

# Linking Sustainable Development Goals and Planetary Boundaries to explore energy pathways

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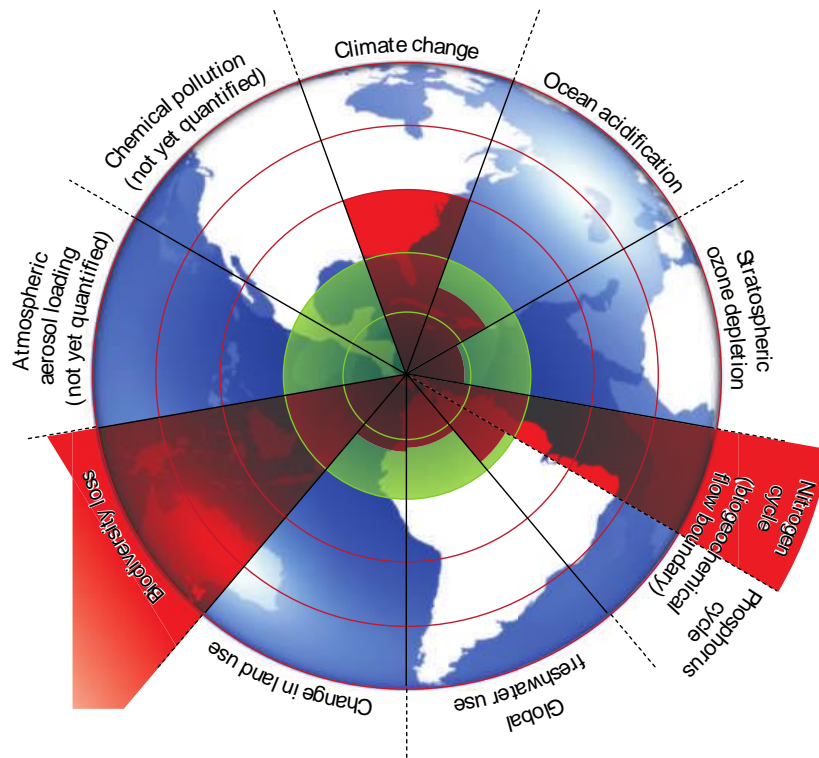
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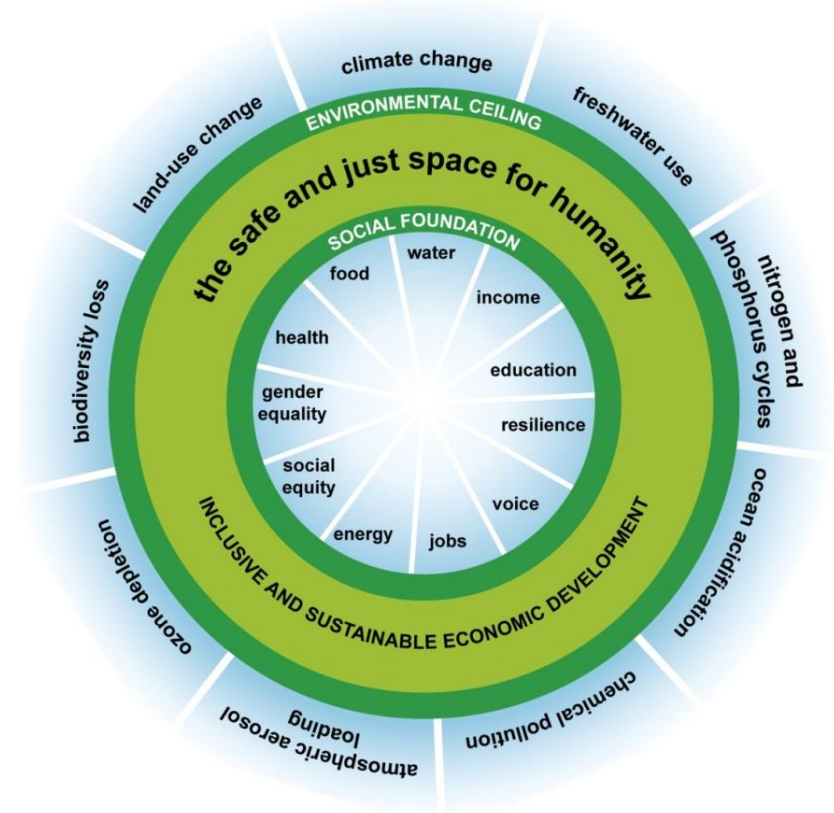
# Human impact on Earth



