Éi helse og miljøets konsekvensar for helse og smittsame sjukdomar

Ågot Aakra
SINTEF Bioteknologi og nanomedisin

EIT AV DEI STØRSTE UAVHENGIGE FORSKNINGSINSTITUTTA I EUROPA

4,0 mrd
omsetning

2200
tilsette

7000
prosjekt

3200
kundar

INTERNASJONALT
652 mill NOK

NASJONALITETAR
80

PUBLIKASJONAR (INKL. FORMIDLING)
6200

TILFREDSE KUNDAR
4,5 av 5

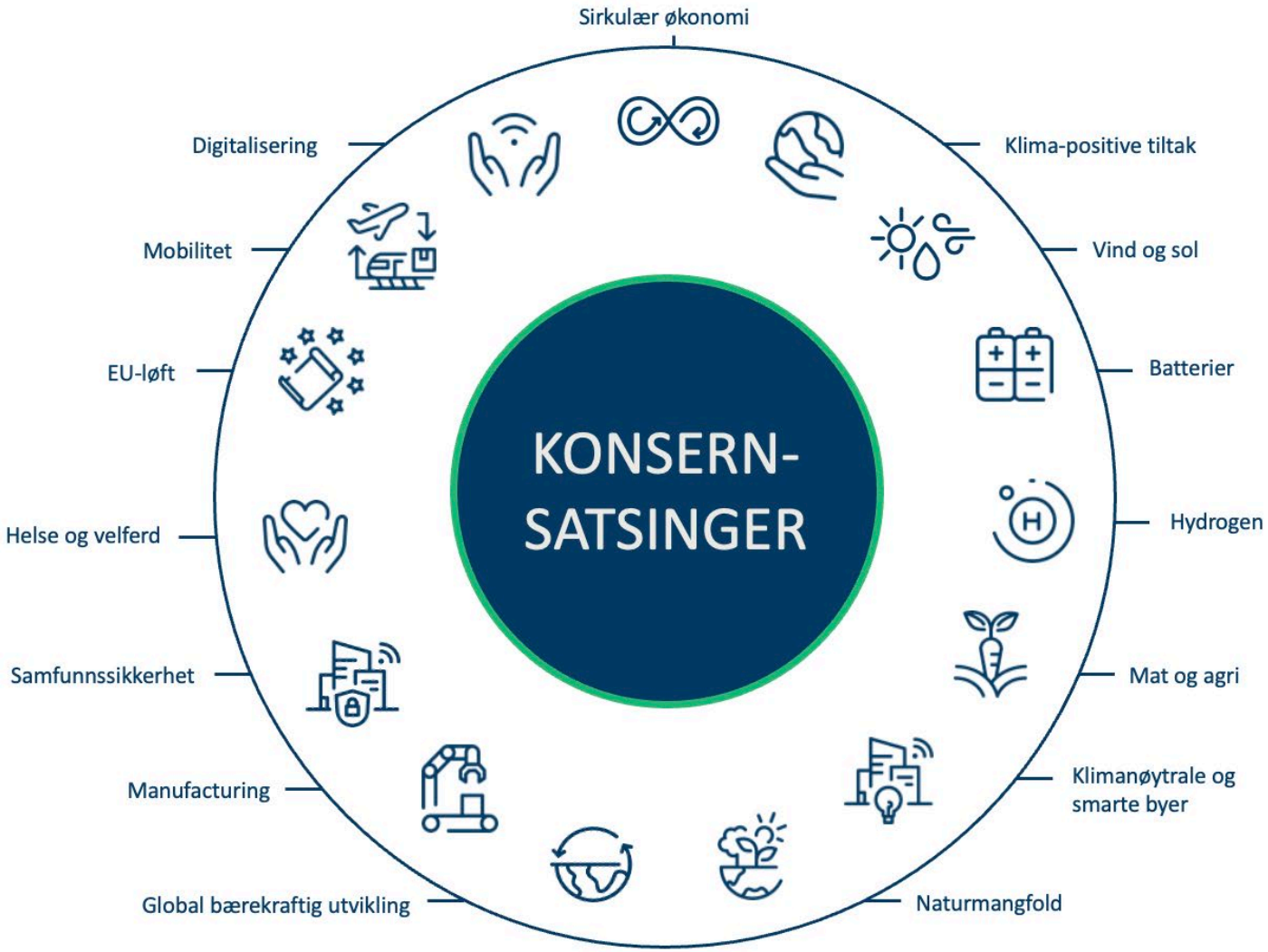
Teknologi for eit betre samfunn

Visjon: Teknologi for eIt beTre samfunn

Bidra til konkurransekraft og samfunnsnytte gjennom å realisera FNs berekraftsmål

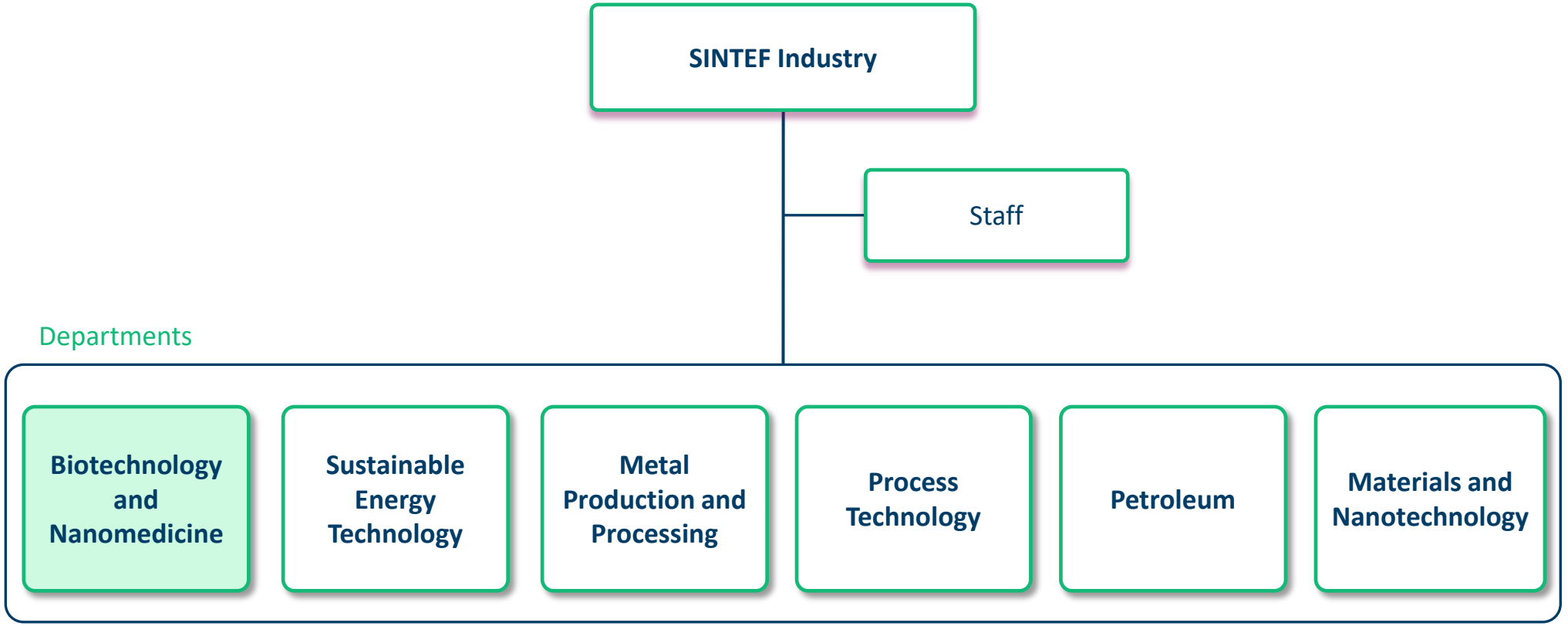
Konsernsatsingar

-gir fleirfagleg samarbeid for svar på komplekse utfordringar



Teknologi for eit betre samfunn

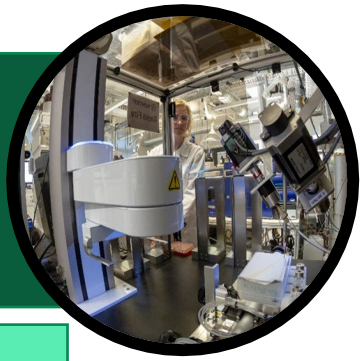
SINTEF Industry - organisation



Broad biotechnology competence

Drug discovery and design

Identifying new bioactive molecules, gene clusters, and development of substances, for medical use

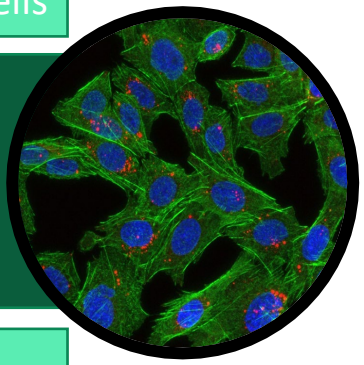


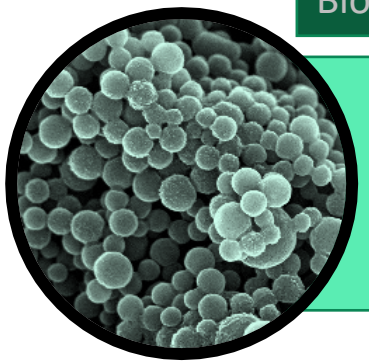
Biologic production

Developing processes for microbial and cell-based production of small molecules, biopolymers, plasmids, viruses, proteins and cells

Characterization and effect

Characterization and quantification of active ingredients, in production and in biologic samples. Biologic safety and efficacy in cell-based screening





Formulation and uptake

Development of emulsions and nanoparticles for enhanced and targeted delivery, evaluation of uptake and biodistribution of active substances

FHI
Folkehelseinstituttet

Innhold A til Å | Kontakt oss | English website

Søk i nettsidene til FHI | Meny

Forside > Smittevern & Vaksine > Smittsomme sykdommer og forebygging > Smitte fra mat, vann og dyr > Én-helse (One Health)

ARTIKKEL

Én-helse (One Health)

Publisert 19.12.2020

Hva betyr Én- helse (One Health)? Det er en tilnærming for å lage og gjennomføre programmer, politikk, lovgivning og forskning der flere sektorer kommuniserer og jobber sammen for å oppnå bedre folkehelse.

