Klodens tilstand – er det lys i tunnelen?

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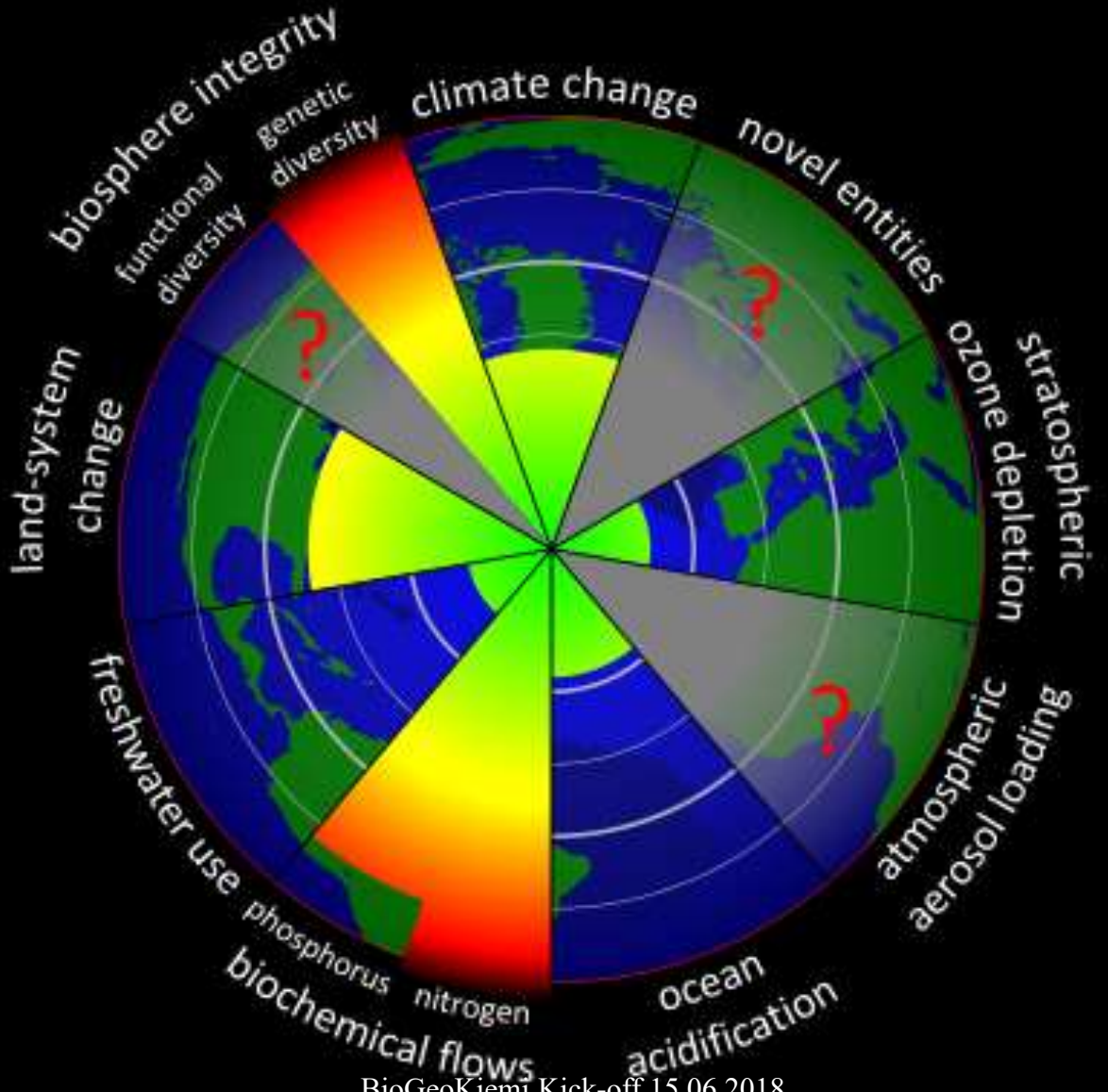
