts, wars** (Access to Land, Water, Oil and Gas, Minerals, Precious Metals ...)*

*And the whole history of the colonialisaton of nature, is also central to **fairness and equity**.*



Changing our Relationship with (the rest of) Nature, is ultimately an Economic, Equity and Security Imperative to strengthen collective Resilience

*The lessons learned recently (war, pandemic, the hottest summer) are more than convincing to understand that. This relationship is not stable, nor balanced, and it will be **resolved either with collective wisdom and effort, or in a hard and very painful way** (conflicts, pandemics, migration ...)*

*Thus, we should **broaden and strengthen the front of stakeholders for change to put the current challenges in a more strategic context. I hope you are onboard** 😊*



And finish the story in my former country and in country I do spend most of my time currently



Source: Diplomacy and commerce exhibition-alan-ford-running-a-lap-of-honor-in-the-museum-of-yugoslavia

Quote from *Alan Ford*, most famous comics from Ex-Yugoslavia, explaining well where the current rules of capitalism and the established practice of the economic system are leading us ...

*It is not the problem to drive without the breaks ...
The problem is to stop.*

And finally, most important advice from the most famous Belgian

HERCULE POIROT



When asked why he is speaking about himself always in a third person he replied something like that:

If one is such a genius like me, it is very important to establish a healthy distance to himself.



THANK YOU

for helping us delivering the future we want!