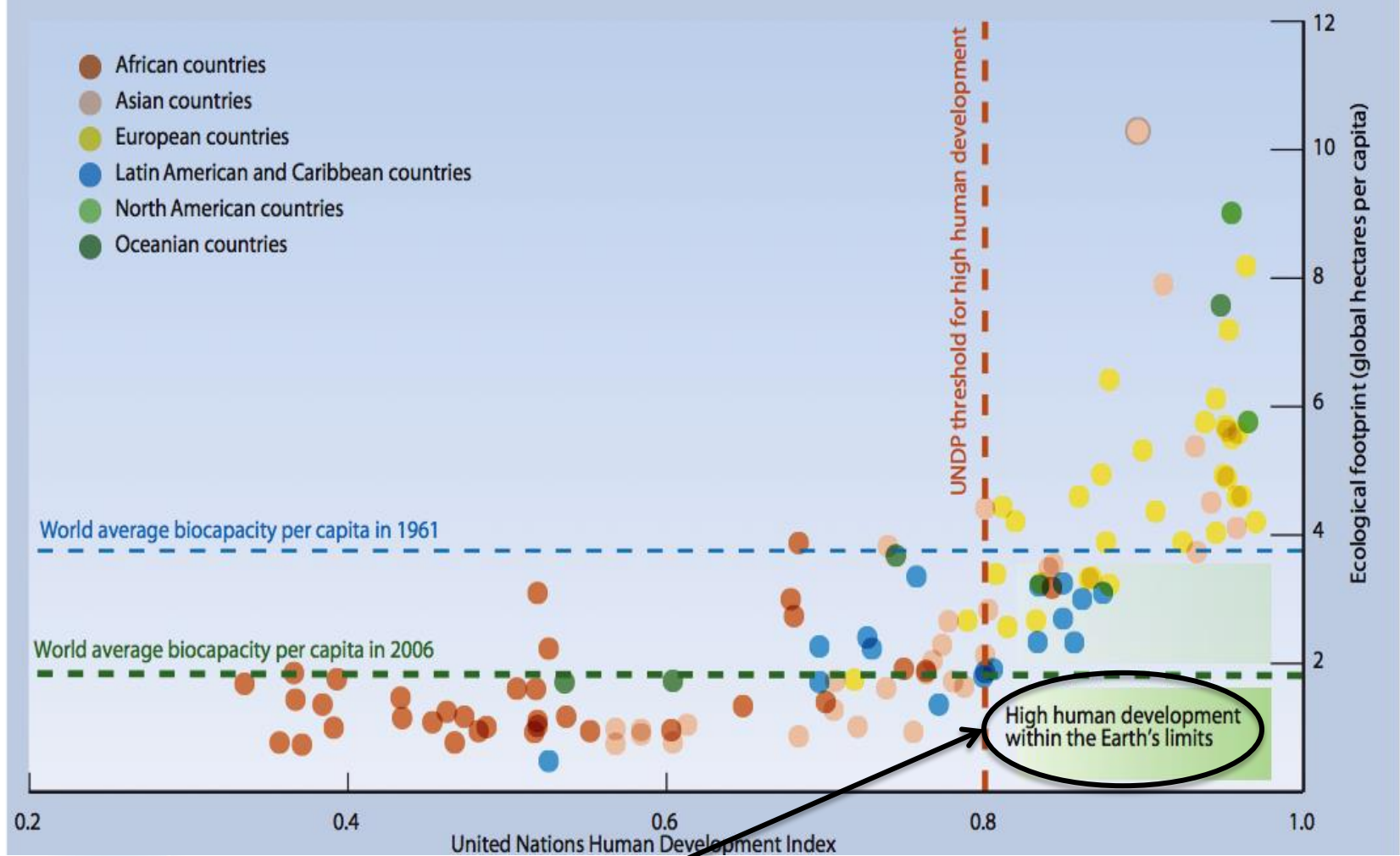
# Safe and just operating space



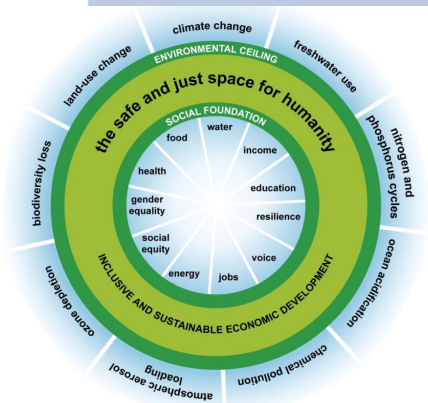
Rockström et al. 2009



Raworth, 2012



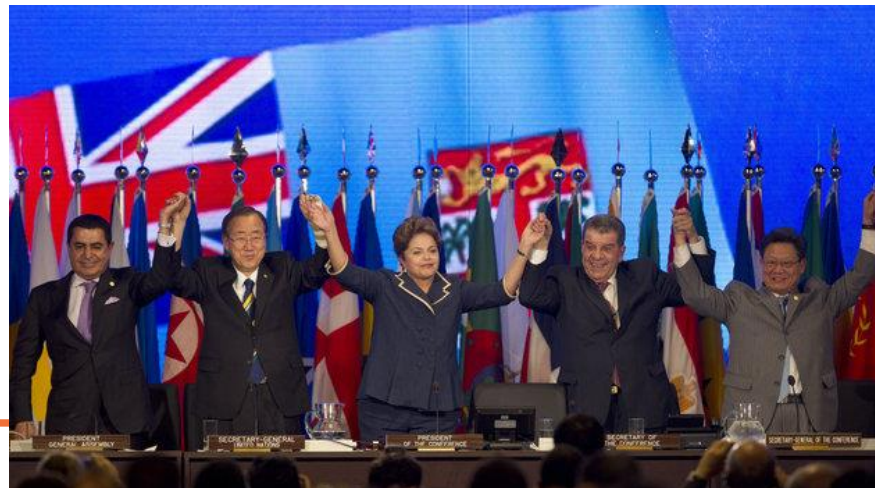
Source: UNEP, 2011



# Sustainable Development Goals (SDGs)

## UN conference on Sustainable Development (Rio +20) in Brazil in 2012

- Starting point for the process of formulating a set of SDGs for the period after 2015 (period after Millennium Development Goals)
- The goals should address and incorporate social, environmental and economic dimensions of sustainable development