Read in English | Del/tips | Skriv ut | Få varsel om endringer

Verdens helseorganisasjon (WHO) nevner også at en Én- helse tilnærming er spesielt relevant for områder som:

- matsikkerhet,
- bekjempelse av zoonoser, sykdommer som overføres mellom dyr og mennesker, som influensa, rabies og riftdalfeber (Rift Valley Fever),
- bekjempelse av antibiotikaresistens, når bakterier muterer etter eksponering for antibiotika og blir vanskeligere å behandle.[i]

NIBIO | PROSJEKTER | PUBLIKASJONER | TEMA | KALENDER | TJENESTER | NYHETER | ANSATTE | OM NIBIO | ENGLISH VERSION

Søk i tema: | Bruk anførselstegn ved søk på eksakt ord eller frase | Søk →

... MAT → ÉN-HELSE I LANDBRUKS- OG MATPRODUKSJONEN

Én-helse i landbruks- og matproduksjonen

Tverrfaglig kunnskap om hvordan norsk matproduksjon påvirker helsen til mennesker, dyr, planter og økosystemer.

→ Folkehelse, matproduksjon og matforbruk- hva er sammenhengen?

LES MER ↓

Veterinærinstituttet
Norwegian Veterinary Institute

Forskning | Ansatte | Diagnostikk | Sykdom | Øvrig innhold | Søk | English

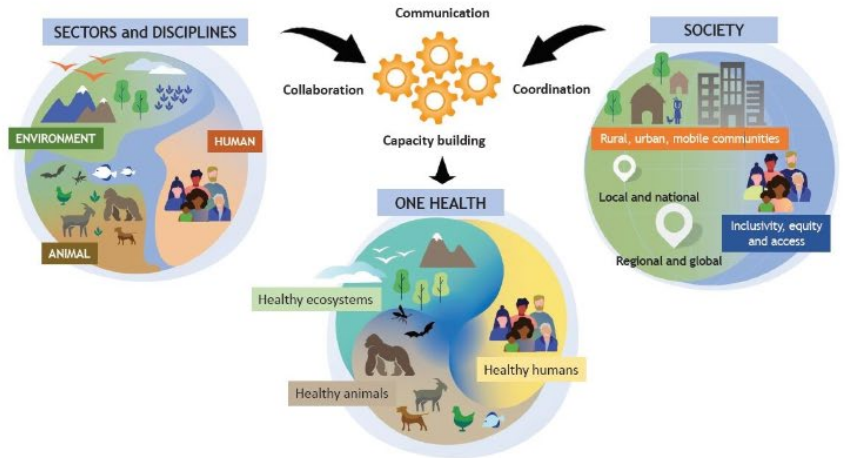
Forside • Én helse

Hvorfor trenger vi en Én helse tilnærming? | Én helse ved Veterinærinstituttet | Én velferd

Én helse og akvatiske miljøer | Én helse og zoonoser | Én helse og antimikrobiell resistens | Én helse - vilt

Det eksisterer en gjensidig avhengighet mellom helse for mennesker, dyr og i miljøet, hvor helsen til den ene parten påvirker helsen til de andre. Menneskers aktiviteter har innvirkning på helsen til dyr og miljø, og sykdom hos dyr eller i miljøet påvirker menneskers helse. Mennesker og dyr deler og utveksler smittestoffer, og endringer i miljøet påvirker denne dynamikken. Økosystemer i balanse er nødvendig for bærekraftig matproduksjon, og for at jorden skal kunne fø den stadig voksende befolkning.

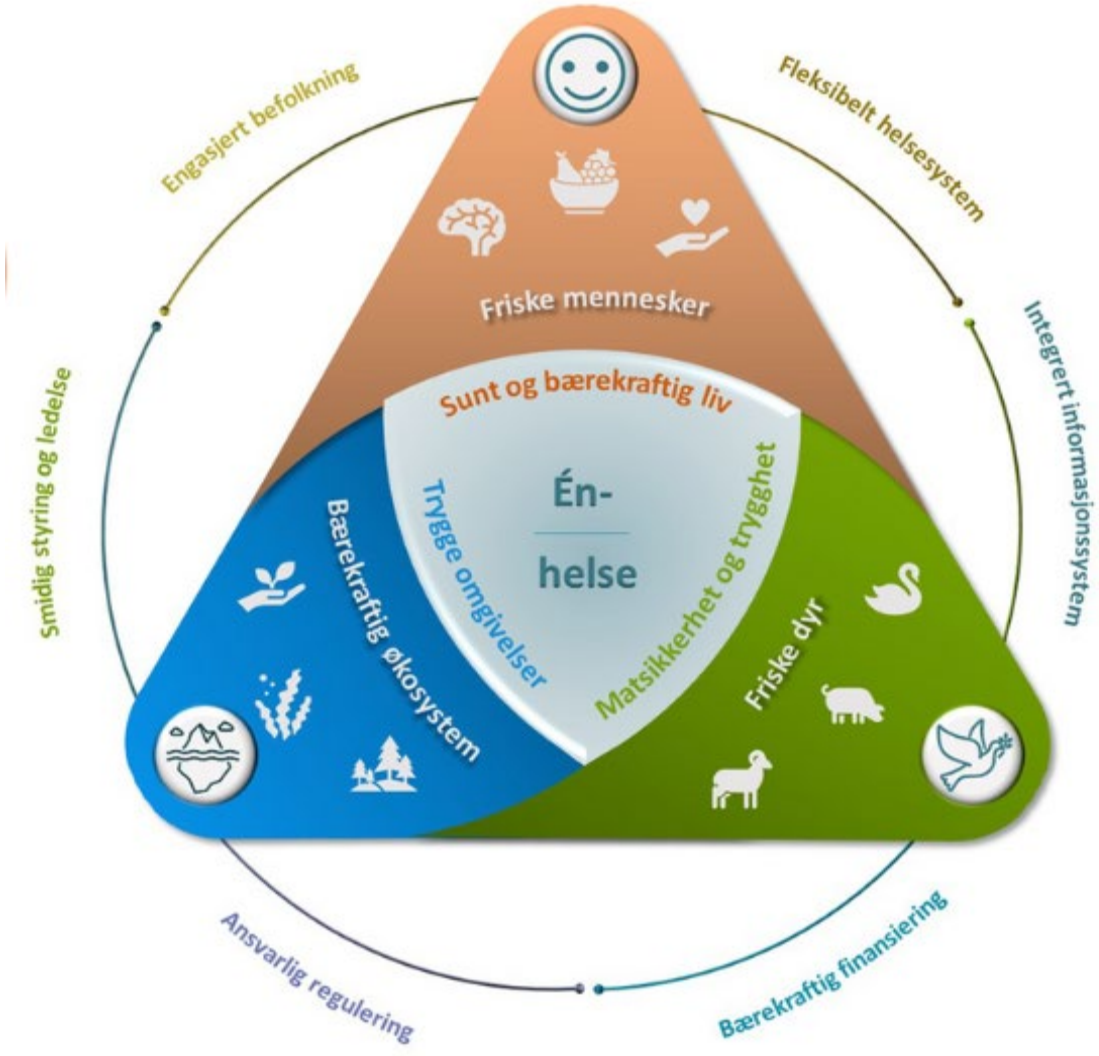
Konseptet Én Helse anerkjenner det komplekse samspillet mellom mennesker, dyr og miljø og betydningen av et balansert samspill for god helse og velferd for alle parter. Det understreker betydningen av å arbeide tverrfaglig for å forstå helseutfordringer, løse problemer og oppnå god helse for alle parter.



