Our Successful Future
Summary & Consequences

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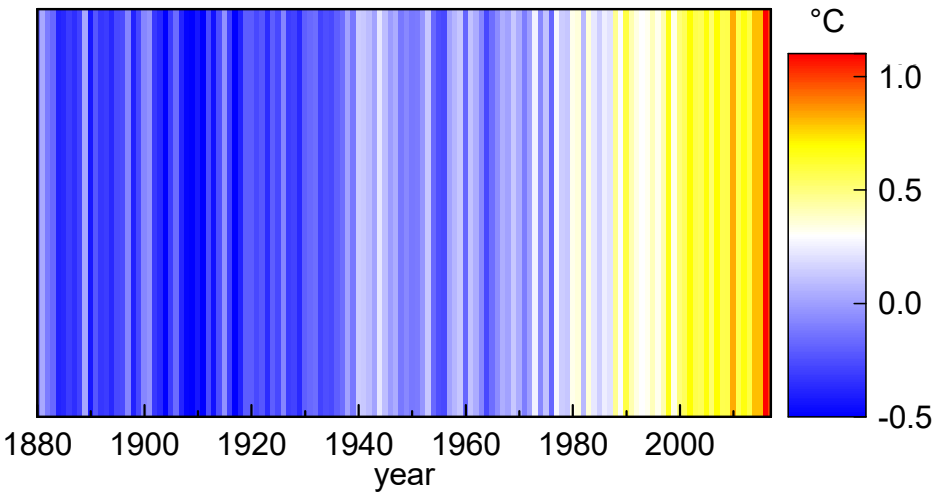
agenda

- How can we master the grand challenges of humanity?
  - undernourishment
  - climate change
  - sustainable-energy transition
- What do we need to do politically and individually?
- Basis are quantitative interrelations between some major aspects of sustainability.

(some diagrams newly evaluated)

global mean temperature



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GISTEMP Team, 2018: *GISS Surface Temperature Analysis (GISTEMP)*. NASA Goddard Institute for Space Studies. Dataset accessed 2018-11-14 at https://data.giss.nasa.gov/gistemp/

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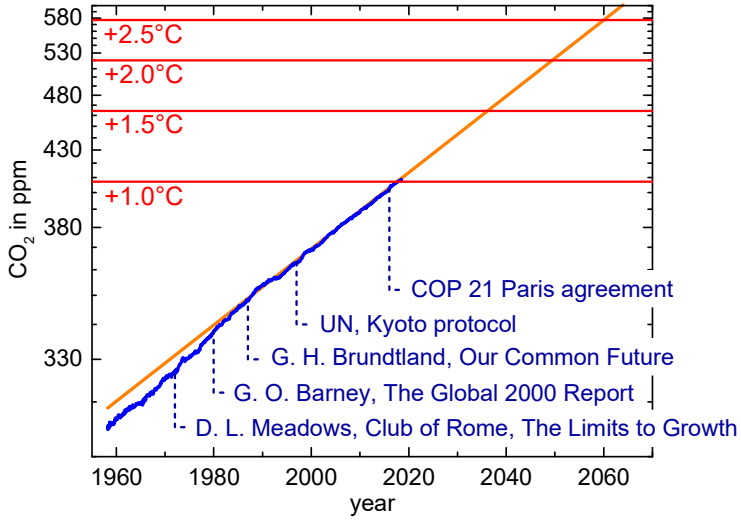
CO_2 content of the atmosphere



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source: http://www.esrl.noaa.gov/gmd/ccgg/trends/

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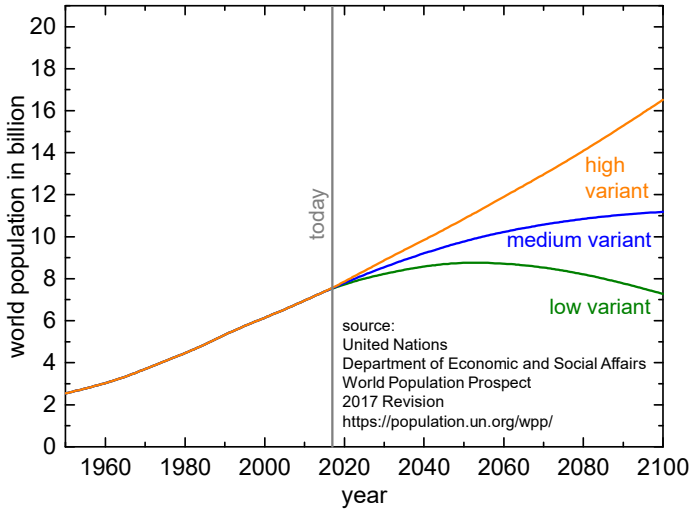
UN world-population scenarios



