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Setting the Stage:
Links between Environment & Health

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Head, Department Epidemiology & Public Health

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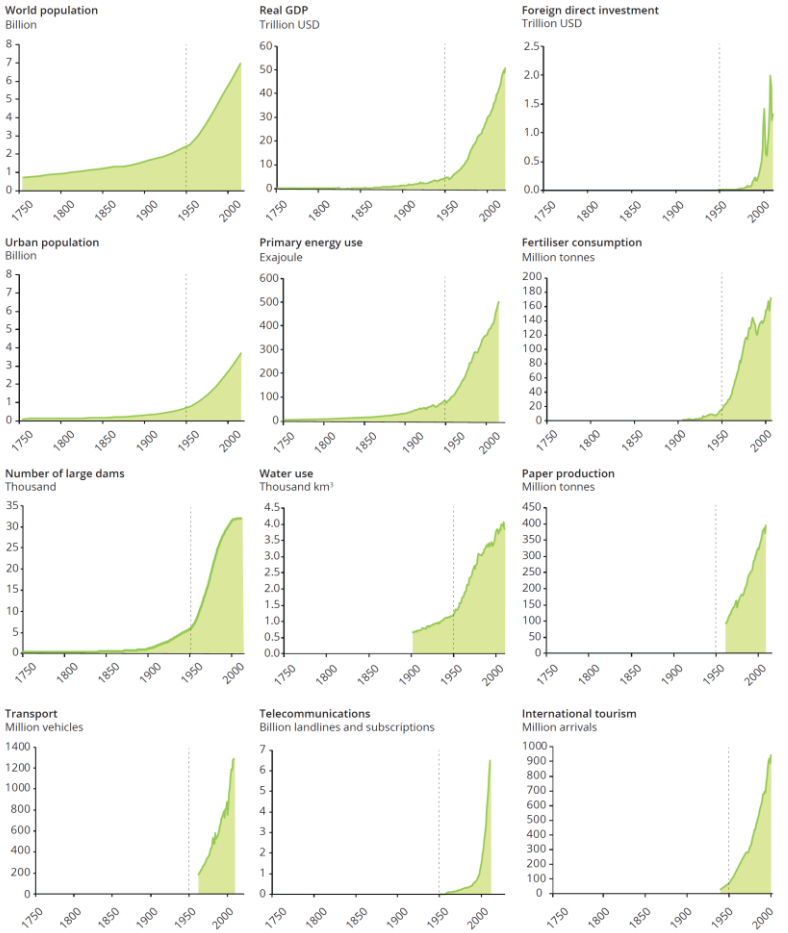
The state of the environment

The price we pay for economic growth and standard of living

The great accceleration since 1950

- Global population tripled – urban quadrupled
- GDP expanded 10-fold
- Primary energy used increased 5-fold
- International tourism fast growing sector
- Enormous improvement in living standard
  - in Europe and high income countries
  - extreme poverty dropped from 42% (1981) to 10% (2013)
  - stunting in under 5 year old children dropped from 40% (1990) to 22% (2017)



Many of the non-environmental drivers of global mega-trends have strong impacts on the environment and climate

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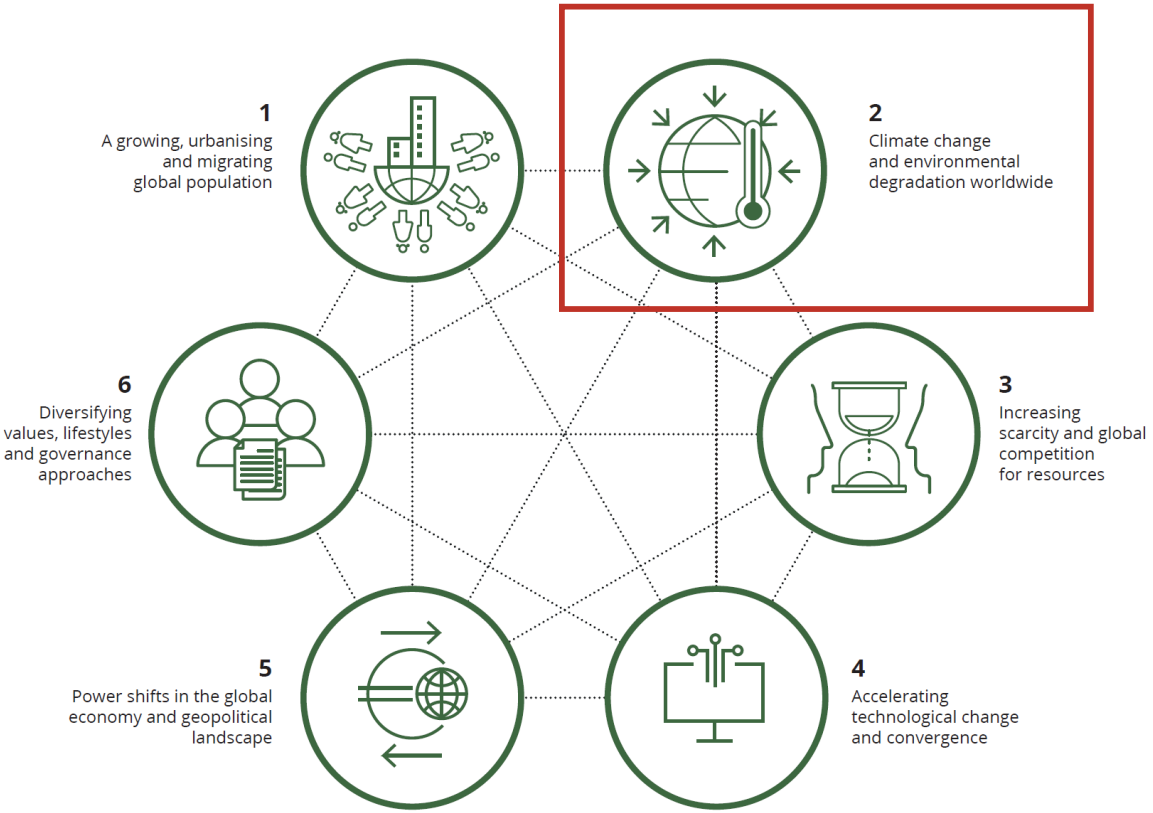
They are therefore of key importance in determining Europe's long-term environmental outlook