Figur: Verdens helseorganisasjon

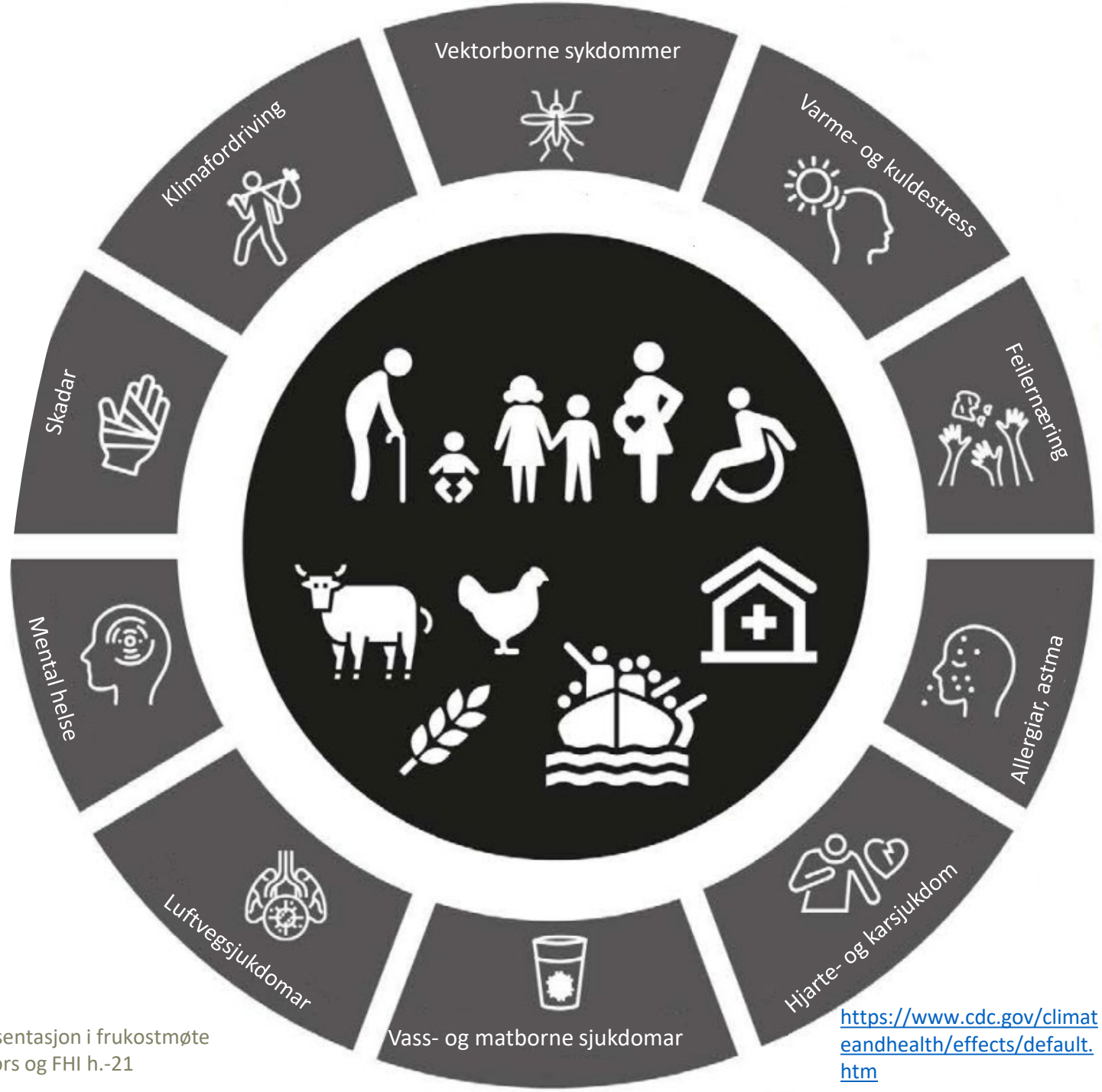
Verdens helseorganisasjon (WHO), FNs organisasjon for ernæring og landbruk (FAO), Verdens dyrehelseorganisasjon (WHOA, tidl. OIE) og FNs miljøprogram (UNEP) har enes om en felles definisjon av én helse (*se tekstboks*).

Teknologi for eit betre samfunn


Engasjert befolkning
Fleksibelt helsesystem
Integrert informasjonssystem
Bærekraftig finansiering
Ansvarlig regulering
Smidig styring og ledelse
Friske mennesker
Sunt og bærekraftig liv
Én-
helse
Trygge omgivelser
Matsikkerhet og trygghet
Bærekraftig økosystem
Friske dyr

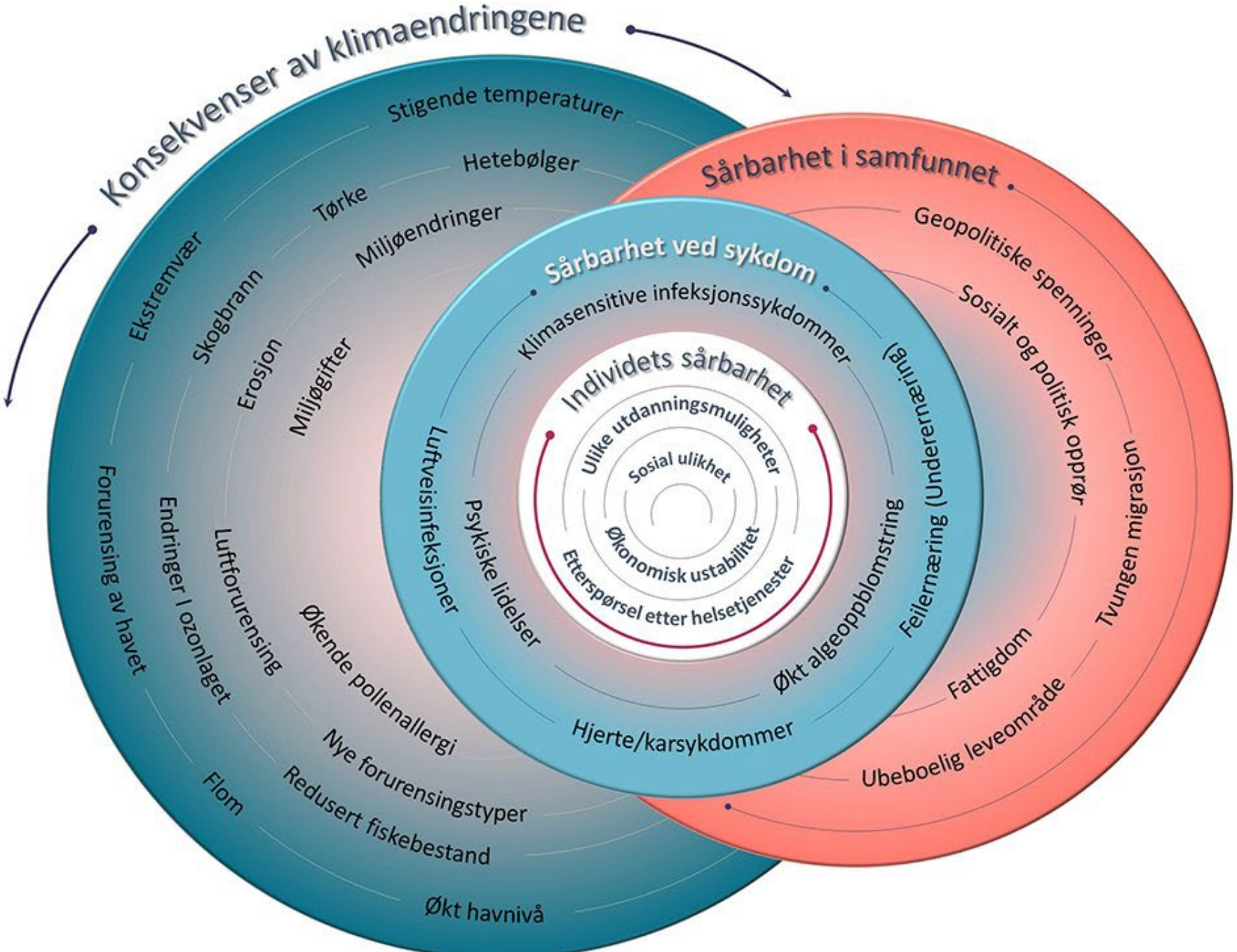
Frå farar til helse-konsekvensar

- Ekstremvêr og –temperaturar som vi merkar på kroppen
- Endringar i vatn- og matkvalitet som verkar på helsa
- Endra risiko for vektor-, vatn- og matborne sykdommer
- Mental helse
- ….