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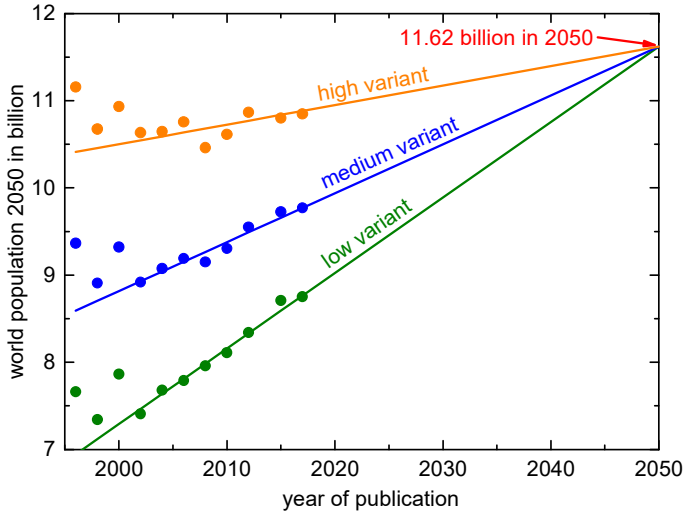
development of UN-WPP scenarios for 2050



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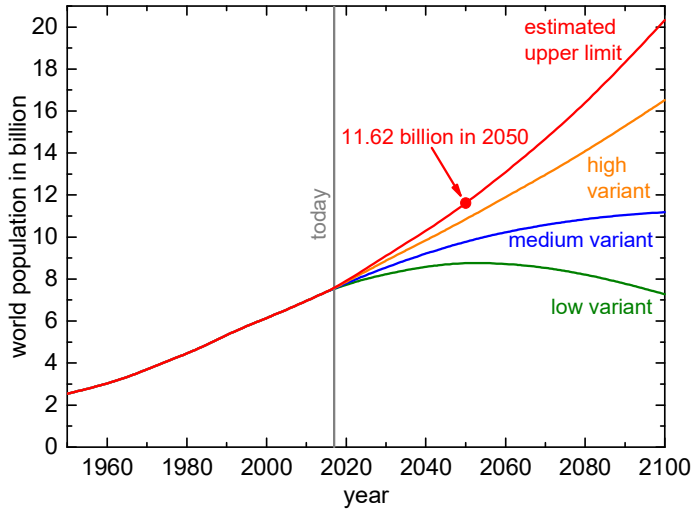
projection of WPP development



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uncertainty vs. ignorance

uncertainty:
- known possible errors
- can be quantified

ignorance:
- lack of knowledge
- decreases over time
- cannot be quantified

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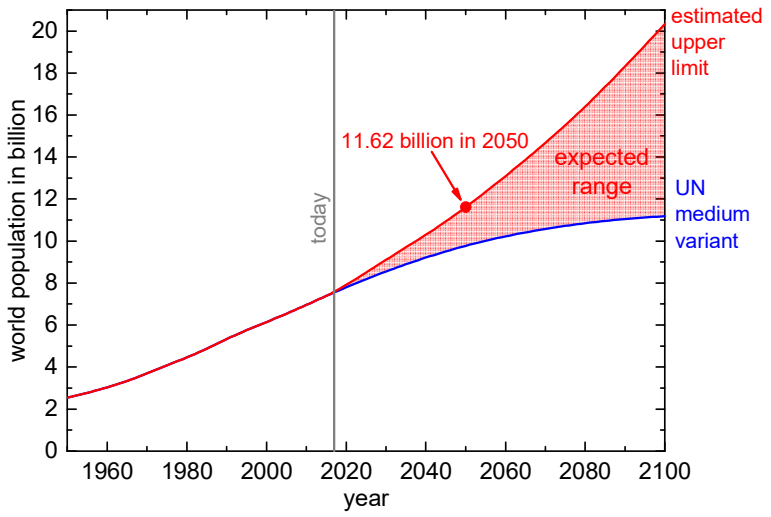
expected population development