Drivers of global mega-trends

Europe’s global responsibility
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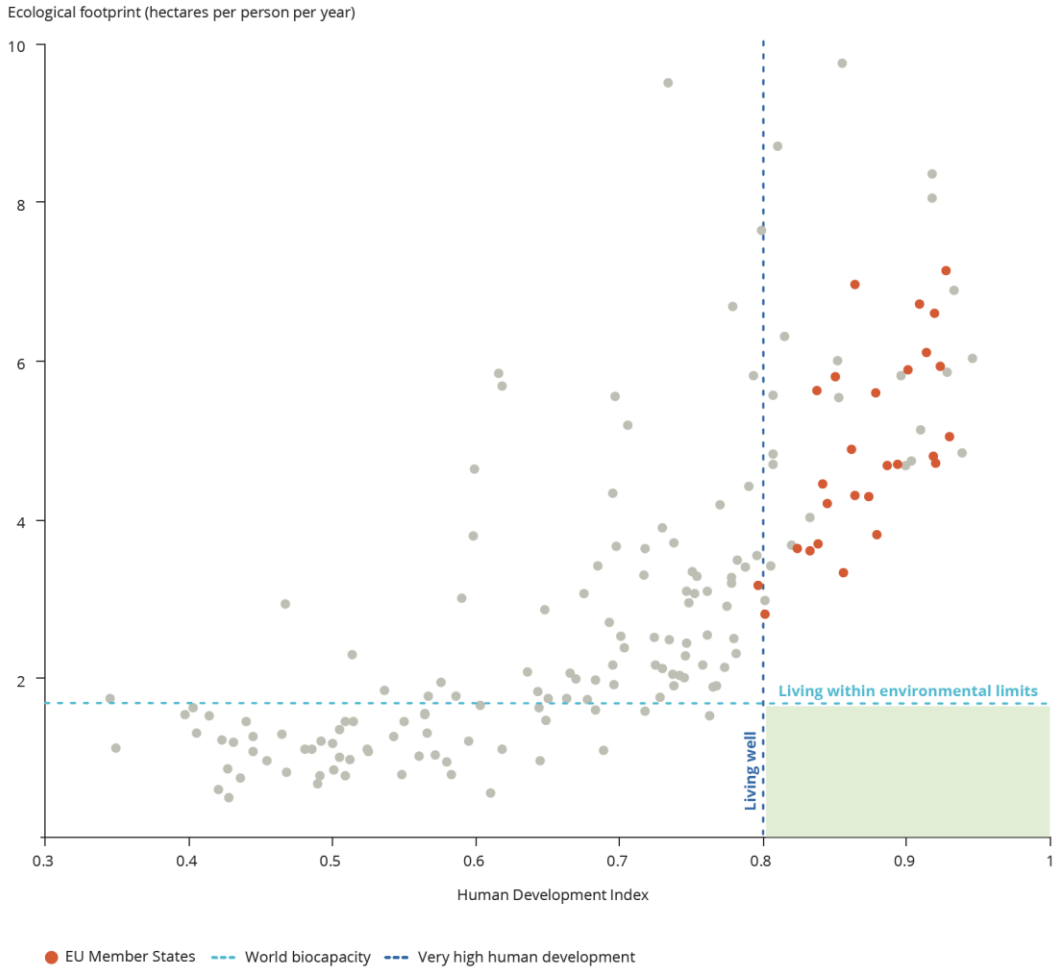
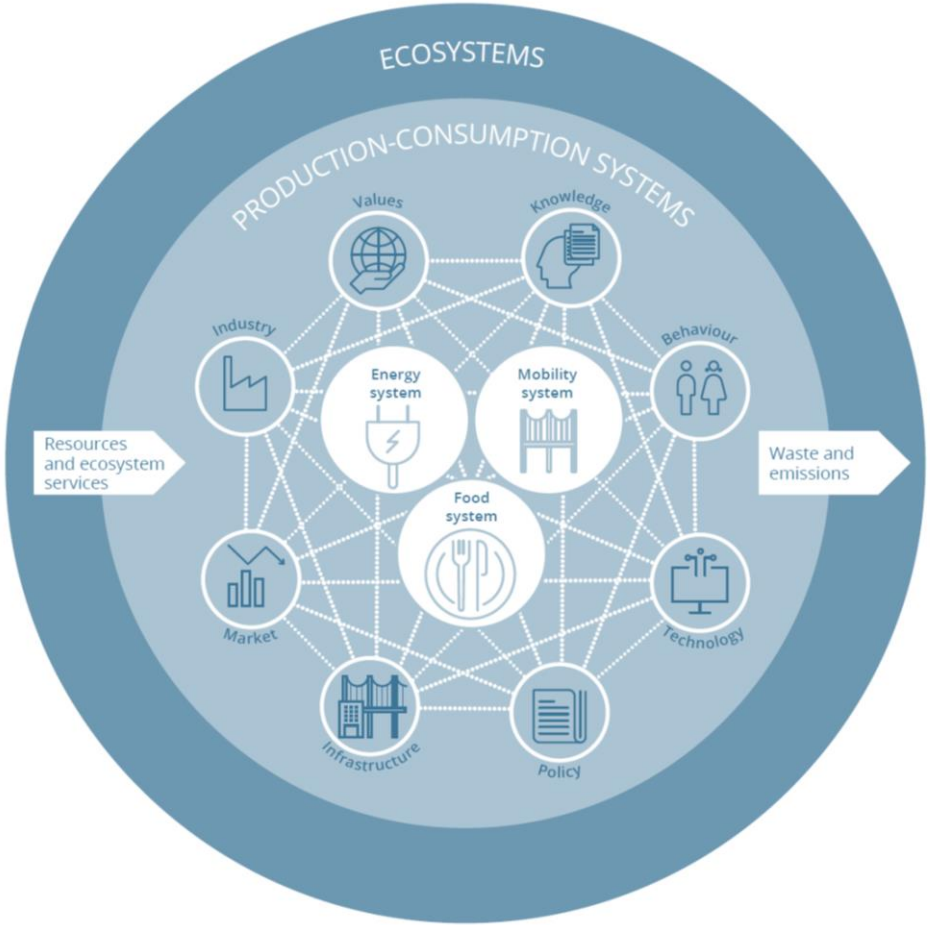
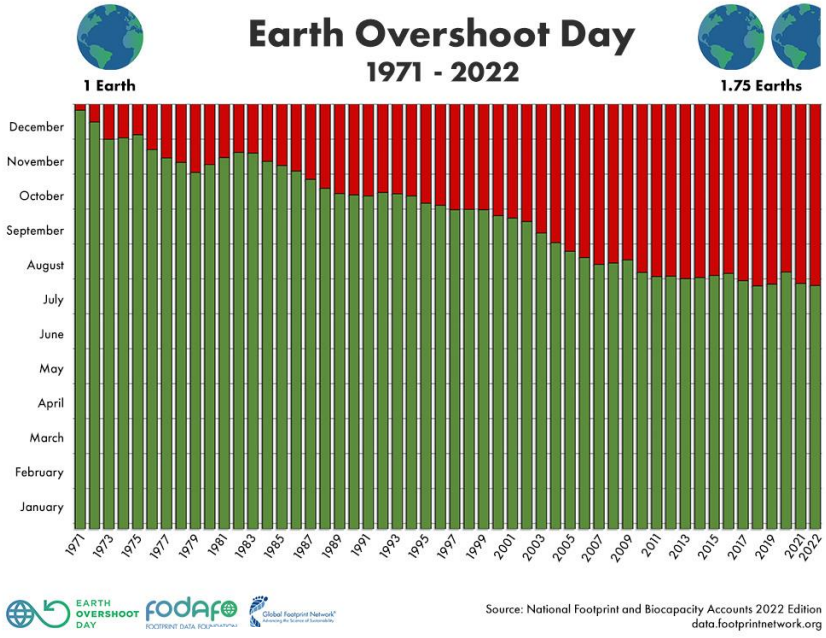
correlation
bewteen
eological footprint
and
human development index



Interrelation between Ecosystem and Production-Consumption Systems

- European consumption is tied to economic growth and living standards
- The food, energy, and mobility systems account for much of Europe's pressure on the environment and health
- The associated total environmental footprint of European consumption that occurs outside Europe is estimated to be in the range of 30-60 %





18

of the 19 warmest years on record globally have occurred since 2000.