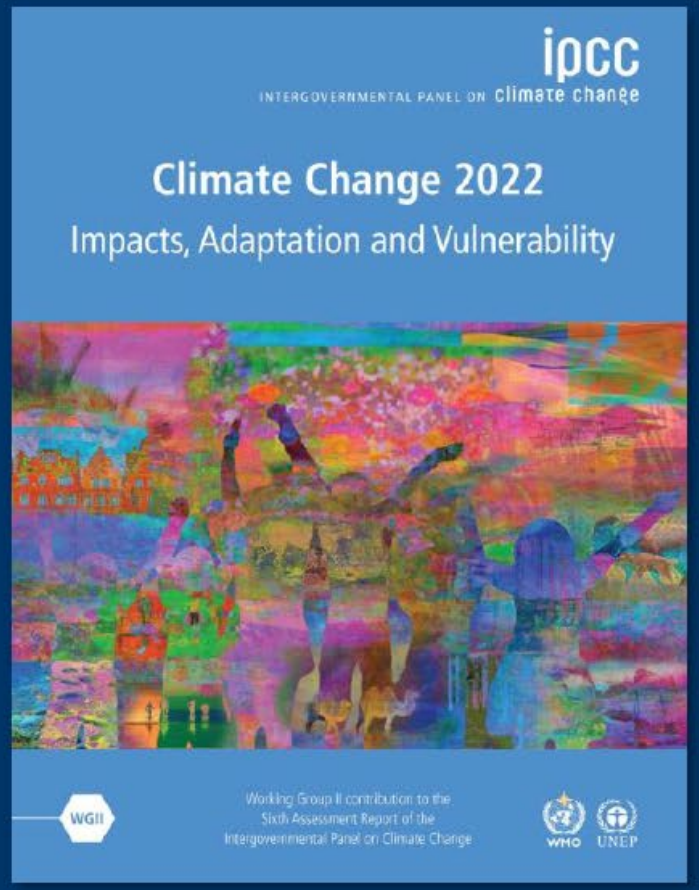


Figur kopiert frå presentasjon i frukostmøte arrangert av Røde kors og FHI h.-21

https://www.cdc.gov/climateandhealth/effects/default.htm



[Folkehelserapporten]



"The scientific evidence is unequivocal: climate change is a threat to human well-being and the health of the planet.

Any further delay in concerted global action will miss the brief, rapidly closing window to secure a liveable future.

This report offers solutions to the world.

ipcc
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE
WMO UNEP

Folkehelse står i sentrum for transformasjon mot klimarobust utvikling

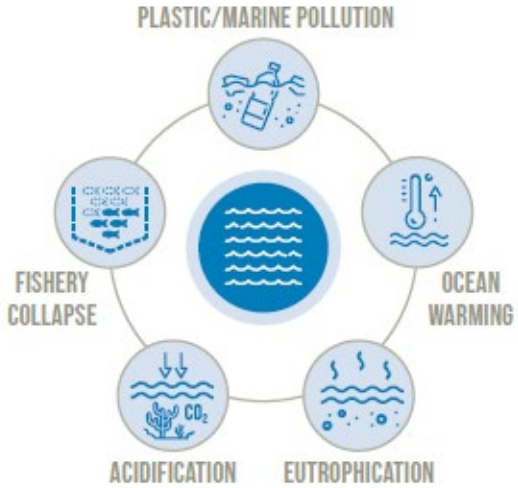
- **Transitioning toward equitable, low-carbon societies has multiple benefits for health and wellbeing *(very high confidence)*.** Benefits for health and wellbeing can be gained from wide-spread, equitable access to affordable renewable energy (*high confidence*); active transport (e.g., walking and cycling) (*high confidence*); green buildings and nature-based solutions, such as green and blue urban infrastructure (*high confidence*), and by transitioning to a low-carbon, wellbeing-oriented and equity-oriented economy consistent with the aims of the Sustainable Development Goals *(high confidence)*. (IPCC WGII 2022, kap 7)

- WG2AR6_FD_Ch07_Final (ipcc.ch)

14 LIFE BELOW WATER

CONSERVE AND SUSTAINABLY USE THE OCEANS, SEA AND MARINE RESOURCES FOR SUSTAINABLE DEVELOPMENT

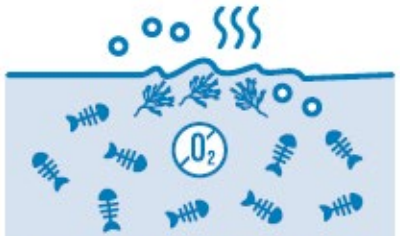
THE SUSTAINABILITY OF OUR OCEANS IS UNDER SEVERE THREAT



OVER 3 BILLION PEOPLE
RELY ON OCEANS FOR THEIR LIVELIHOODS

DEAD ZONES

ARE RISING AT AN ALARMING RATE, FROM 400 IN 2008 TO 700 IN 2019



"DEAD ZONES" ARE AREAS OF WATER THAT LACK SUFFICIENT OXYGEN TO SUPPORT MARINE LIFE

OVER HALF OF
MARINE KEY BIODIVERSITY AREAS
ARE NOT PROTECTED

ABOUT HALF OF COUNTRIES WORLDWIDE
HAVE ADOPTED SPECIFIC INITIATIVES
TO SUPPORT SMALL-SCALE FISHERS

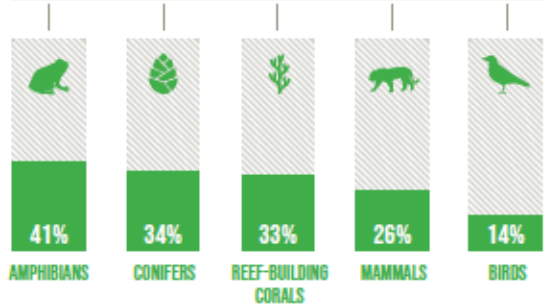
ON AVERAGE, ONLY **1.2%**
OF NATIONAL RESEARCH BUDGETS ARE
ALLOCATED FOR OCEAN SCIENCE

15 LIFE ON LAND

PROTECT, RESTORE AND PROMOTE SUSTAINABLE USE OF TERRESTRIAL ECOSYSTEMS, SUSTAINABLY MANAGE FORESTS, COMBAT DESERTIFICATION, AND HALT AND REVERSE LAND DEGRADATION AND HALT BIODIVERSITY LOSS

MORE THAN A QUARTER OF SPECIES ASSESSED BY THE IUCN RED LIST ARE THREATENED WITH EXTINCTION

PROPORTION OF SPECIES THREATENED WITH EXTINCTION



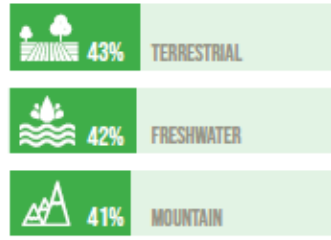
IUCN RED LIST
TRACKS DATA ON MORE THAN 134,400 SPECIES OF MAMMALS, BIRDS, AMPHIBIANS, REEF-BUILDING CORALS AND CONIFERS. MORE THAN 37,400 SPECIES ARE THREATENED WITH EXTINCTION.

PROGRESS HAS BEEN MADE TOWARDS SUSTAINABLE FOREST MANAGEMENT

BUT THE WORLD HAS LOST
100 MILLION HECTARES OF FOREST
IN TWO DECADES
(2000-2020)

PROGRESS TO SAFEGUARD KEY BIODIVERSITY AREAS HAS STALLED OVER THE LAST 5 YEARS

GLOBAL MEAN PERCENTAGE OF EACH KEY BIODIVERSITY AREA COVERED BY PROTECTED AREAS (2021)



ALMOST ALL COUNTRIES HAVE ADOPTED
LEGISLATION FOR PREVENTING OR CONTROLLING INVASIVE ALIEN SPECIES

Biodiversity and human health

Health "is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity".

Biological diversity (biodiversity) is "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems."

Biodiversity underpins ecosystem functioning and the provision of goods and services that are essential to human health and well being.

The links between **biodiversity and health** are manifested at various spatial and temporal scales. Biodiversity and human health, and the respective policies and activities, are interlinked in various ways.

Direct drivers of biodiversity loss include land-use change, habitat loss, over-exploitation, pollution, invasive species and climate change. Many of these drivers affect human health directly and through their impacts on biodiversity.

Women and men have different roles in the conservation and use of biodiversity and varying health impacts.

Human population health is determined, to a large extent, by social, economic and environmental factors.

The social and natural sciences are important contributors to biodiversity and health research and policy. Integrative approaches such as the Ecosystem Approach, Ecohealth and One Health unite different fields and require the development of mutual understanding and cooperation across disciplines.

World Health Organization

Convention on Biological Diversity

BIODIVERSITY IS FUNDAMENTAL TO HUMAN LIFE ON EARTH, AND IT IS BEING DESTROYED BY US AT A RATE UNPRECEDENTED IN HISTORY.

Slide copied from presentation by dr. Carlos das Neves.

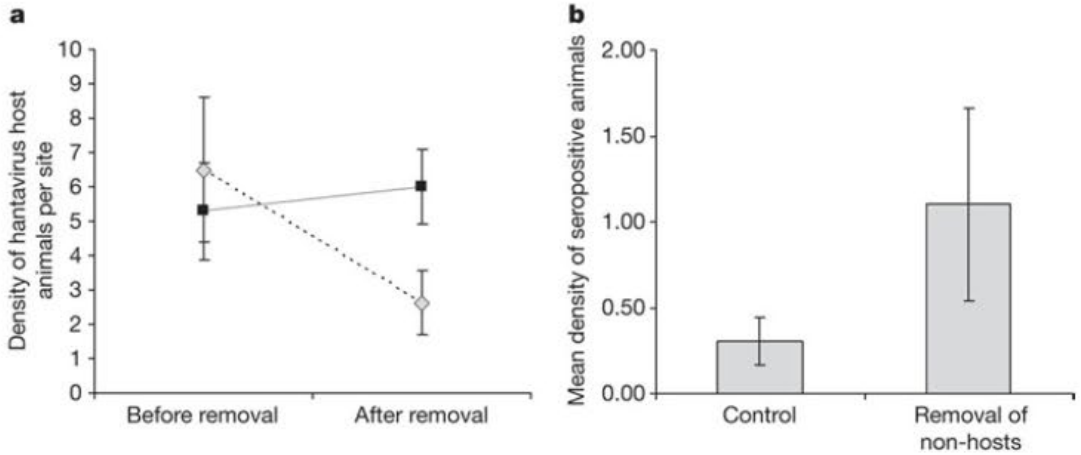
CHANGE

"Many of nature's contributions to people are essential for human health and their decline thus threatens a good quality of life"

Slide copied and modified from presentation by dr. Carlos das Neves.