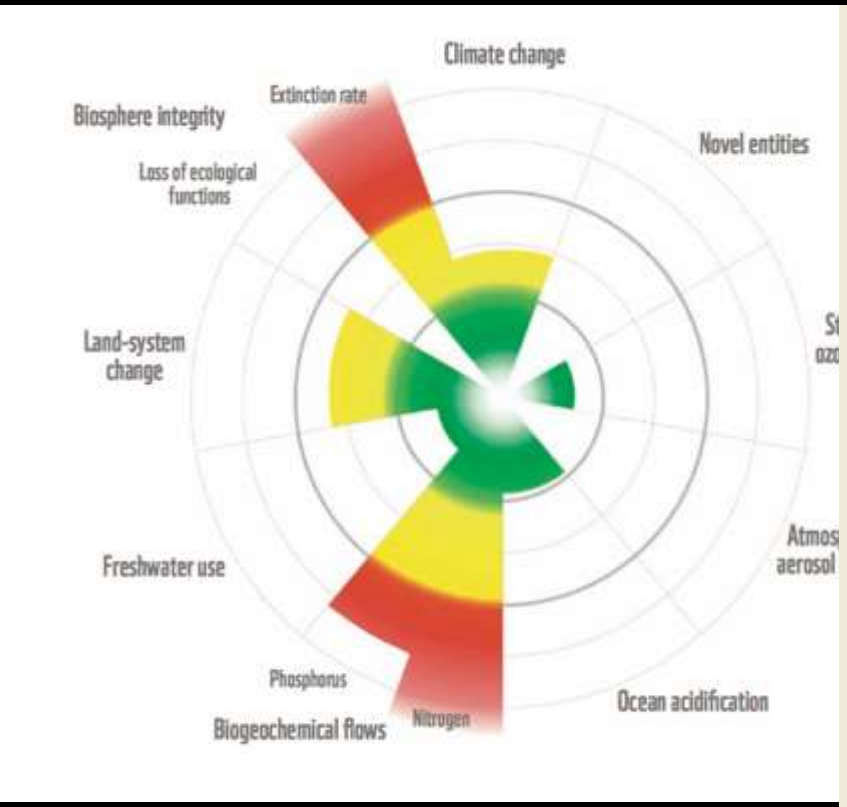
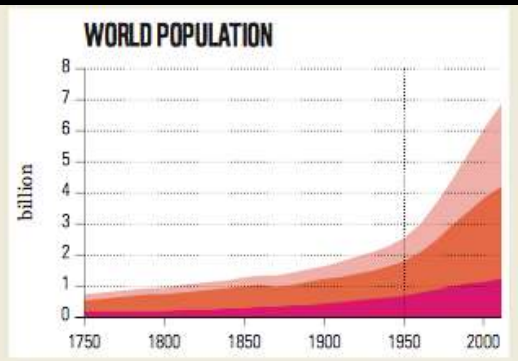
Centre for Biogeochemistry in the Anthropocene

