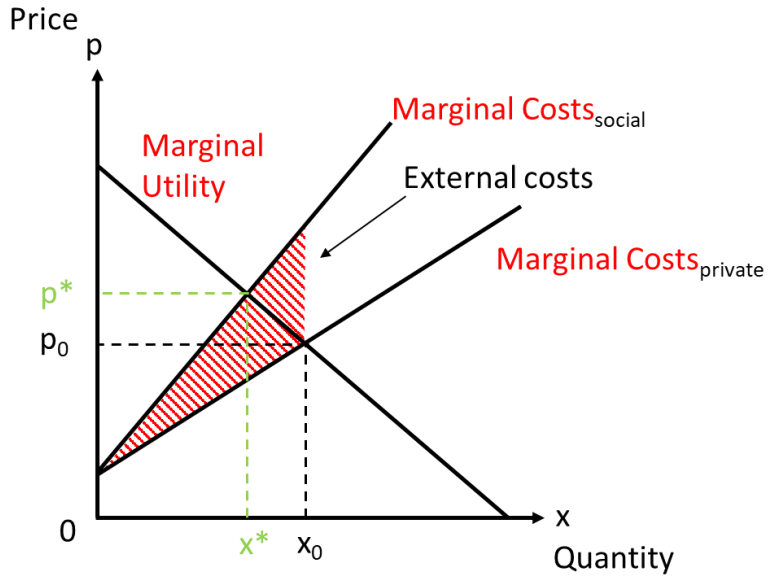
Source: Unknown (Creative commons)

On Growth and Degrowth within Planetary Boundaries

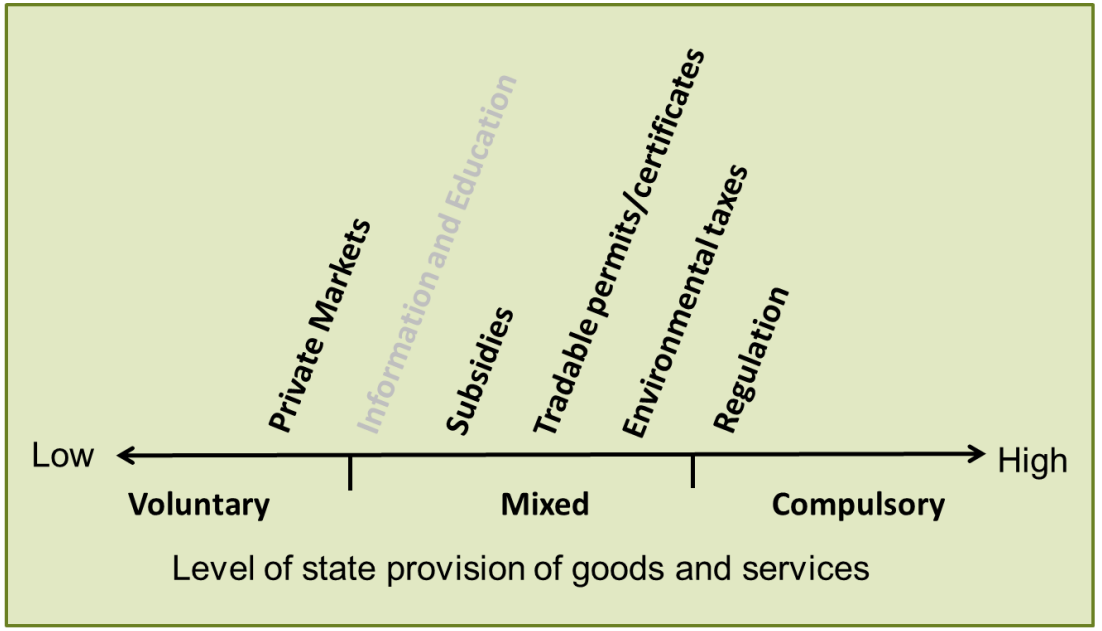
Dr. Daniel Johnson, Professor for Value-Based Forest Economy
05.11.2024

Eberswalde University for Sustainable Development

Recap

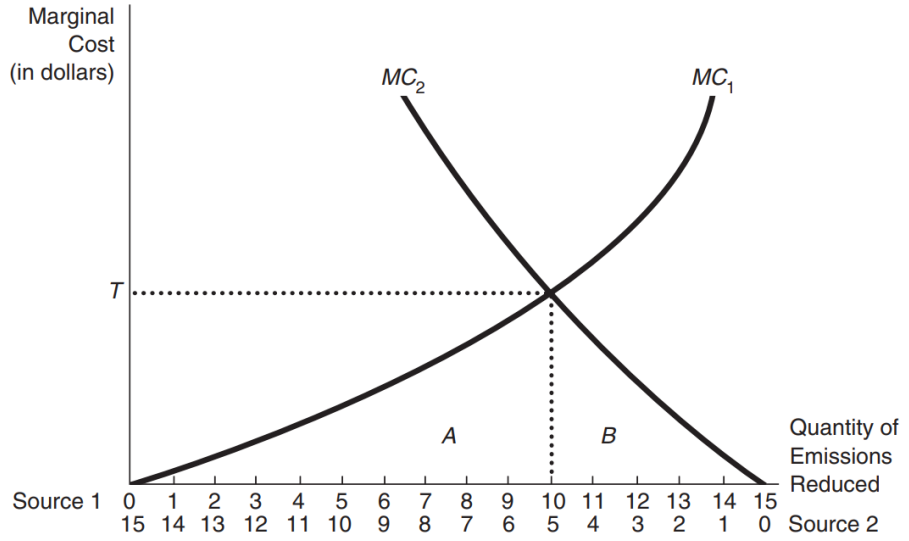


=> Different level of state involvement (spectrum)



- Market failures exist for different reasons, and especially externalities (costs/benefits not included in the price) are a large factor
  - No optimal allocation of resources
  - Often too much pollution
  - Not enough ecosystems and services
- A range of instruments can be used to internalize the externalities (from private to state-led instruments)
- Different criteria for evaluating instruments help to alleviate market failures

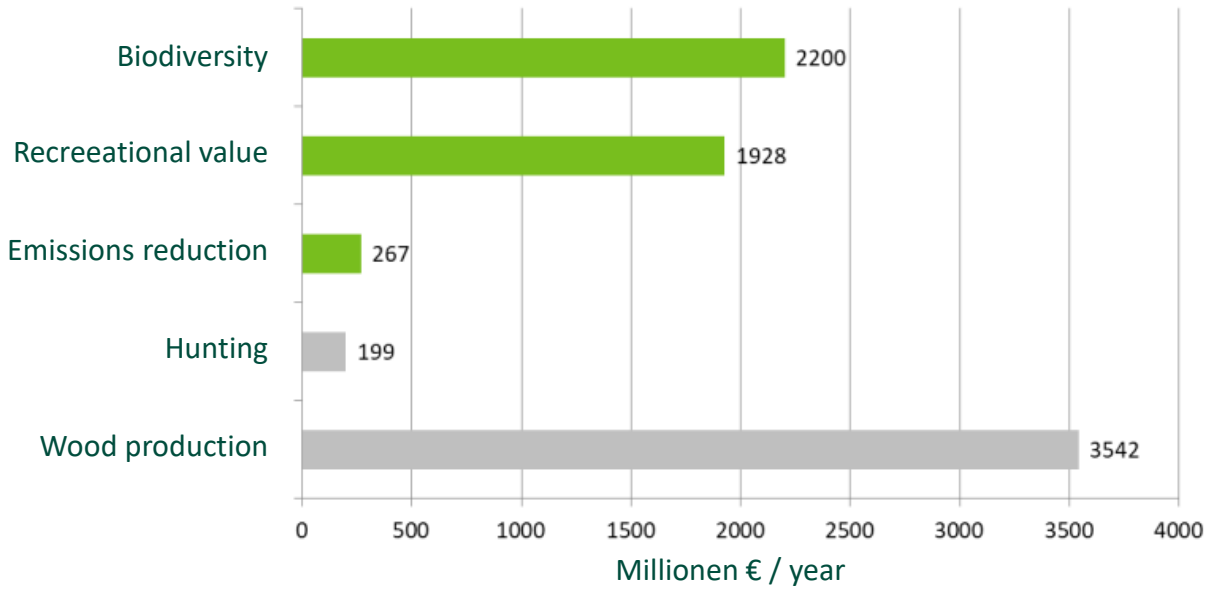
(Howlett & Ramesh 1995)



Environmental policy instruments

Rewarding systems for ecosystem services

- Research funded by the Federal Ministry of Nature Conservation (Bundesamt für Naturschutz) to develop rewarding systems for provision of ecosystem services in forests and peatlands
  - Current study being carried out by the Institute for Ecological Economy Research and biota Institute for Ecological Research and Planning
  - Valuation of ecosystem services following restoration → monetary flows for forest and peatland owners/users to compensate for restoring ecosystems and maintaining services
- "Climate-adapted forest management" funding for forestry is one example that rewards the more protection of climate in biodiversity in forests in Germany (Klimaangepasstes Waldmanagement)



Source: Naturkapital Deutschland – TEEB (Hartje et al., 2015; von Haaren & Albert 2016)

HNEE

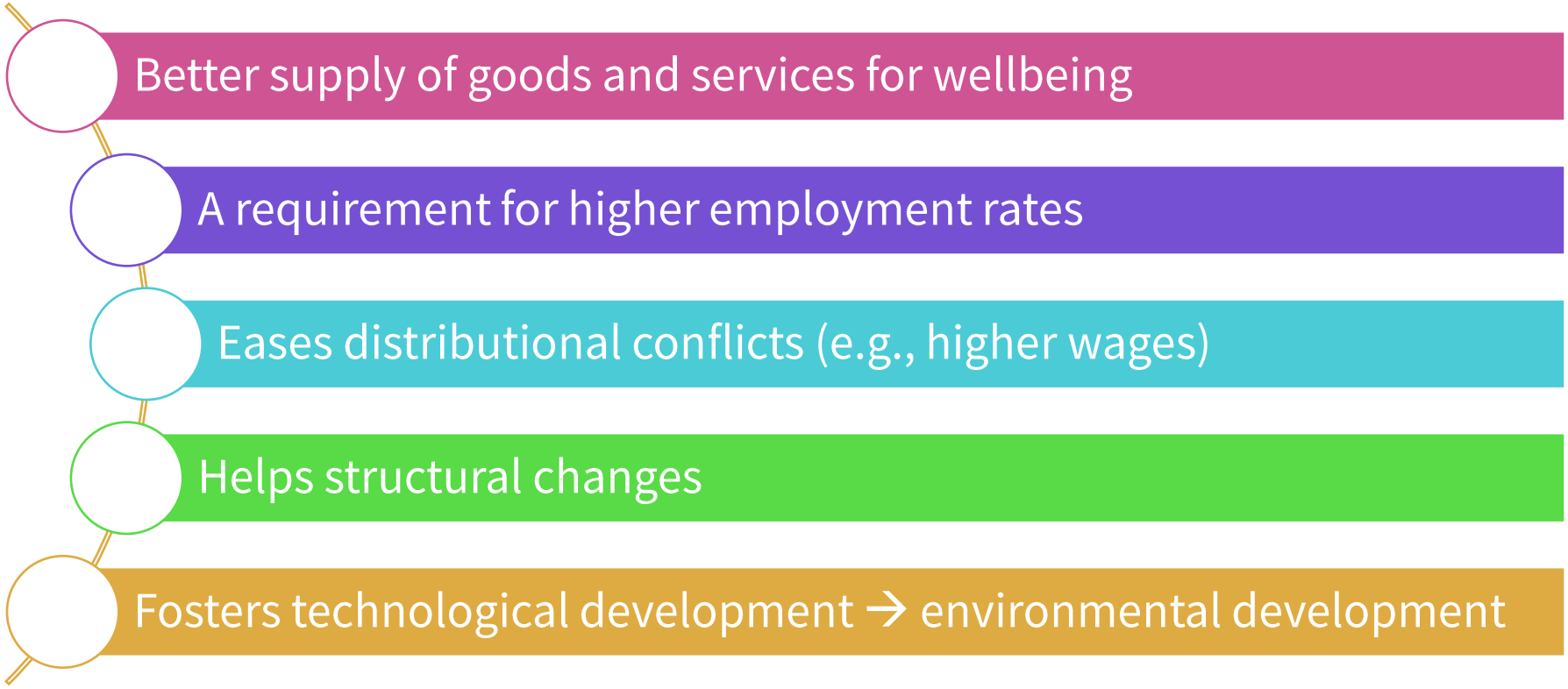
Goals for today

- To reflect on the concept of economic growth
- To understand the consequences of growth and potential of alternative paths to live within planetary boundaries

HNEE

Economic growth

- Economic growth is usually the core objective. But why?



How is economic growth measured?

- Most often through the **gross domestic product (GDP)**
  - A monetary measure of the total market value of all final goods and services produced within a country's borders during a specific period
  - 2023:
    - USA = $27.7 trillion
    - China = $17 trillion
    - Germany = $4 trillion
  - 2023 GDP per capita:
    - Monaco = 256,500 $/person
    - USA = 82,700 $/person
    - Germany = 54,300 $/person

Calculated using national accounts, a central statistical program that systematically presents all economic activity within a national economy over a given period

- Records products and services produced and how they were used
- Records incomes and profits generated through production and value added by each industry
- GDP is then determined
  - By production approach (how much value added)
  - By expenditure approach (who consumed goods and services)
  - Income approach (who earned what in the process)

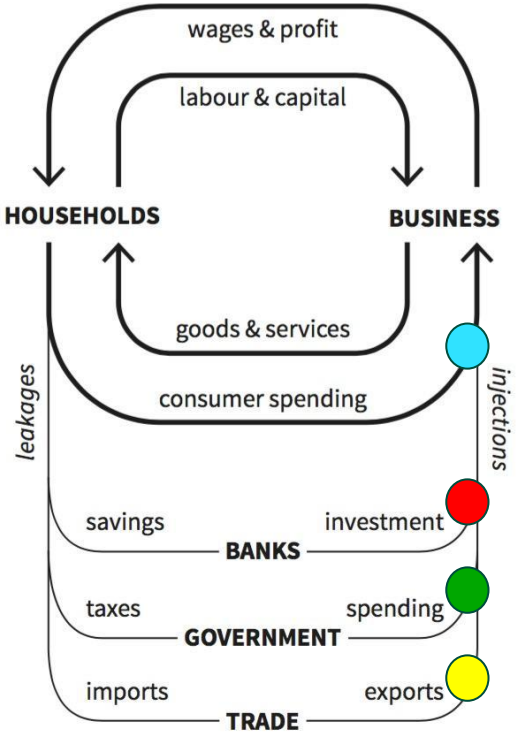
What is economic growth?

An increase in Gross Domestic Product

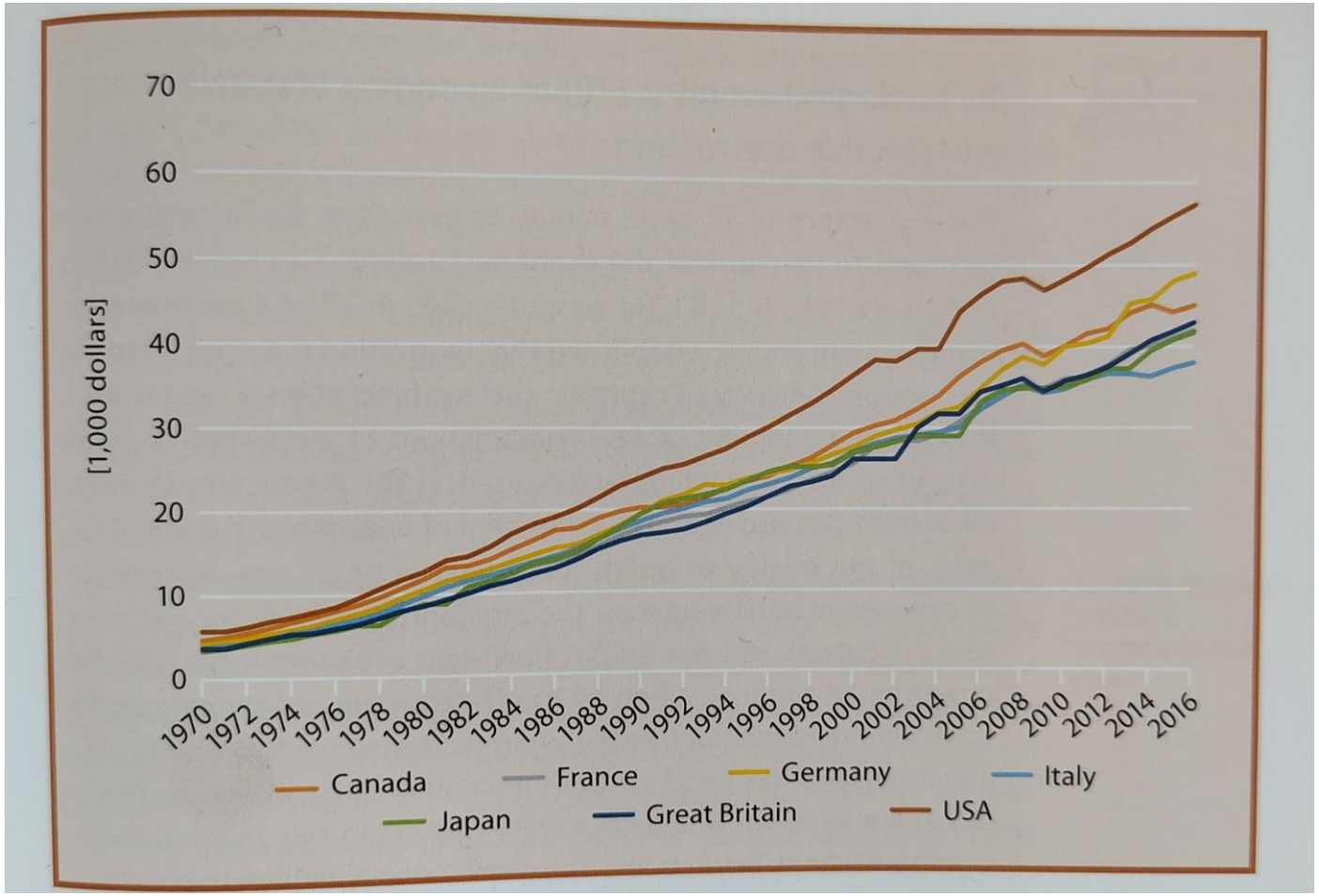
$$Y = C + I + G + (X - M)$$

GDP (output) | private consumptio | private investment | government spending | net exports

GDP is the marketed value of officially recognized goods and services produced domestically in a given period



How is economic growth measured?