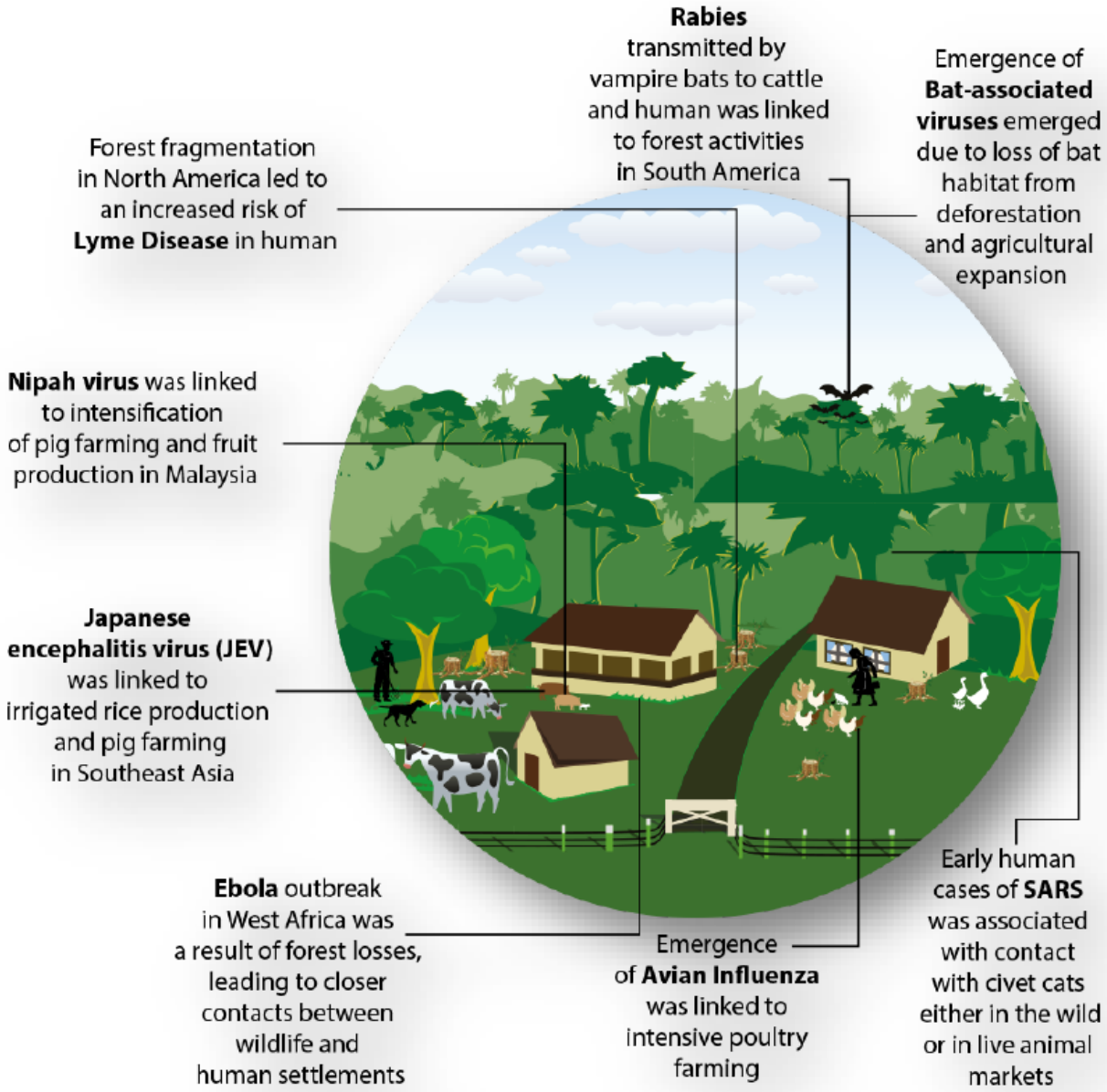
Paula Ribeiro Prist, et al., 2021 Moving to healthier landscapes: Forest restoration decreases the abundance of Hantavirus reservoir rodents in tropical forests, *Science of The Total Environment, Volume 752,*

https://www.sciencedirect.com/science/article/pii/S0048969720354966



Keesing F, Belden LK, Daszak P, et al. Impacts of biodiversity on the emergence and transmission of infectious diseases. *Nature*. 2010;468(7324):647-652. doi:10.1038/nature09575

https://www.nature.com/articles/nature09575



Created based on data from Jones *et al.* (2013)[5]

Slide copied and modified from presentation by dr. Carlos das Neves.

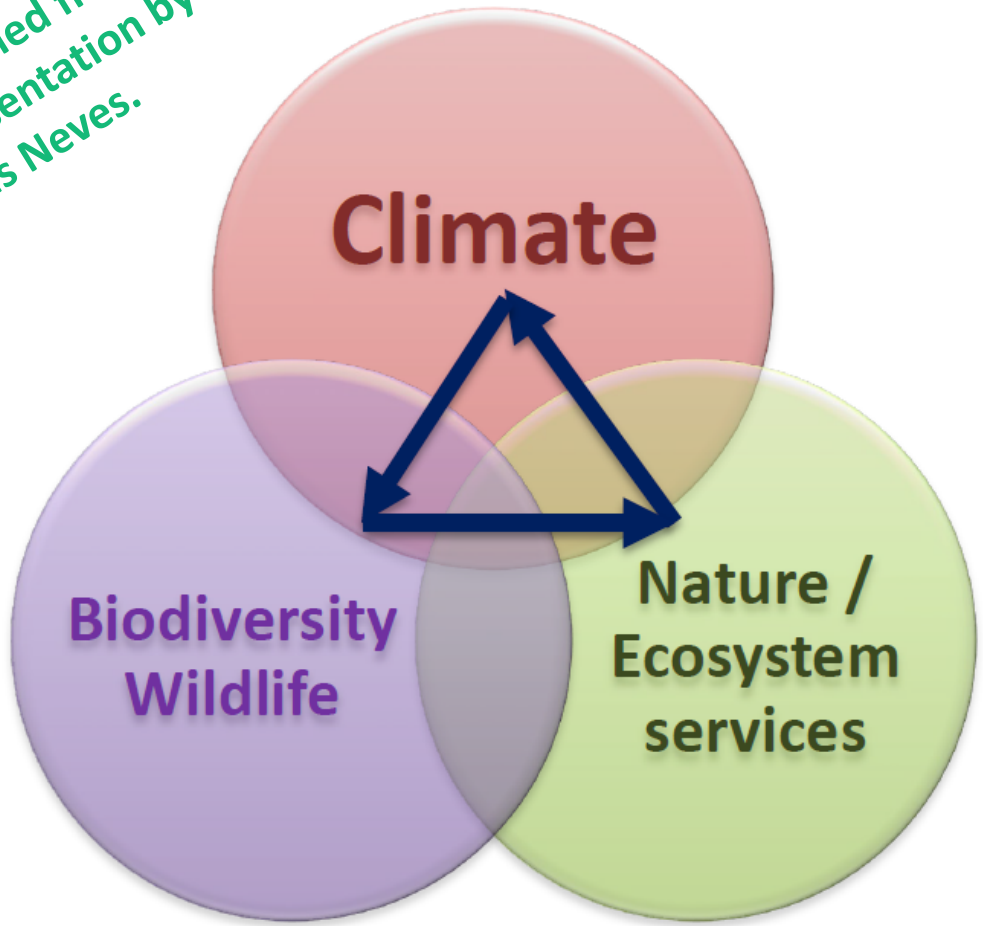
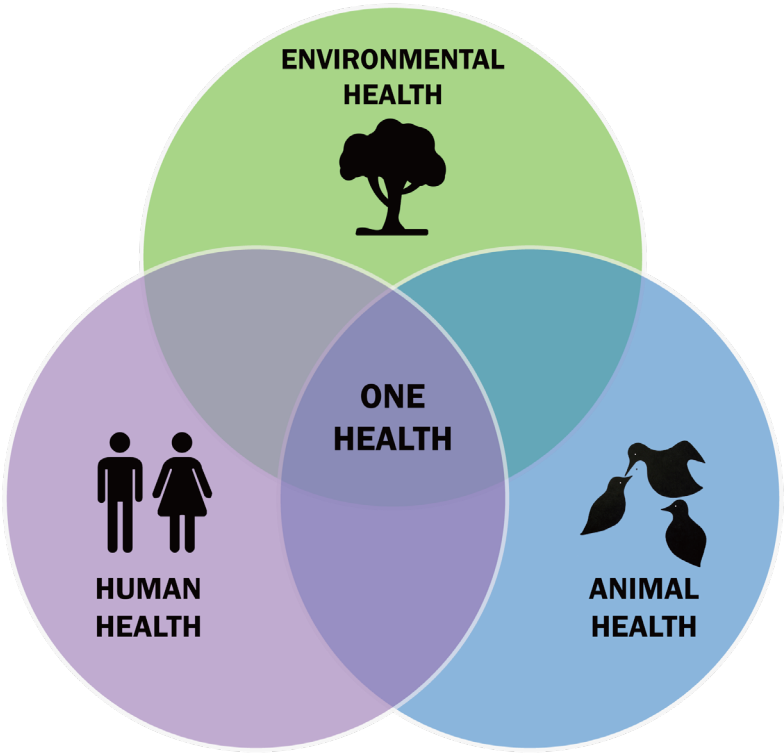