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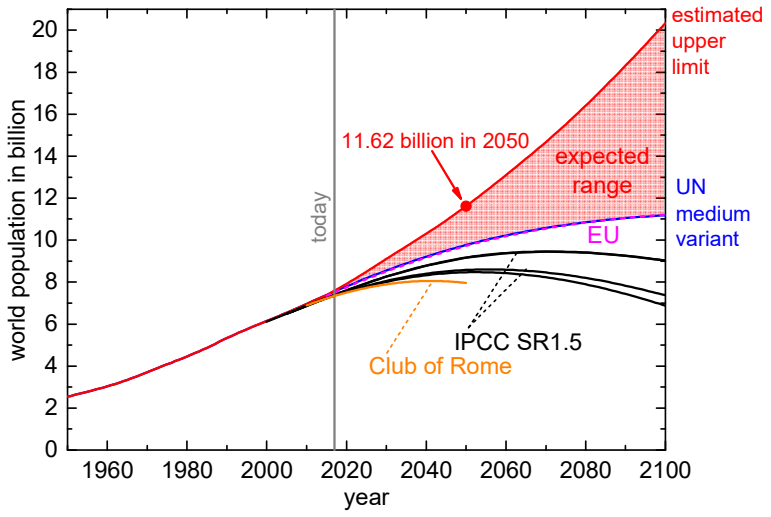
scenarios for policy making



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Europen Comission, 28.11.2018, A Clean Planet for all.
IPCC Special Report 6.10.2018 Global Warming of 1.5°C
Club of Rome: J. Randers (2012) 2052: A global forecast for the next 40 years.

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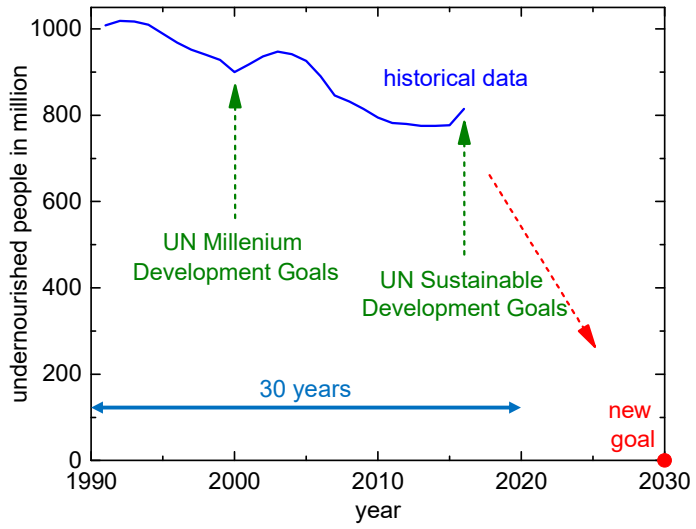
world hunger



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population growth eating up progress

since 1990, i.e. within ≈ 30 years:

- additional people fed: 2.5 bn
- population increased by: -2.3 bn
- undernourishment decreased by 0.2 bn

in 2050, i.e. in ≈ 30 years:

- population increases by: 2.0 to 4.0 bn

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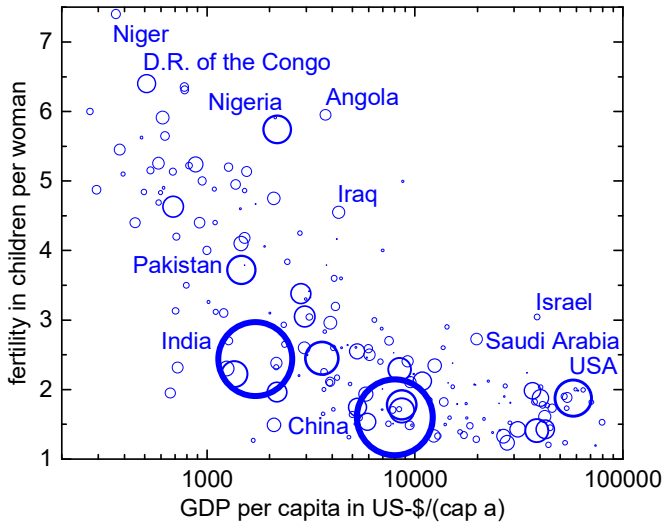
strong influence of GDP on fertility