Source: Ibisch et al. (2019): Humans in the Global Ecosystem

Growth and more growth

Assuming all other things equal, any increase in labor, machines and capital, raw materials from nature, energy, information etc. can lead to higher output (**extensive growth**)

Intensive growth occurs when the inputs does not increase but efficiency improves (through technological innovation for example)

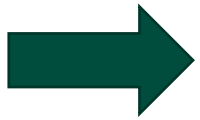
→ Economies of scale: positive economies of scale are when a doubling of production factors leads to a more than double increase in output

What happens with the profit from efficiency improvements?

→ Reinvestment in more capital (the inputs from above)

→ More innovation

→ Dividends to shareholders



More growth!

Growth and more growth

But how is all this financed???

Companies need money for investments

- Private individuals may also not use up all their income and decide to put it in the bank as savings
- These savings could be made available to companies in the form of loans
- How to make sense of this? Rational individuals would only put money in savings if they expect a return
  - You forego using this money by leaving it in the bank, hoping to use it in the future
  - The bank rewards you for this with interest
  - Companies pay interest on the loan, and the bank rewards you for parking your money with interest on your savings
  - Individuals do something similar with loans for big purchases as well
  - Companies also pay through shares of the company on the stock market
- In the long term, money is produced through compound interest

Interest: *the price paid for a transfer of money or capital. Borrows pay it as a price for the risk taken on by lenders. Savers receive it as remuneration for the transfer of capital and the associated deferral of consumption*

A question for debate

- Income and earned interest on investments is taxed in Germany
- Only on income are social payments made (social security, public health insurance, etc.)

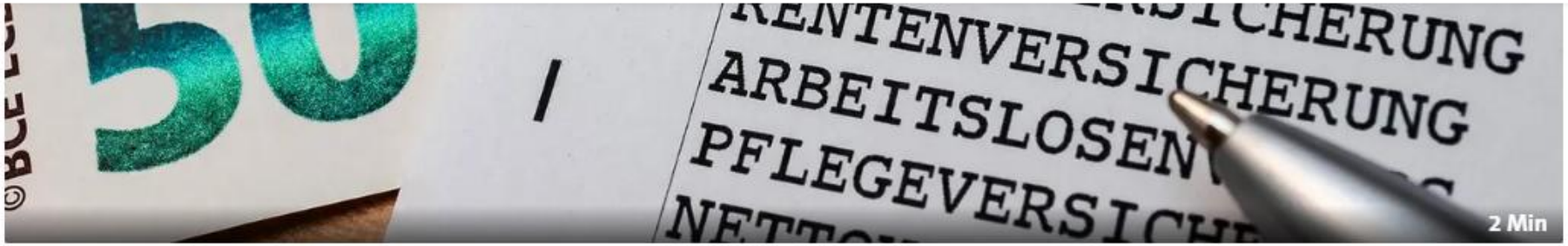
Discuss with a neighbor:

Would you agree with making social payments on earned interest from investments?

tagesschau

Eilmeldung

Startseite ▸ Inland ▸ Innenpolitik ▸ Grünen-Vorschlag zu Sozialabgaben auf Kapitalerträge löst Debatte aus



Sozialabgaben auf Kapitalerträge

Grünen-Vorschlag löst breite Diskussion aus

Stand: 14.01.2025 20:01 Uhr

Die Grünen wollen Sozialabgaben auf Aktien- oder Zinsgewinne erheben - und lösen damit eine breite Debatte aus. Ein Schlag gegen deutsche Sparer, schimpfen die einen. Ein sinnvoller Schritt, finden andere.

Es war am Sonntagabend im *Bericht aus Berlin*: Da stellte der Kanzlerkandidat der Grünen, Robert Habeck, jene Frage, die eine der hitzigsten Debatten im bisherigen Wahlkampf auslöste: "Warum soll eigentlich Arbeit höher belastet sein als Einkommen durch Kapitalerträge?" Konkret meinte Habeck, dass künftig auch Einkünfte aus Kapitalerträgen herangezogen werden müssten, um die leeren Sozialkassen in Deutschland zu füllen.

Source: Tagesschau

Innovation and growth

Technological progress can promote growth and creative destruction

Joseph Schumpeter (1883-1950) proposed the idea that capitalism is evolutionary and exhibits creative destruction

- "the process of an industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroys the old structure and incessantly creates a new one."
- Innovation: adoption of new combinations of properties of products, or of the production factors used in the production process, or development of new goods, improvement in quality of goods, opening new markets, new material sources, reorganization of firms, new social initiatives, etc.
- Innovation leads to greater market share, greater profit
- Other companies fail or adapt
- Technological progress continuously revolutionizes the entire economic system and brings about social changes → cyclic processes

Source: https://thinkingoftheworld.files.wordpress.com/2013/06/joseph-alois-schumpeter.jpg

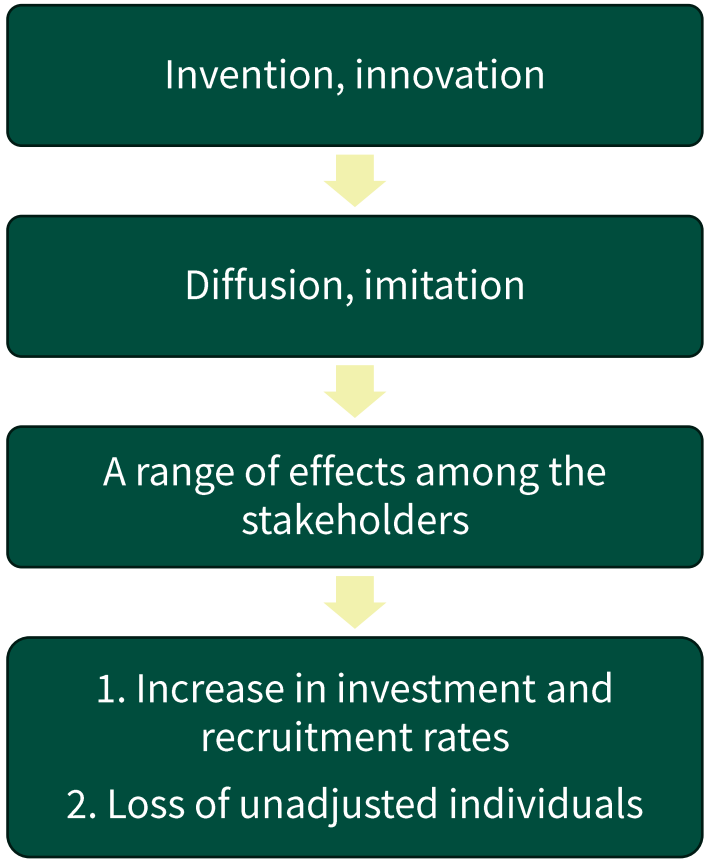
Innovation and growth

After invention and innovation, Schumpeter sees diffusion and imitation as crucial for economic development

Diffusion of innovations drives society, growth, investment, jobs and technological performance

“Add successively as many coaches as you please, you will never get a railway thereby” (Schumpeter, 1934, p. 65)

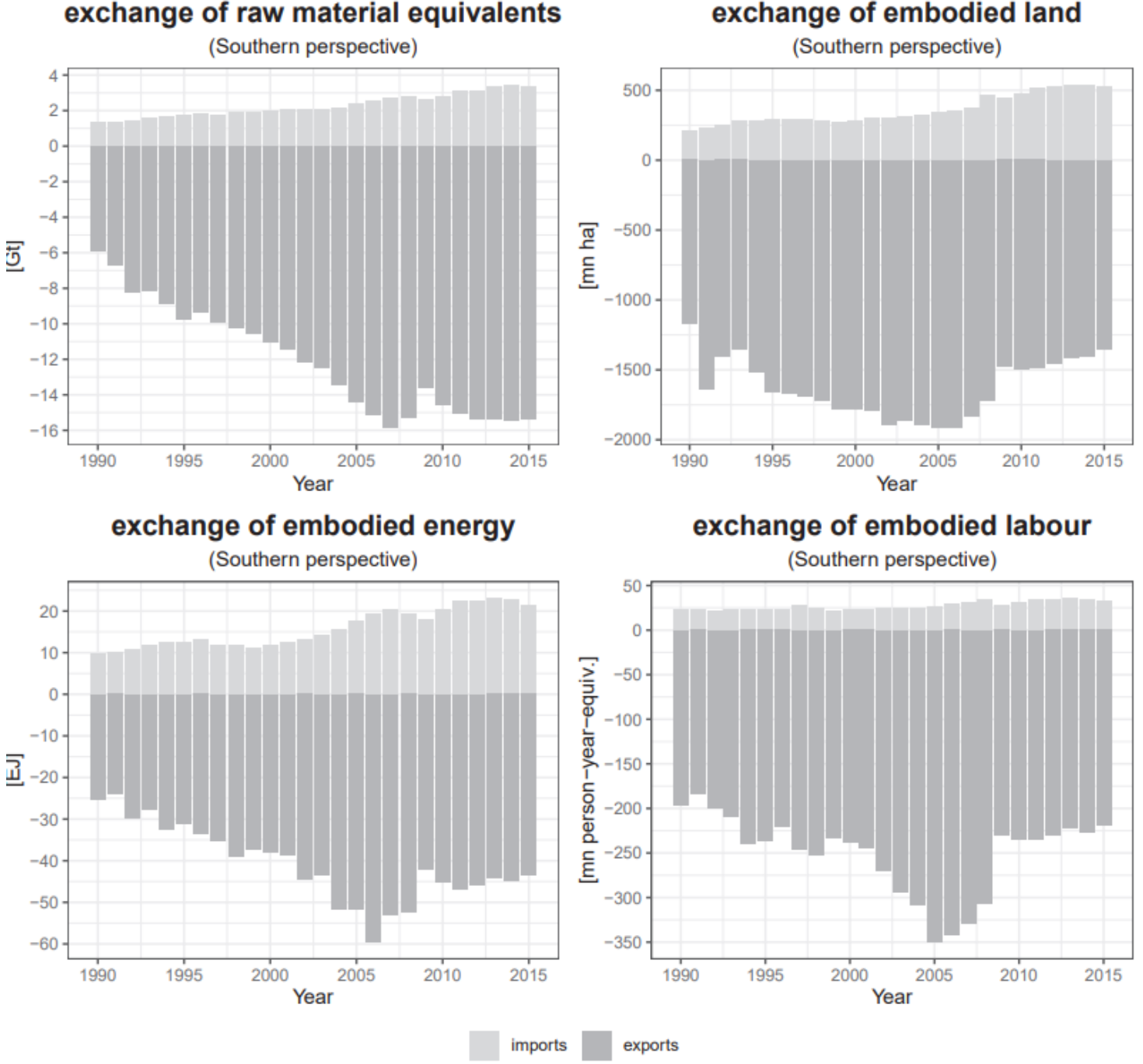
Qualitative changes: Individuals, industries, sectors, activities, objects



Source: https://thinkingoftheworld.files.wordpress.com/2013/06/joseph-alois-schumpeter.jpg

Where did all this growth come from?

- Imperialism (extending a country's power and influence through colonization)
- Resource exploitation of the global south by the global north
- Resource exploitation from future generations



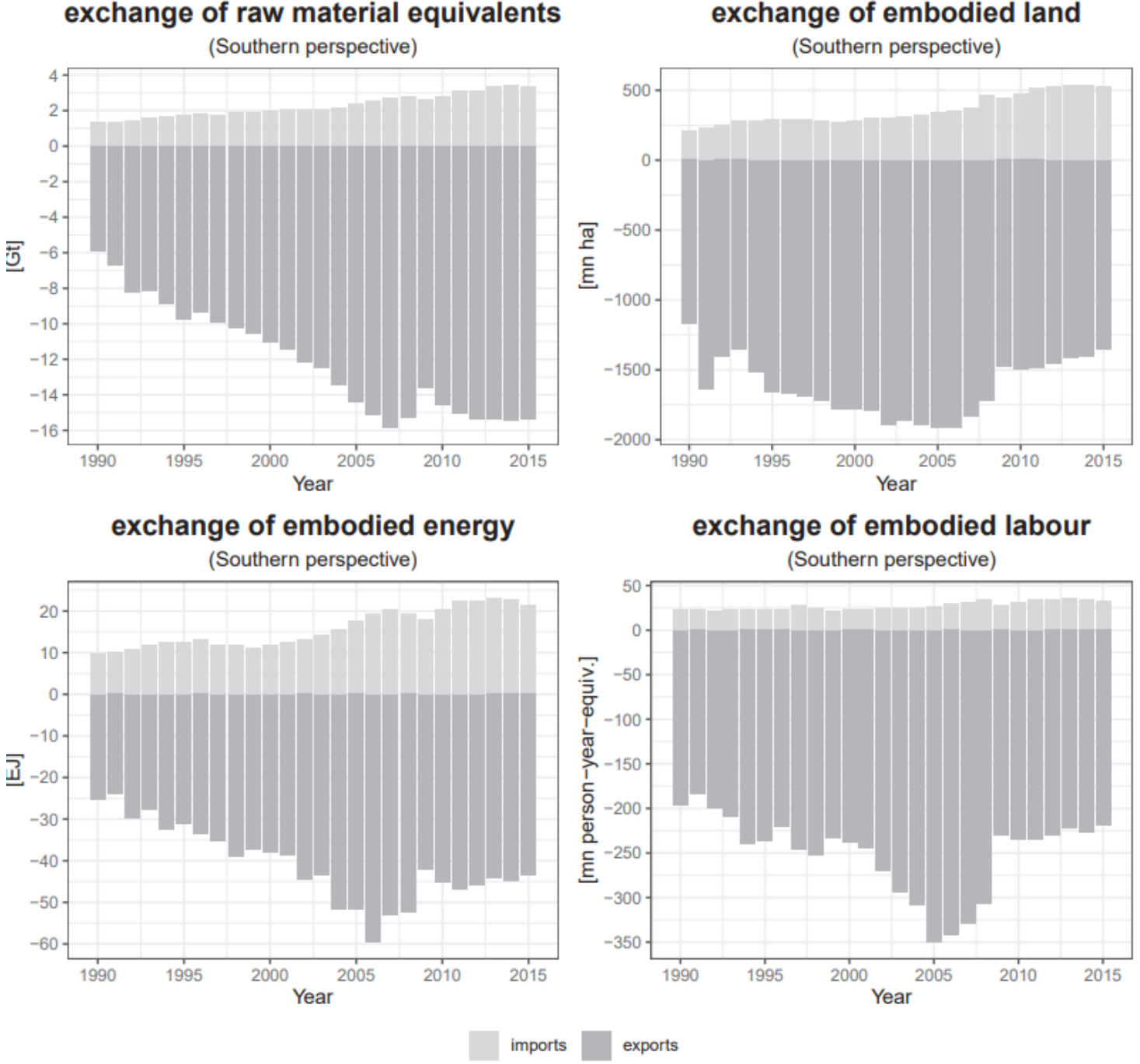
Source: Hickel et al. (2022)

Fig. 1. Resource drain from the South.

Where did this growth come from?

- Drain from the South is worth over $10 trillion per year
- Although aid is provided in the south, this is outnumbered by the losses by a factor of 30

→ Growth on the costs of others



Source: Hickel et al. (2022)

Fig. 1. Resource drain from the South.