Figure I: The Evolving Risks Landscape, 2007–2020

Source: World Economic Forum 2007-2020, *Global Risks Reports*.
Note: Global risks may not be strictly comparable across years, as definitions and the set of global risks have evolved with new issues emerging on the 10-year horizon. For example, cyberattacks, income disparity and unemployment entered the set of global risks in 2012. Some global risks have been reclassified: water crises and income disparity were recategorized as societal risks in the 2015 and 2014 *Global Risks Reports*, respectively.

Antimikrobiell resistens (AMR)

- 2019: 1,3 mill direkte og 5 mill assosierte dødsfall
- Estimert 2050: 10 mill per år 2050
- COVID-19: 7 mill dødsfall over 3 år
- Redusert bruk av antibiotika i human medisin aleine vil ikkje kunna bekjempa AMR
- WHO: Opptatt av å hindra spreiing, med éi-helse-perspektiv



Antibiotikabruken globalt

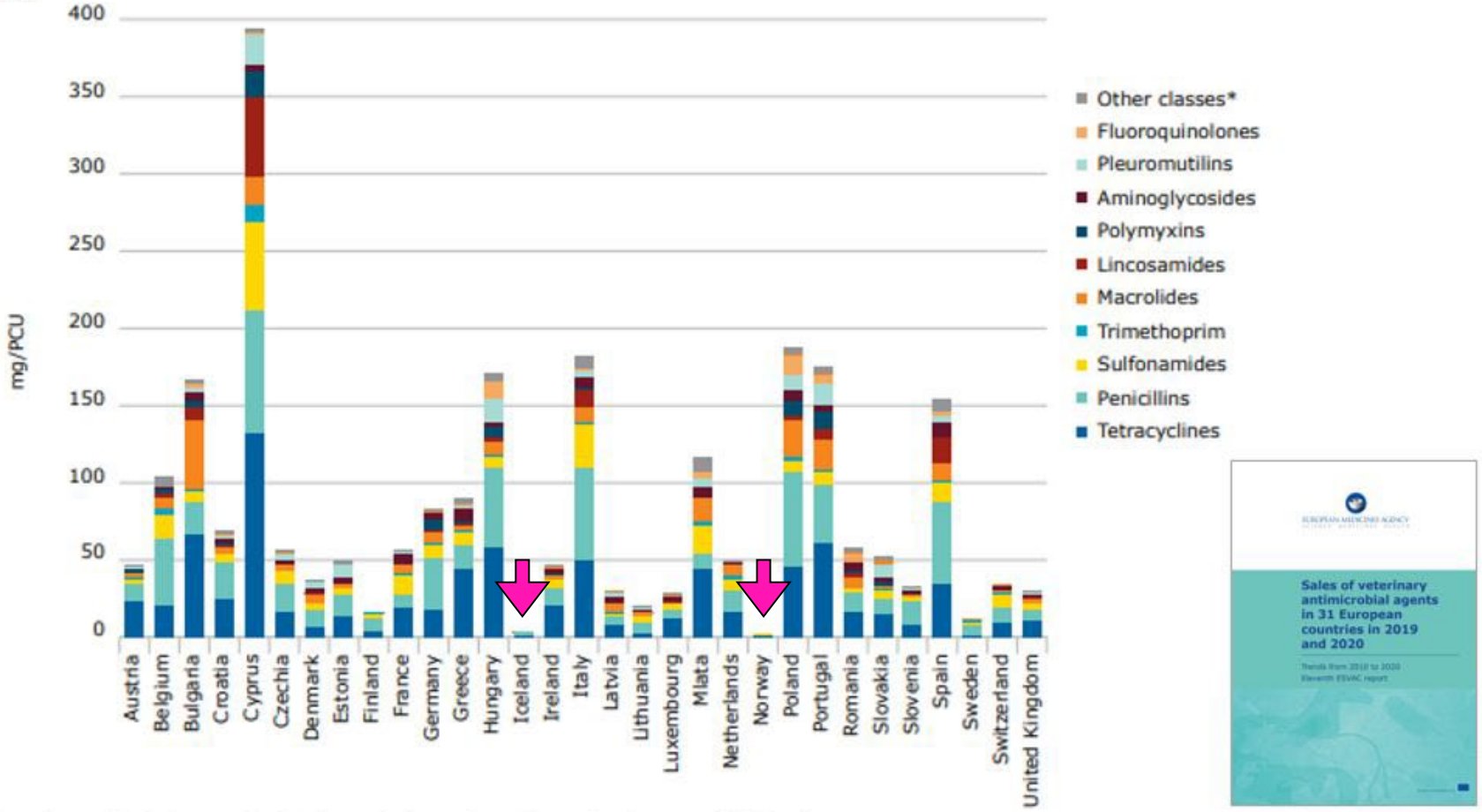
- 73 % blir brukt i husdyrproduksjon
  - Vekstfremmar i fôr
  - Profylaktisk
  - Overfylte, uhygieniske fjøs
  - Mat er smitteveg for AMR
  - Antibiotikabruk i matproduksjonen fører til resistens hos folk

Antibiotikabruk i akvakultur

- **Også akvakulturen er ein AMR-syndar**
  - Ein av dei raskast veksande sektorane I matproduksjon
  - Halvparten av produksjonsstapet skuldast sjukdom
  - Antibiotikabruken er høg
    - Kina, India, Indonesia og Vietnam
  - Bruk av antibiotika for vekstfremming og til profylakse er forbode I Noreg.

Antibiotikabruk i europeisk husdyrproduksjon 2020

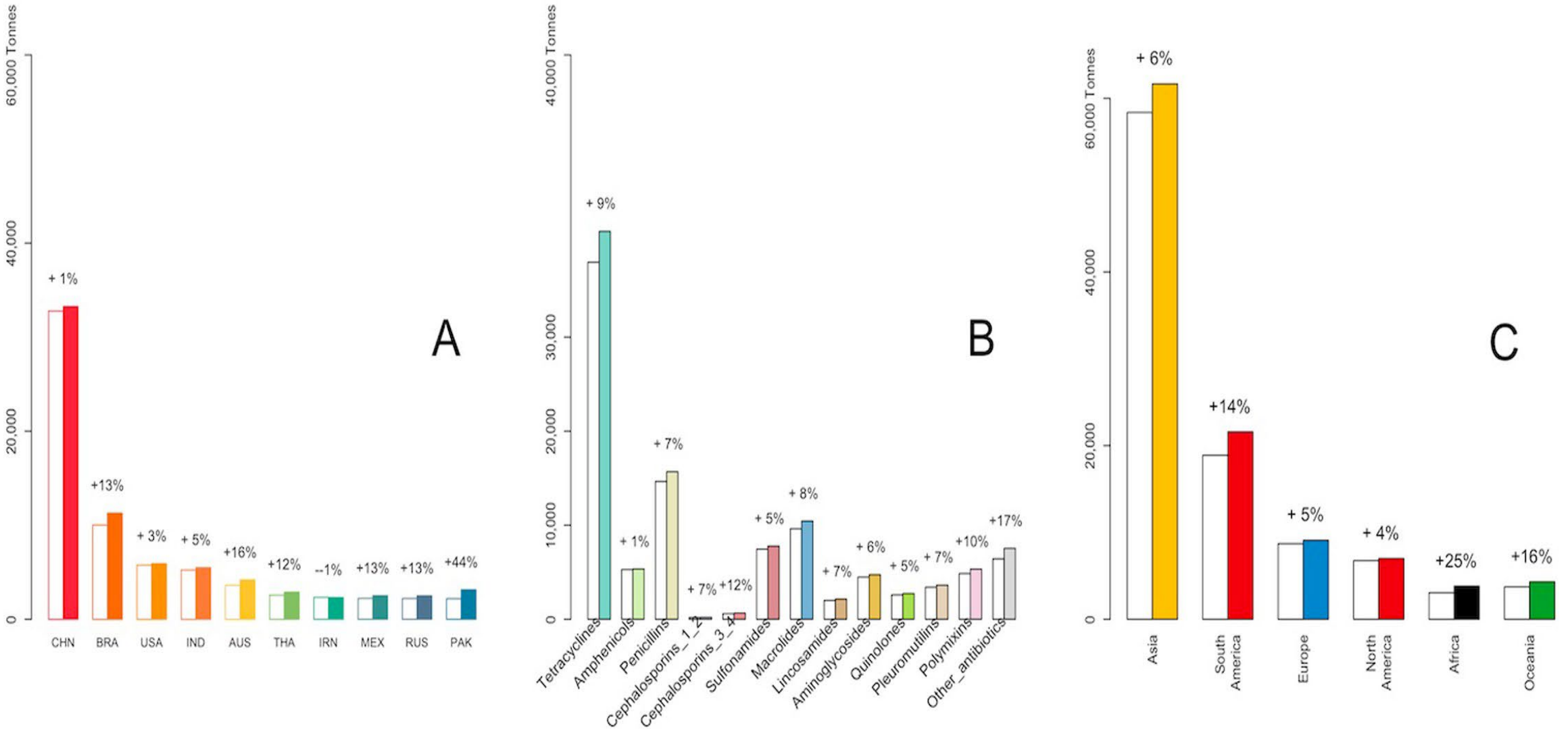
Figure 2. Sales for food-producing animals, in mg/PCU, of the various antimicrobial classes, for 31 European countries, in 2020[1]



* 'Other classes' includes amphenicols, cephalosporins, other quinolones and 'Others'.