- Progress towards the achievement of the goals needs to be assessed and accompanied by targets and indicators
- Open Working Group has left its proposal for 17 SDGs

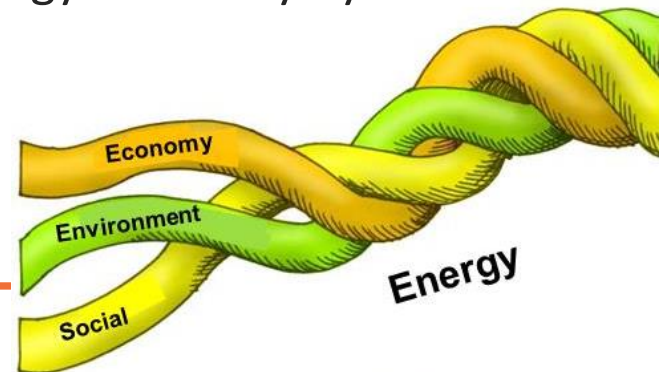


# Focus on the energy sector

- Sustainable Energy is a key factor for sustainable development for all countries and all people
- Energy is vital for alleviating poverty, improving human welfare and raising living standards

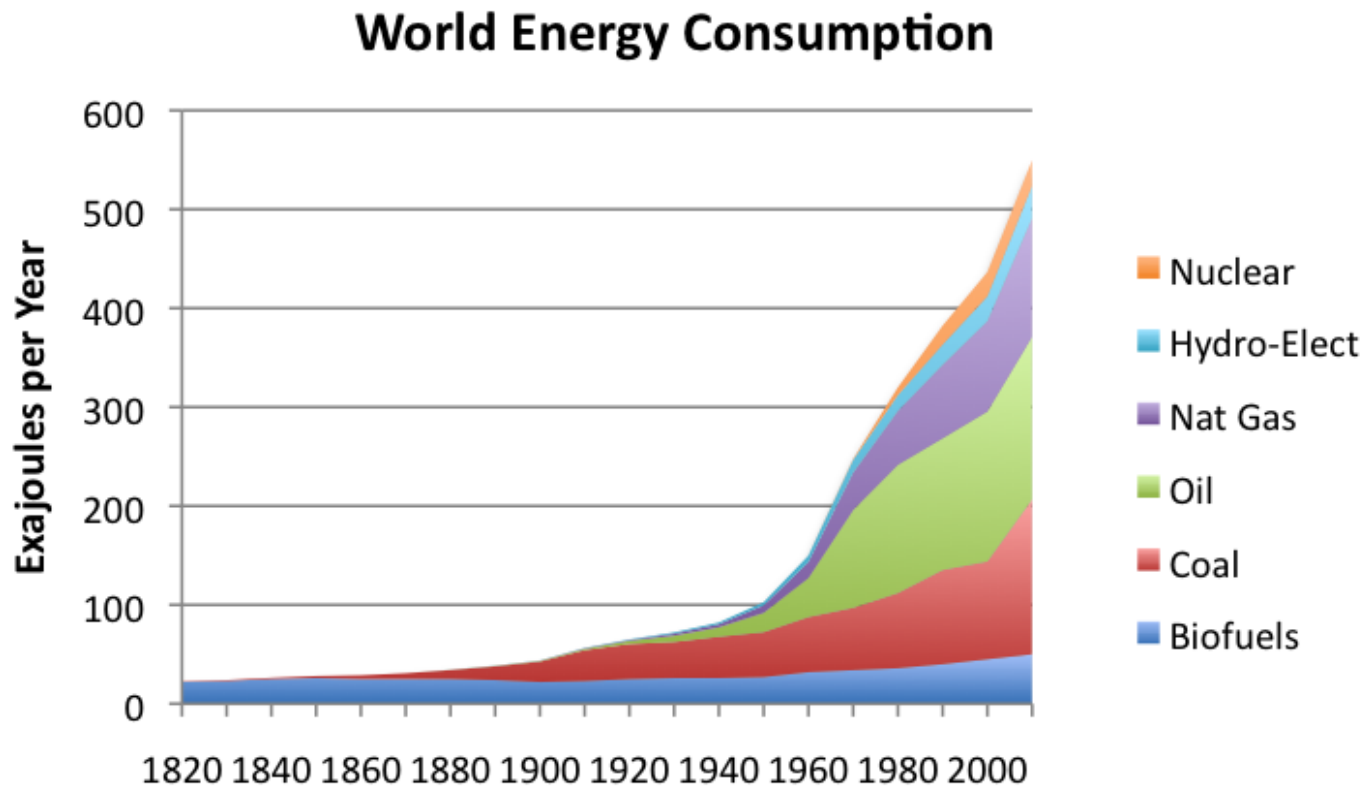
## **Goal 7. Ensure access to affordable, reliable, sustainable, and modern energy for all**