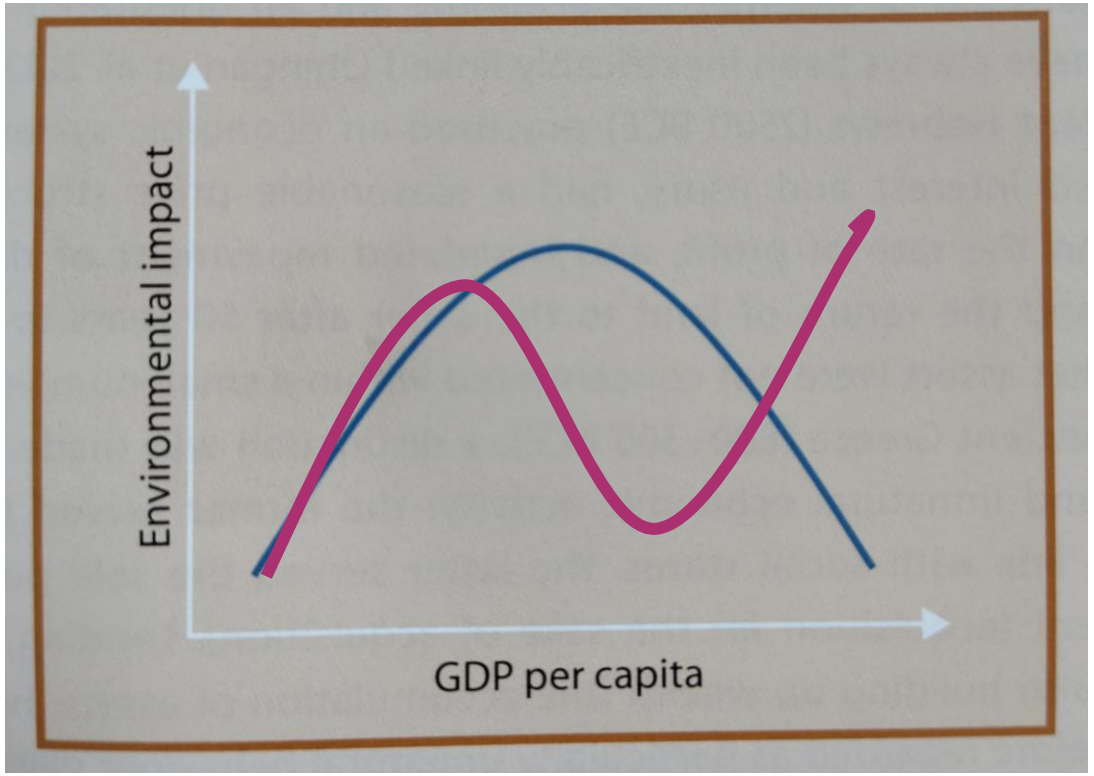
Economic growth and environmental impact tradeoff

Simon S. Kuznets (Russian American economist, 1901-1985) developed the idea of the relationship between economic growth and environmental impact → Kuznet curves

Environmental damage increases with economic output at first to maximum and then declines

Is this realistic?

- Could be argued because of technological progress (e.g. shifting to renewable energies)
- Population preferences might change (e.g. a shift away from materialistic, economic lifestyles)
- No indisputable evidence: some studies even show an N-shaped curve (pollution first decreases with continuing growth only to then increase again)



Source: Ibisch et al. (2019): Humans in the Global Ecosystem

Economic growth

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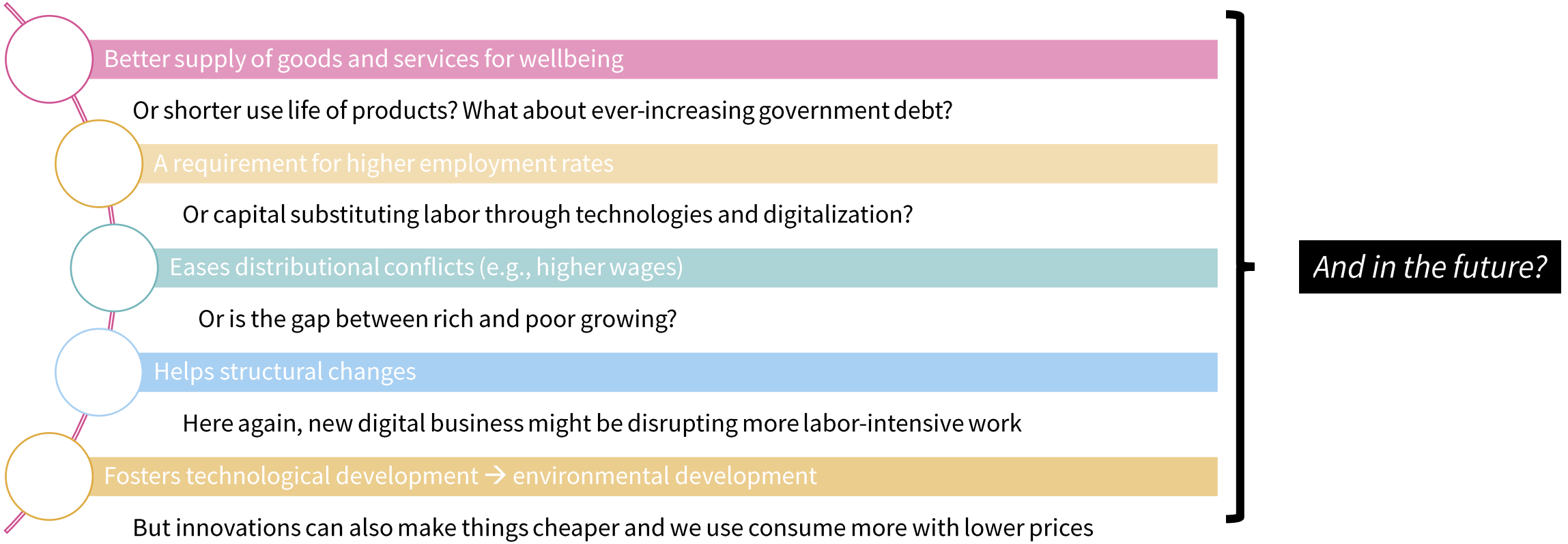
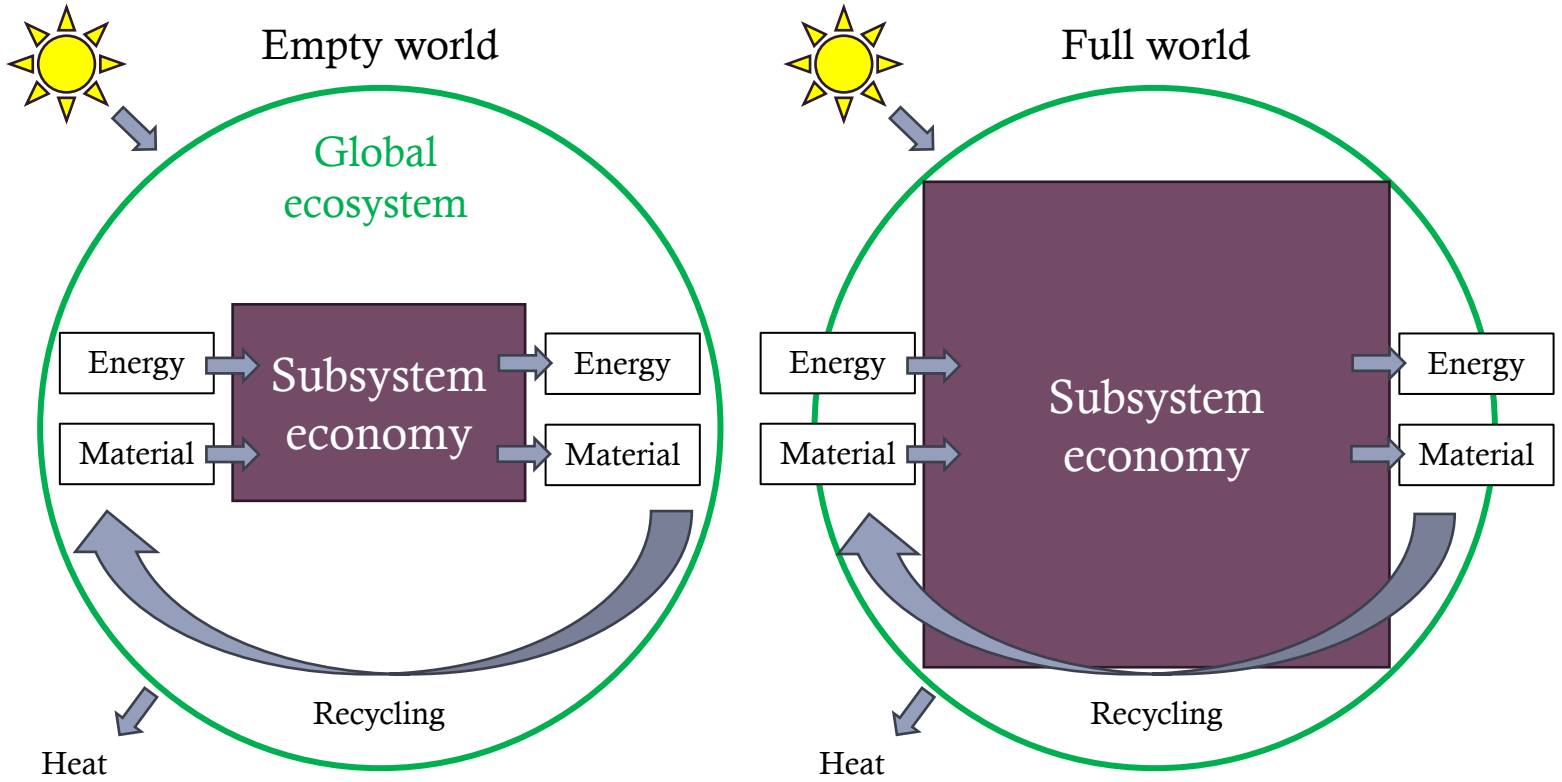


Economic growth



Source: Daly (1996)

Economic growth

'STEADY AS SHE GOES'

Tell a new story

Video

Green growth

‘Green growth means fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies.’

- OECD

Green growth seeks to reduce some resource use while maintaining GDP growth. Many international institutions are committed to this approach:

> Improve progressively, trough 2030, global resource efficiency in consumption and production and endeavour **to decouple economic growth from environmental degradation,** in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead.
>
> Target 8.4 of the Sustainable Development Goals, 2015

> Accelerating, encouraging and enabling innovation is critical for an effective, long-term global response to climate change and **promoting economic growth and sustainable development**.
>
> Article 10.5 of the Paris Agreement, 2015

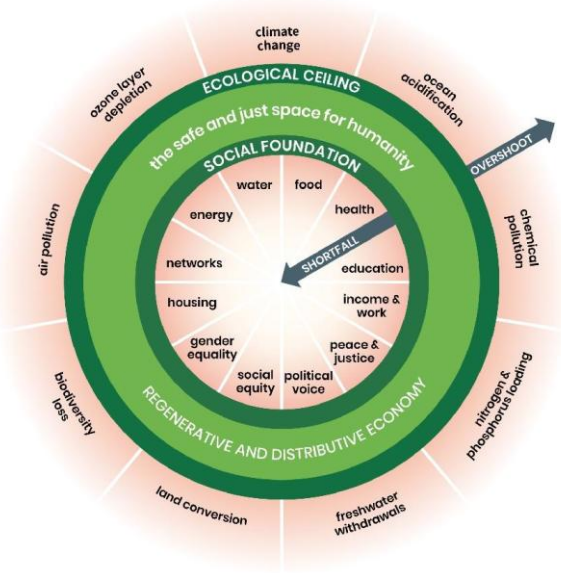
> the European Green Deal will transform the EU into a modern, resource-efficient and competitive economy, ensuring:
> 1) no net emissions of greenhouse gases by 2050,
> 2) **economic growth decoupled from resource use**,
> 3) no person and no place left behind.
>
> A European Green Deal, 2019

Graphic by Timothée Parrique

Post-growth

‘A post-growth economy puts life and everything needed to maintain it at the centre of economic and social activity as opposed to the never-ending accumulation of money, and the pursuit of growth of all kinds without regard for its consequences.’

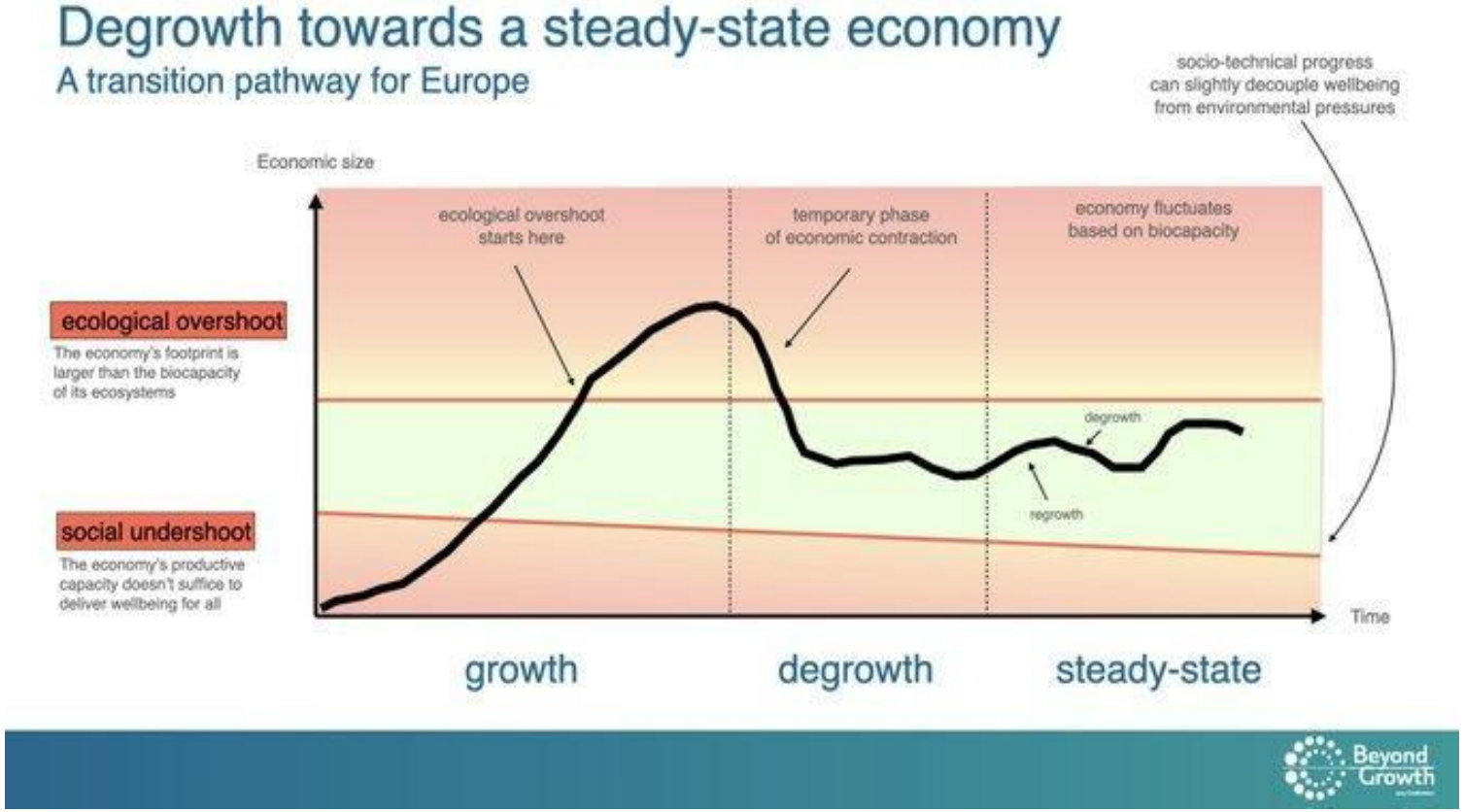
- Post Growth Institute



Degrowth

‘Degrowth is a planned reduction of energy and resource use designed to bring the economy back into balance with the living world in a way that reduces inequality and improves human well-being.’