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Bénard convection setup

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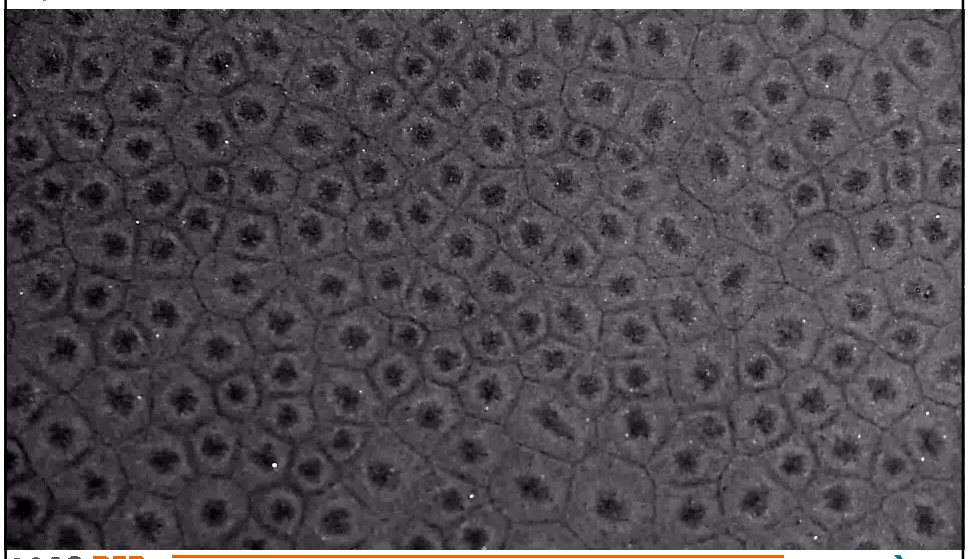
Bénard convection: dissipative structure



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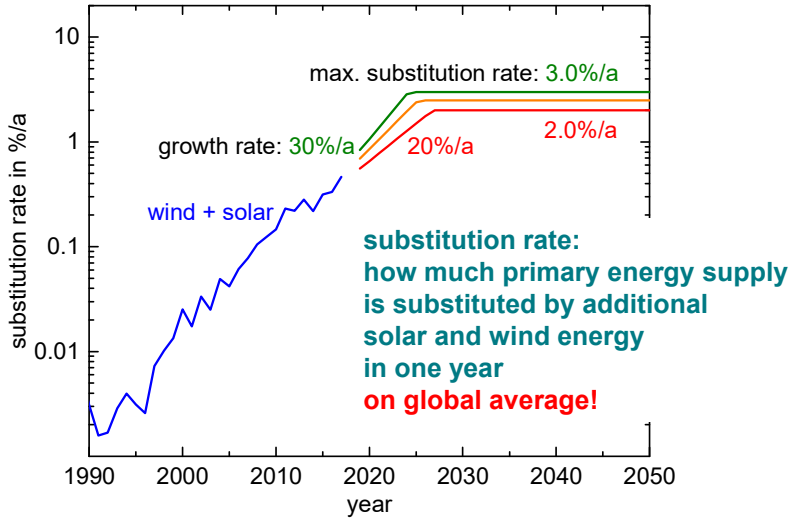
defining three future scenarios



substitution rate:
how much primary energy supply is substituted by additional solar and wind energy in one year on global average!

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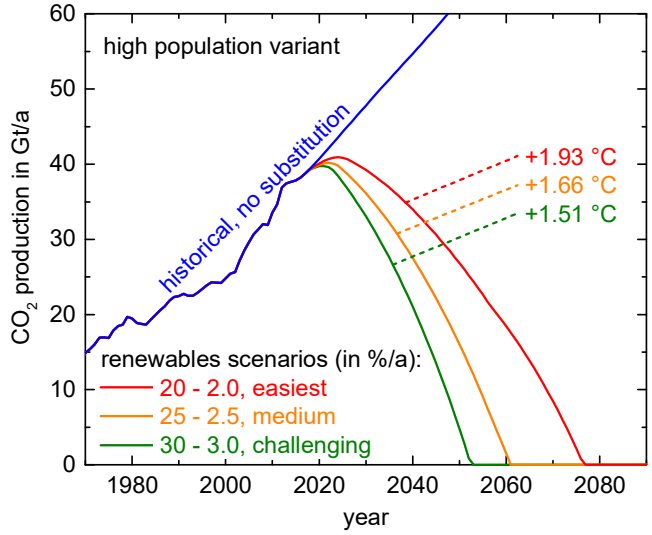
CO_2 according to three scenarios



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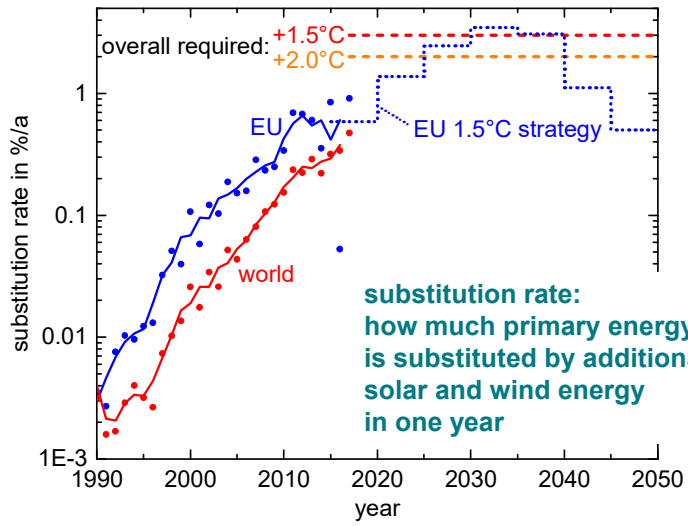
substitution rates solar & wind



substitution rate:
how much primary energy supply is substituted by additional solar and wind energy in one year