- 7.1 by 2030 ensure universal access to affordable, reliable, and modern energy services
- 7.2 increase substantially the share of renewable energy in the global energy mix by 2030
- 7.3 double the global rate of improvement in energy efficiency by 2030



# Where are we now?

- 82% of total primary energy supply is run by fossil fuels, while renewable energy accounts for 12% of TPES



2.7 billion people use traditional biomass such as wood or dung for cooking and heating

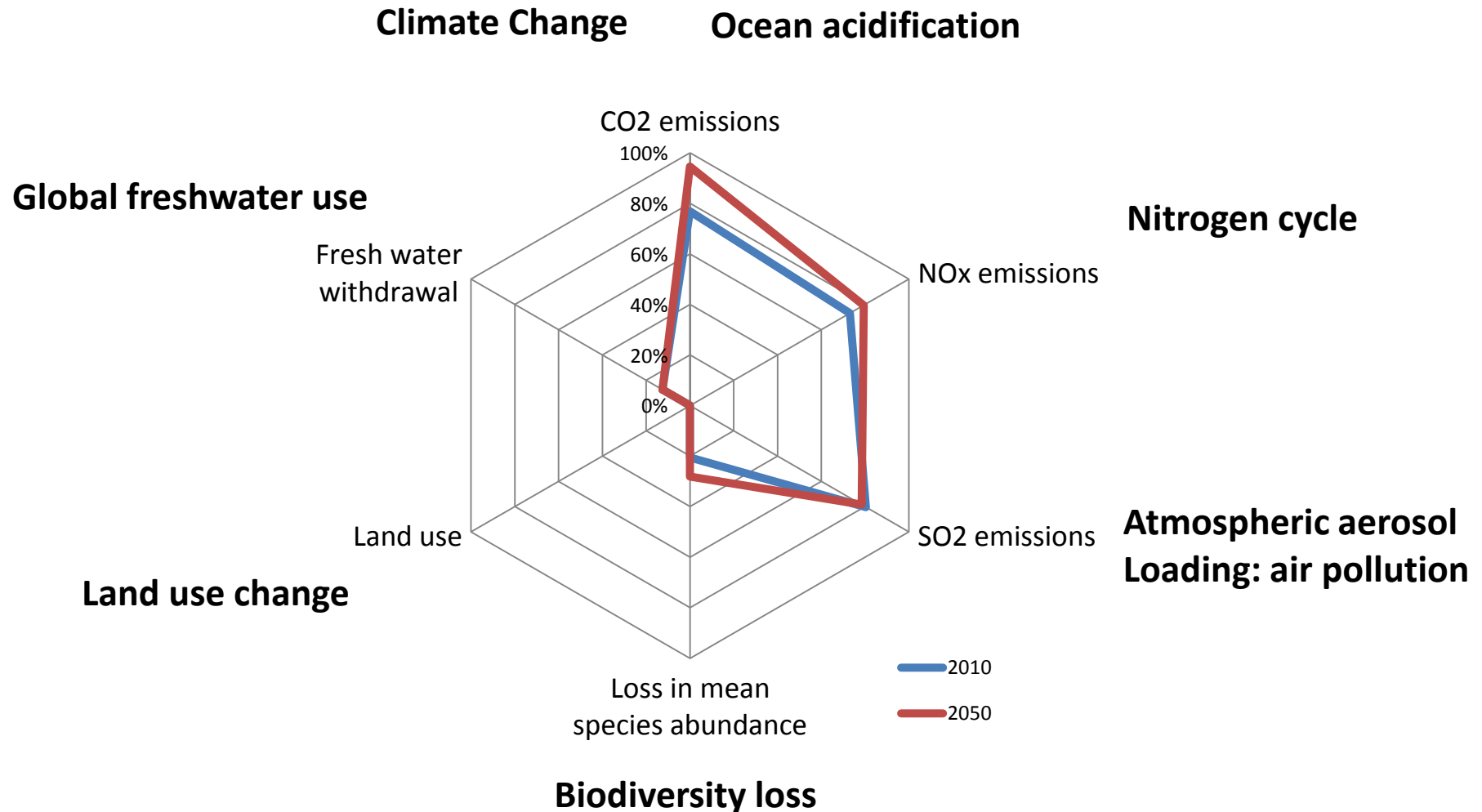


1.3 billion people do not have access to electricity



Earth's lights at night, NASA.

# What is the importance of energy sector as a driver behind different planetary boundary processes?



# Trade-offs and synergies between different goals and targets

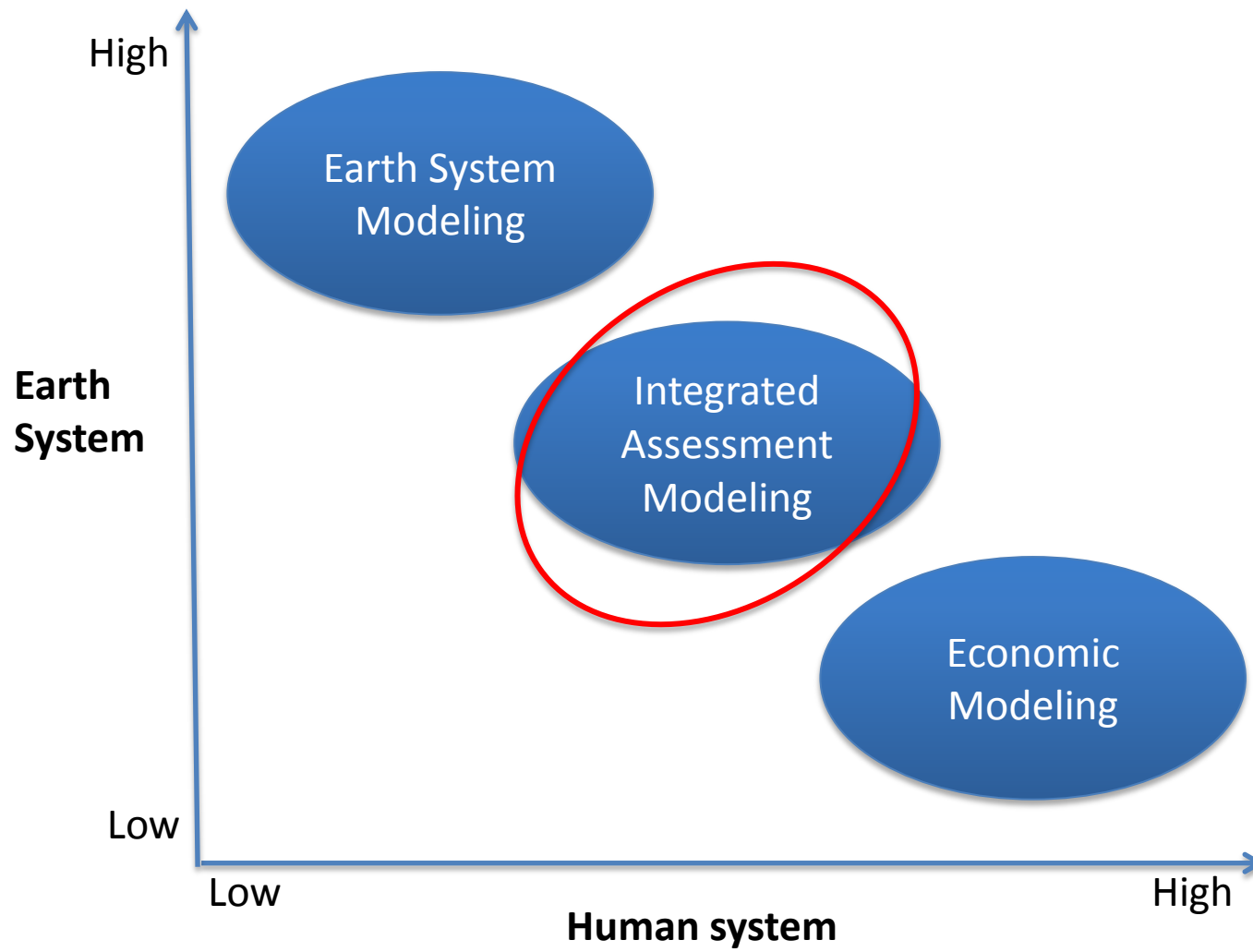
	<b>Eradicate hunger</b>	<b>Access to water</b>	<b>Access to energy</b>	<b>Clean air</b>	<b>Climate mitigation</b>	<b>Conserve biodiversity</b>
<b>Eradicate hunger</b>		ns	ns	ns	More GHG emissions from increased production (fertilisers; land expansion, tractors) <sup>1)</sup>	More impact of agriculture on ecosystems
<b>Access to water</b>	Access to safe drinking water helps to prepare safe food		ns	ns	ns	ns
	Competition as well as synergy between water for residential use and in agriculture					
<b>Access to energy</b>	Allows making use of income opportunities when less time is spent on collecting fuels, and health improved through less indoor air pollution	Water required for power generation Modern energy helps to improve