- Jason Hickel



A good life for all within planetary boundaries

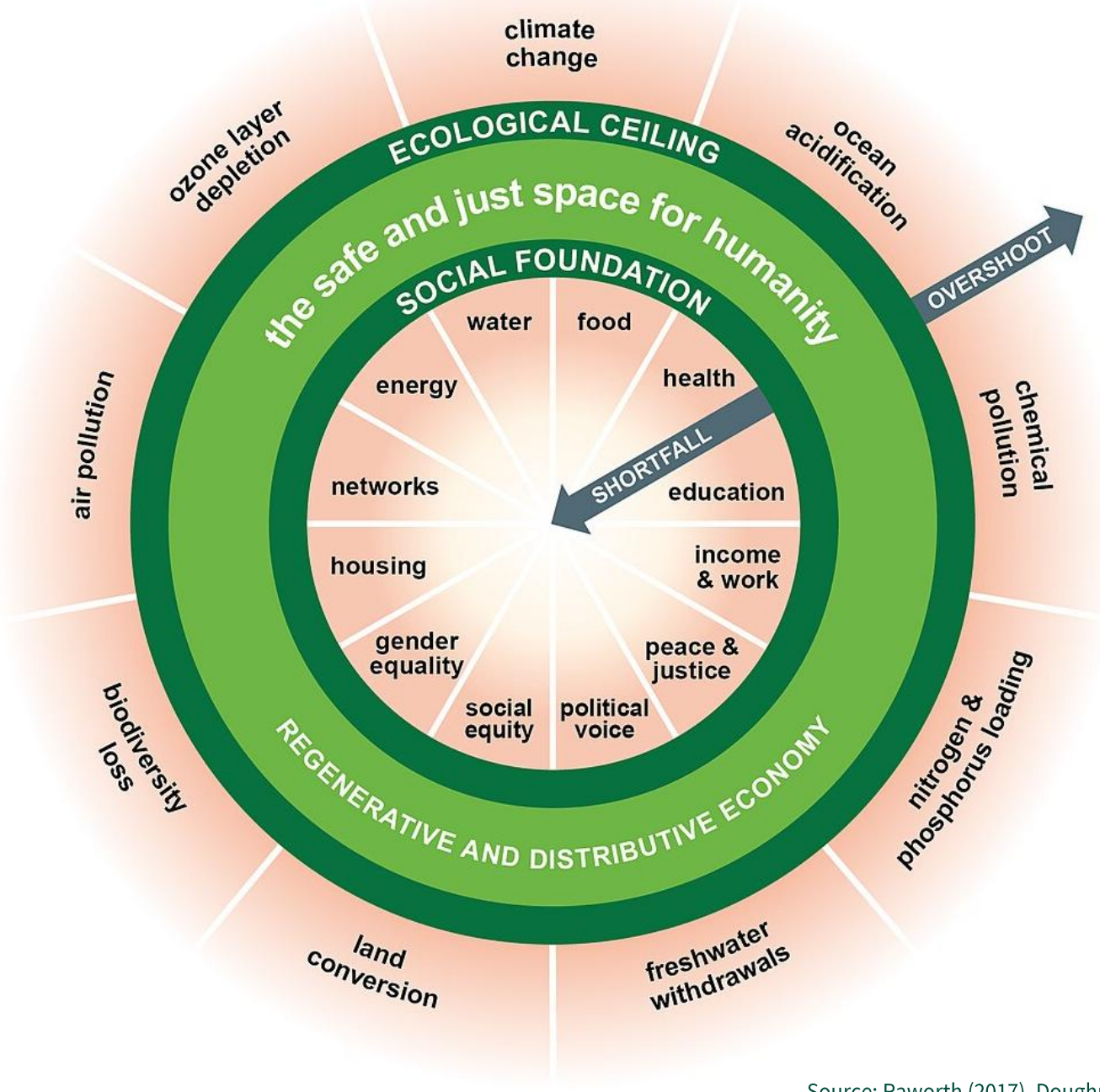
Discussion (10 minutes)

With a neighbor, discuss which ecological and social aspects could be important for achieving a good life for all within planetary boundaries

HNEE

Doughnut Economics

- Ecological ceiling bounds the exploitation of resources and pollution of ecosystems
- Social foundation bounds the shortfalls to basic societal needs
- In the safe and just space, a good life for all can be achieved within planetary boundaries

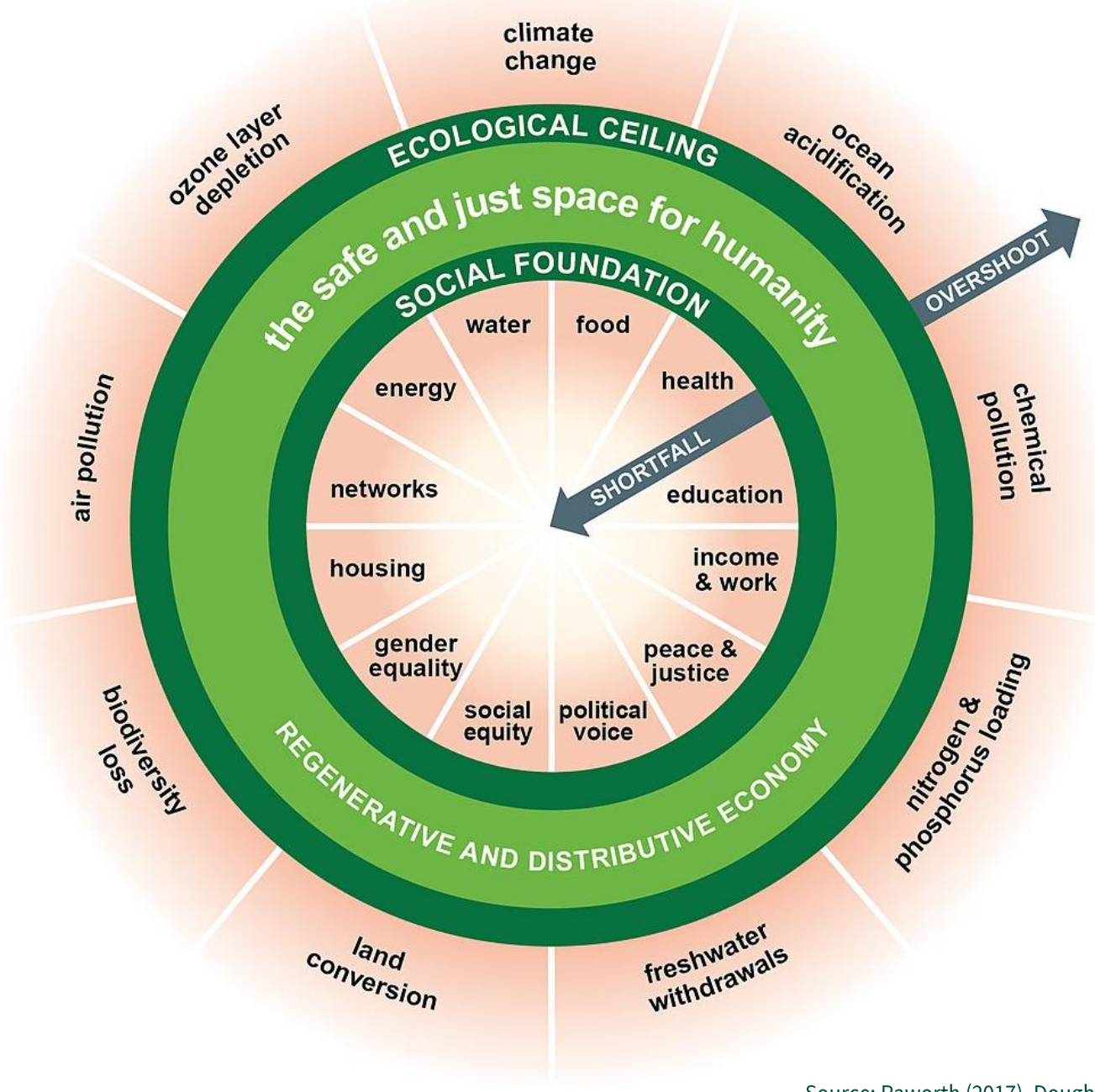


Source: Raworth (2017), Doughnut Economics

Doughnut Economics

The ecological ceiling comprises 9 planetary boundaries

- **Climate change**: greenhouse gases like carbon dioxide, methane and nitrous oxide
- **Ocean acidification**: 25% of carbon dioxide emitted by humans dissolves in oceans → carbonic acid, lower pH
- **Chemical pollution**: like synthetic organic pollutants and heavy metals released to biosphere can persist for years, accumulating in tissues of organisms, reducing fertility, causing genetic damage
- **Nitrogen and phosphorus loading**: agricultural fertilizers runoff in lakes, rivers and oceans, causing algal blooms
- **Freshwater withdrawal**: excessive withdrawals dry up lakes, rivers and aquifers

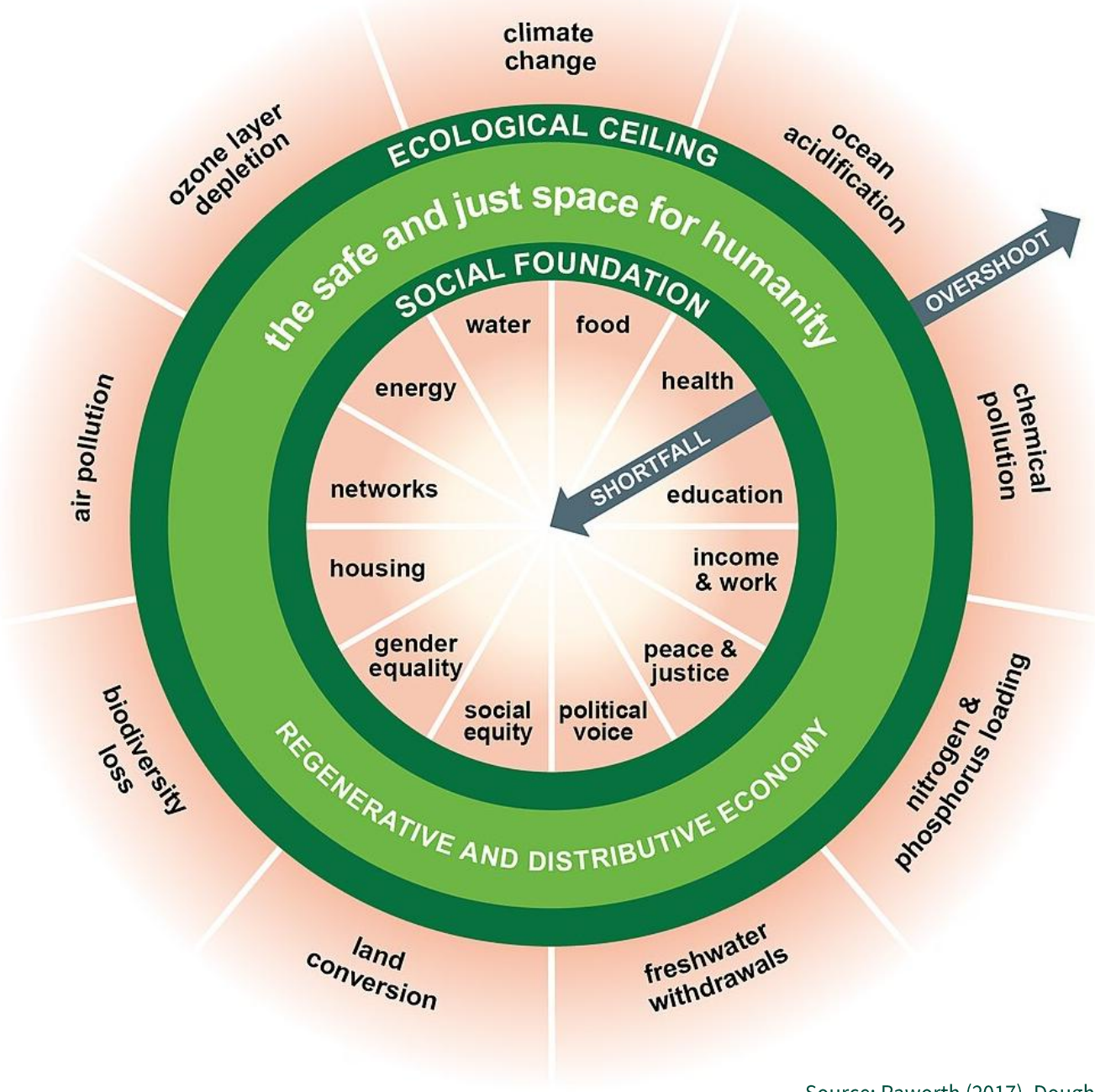


Source: Raworth (2017), Doughnut Economics

Doughnut Economics

The ecological ceiling comprises 9 planetary boundaries

- **Land conversion:** turning forests and wetlands into cities, farmland and highways depletes carbon sinks, destroys wildlife and interrupts cycling (water, nitrogen, phosphorous)
- **Biodiversity loss**: declining number and variety of species, damaging integrity and resilience of ecosystems
- **Air pollution**: micro-particles or aerosols damage living organisms, even altering regional rainfall patterns
- **Ozone layer depletion**: stratospheric layer filters our ultraviolet radiation but some chemicals like chlorofluorocarbons (CFCs) deplete this



Source: Raworth (2017), Doughnut Economics

HNEE

Doughnut Economics

Table 2. The ecological ceiling and its indicators of overshoot

Earth-System Pressure	Control Variable	Planetary Boundary	Current Value and Trend
Climate change	Atmospheric carbon dioxide concentration, parts per million (ppm)	At most 350ppm	400ppm and rising (worsening)
Ocean Acidification	Average saturation of aragonite (calcium carbonate) at the ocean surface, as a percentage of pre-industrial levels	At least 80% of pre-industrial saturation levels	Around 84% and falling (intensifying)
Chemical Pollution	No global control variable yet defined	—	—
Nitrogen and Phosphorus Loading	Phosphorus applied to land as fertiliser, millions of tons per year	At most 6.2 million tons per year	Around 14 million tons per year and rising (worsening)
	Reactive nitrogen applied to land as fertiliser, millions of tons per year	At most 62 million tons per year	Around 150 million tons per year and rising (worsening)

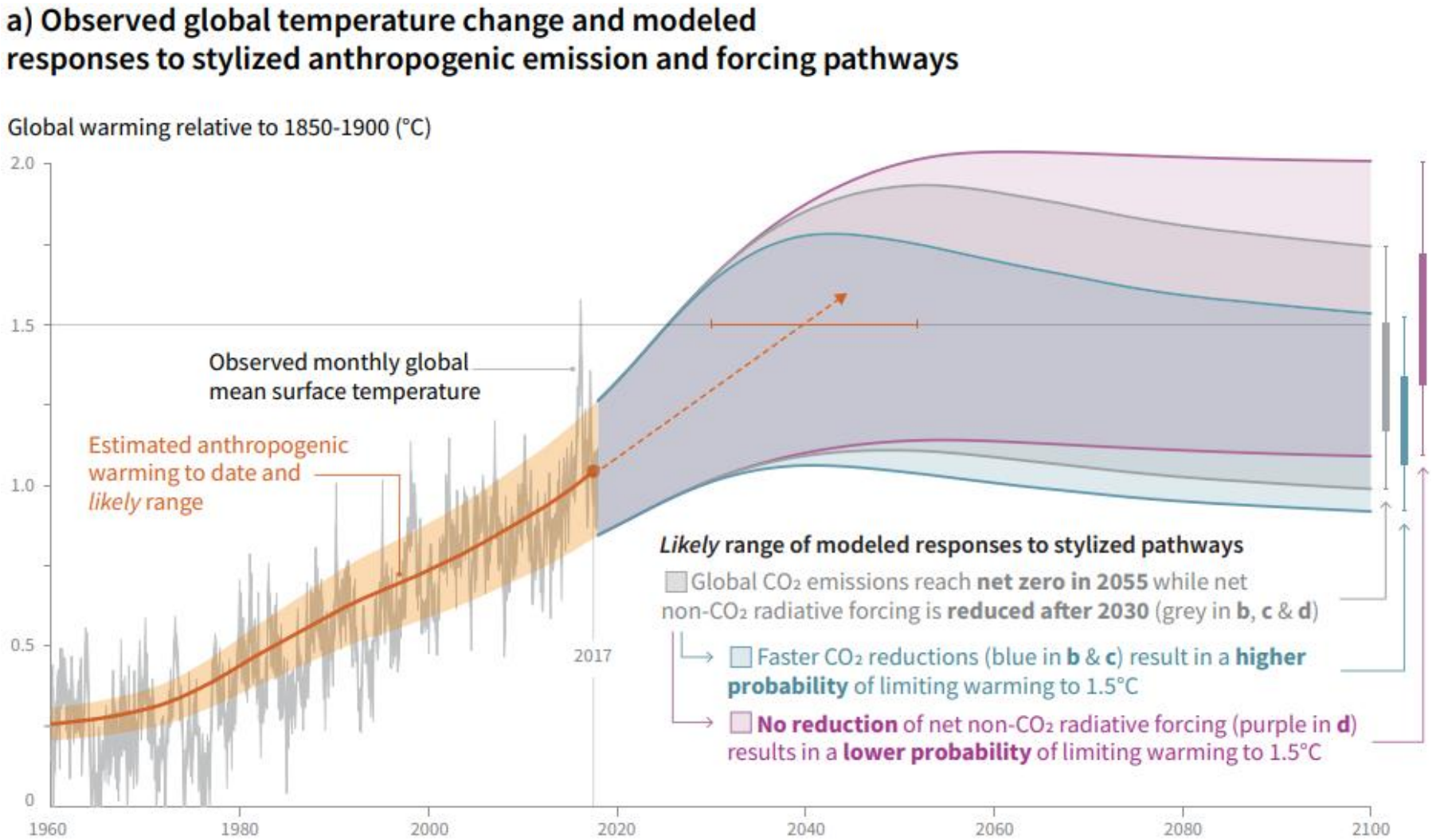
Table 2. The ecological ceiling and its indicators of overshoot

Earth-System Pressure	Control Variable	Planetary Boundary	Current Value and Trend
Freshwater Withdrawals	Blue water consumption, cubic kilometres per year	At most 4,000 km^3 per year	Around 2,600 km^3 per year and rising (intensifying)
Land Conversion	Area of forested land as a proportion of forest-covered land prior to human alteration	At least 75%	62% and falling (worsening)
Biodiversity Loss	Rate of species extinction per million species per year	At most 10	Around 100–1,000 and rising (worsening)
Air Pollution	No global control variable yet defined	—	—
Ozone Layer Depletion	Concentration of ozone in the stratosphere, in Dobson Units	At least 275 DU	283 DU and rising (improving)

Source: Steffen et al. (2015).