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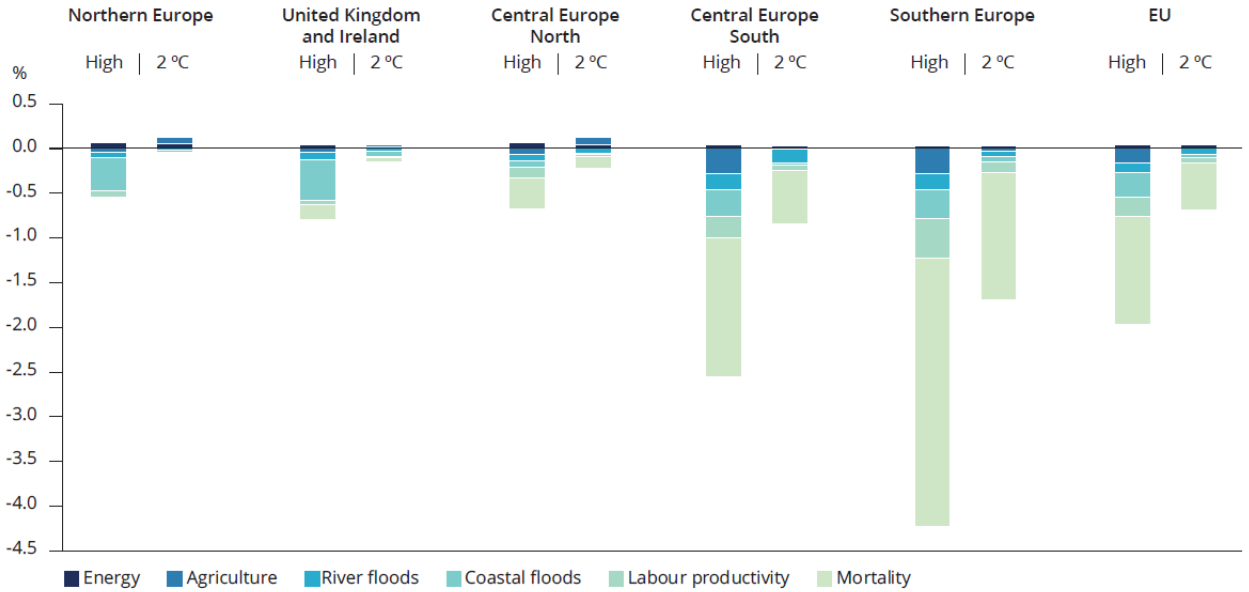
Environment and Health

Finding the right balance

'Living well, within the limits of our planet' is the EU's sustainability vision for 2050.

Projected welfare impact of climate change, by region and sector



The health relevance of environmental pollution

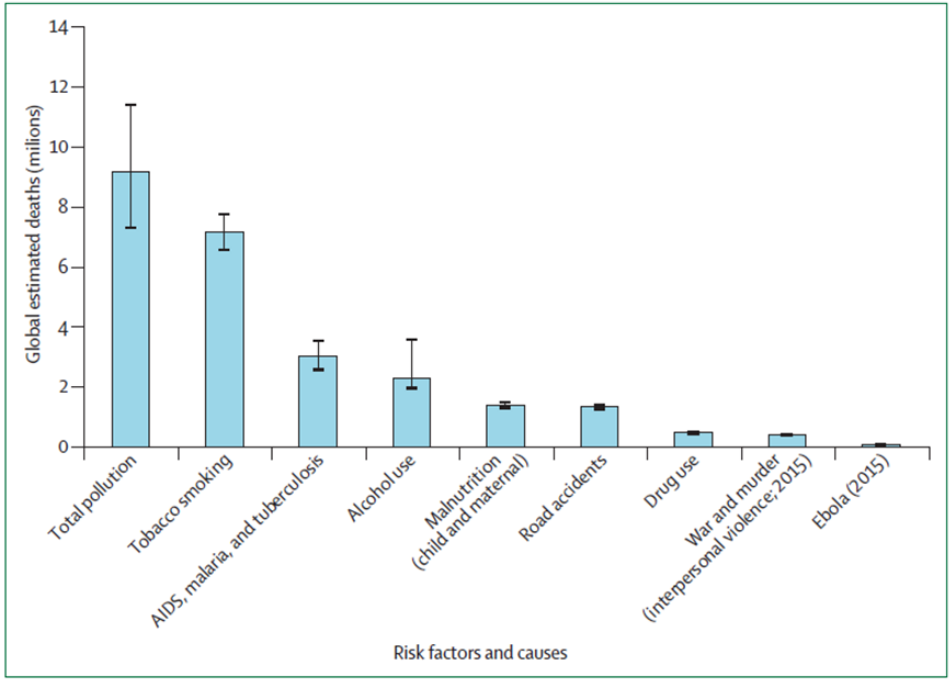


Figure 5: Global estimated deaths by major risk factor and cause, 2015
Using data from the GBD Study, 2016.[41]