access to safe water (e.g. pumps)		Less pollution from traditional energy sources (charcoal, firewood)	Less deforestation vs more fossil-fuel use, but modern energy more efficient than traditional energy systems	Less disturbance of natural ecosystems from wood collection for fuel or charcoal
	Less impact of air pollution on crop yields and quality	Less contamination from the deposition of airborne pollutants	ns		Depends on the choice of air pollutants to be targeted (BC/CH <sub>4</sub> )	Lower deposition of atmospheric pollutants on ecosystems
<b>Clean air</b>	Less risk of disruption of vital ecosystem services	Effects of climate change on precipitation patterns and potential evapo-transpiration	Higher energy price	Less pollution thanks to a reduced use of fossil fuels, particularly oil and coal		Less impact of climate change on biodiversity
<b>Climate mitigation</b>	Bio-energy competes with food and feed and may spur scrambles for land; but also opportunities for poor in rural areas					Effects of GHGs and climate change on crop yields
						Additional land required for bio-energy crops
<b>Conserve biodiversity</b>	Less land used for food production	A more gradual / uniform flow and cleaner water to rivers and aquifers	ns	More intact ecosystems contribute to air quality	Fewer CO <sub>2</sub> emissions from land conversion and agriculture Restoration of degraded land creates new CO <sub>2</sub> sinks	
	Preservation of ecosystem services helps safeguard long-term sustainable food supply	Increased water use by permanent vegetation				