Source: Raworth (2017), Doughnut Economics

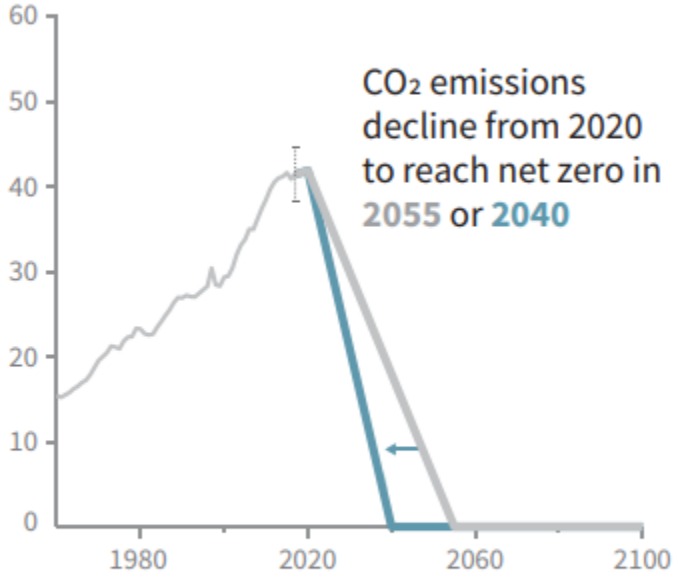
2018 IPCC Reports—1.5 C Warming



Source: https://www.ipcc.ch/sr15/chapter/spm/

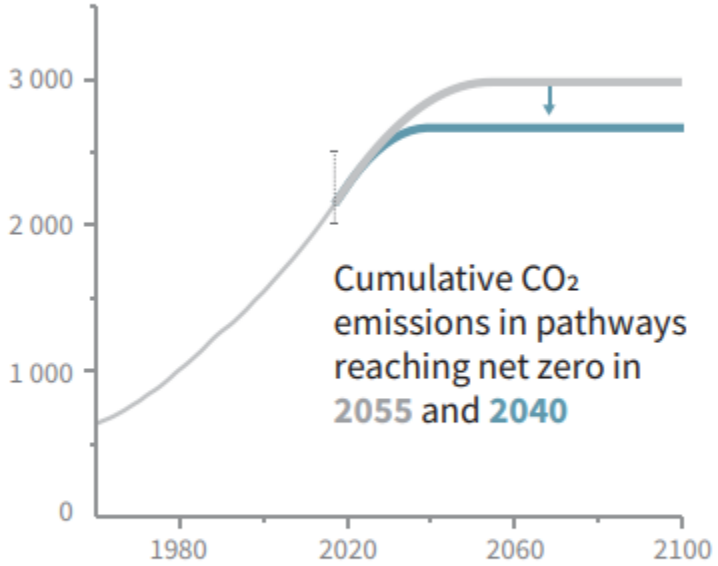
2018 IPCC Reports—1.5 C Warming

b) Stylized net global CO_2 emission pathways
Billion tonnes CO_2 per year ($GtCO_2/yr$)

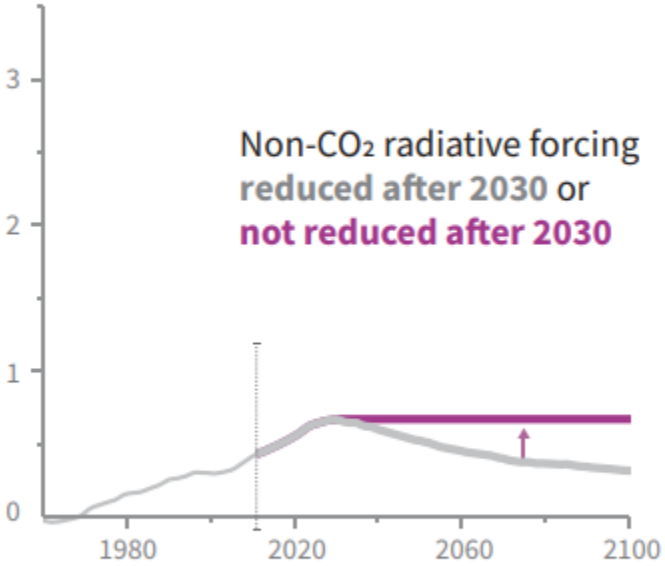


Faster immediate CO_2 emission reductions limit cumulative CO_2 emissions shown in panel **(c)**.

c) Cumulative net CO_2 emissions
Billion tonnes CO_2 ($GtCO_2$)



d) Non-CO_2 radiative forcing pathways
Watts per square metre (W/m^2)

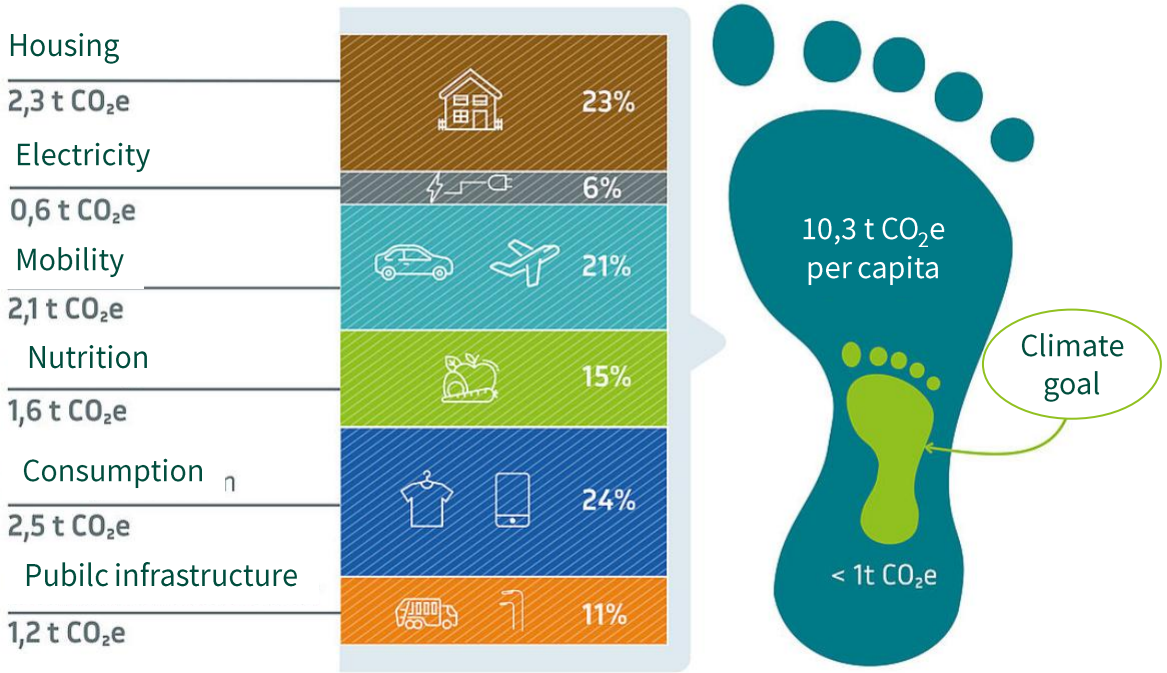


Maximum temperature rise is determined by cumulative net CO_2 emissions and net non-CO_2 radiative forcing due to methane, nitrous oxide, aerosols and other anthropogenic forcing agents.

Source: https://www.ipcc.ch/sr15/chapter/spm/

Some more examples

Average CO_2 footprint per capita in Germany



CO_2e: Die Effekte von unterschiedlichen Treibhausgasen (z.B. Methan) werden zu CO_2-Äquivalenten umgerechnet und in die Berechnung einbezogen.

Quelle: Umweltbundesamt CO_2-Rechner (Stand 2024)
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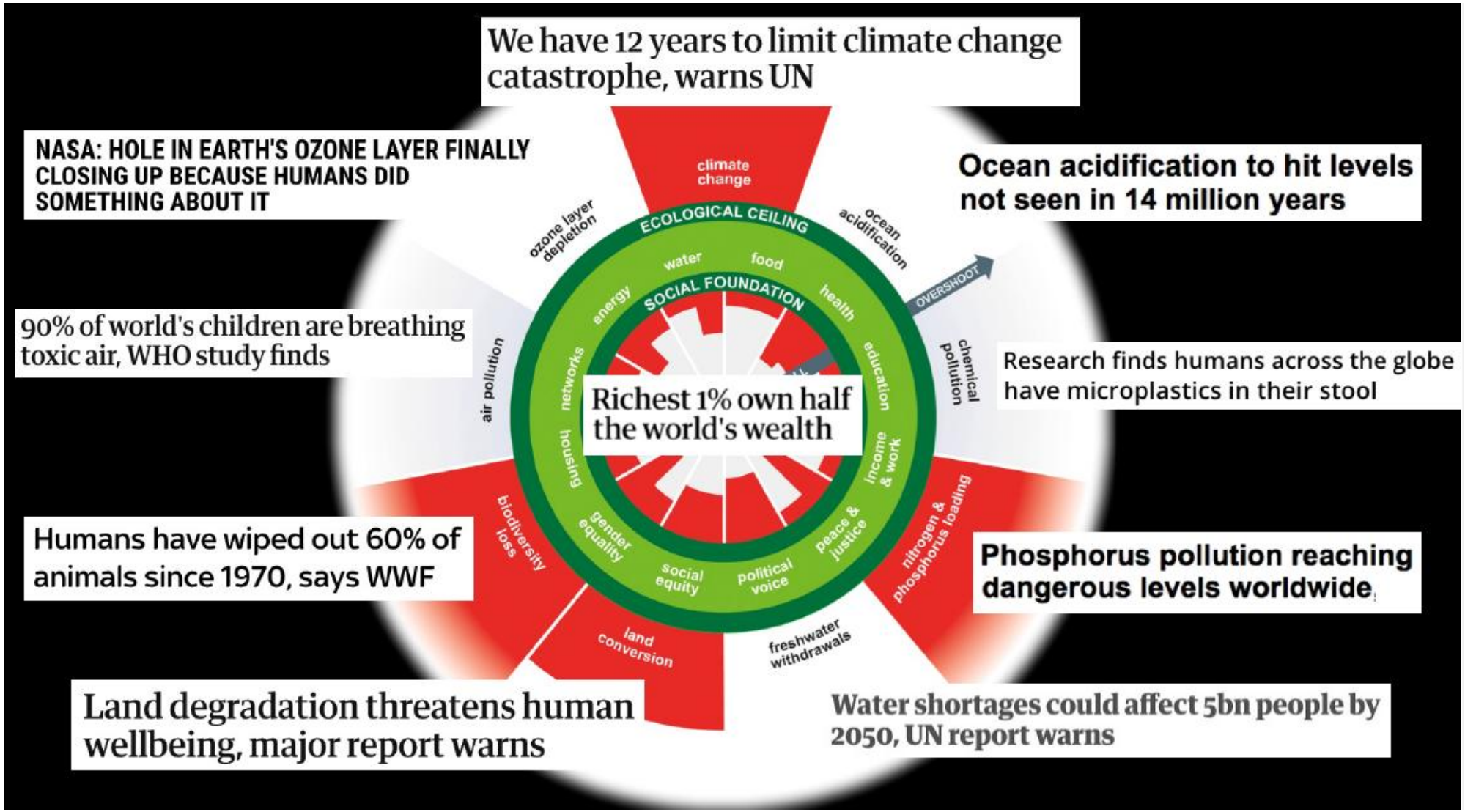
Source: https://www.bmuv.de/media/kohlenstoffdioxid-fussabdruck-pro-kopf-in-deutschland