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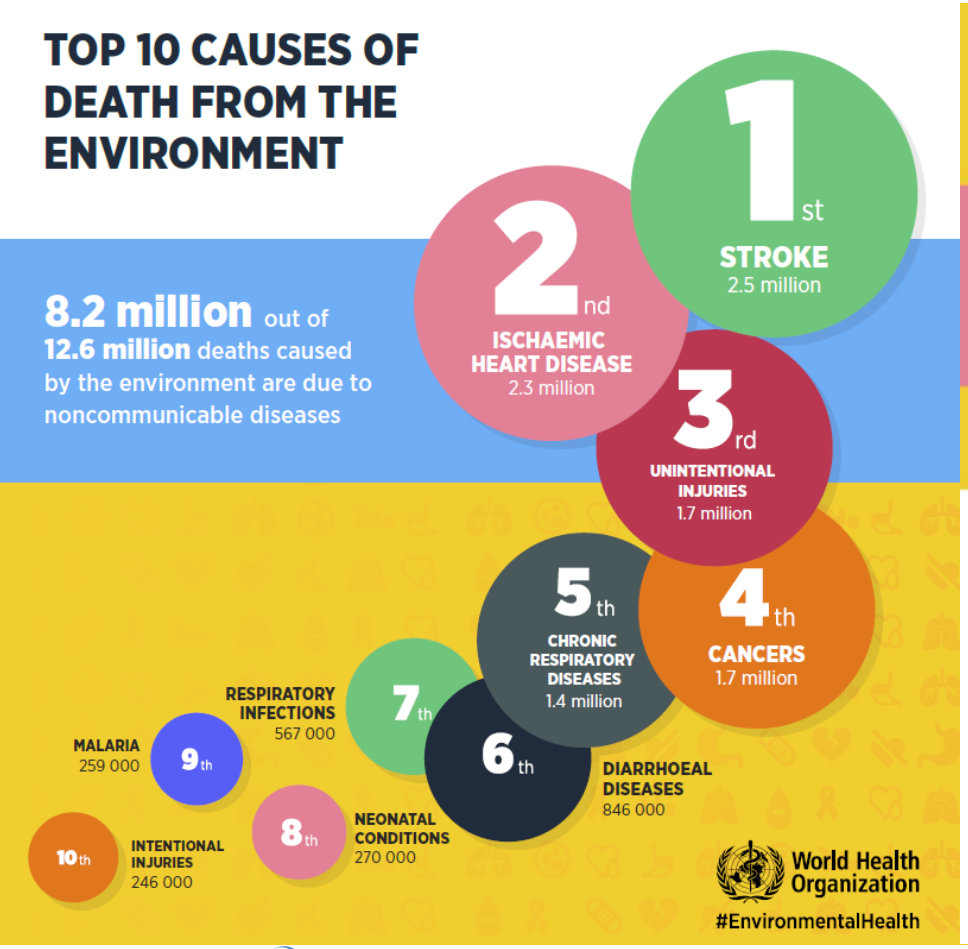
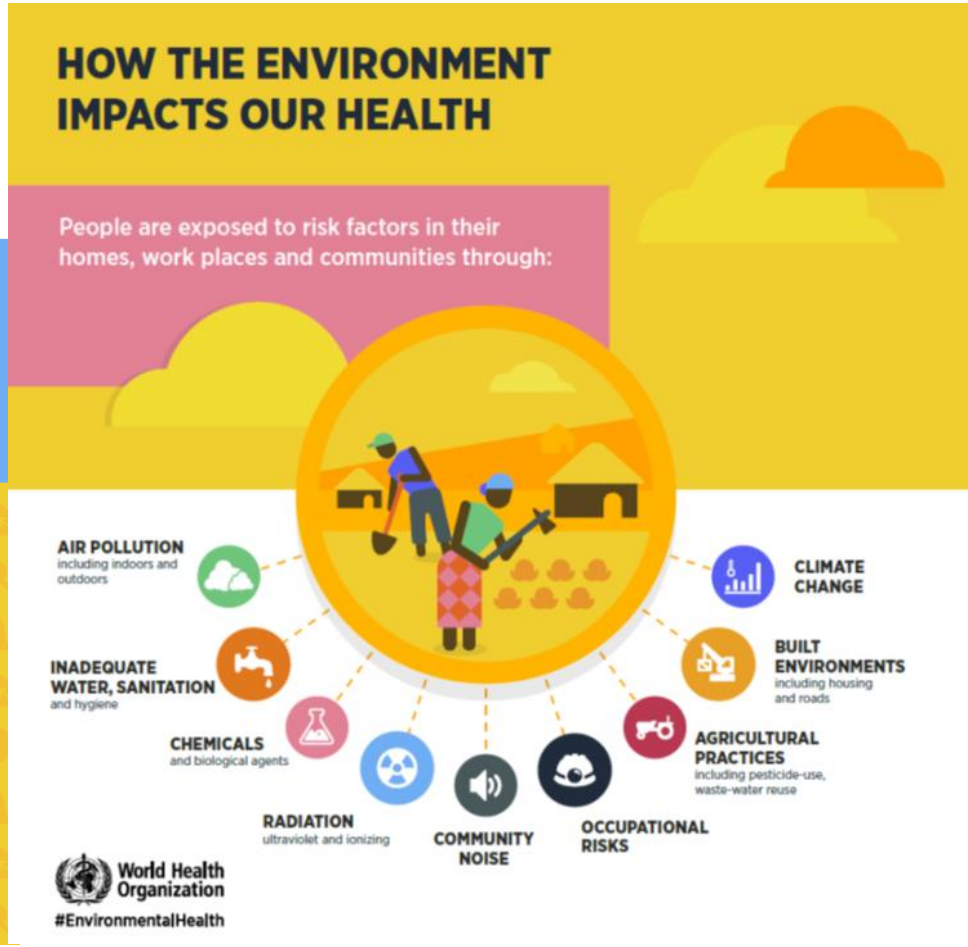
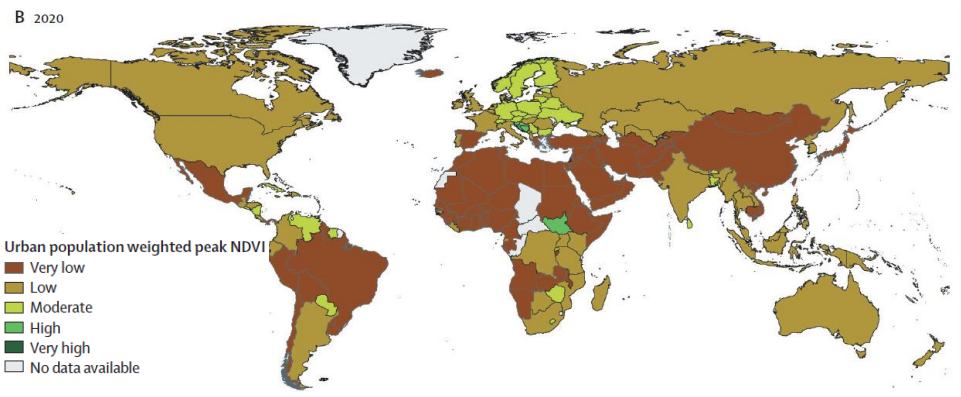
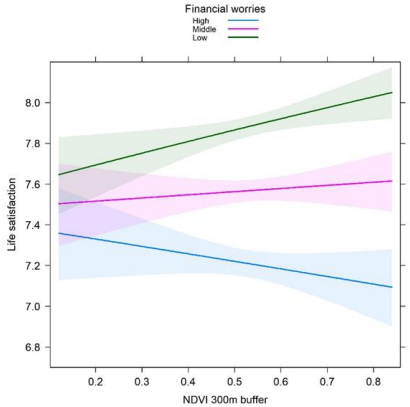
WHO; Landrigan PJ et al. Lancet Oct 2017;