 Synergy

 Mixed

 Trade-off

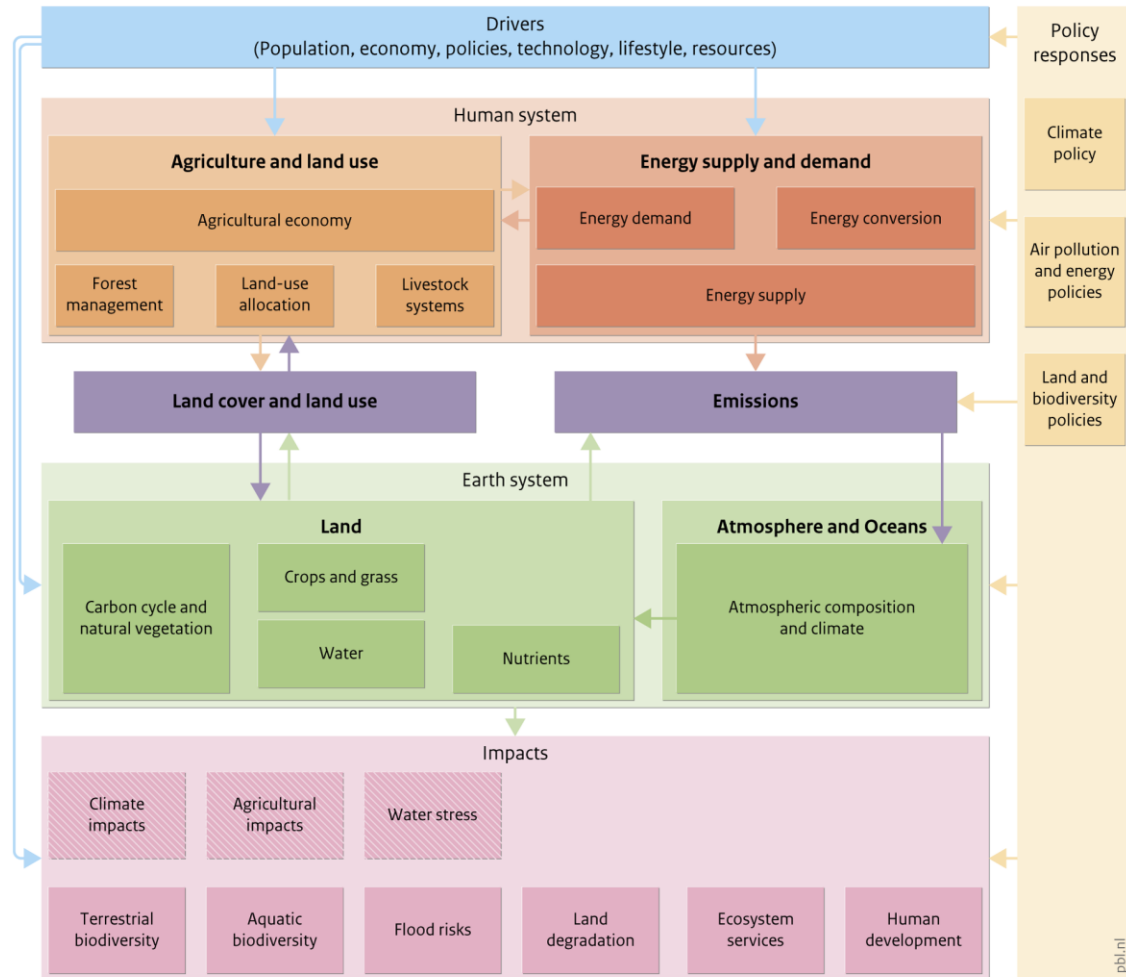
Source:  
Roads from Rio+20  
(PBL, 2012)