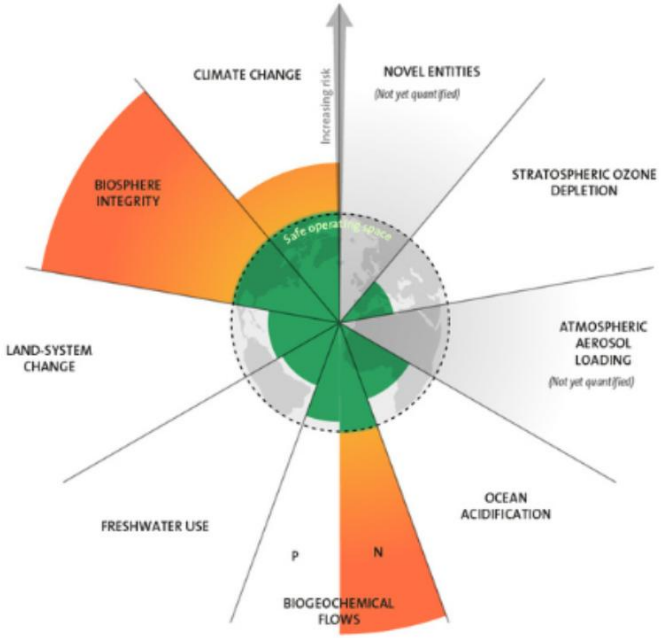
Doughnut Economics



Source: Raworth (2019), Keynote speech

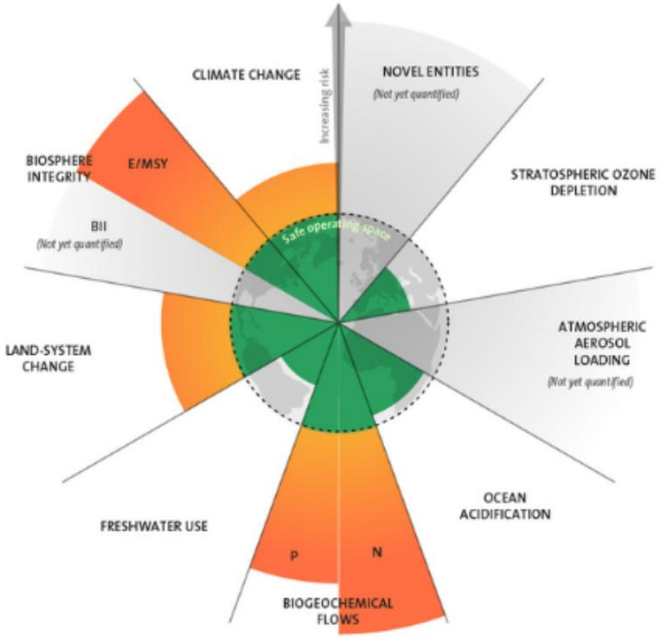
Planetary limits

2009



7 boundaries assessed,
3 crossed

2015



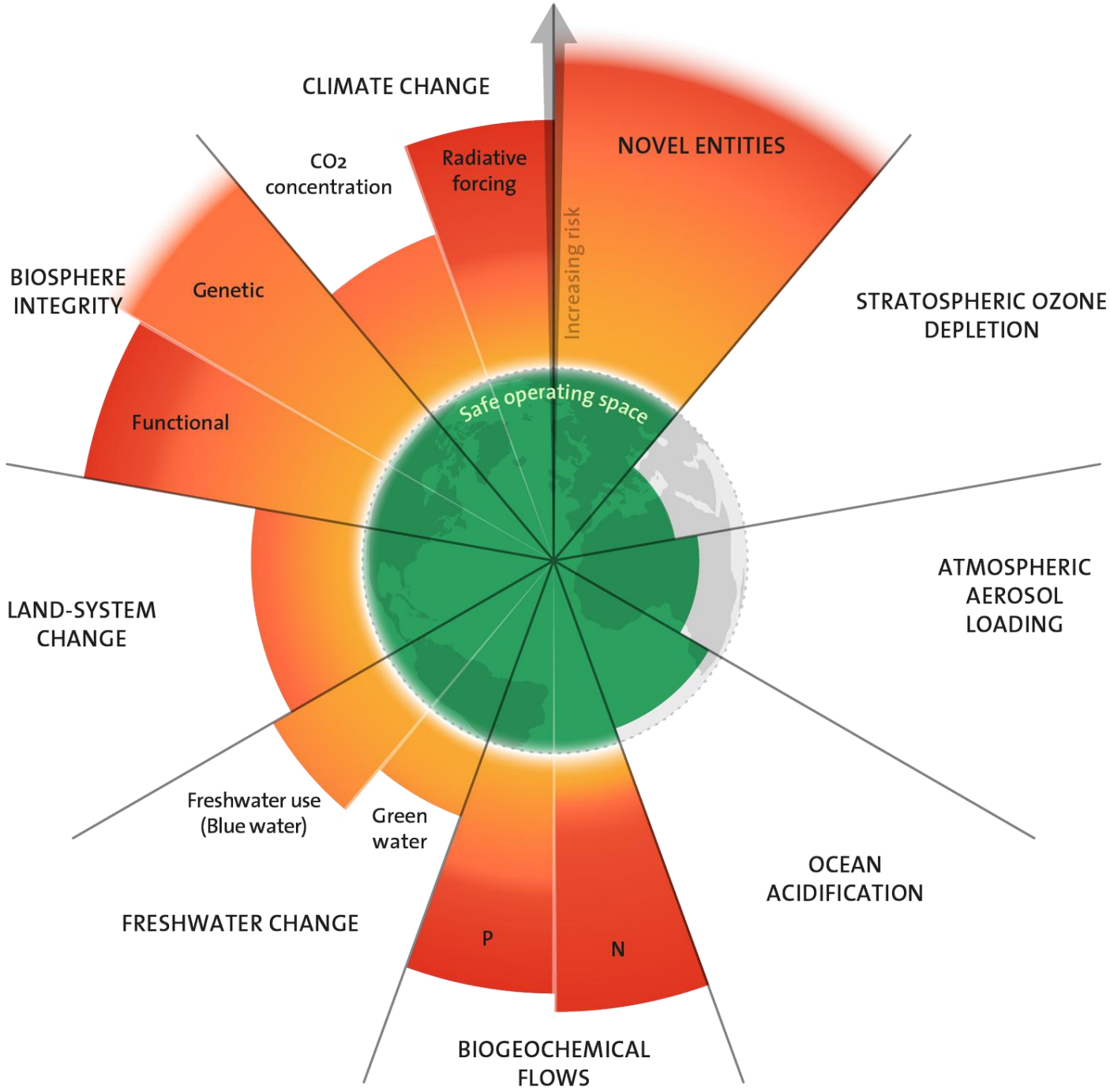
7 boundaries assessed,
4 crossed

2023

9 boundaries assessed,
6 crossed

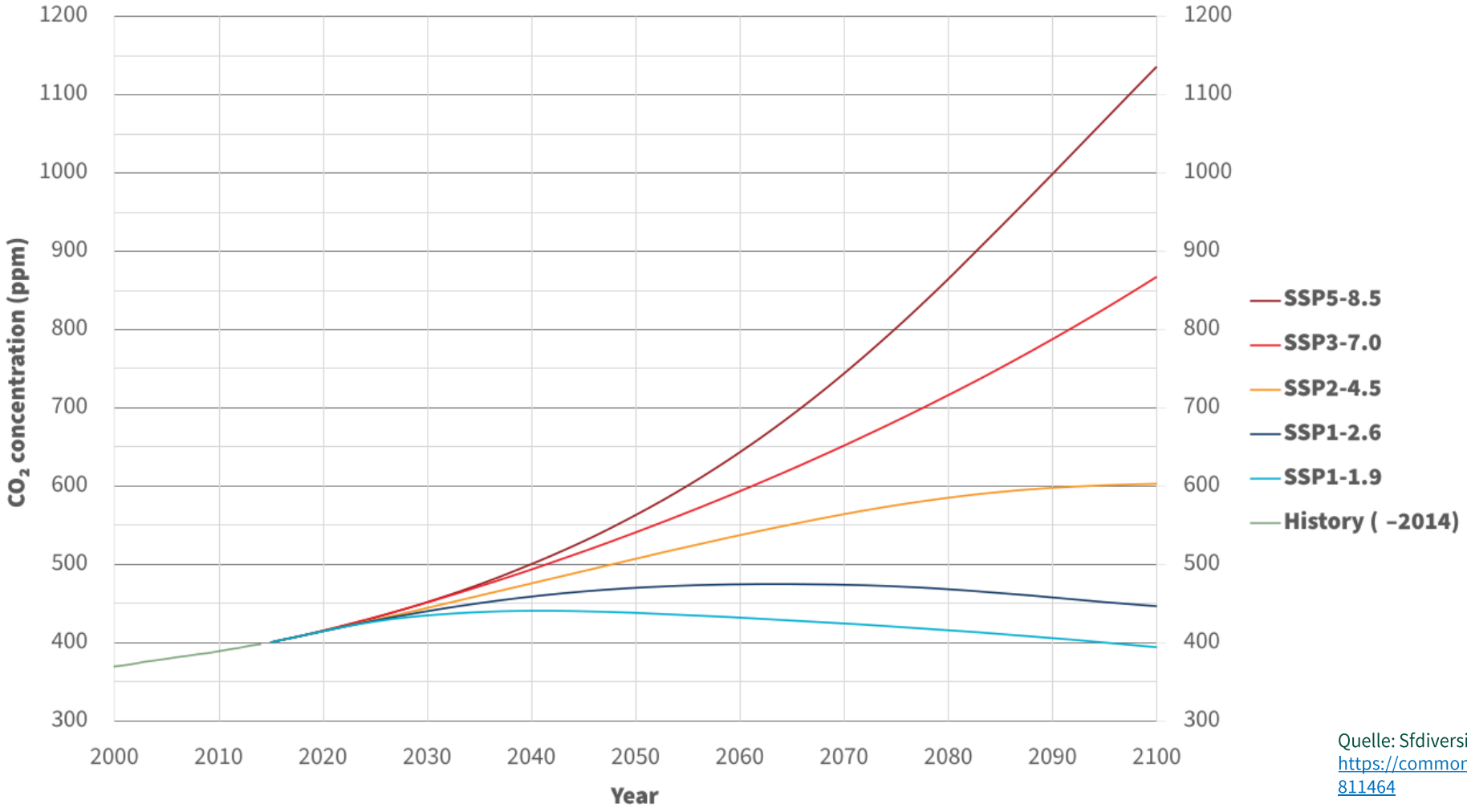
Stockholm Resilience Centre

Planetary limits



HNEE

Shared Socioeconomic Pathways (SSPs)



Quelle: Sfdiversity - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=86811464

Shared Socioeconomic Pathways (SSPs)

Szenariokürzel	Szenarioname	Farbcodierung[1]
	Kurzbeschreibung	
SSP1-1.9	Der 1,5 Grad Weg	RGB: 0 – 170 – 208

Internationally coordinated development in line with the Paris Agreement will make it possible to limit global warming to 1.5 degrees Celsius compared to the pre-industrial period through active climate protection.

SSP1-2.6	Der 2 Grad Weg	RGB: 0 – 52 – 102

Internationally coordinated development in line with the Paris Agreement will make it possible to limit global warming to 2 degrees Celsius compared to the pre-industrial period through active climate protection.

SSP2-4.5	Der Mittelweg	RGB: 247 – 148 – 32

Climate protection and economic development, which continues to be based on the use of fossil fuels, are in balance. This creates an increasing need for adaptation in vulnerable regions.

SSP3-7.0	Der konfliktreiche Weg	RGB: 224 – 0 – 0

National interests and regional conflicts lead to a high demand for raw materials and energy, which is largely covered by easily available fossil fuels such as coal. As a result, there are increasingly major global challenges in adapting to climate change, which must largely be shouldered by the countries themselves.

SSP5-8.5	Der fossile Weg	RGB: 153 – 0 – 2

The social and economic development of a rapidly developing world based on the active and increased use of fossil fuel resources goes hand in hand with an energy-intensive lifestyle worldwide. Measures to prevent climate change are being reduced to a minimum. The very high challenges of climate change adaptation are being tackled in an internationally coordinated manner.

Quelle: Scientists4future (2022)

Shared Socioeconomic Pathways (SSPs)

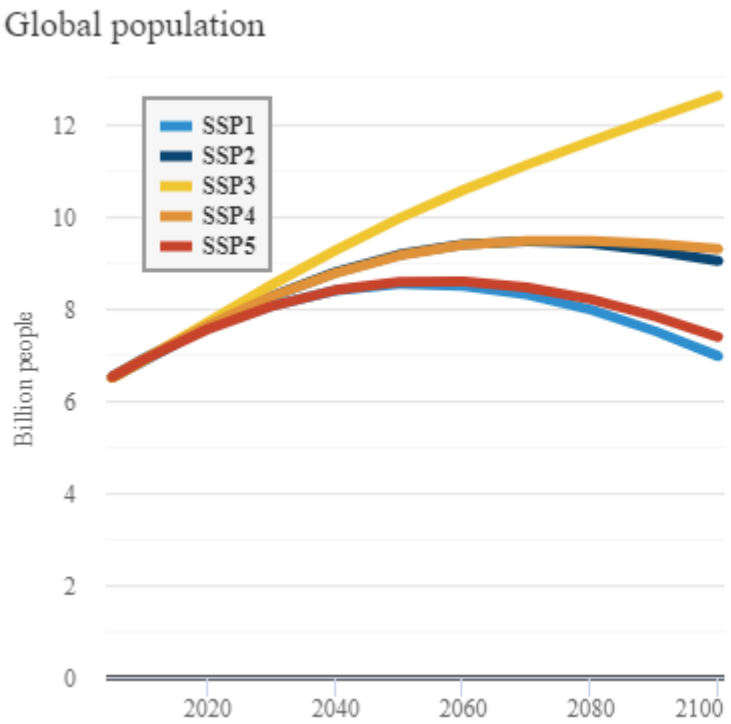
Quelle:
https://doi.org/10.1016%2Fj.gloenvcha.2015.01.004

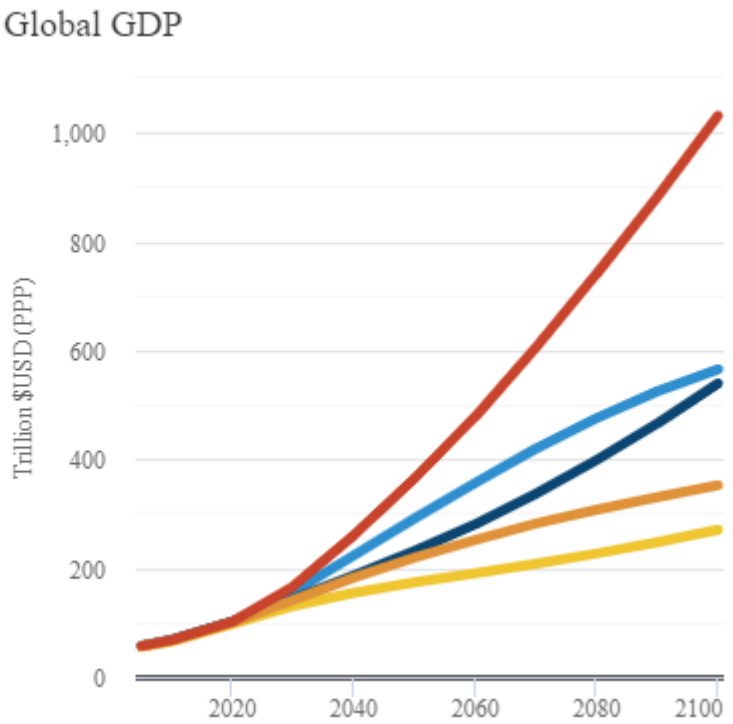
Shared Socioeconomic Pathways (SSPs)

SSP	Scenario	Estimated warming (2041–2060)	Estimated warming (2081–2100)	Very likely range in °C (2081–2100)
SSP1-1.9	very low GHG emissions: CO_2 emissions cut to net zero around 2050	1.6 °C	1.4 °C	1.0 – 1.8
SSP1-2.6	low GHG emissions: CO_2 emissions cut to net zero around 2075	1.7 °C	1.8 °C	1.3 – 2.4
SSP2-4.5	intermediate GHG emissions: CO_2 emissions around current levels until 2050, then falling but not reaching net zero by 2100	2.0 °C	2.7 °C	2.1 – 3.5
SSP3-7.0	high GHG emissions: CO_2 emissions double by 2100	2.1 °C	3.6 °C	2.8 – 4.6
SSP5-8.5	very high GHG emissions: CO_2 emissions triple by 2075	2.4 °C	4.4 °C	3.3 – 5.7

Quelle: 6. IPCC Assessment Report
https://doi.org/10.1017/9781009157896.001

Shared Socioeconomic Pathways (SSPs)





Quelle: Carbon Brief (2018)

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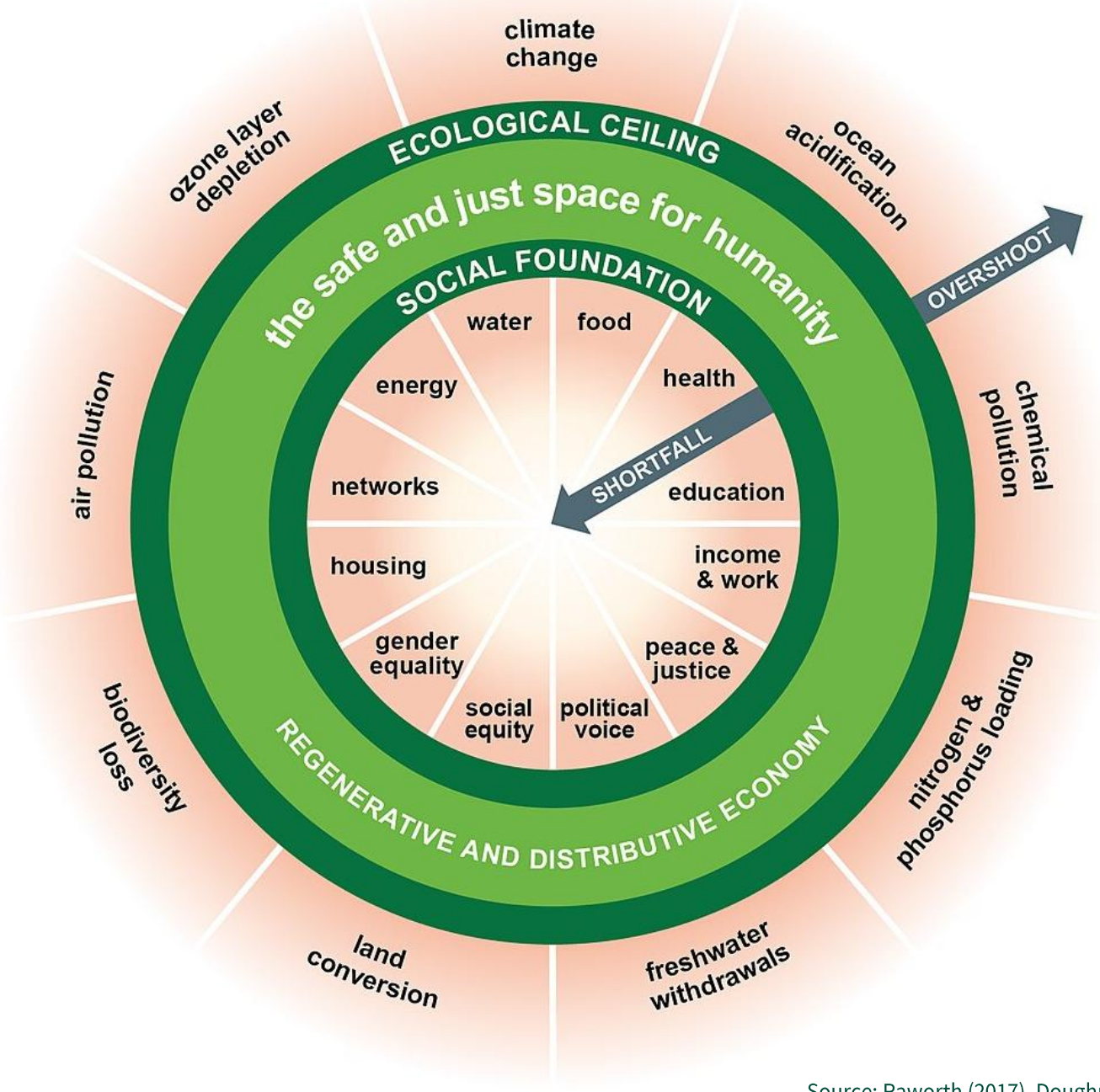
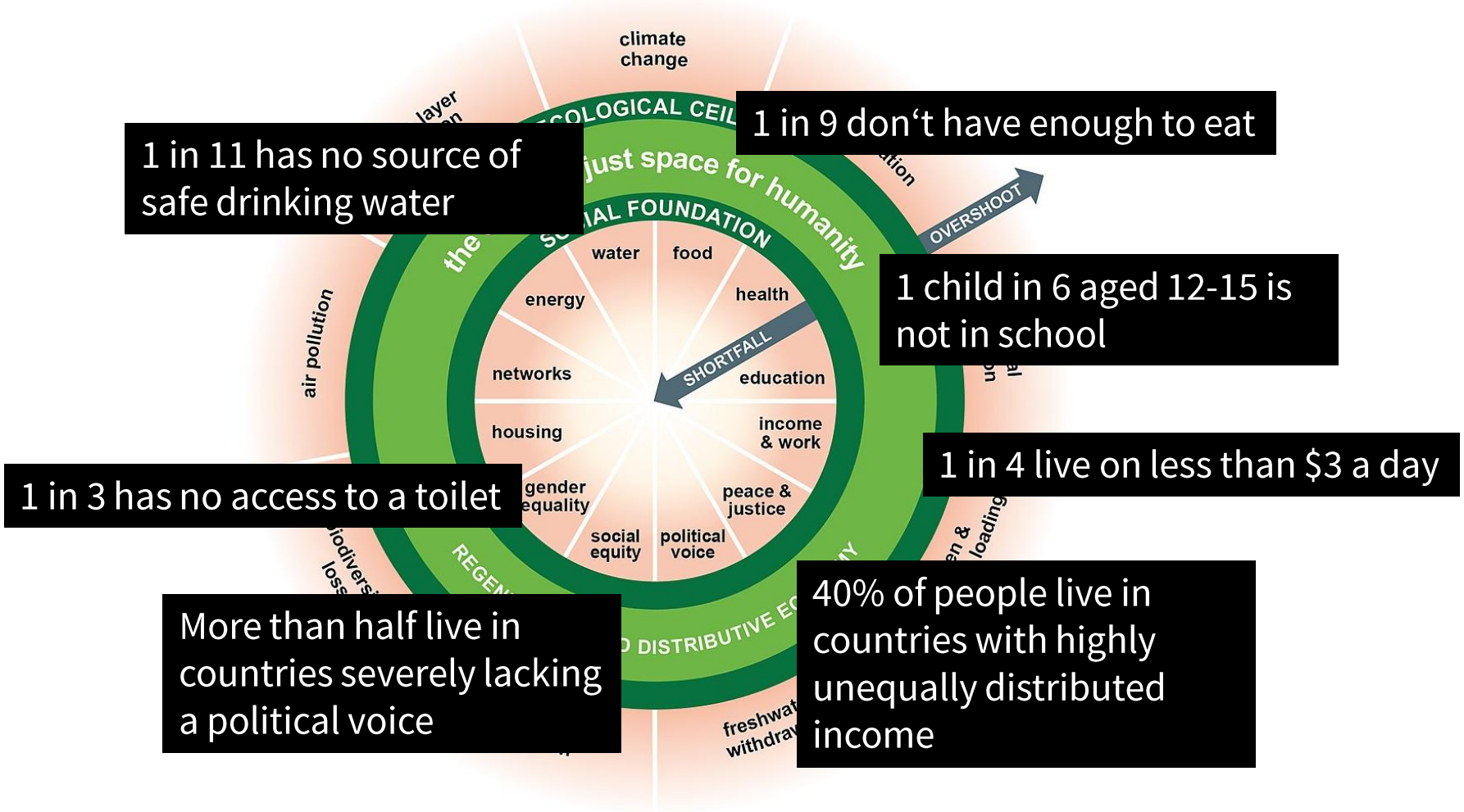
Doughnut Economics