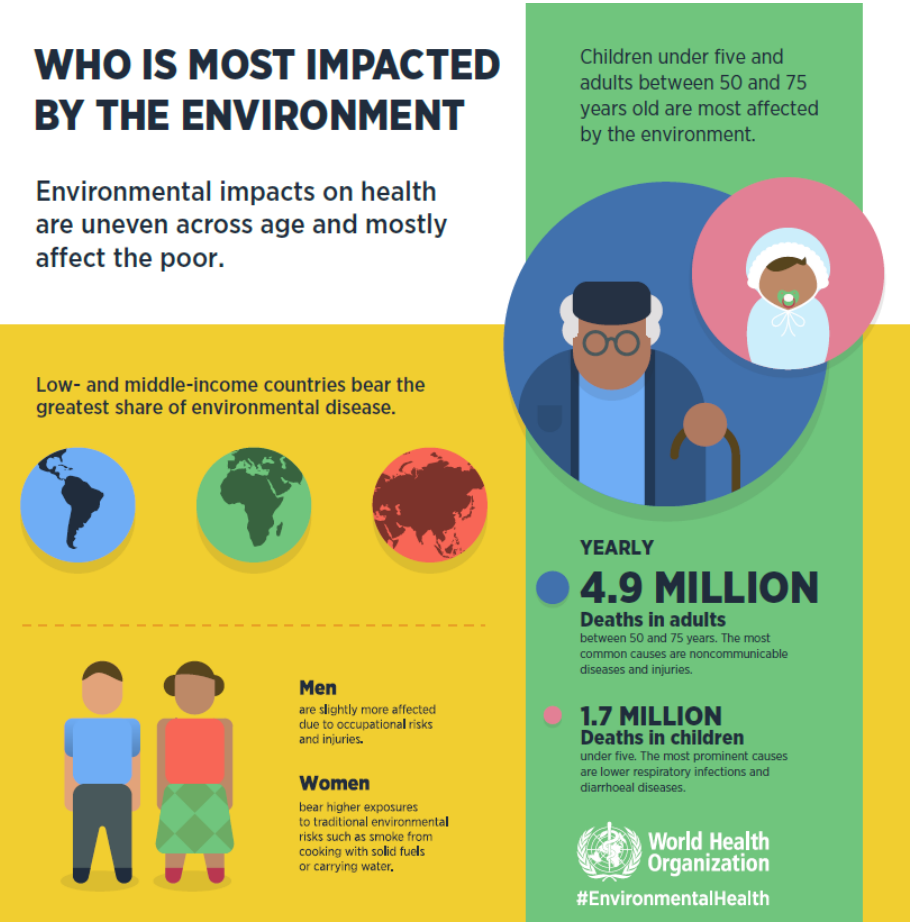

TOP 10 CAUSES OF DEATH FROM THE ENVIRONMENT
8.2 million out of 12.6 million deaths caused by the environment are due to noncommunicable diseases
1st STROKE 2.5 million
2nd ISCHAEMIC HEART DISEASE 2.3 million
3rd UNINTENTIONAL INJURIES 1.7 million
4th CANCERS 1.7 million
5th CHRONIC RESPIRATORY DISEASES 1.4 million
6th DIARRHOEAL DISEASES 846 000
7th RESPIRATORY INFECTIONS 567 000
8th NEONATAL CONDITIONS 270 000
9th MALARIA 259 000
10th INTENTIONAL INJURIES 246 000
World Health Organization
#EnvironmentalHealth


HOW THE ENVIRONMENT IMPACTS OUR HEALTH
People are exposed to risk factors in their homes, work places and communities through:
AIR POLLUTION including indoors and outdoors
CLIMATE CHANGE
INADEQUATE WATER, SANITATION and hygiene
BUILT ENVIRONMENTS including housing and roads
CHEMICALS and biological agents
AGRICULTURAL PRACTICES including pesticide-use, waste-water reuse
RADIATION ultraviolet and ionizing
COMMUNITY NOISE
OCCUPATIONAL RISKS
World Health Organization
#EnvironmentalHealth

The environmental inequity gap
the urban greenspace example







Jeong Swiss Med Wkly 2022; Report Lancet Countdown on Health and Climate Change 2021

a relevant Public Health question

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why do we slow down life and economy in the light of infection pandemics but environmental pandemics

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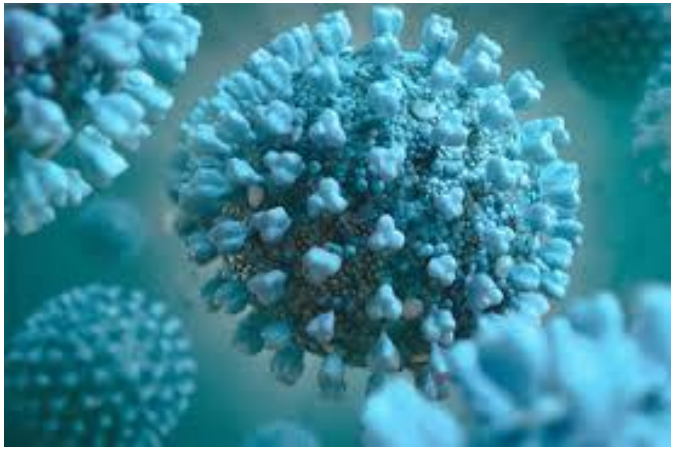
Public Health Challenge 1

Competing wellbeing needs

Impact of SARS-CoV-2 Virus

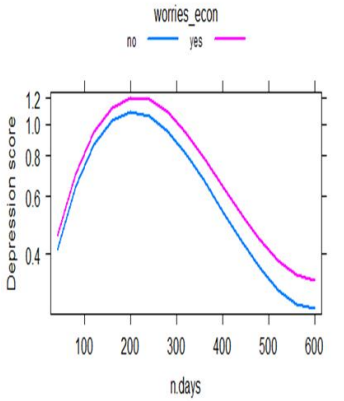


CORONA IMMUNITAS

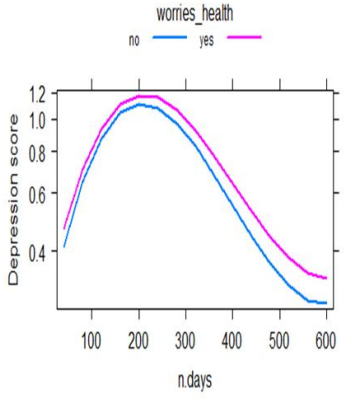
COVCO BASEL

Impact of Containment Measures

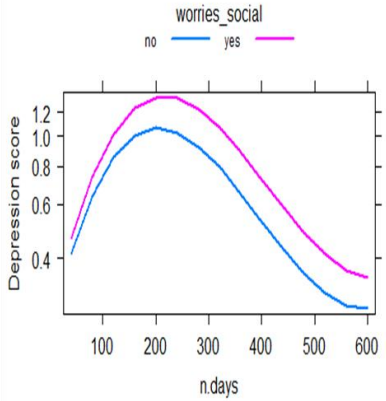
Trajectories of Depression score by economic worries



Trajectories of Depression score by health worries



Trajectories of Depression score by social worries



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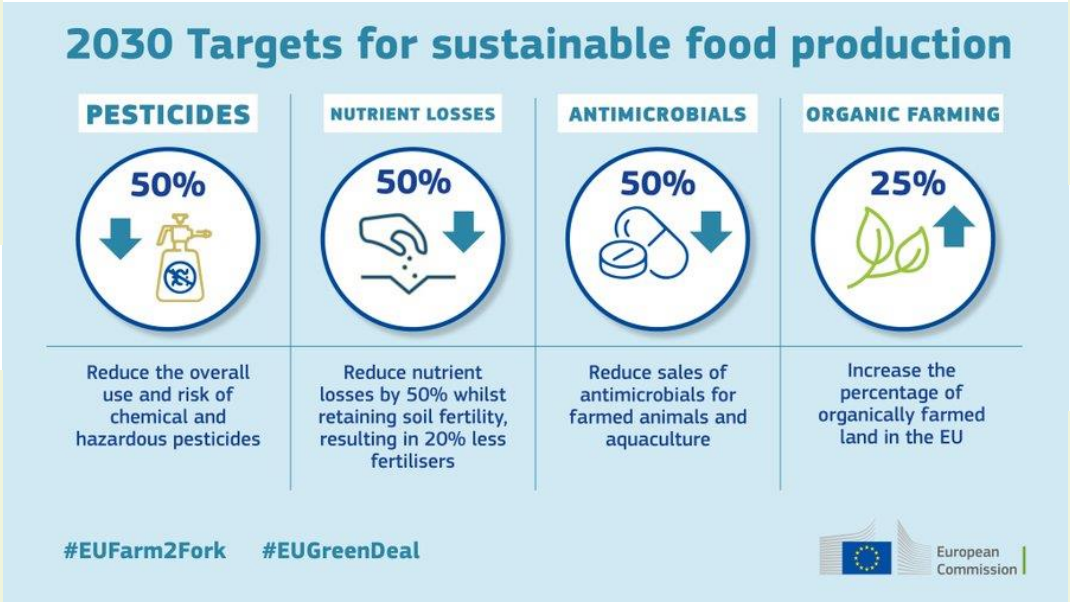
Competing health and wellbeing interests: example farming