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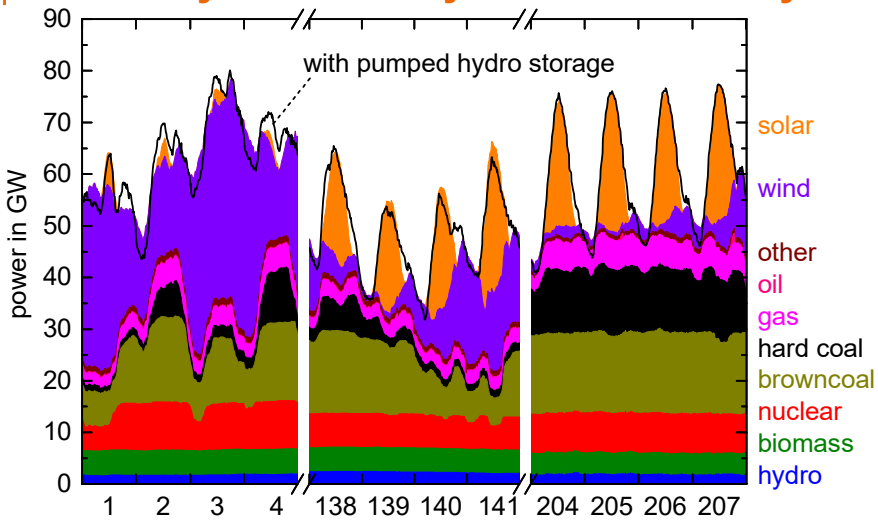
electricity in Germany for selected days



source: https://transparency.entsoe.eu/ 2018

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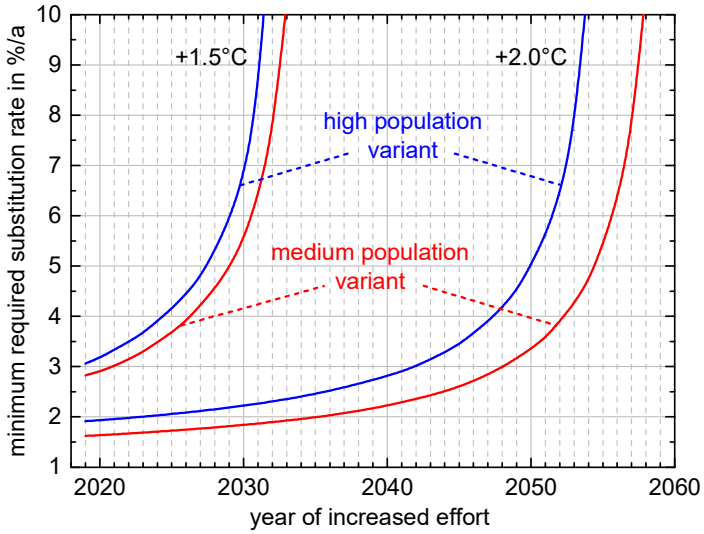
consequences of a delay



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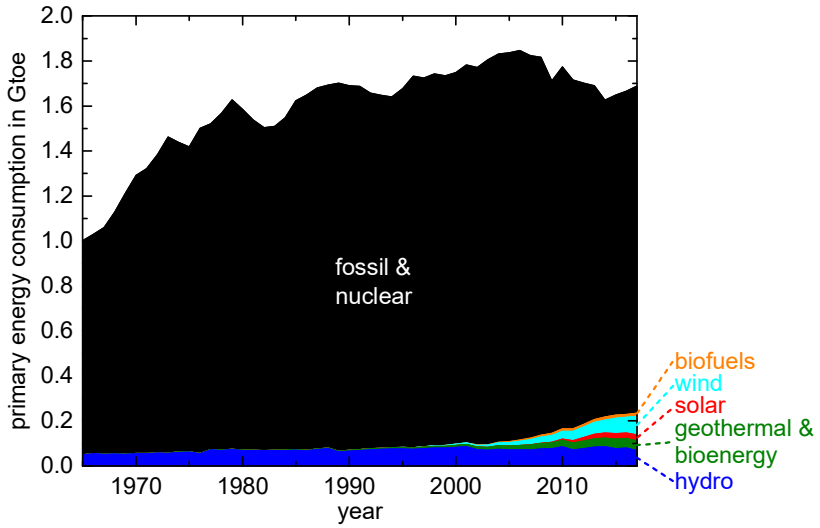
EU primary energy consumption