The social foundation comprises 12 social dimensions, derived from the social priorities in UN's 2015 Sustainable Development Goals



Source: Raworth (2017), Doughnut Economics

Doughnut Economics



Source: Raworth (2017), Doughnut Economics

Doughnut Economics

Table 1. The social foundation and its indicators of shortfall

Dimension	Illustrative Indicators (percent of global population unless otherwise stated)	%	Year
Food	Population undernourished	11	2014–16
Health	Population living in countries with under-five mortality rate exceeding 25 per 1,000 live births	46	2015
	Population living in countries with life expectancy at birth of less than 70 years	39	2013
Education	Adult population (aged 15+) who are illiterate	15	2013
	Children aged 12–15 out of school	17	2013
Income and Work	Population living on less than the international poverty limit of $3.10 a day	29	2012
	Proportion of young people (aged 15–24) seeking but not able to find work	13	2014
Water and Sanitation	Population without access to improved drinking water	9	2015
	Population without access to improved sanitation	32	2015
Energy	Population lacking access to electricity	17	2013
	Population lacking access to clean cooking facilities	38	2013
Networks	Population stating that they are without someone to count on for help in times of trouble	24	2015
	Population without access to the Internet	57	2015
Housing	Global urban population living in slum housing in developing countries	24	2012
Gender Equality	Representation gap between women and men in national parliaments	56	2014
	Worldwide earnings gap between women and men	23	2009
Social Equity	Population living in countries with a Palma ratio of 2 or more (the ratio of the income share of the top 10% of people to that of the bottom 40%)	39	1995–2012
Political Voice	Population living in countries scoring 0.5 or less out of 1.0 in the Voice and Accountability Index	52	2013
Peace and Justice	Population living in countries scoring 50 or less out of 100 in the Corruption Perceptions Index	85	2014
	Population living in countries with a homicide rate of 10 or more per 10,000	13	2008–13

Sources: FAO, World Bank, WHO, UNDP, UNESCO, UNICEF, OECD, IEA, Gallup, ITU, UN, Cobham and Sumner, ILO, UNODC, and Transparency International. All percentages are rounded to the nearest integer.

Table 1. The social foundation and its indicators of shortfall

Source: Raworth (2017), Doughnut Economics

HNEE

Indicators

Table 1 | Country performance with respect to social thresholds and biophysical boundaries (1992–2015)

Indicator	*N*	Threshold/ boundary		Unit	1992	2015
Social					**Countries above threshold (%)**	
Life satisfaction	45 (119)	6.5		[0–10] Cantril ladder scale	(22)	21
Life expectancy	147	74		Years	18	47
Nutrition	137	2,700		Kilocalories per person per day	40	64
Sanitation	137	95		Population with access to improved sanitation, %	25	35
Income poverty	114	95		Population earning above $5.50 per day (2011 PPP), %	29	33
Access to energy	131	95		Population with access to electricity, %	47	60
Secondary education	129	95		Gross enrolment in secondary school, %	16	42
Social support	(118)	90		Population with friends or family they can depend on, %	(39)	28
Democratic quality	144	7		[0–10] scale	29	28
Equality	125	70		[0–100] scale (equivalent to Gini index of 0.3)	21	15
Employment	148	94		Labour force employed, %	50	49
Biophysical		**1992**	**2015**		**Countries within boundary (%)**	
CO_2 emissions	147	Population share of cumulative emissions		$MtCO_2\,yr^{-1}$	68	50
Phosphorus	136	1.1	0.8	$kg\,yr^{-1}$ P	47	44
Nitrogen	136	11.3	8.4	$kg\,yr^{-1}$ N	45	38
Land-system change	142	3.3	2.4	$tC\,yr^{-1}$	61	47
Ecological footprint	145	2.1	1.7	gha	51	34
Material footprint	147	9.1	6.9	$t\,yr^{-1}$	61	47

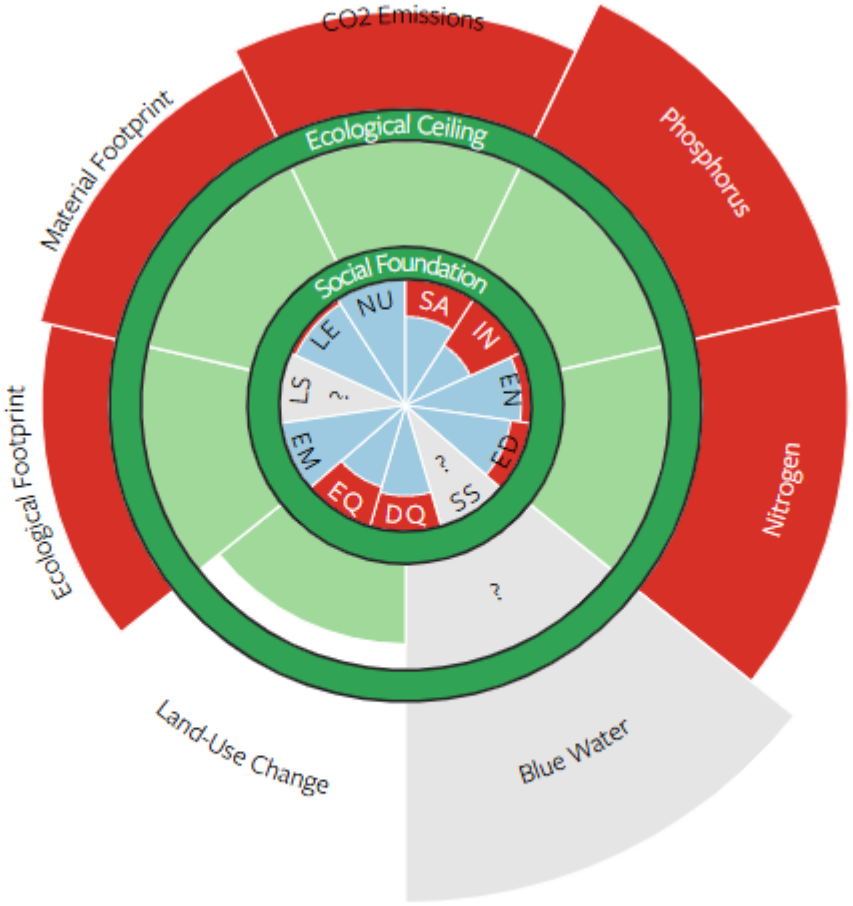
N is the number of countries considered. The social indicators for life satisfaction and social support have observations for a large number of countries only from 2005 onwards (2005 values in parentheses), and therefore a shorter period (2005–2015) is used for all cross-national summary comparisons. The biophysical boundaries shown are global per capita values in 1992 and 2015. They decline over time due to population growth, except for the CO_2 emissions boundary, which is calculated on the basis of each country's population-weighted share of the 770 Gt of cumulative global CO_2 emitted from 1850 to 1988 (the year that the 350 ppm CO_2 boundary was crossed). See Supplementary Information for additional details and the data sources for each social and biophysical indicator.

Source: Fanning et al. (2022)

What do the boundaries look like?

World

- **Blue wedges:** social performance relative to a threshold associated with meeting basic needs
- **Green wedges:** resource use relative to a biophysical boundary associated with sustainability
- **Red wedges:** shortfalls below the social threshold or overshoot beyond biophysical boundaries
- **Grey wedges:** missing data



e Satisfaction — LE - Life Expectancy — NU - Nutrition — SA - Sanitation
ome Poverty — EN - Access to Energy — ED - Education — SS - Social Support
emocratic Quality — EQ - Equality — EM - Employment

Source: https://goodlife.leeds.ac.uk/national-trends/country-trends/#DEU

What do the boundaries look like?

Germany

- **Blue wedges:** social performance relative to a threshold associated with meeting basic needs
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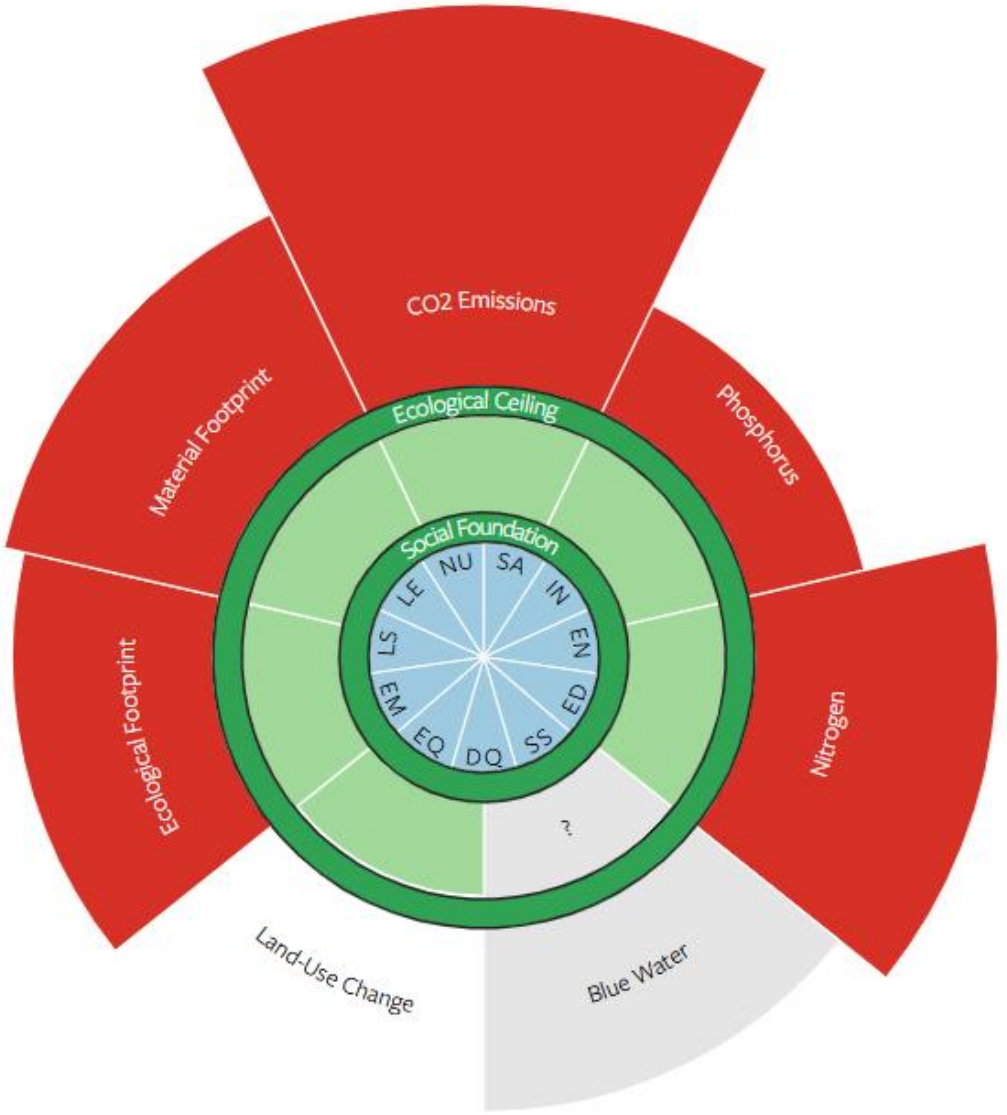

LS - Life Satisfaction	LE - Life Expectancy	NU - Nutrition	SA - Sanitation
IN - Income Poverty	EN - Access to Energy	ED - Education	SS - Social Support
DQ - Democratic Quality	EQ - Equality	EM - Employment	

Source: https://goodlife.leeds.ac.uk/national-trends/country-trends/#DEU

What do the boundaries look like?

USA

- **Blue wedges:** social performance relative to a threshold associated with meeting basic needs
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- **Red wedges:** shortfalls below the social threshold or overshoot beyond biophysical boundaries
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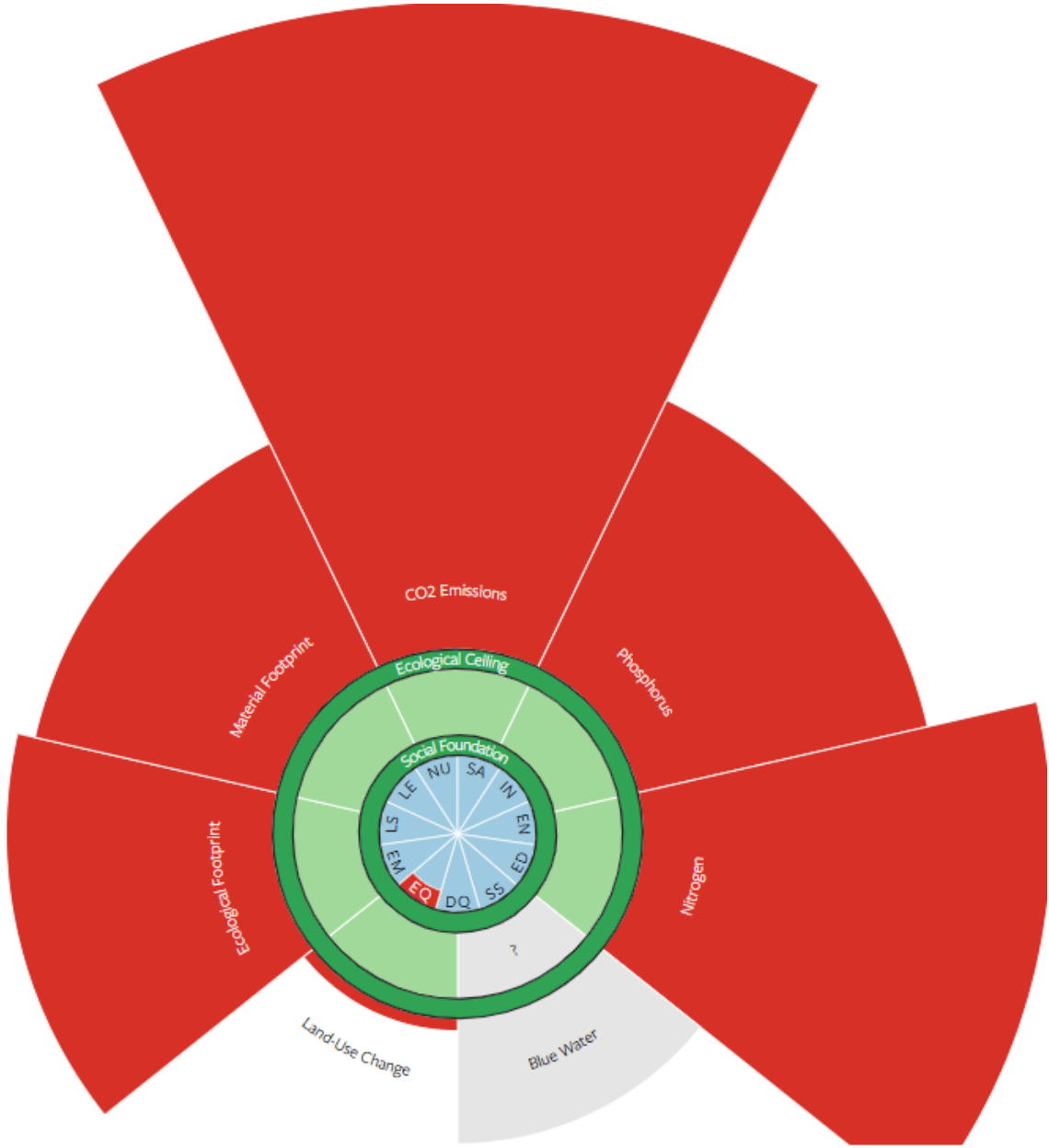