Food security

Farming Practices



Wellbeing Farmers

Wellbeing Population

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FarmCoSwiss

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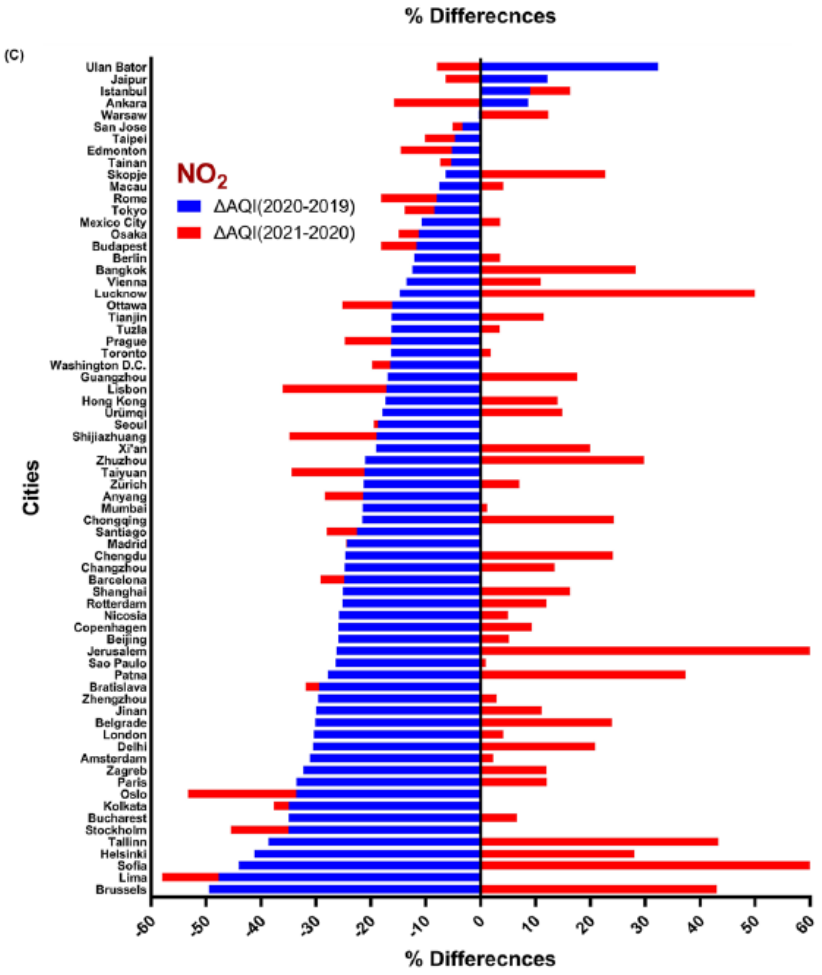
Public Health Challenge 2

Risk perception

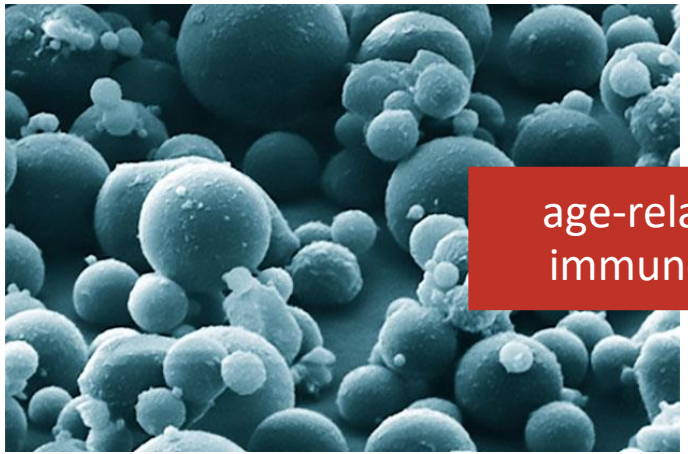
Why does it need a pandemic to reduce air pollution?

Temporary reduction of NO_2 air pollution across cities during COVID-19 pandemic



Air pollution

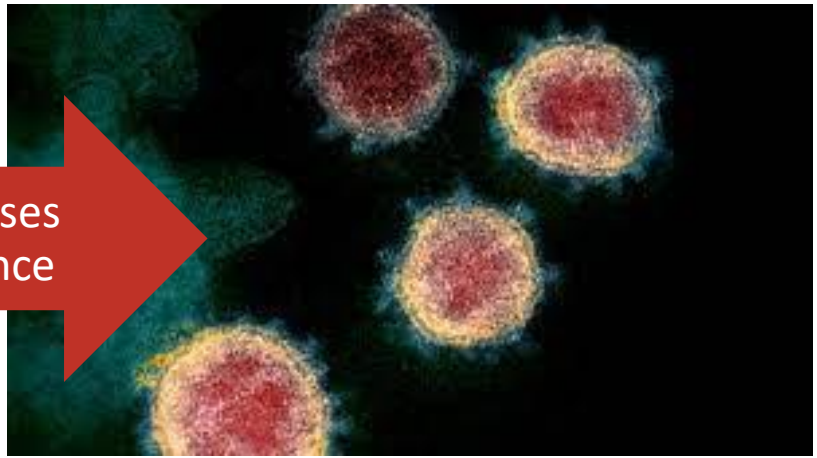
- ~7 Mio. deaths/year



age-related diseases
immunosenescence

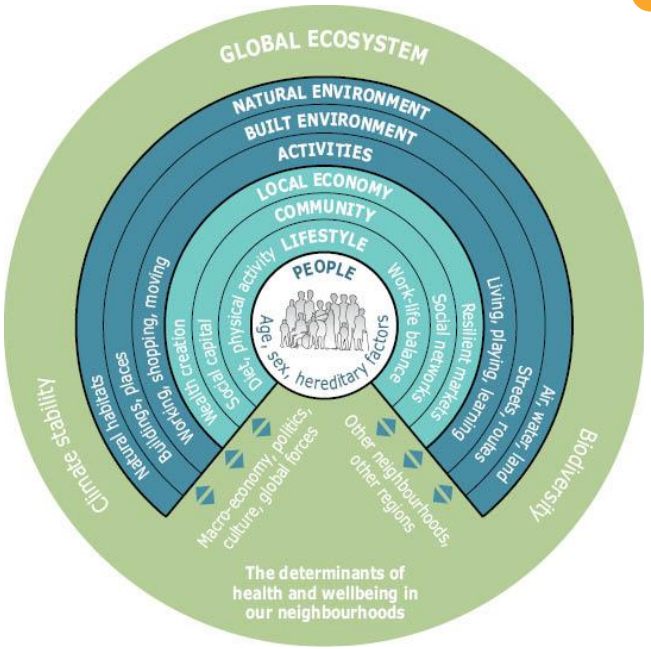
COVID-19

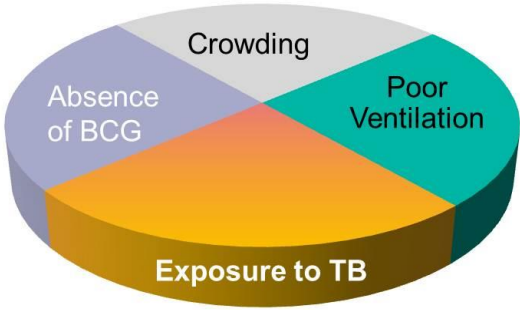
- ~ 7 Mio. deaths total (26.7.2022)