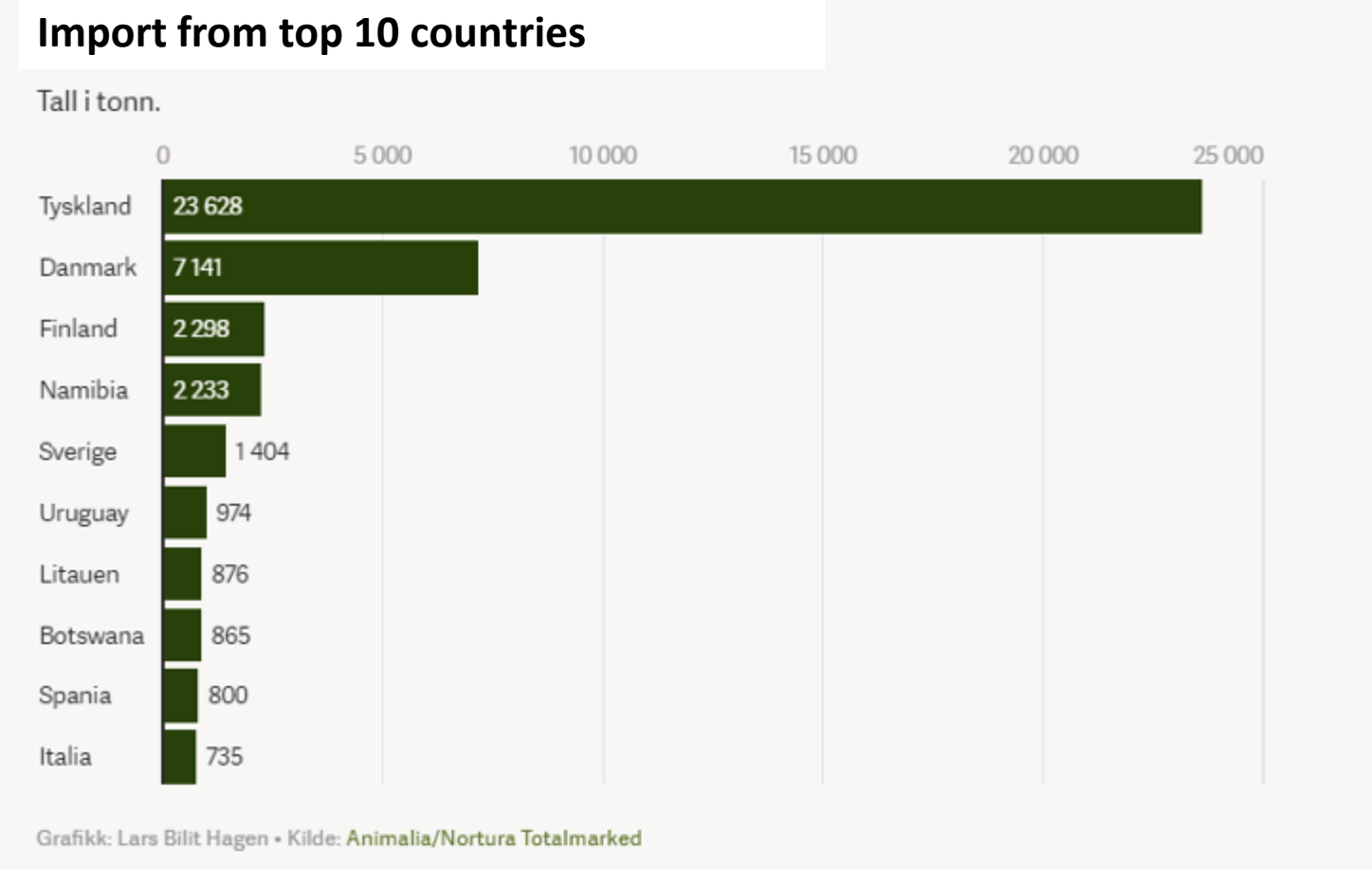
[1] Differences between countries can be partly explained by differences in animal demographics, occurrence of bacterial diseases, selection of antimicrobial agents, dosage regimes, types of data source, and veterinarians' prescribing habits.

Globale trendar – antibiotikabruk i husdyrhald 2020 - 2030

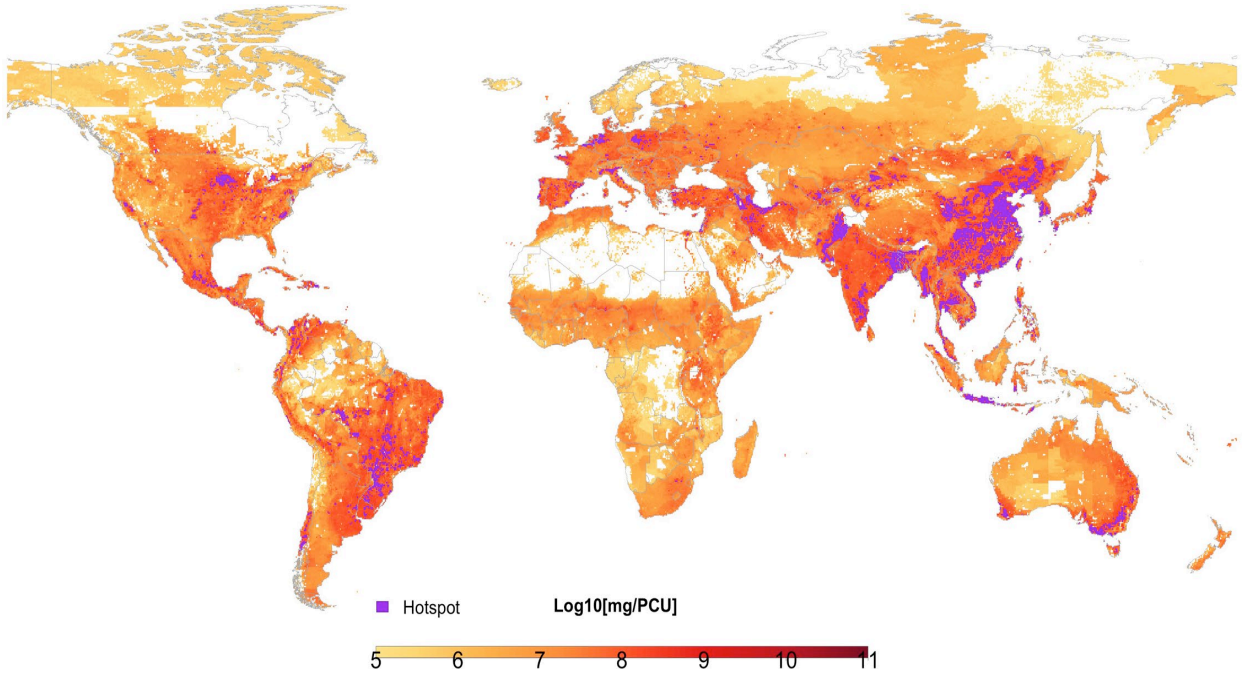


Mulchandani *et al.* 2023. Global trends in antimicrobial use in food producing animals: 2020 to 2030.