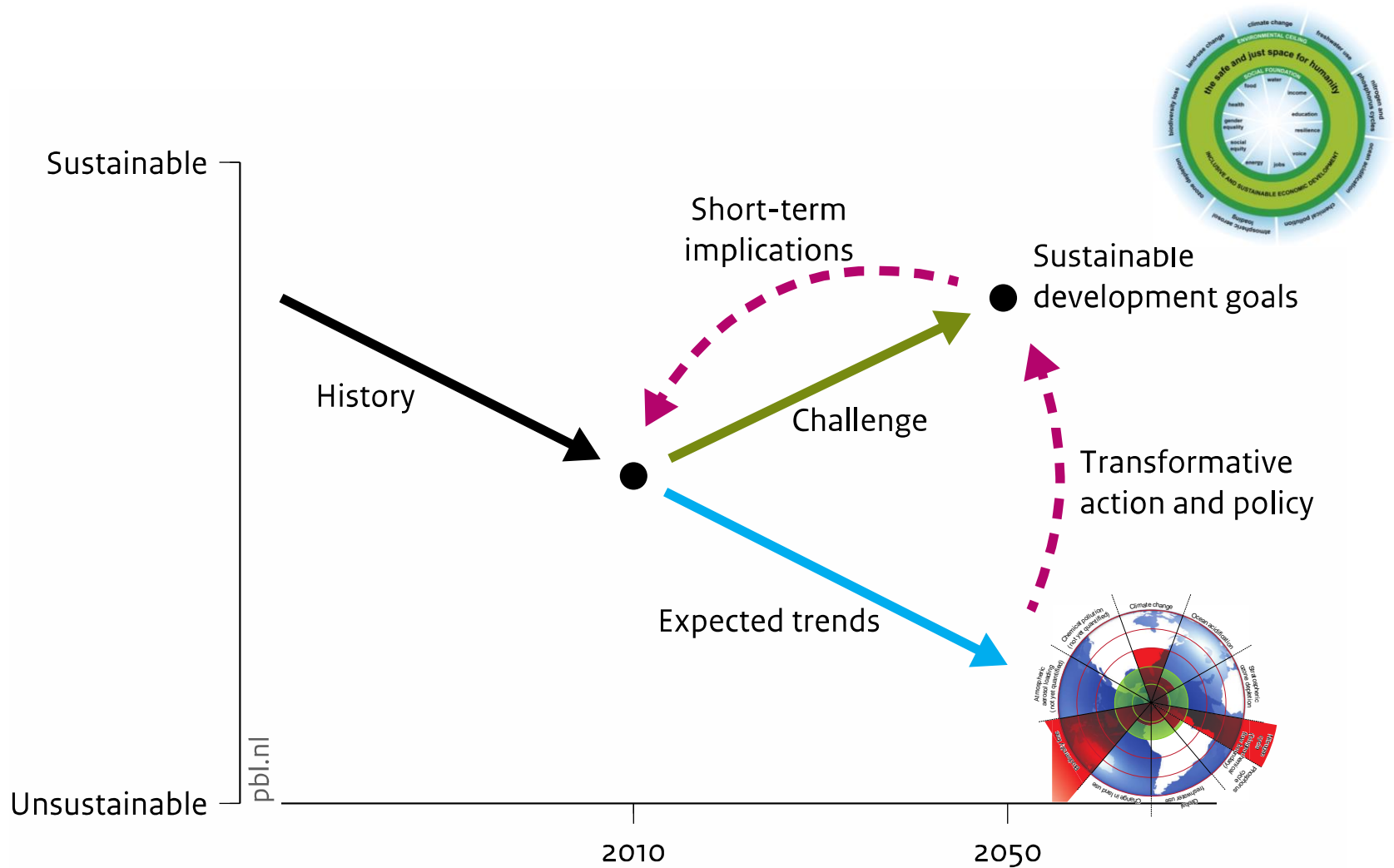
# Integrated Environmental Assessment: IMAGE3.0