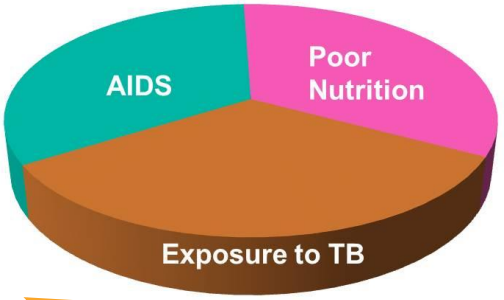


The problem necessary cause problem of NCDs

sufficient causes for infections and NCDs
more complex in NCDs







necessary cause
common in infections - rare in NCDs

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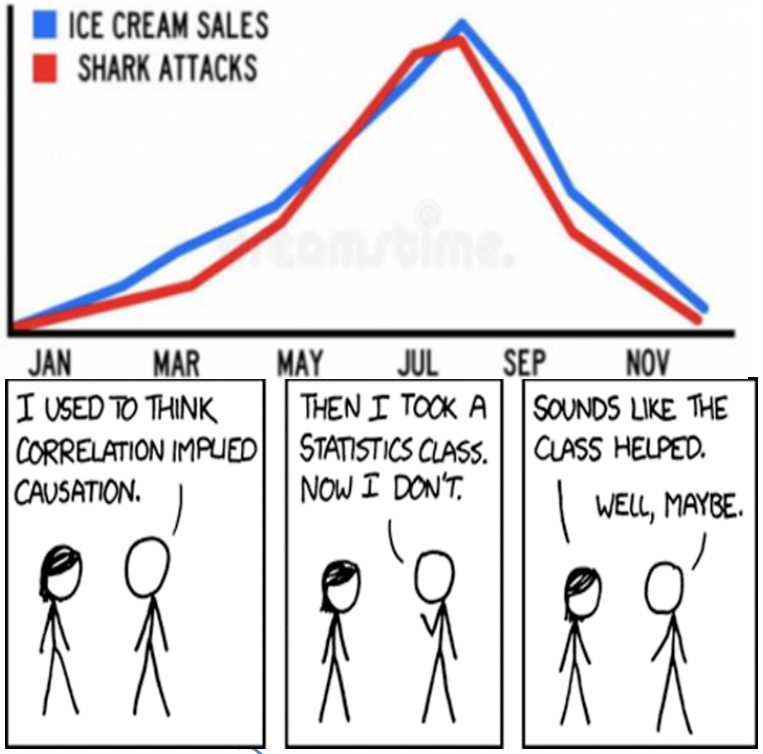
Public Health Challenge 3

Causal inference

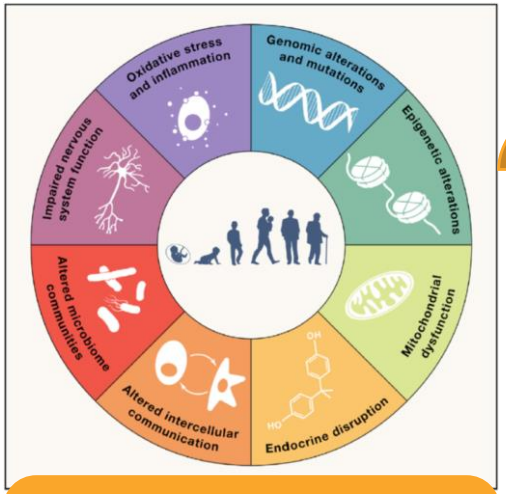
Ideally: causal understanding of environmental risks



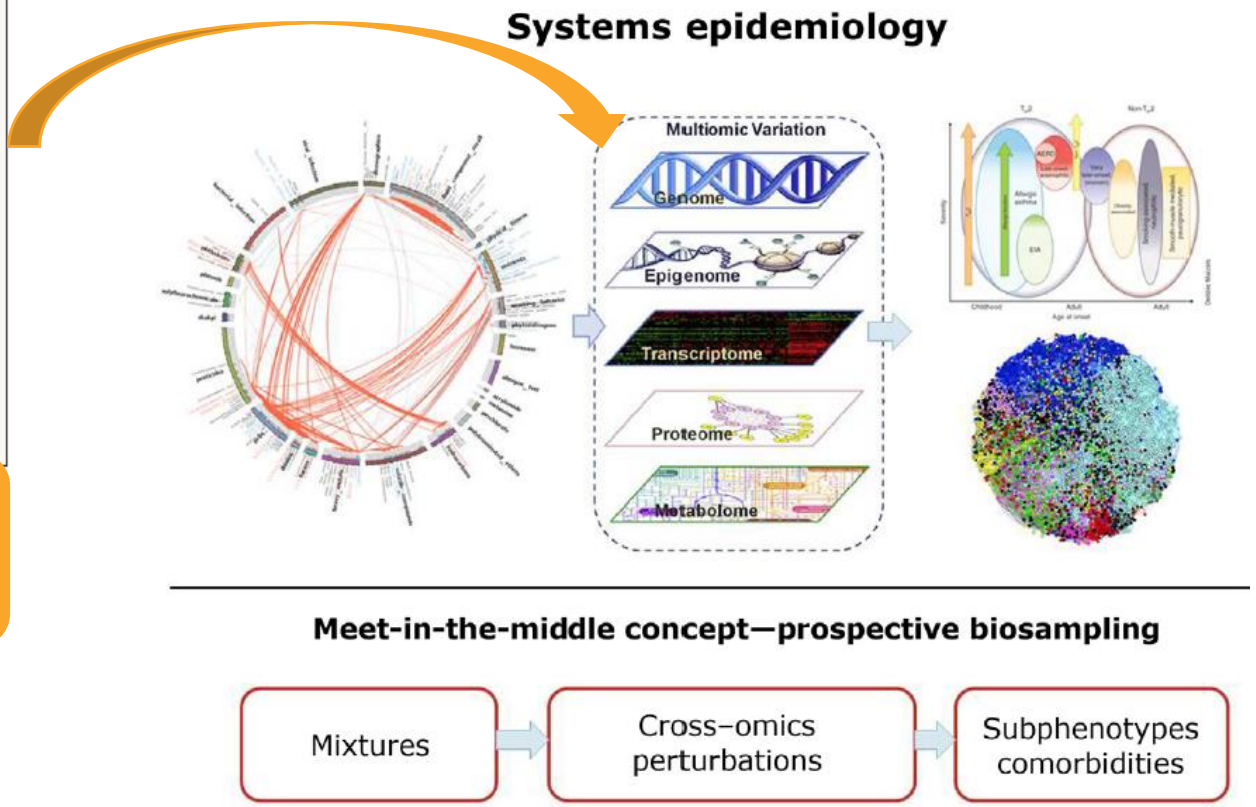
Reality: causal inference and chronic environmental health effects

- **chronic exposures and mixtures cannot be randomized or studied with Mendelian randomization**
- small effects
- correlation and interaction of hazards
- confounding
- measurement error in exposure
  - spatial, temporal, intraindividual variation
  - long latency period (lifecourse perspective; windows of susceptibility; genetic susceptibility)
- measurement error in health outcomes
- **unknown modes of action & causalities**