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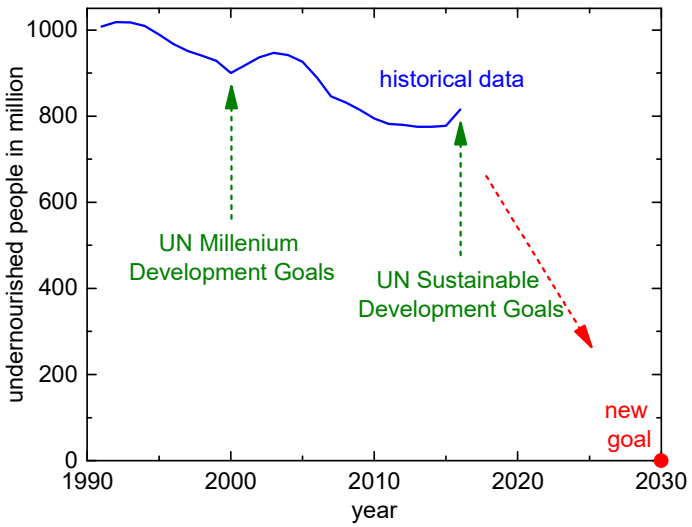
world hunger



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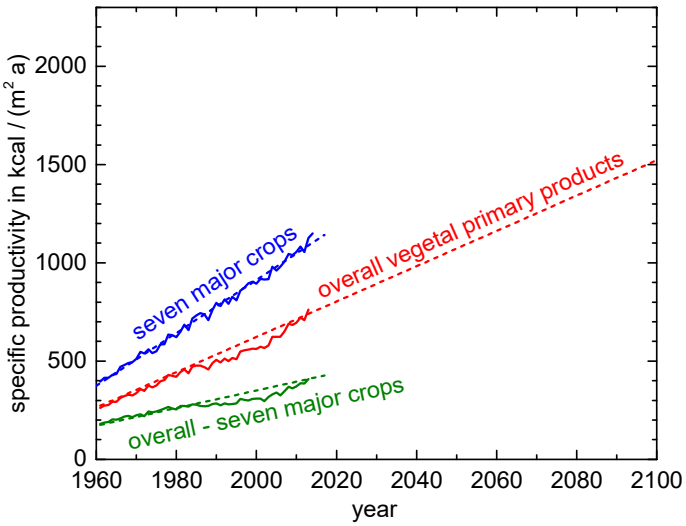
land-area specific agrigultural productivity



seven major crops:

- barley
- corn
- oil palm
- rice
- soybeans
- sugar cane
- wheat

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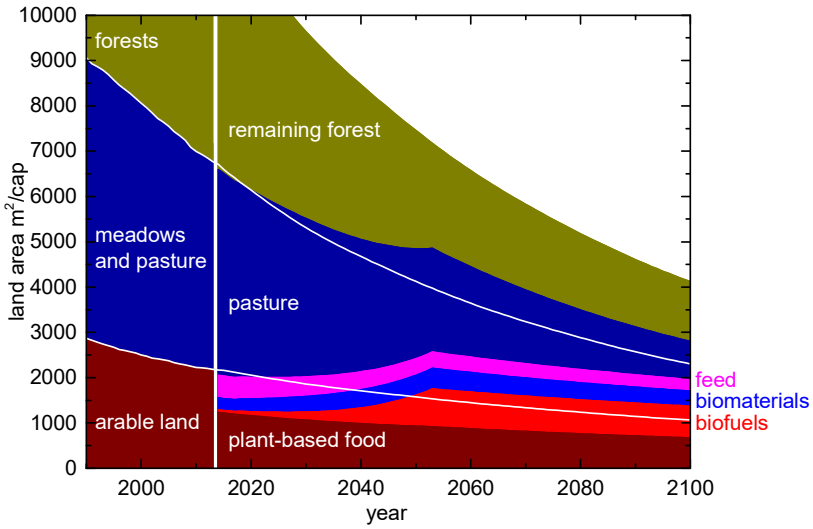
land-area: challeng., 11.6 bn in 2050