LS - Life Satisfaction	LE - Life Expectancy	NU - Nutrition	SA - Sanitation
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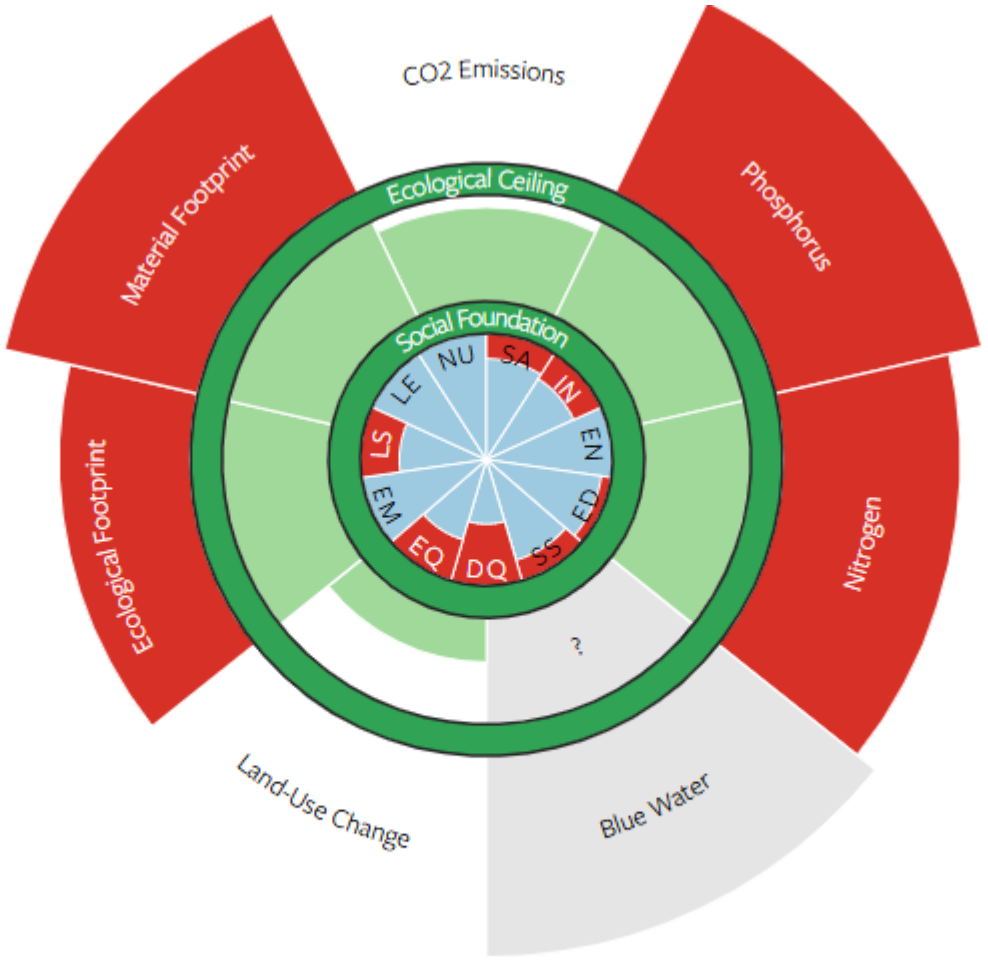
Source: https://goodlife.leeds.ac.uk/national-trends/country-trends/#DEU

What do the boundaries look like?

China

- **Blue wedges:** social performance relative to a threshold associated with meeting basic needs
- **Green wedges:** resource use relative to a biophysical boundary associated with sustainability
- **Red wedges:** shortfalls below the social threshold or overshoot beyond biophysical boundaries
- **Grey wedges:** missing data



e Satisfaction	LE - Life Expectancy	NU - Nutrition	SA - Sanitation
ome Poverty	EN - Access to Energy	ED - Education	SS - Social Support
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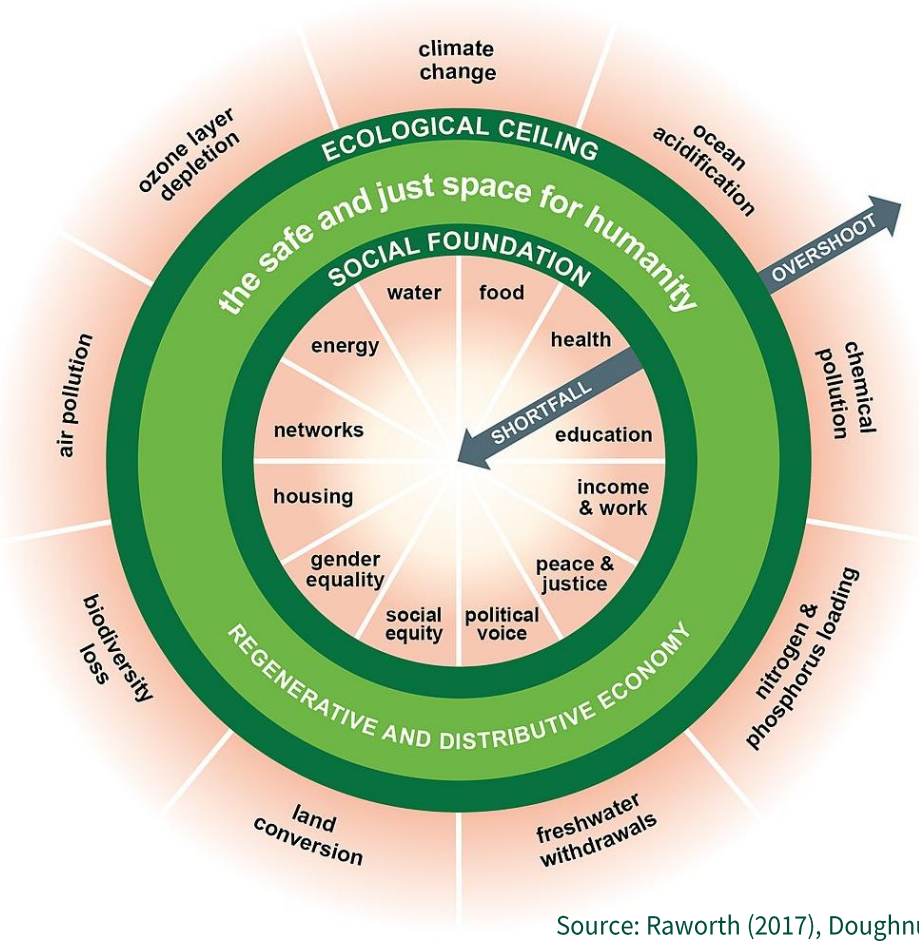
Source: https://goodlife.leeds.ac.uk/national-trends/country-trends/#DEU

Doughnut Economics

But how can we put Doughnut Economics into action?

→ Doughnut Economics Action Lab



Source: Raworth (2017), Doughnut Economics

ENVIRONMENTAL IMPACTS

3 What impact will the project have on...?

Climate change

LOCAL
GHG emissions in the area ?

GLOBAL
Territory footprint ?

Biodiversity

LOCAL
Local biodiversity ?

GLOBAL
Biodiversity elsewhere ?

Land use

Land use change ?

Water cycle

The water resource and cycle ?

Nitrogen and phosphorus pollution

Nitrogen and phosphorus emissions?

Air pollution

Aerosol emissions?

Chemical and plastic pollution

Chemical and plastic pollutant emissions ?

PRACTICES AND RESOURCES

4 What practices and resources should we engage to be in the safe and just space ?

INCLUSION

SUFFICIENCY - EFFICIENCY - CIRCULARITY

RESILIENCE

CREATIVITY

SOCIAL IMPACTS

1 Does the project meet a NEED expressed at the local level ?

PARTICIPATION

Democratic voice

Taking citizens' opinions into account in decision-making?

SUBSISTENCE

Work

Local employment development?

Food & Access to water

Access to quality food and water?

PROTECTION

Housing

Access to decent housing?

Energy

Access to affordable and reliable energy?

AFFECTION

Physical and mental health

The physical or mental health of residents?

Justice and safety

Access to justice and safety?

2 What impact will the project have on...?

CREATION

Education

Access to education and training?

LEISURE

Community & culture

Social links and local culture?

IDENTITY

Social equity

LOCAL
Social equity across the territory?

GLOBAL
People's lives elsewhere?

Gender equality

Gender equality ?

FREEDOM

Networks

Access to mobility or digital technology?

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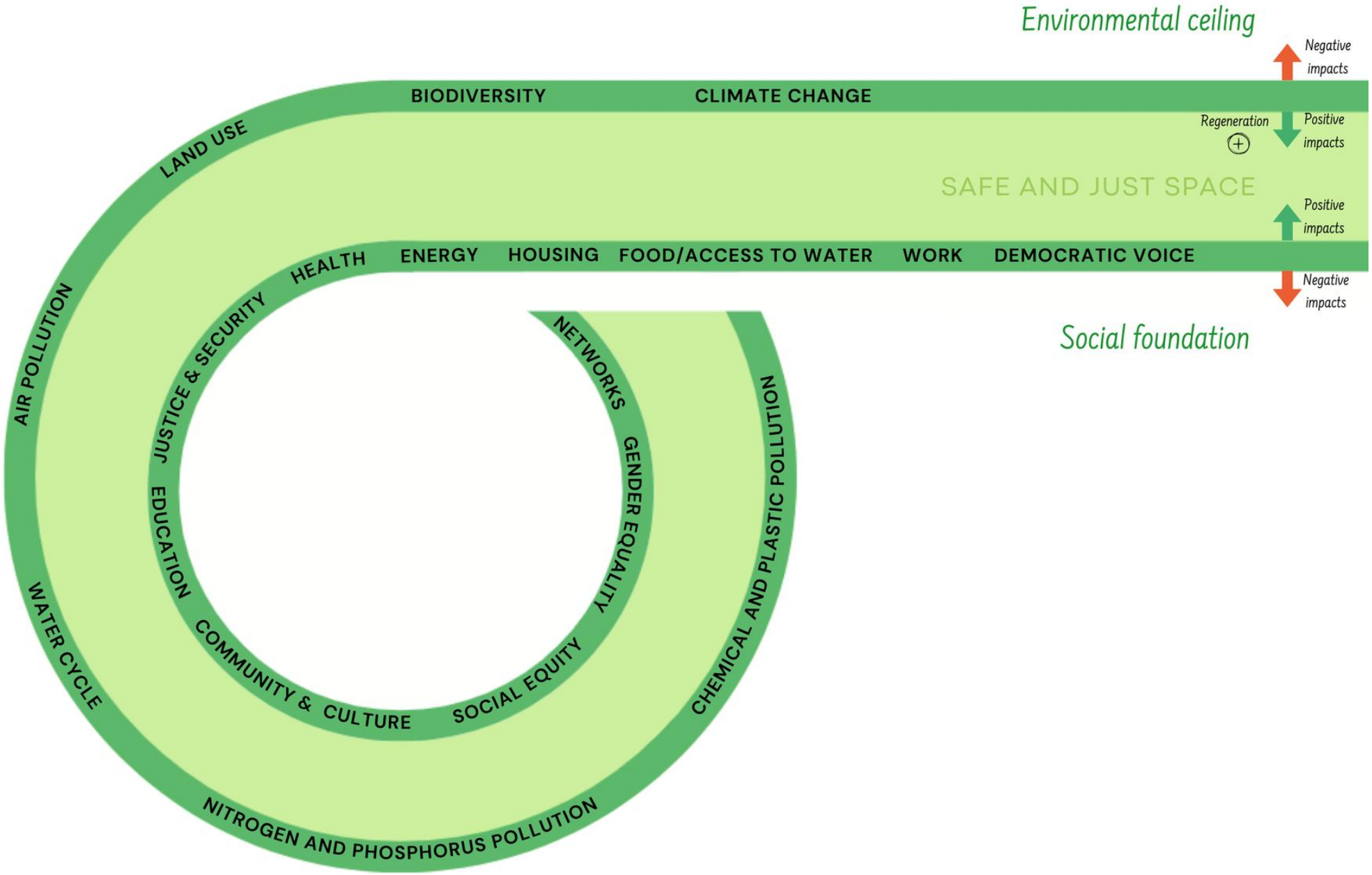
Environmental ceiling
Negative impacts
BIODIVERSITY
CLIMATE CHANGE
Regeneration
Positive impacts
LAND USE
SAFE AND JUST SPACE
Positive impacts
HEALTH
ENERGY
HOUSING
FOOD/ACCESS TO WATER
WORK
DEMOCRATIC VOICE
Negative impacts
Social foundation
AIR POLLUTION
JUSTICE & SECURITY
EDUCATION
NETWORKS
GENDER EQUALITY
COMMUNITY & CULTURE
SOCIAL EQUITY
CHEMICAL AND PLASTIC POLLUTION
WATER CYCLE
NITROGEN AND PHOSPHORUS POLLUTION

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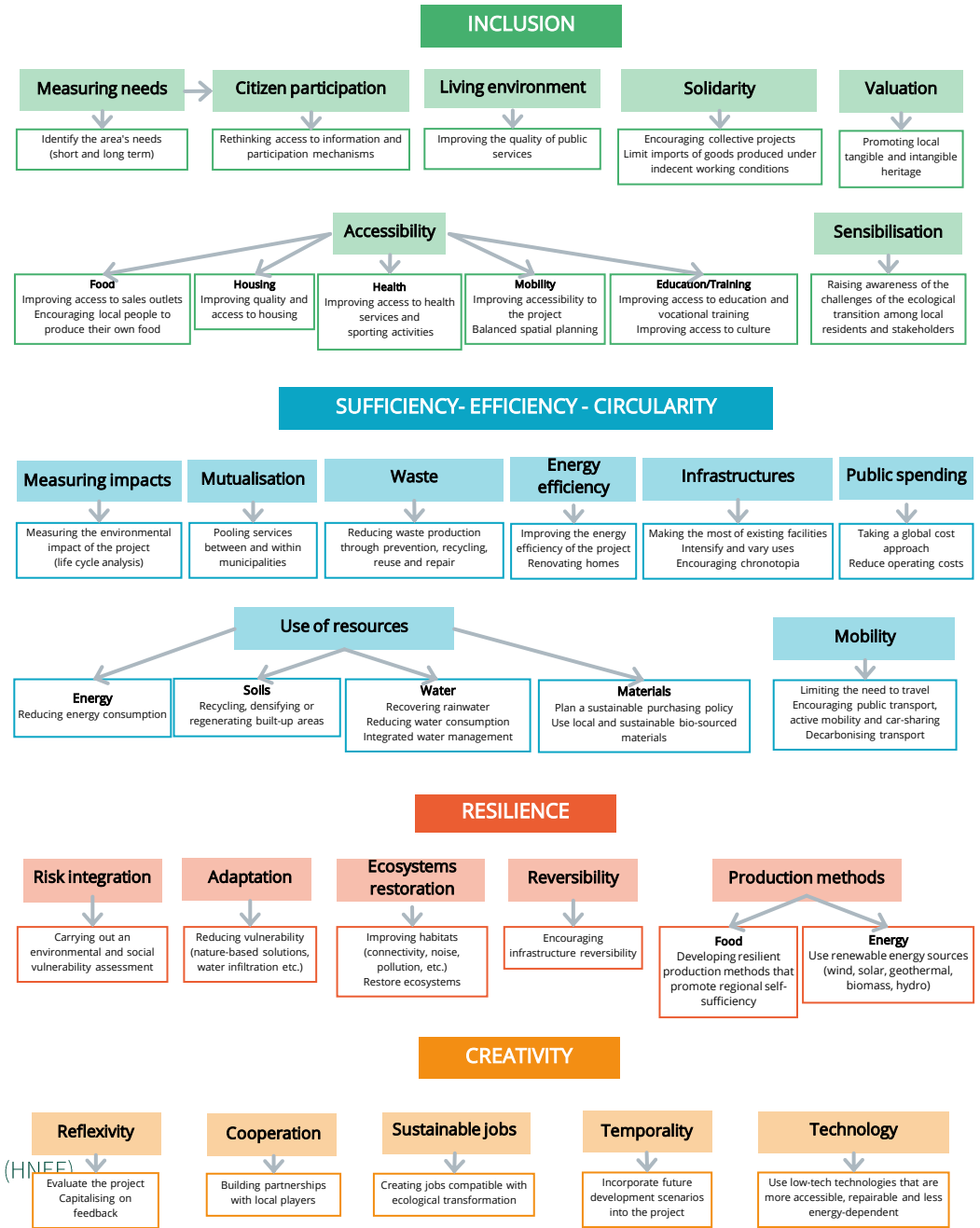
PRACTICES AND RESOURCES

What practices and resources should we engage to be in the safe and just space ?



Thank you for your attention!

Dr. Daniel Johnson, Professor for Value-Based Forest Economy