Exposome Science to Improve Causal Inference



Hallmarks of environmental insult



Probst-Hensch N. In: Patrinos GP, (ed). Applied Genomics and Public Health.San Diego: Elsevier Inc./Academic Press, 2020: pp-pp.
Peters A et al. Cell 2021;184

EXPANSE - a new era of environmental epidemiology

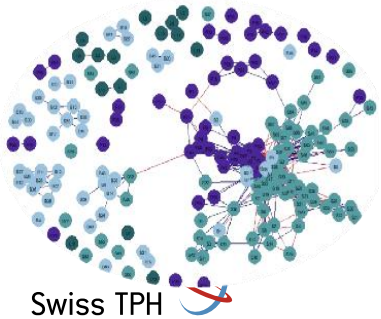
PI: R. Vermeulen; https://expanseproject.eu/

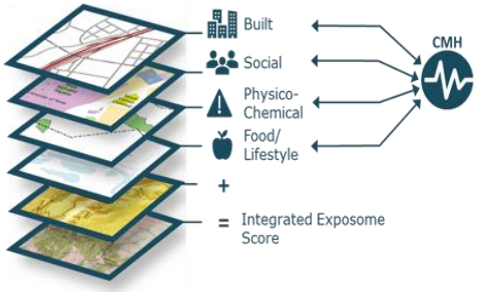
Personalised exposome of 55 million European citizens from 12 countries
>25,000 biological samples
Association of exposome with cardio-metabolic and chronic respiratory diseases

Reference Exposome

Exposome Map

Exposome Navigator





a relevant Public Health question

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how do we take science to impact in the light of uncertainty

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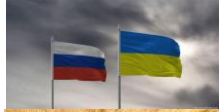
Barriers to sustainable impact of scientific evidence: example reduction of agricultural pesticide risk

Hoffmann B et al. submitted; PI Trapego: Ingold K

- science provides tentative truths
- utility-maximizing, sense-making, and truth-seeking actors reflect distinct logics of treating evidence
- messages need to be tailored to needs, interests, norms, routines of different actors – based on intense exchange between researchers and actors



opportunities of post-COVID spending

Fossil-fuel driven recovery

Low-carbon economy

Social equity

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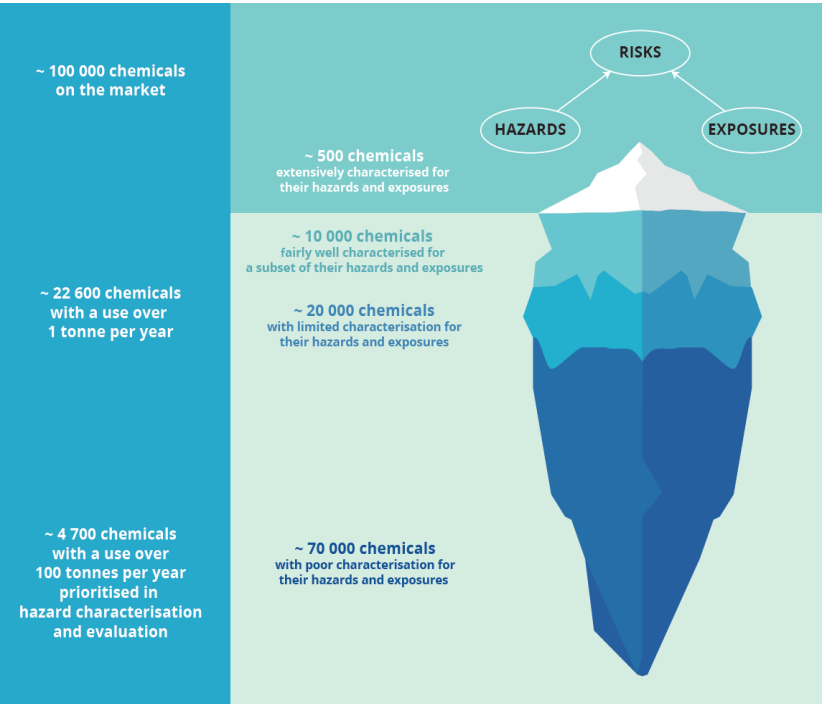
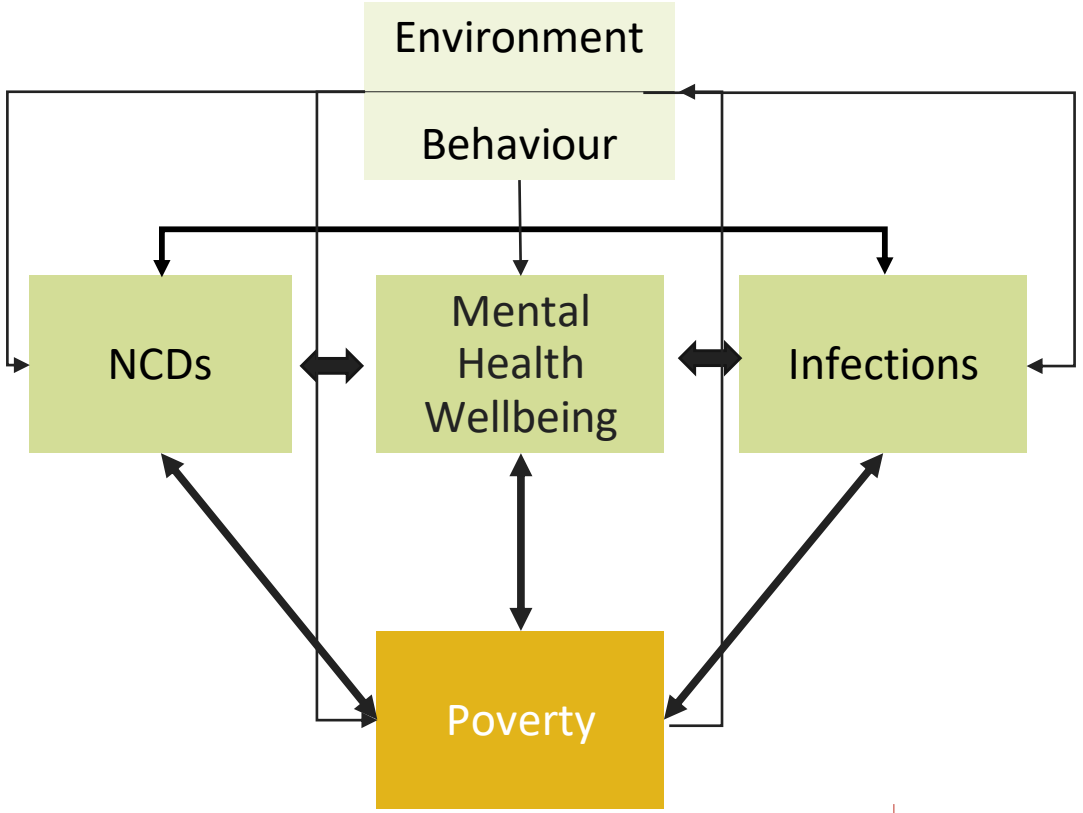
Swiss Citizen Cohort

–

a must for environmental public health research and surveillance

Switzerland needs a large citizen cohort for an integrated evidence-base on parallel epidemics