Norsk kjøtimport 2021



Snu utviklinga



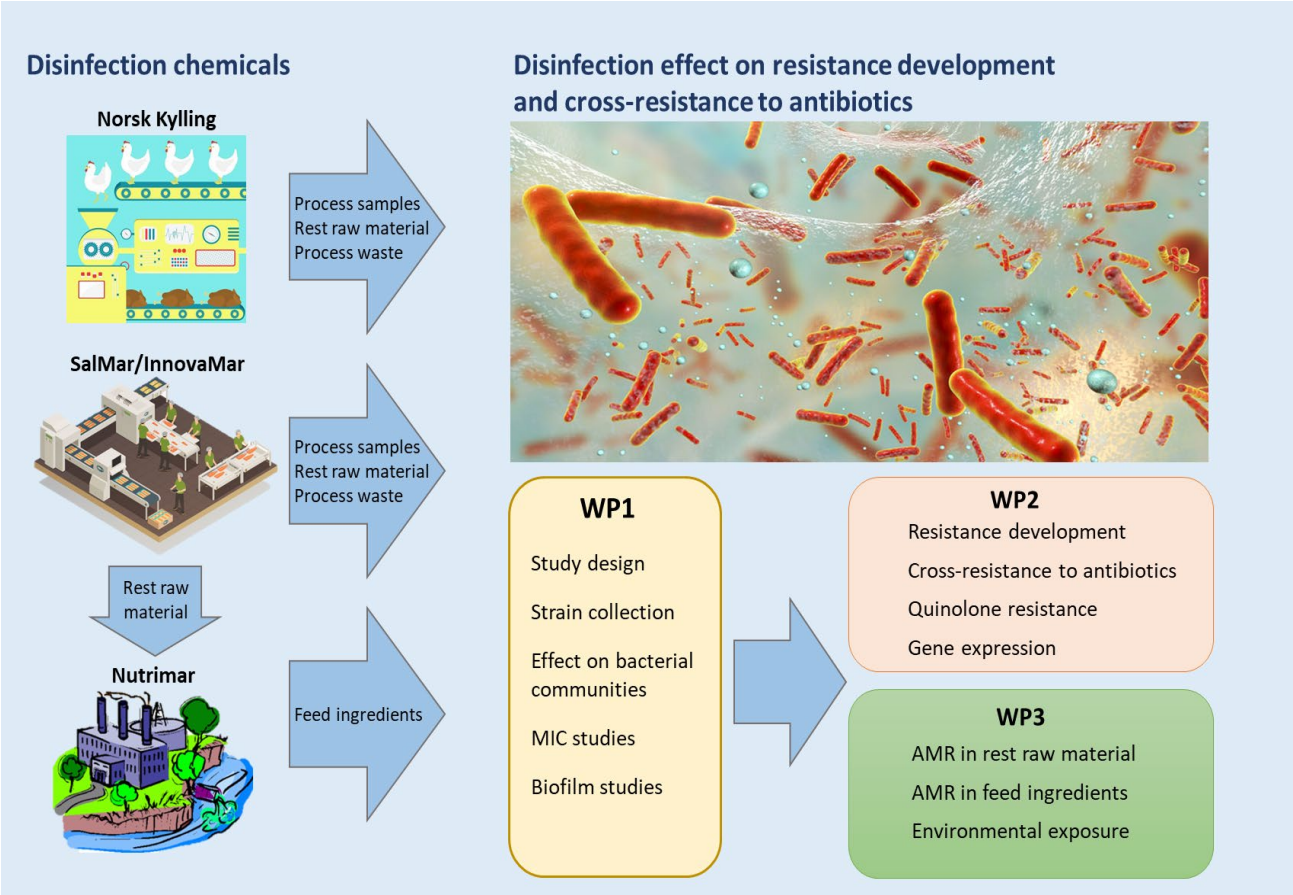
Mulchandani *et al.* 2023. Global trends in antimicrobial use in food producing animals: 2020 to 2030.

- Resistente organismar kjenner ikkje grenser. Ingen er trygge før alle er trygge
- Regulering: overbruk og misbruk av antibiotika og biocid
- ‘BigPharma’ og agroindustri arbeider mot regulering av antibiotikabruk i fôr
- Ein må hindra AMR-spreiing på tvers av éi-helse-domene
- Betre data på AMR-berar-status (dyr og menneske)
- Nye bioaktive stoff for behandling trengst

AMR-forsking på SINTEF

Drivarar for AMR-utvikling utanom klinisk og veterinær bruk

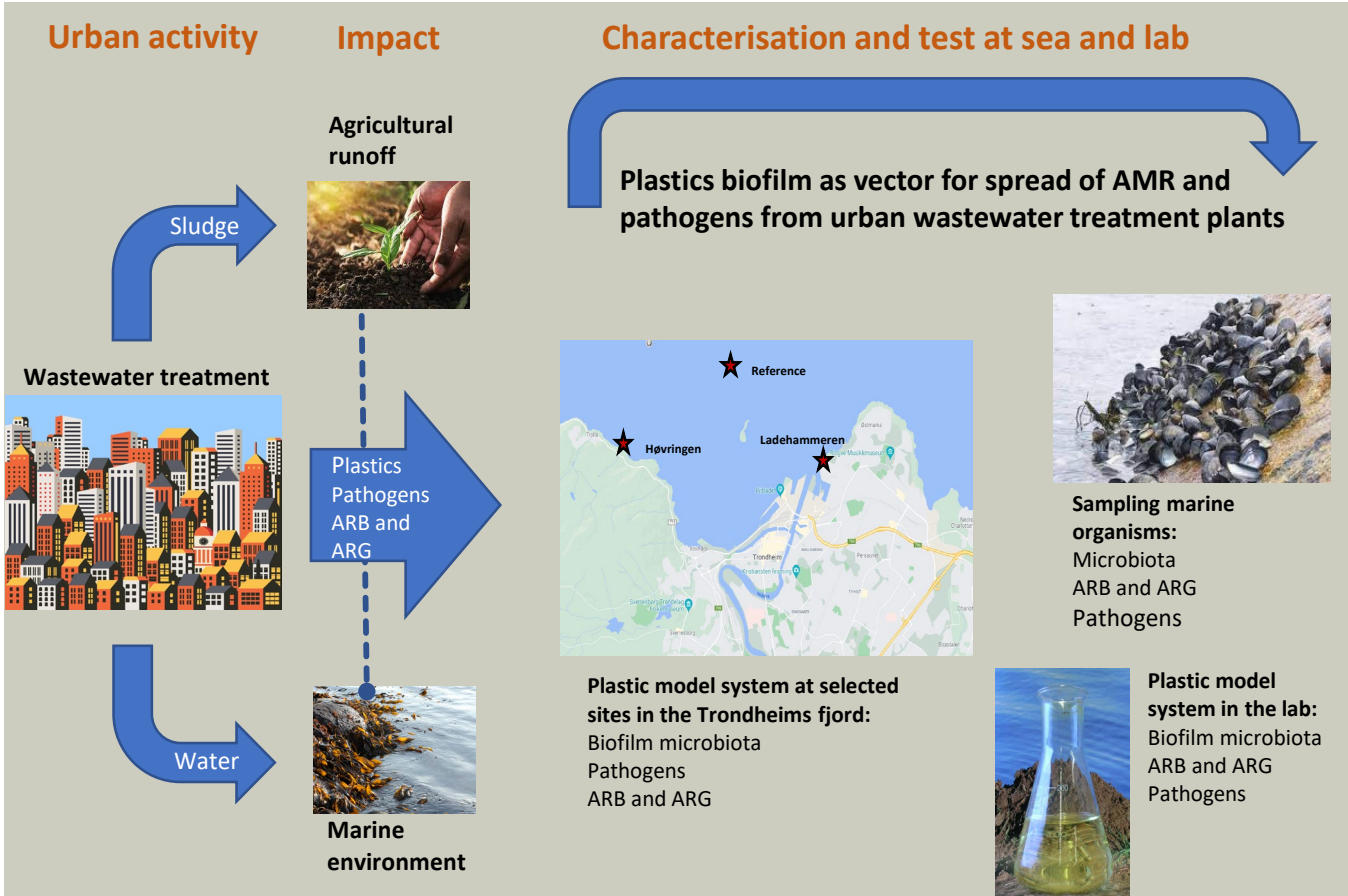
- **Desinfeksjonsmidlar**
  - WHO: ‘disinfection is a missing link in the fight against AMR’
  - Biocides may have the same effect as antibiotics on cell level
  - SINTEF-prosjekt: **DisinfectAMR**



AMR-forsking på SINTEF

Drivarar for AMR-utvikling utanom klinisk og veterinær bruk

- Avløpsvatn
  - Utslepp av bakteriar, antibiotika og miljøgifter
  - Kopling til marin plast via biofilm
  - Kan marin plast vera vektor for AMR -utvikling og -spreiing??
  - SINTEF-prosjekt: **PlastiSpread**



- It is a serious and emerging threat to public health that bacteria that cause infectious diseases develop resistance to commonly used antibiotics in the clinic.
- There is a shortage in the availability of new effective antibiotics for clinical use.
- Promising lead compounds with high activity and wide therapeutic windows fail to progress due to poor solubility, protein absorption or other problems in formulation (e.g. low drugability).

LeadtoTreat proposes a new solution to these challenges by introducing a platform for future infection treatment, enabling targeted delivery of novel lead compounds with low drugability, as well as synergistic combinations of antibiotics and potentiators in a nano-formulation.

The primary objective of LeadtoTreat is to develop a flexible, targeted nanoparticle system for delivery of synergistic antimicrobial treatments, demonstrated with MRSA targeting nano-formulations of difficult-to formulate-drug leads towards multidrug resistant S. aureus bacterial infections.

Scientific Community for Discovery of Future Medicines

Inaugural meeting

11th-15th September 2023
Les Pensières Center for Global Health
Annecy, France

https://c4d-global.org/

Teknologi for eit betre samfunn

agot.aakra@sintef.no