- How global long-term environmental change and sustainability problems develop over time, driven by human activities, such as economic development and population growth
- Used to assess key policy issues, such as climate change, air pollution, land-use change, biodiversity loss, and water scarcity
- Used for many international assessments, including IPCC assessments, UNEP's Global Environment Outlooks, OECD's Environmental Outlooks and the Millennium Ecosystem Assessment

IMAGE 3.0 framework

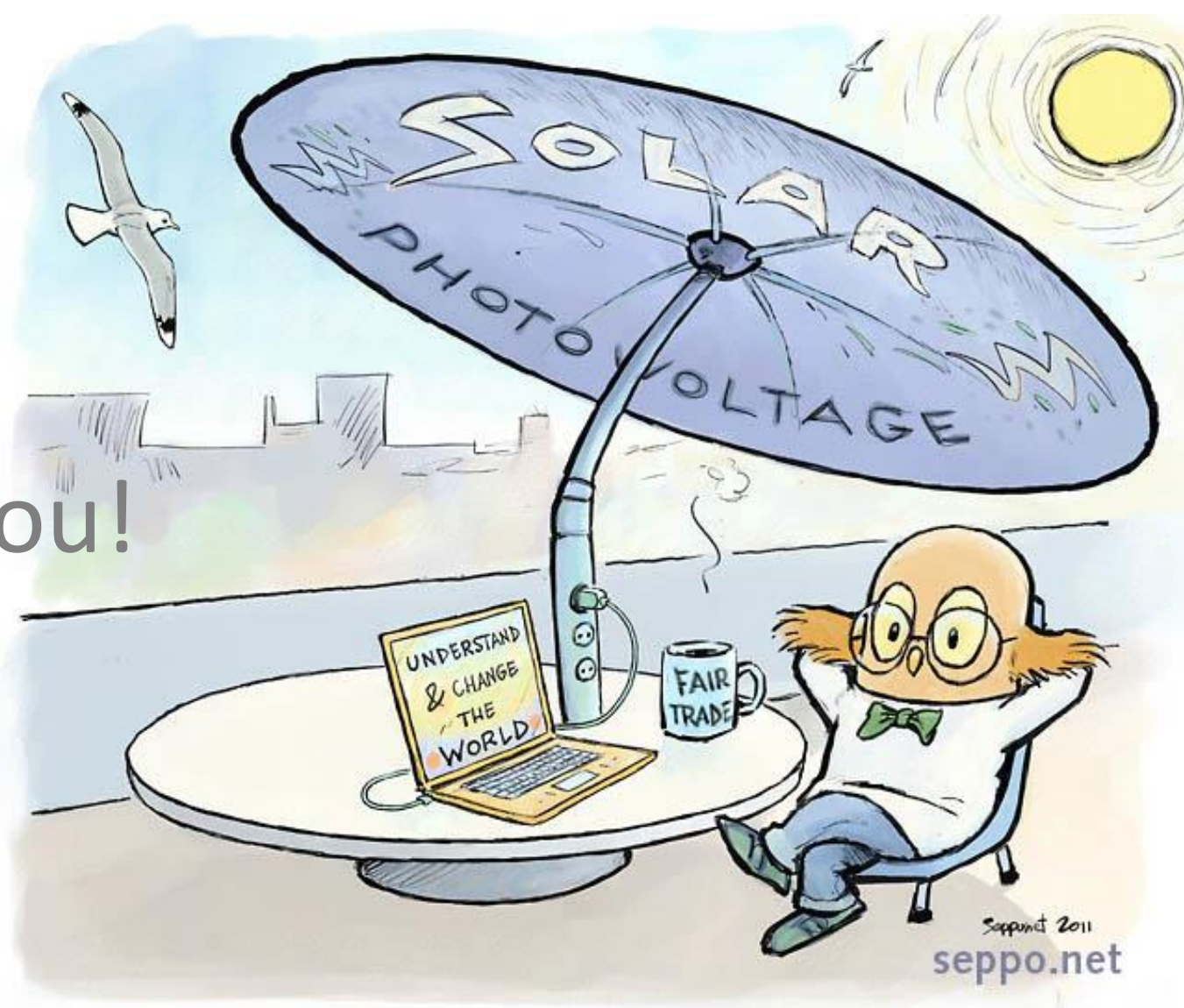


# Pathway analysis & safe operating space



# Thank you!

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