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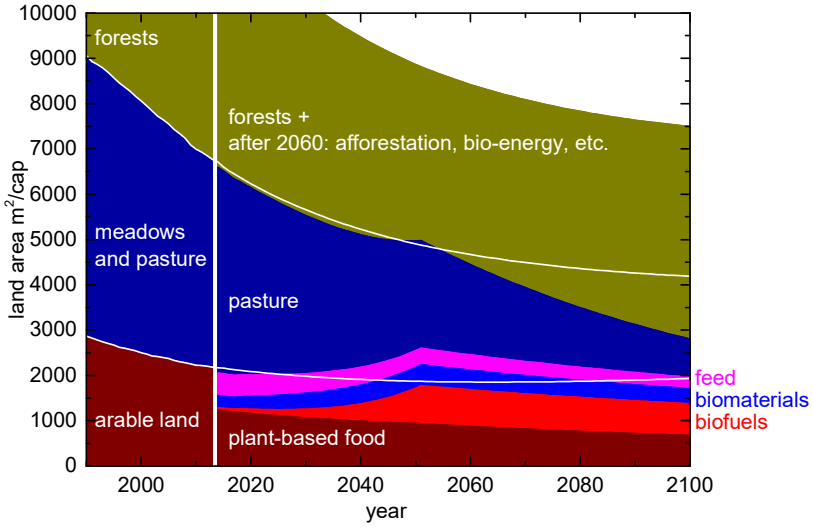
land-area: challenging, medium pop. variant



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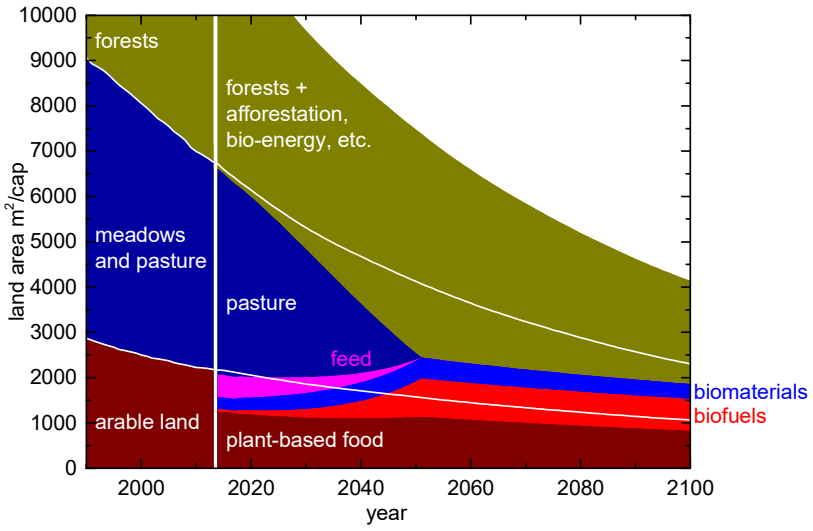
land-area: challeng., 11.6 bn 2050, vegetal



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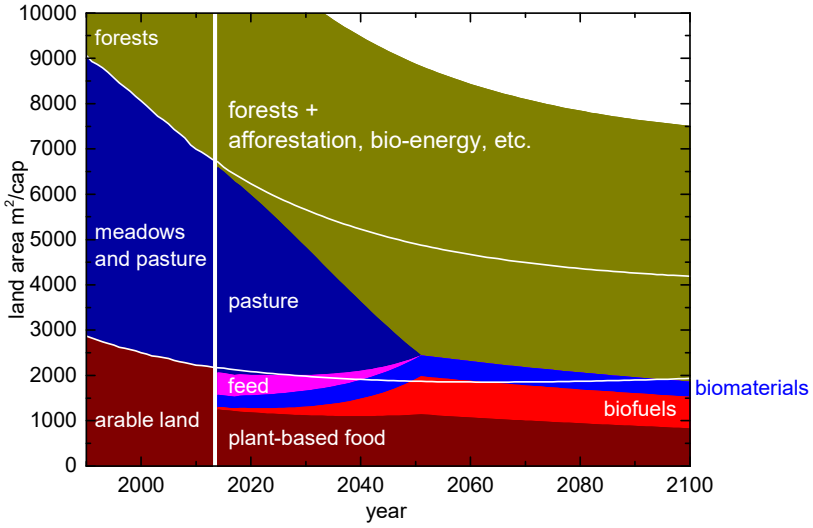
land-area: challeng., medium pop., vegetal



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straightforward relations

?

land area × production per area ≥ No. people × calories demand

influences:

- **land area**:
  less animal-based food ⇒ less pasture required
  more bio-energy, biodiversity,... ⇒ less land area for food
- **productivity per area**:
  less animal-based food ⇒ less losses feed to food
- **No. of people**:
  lower birth rate, No. of children ⇒ lower No. of people

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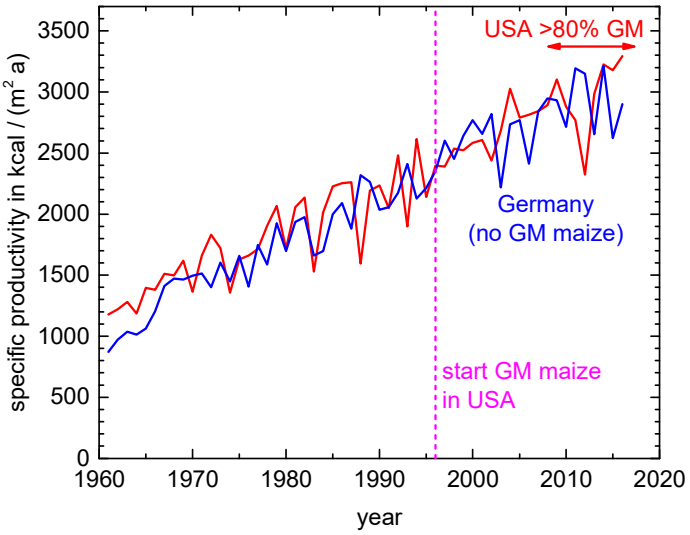
productivity increase with GM maize?



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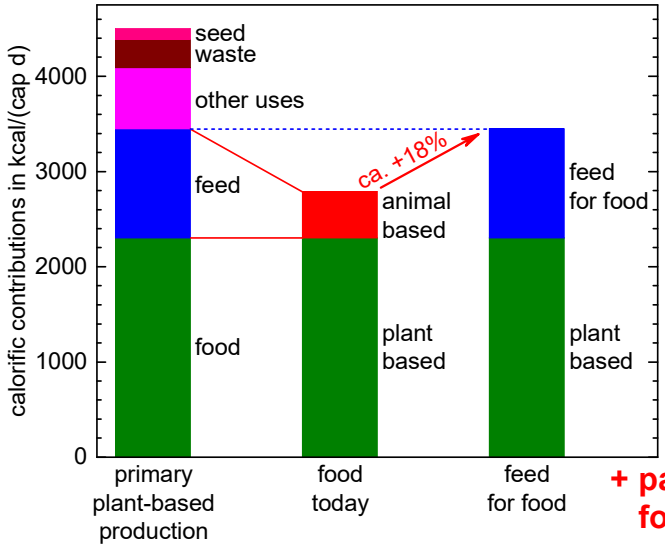
production and food supply



+ pasture available for other uses

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ethical food choices

food for undernourished

↔

vegan

+

meat

?

...

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individual actors

individual citizen

media, NGOs, religion, ...
- legitimation?
- representing whom?
- legitimate goals?
- controlled how?
- transparency!

demands
supply
organize
elect

stable sustainable development

company manager

politician

control
negotiate

⇒ systems view essential

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in conclusion

- reaching climate goals is possible with available **technology**, but has to be systematically applied **on larger scale**
- **instantaneous** significant **increased global effort** is required, **factor 4 to 6 compared to today**, until 2050 to 2075
- **food supply is critical**, but **change of individual choices (behavior) essential:**
  - number of children
  - plant-based vs. animal-based food
- **without behavior change: bio-energy unethical:** fuel vs. food
- **systems view** instead of focus on own interests
- **developmental tipping point** is possible
- **individually responsible**, not just question of politics & technology
- it **has to happen now,** otherwise situation will get **bad** during our lifetime and that of our children

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changes in perspective required

- assumptions: **realistic** world population
  optimistic land-area productivity
- systems view: interrelated but straightforward
- wellbeing of us depends on wellbeing of others
- behavior at least as important as technology, applies already today
- sustainability depends on us individually
  ⇒ it is not only politics but largely also us!
- we cannot delegate our responsibility to politics
- Youth, Fridays, Scientists,... for Future: tell whole story
- there is no right to have only rights
- every single person has to follow sustainability ethics

more details available

Sustainability and Future Human Development
www.youtube.com playlist

www.vision3000.eu

A. Pfennig:
Sustainable Bio- or CO_2 Economy:
Chances, Risks, and Systems Perspective
ChemBioEng Reviews 2019, 6(3)
DOI: 10.1002/cben.201900006

2018,
Books on Demand,
Norderstedt

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