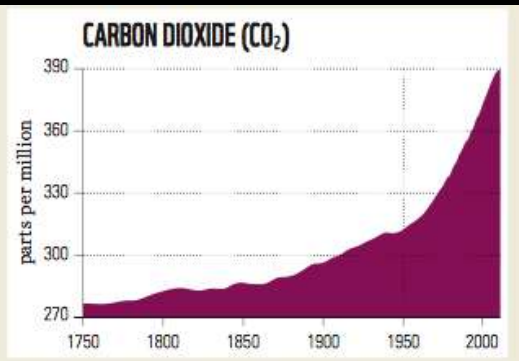
Planetens tålegrenser

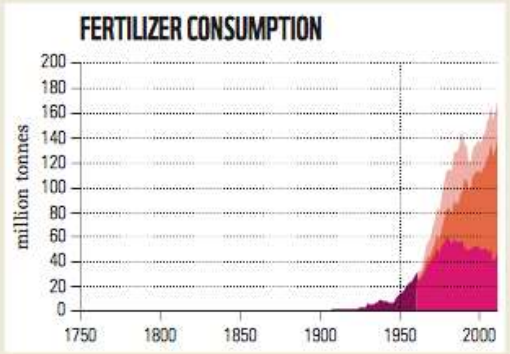


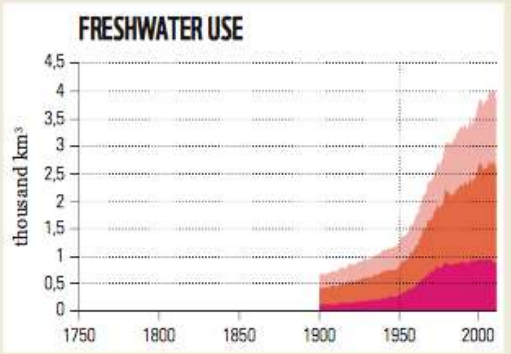
Fotavtrykk opp, natur ned

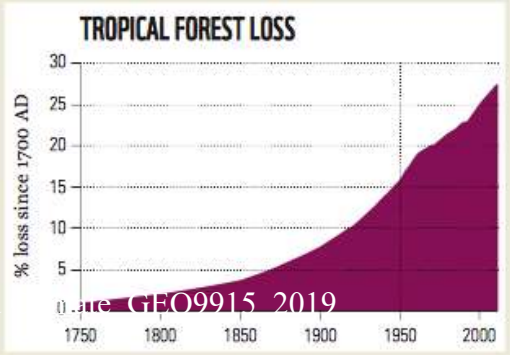


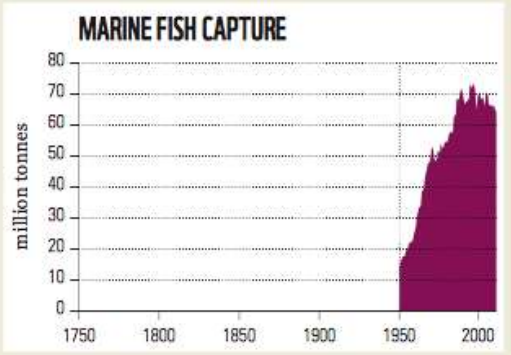












Carbon and [illegible] GEO9915 2019

Grunn til bekymring?

- Vi vil gå tom for ressurser: Malthus 1803, Ehrlic 1968 (*The population bomb*),”Romaklubben” 1972 (*Limits to growth*) og 1991 (*Beyond the limits*)
- Vi vil drukne i avfall/giftstoffer: fra Carson 1962 (*Silent spring*) til IPCC
- Problemer knyttet til habitatødeleggelse og/eller tap av biologisk diversitet: Norman Myers 1979 (Sinking Ark)

Noe blir bedre….

- Miljøbevisstheten er bedret
- Renseteknologien en bedret
- Sterkt reduserte utslipp av en rekke miljøgifter
- Noen store seire: Forsuring, ozon visse miljøgifter

- ... men noe blir verre: klima, mangfold og andre miljøgifter…

Verden: Antropocen – en ny tid

- Klodens CO_2-konsentrasjon har passert 400 ppm, restkapasiteten for utslipp ca 800 gt)
- Verdens dyrebestander er halvert i løpet av 40 år (og vi er avhengig av intakte økosystemer)
- Vektforhold mellom terrestre dyr: mennesker 36%, husdyr: 60%, ville dyr: 4%
- Global footprint: årskapasiteten brukt opp 29.07

Jorda er termodynamisk ustabil– takket være biologi

- Mars; CO_2: 96.0 %, N_2: 1.9%, O_2: 0.145%; - 63 ^oC
- Venus; CO_2: 96.5 %, N_2: 3.5%, O_2: 0.0…%; 327 ^oC
- Jorda; CO_2: 0.04 %, N_2: 78%, O_2: 21%; 15 ^oC

- The Earth has a thermodynamically unstable atmosphere, it was anoxic for nearly 2 billion years, life itself creates a “perfect” climate and gas composition and is instrumental to climate

WWF

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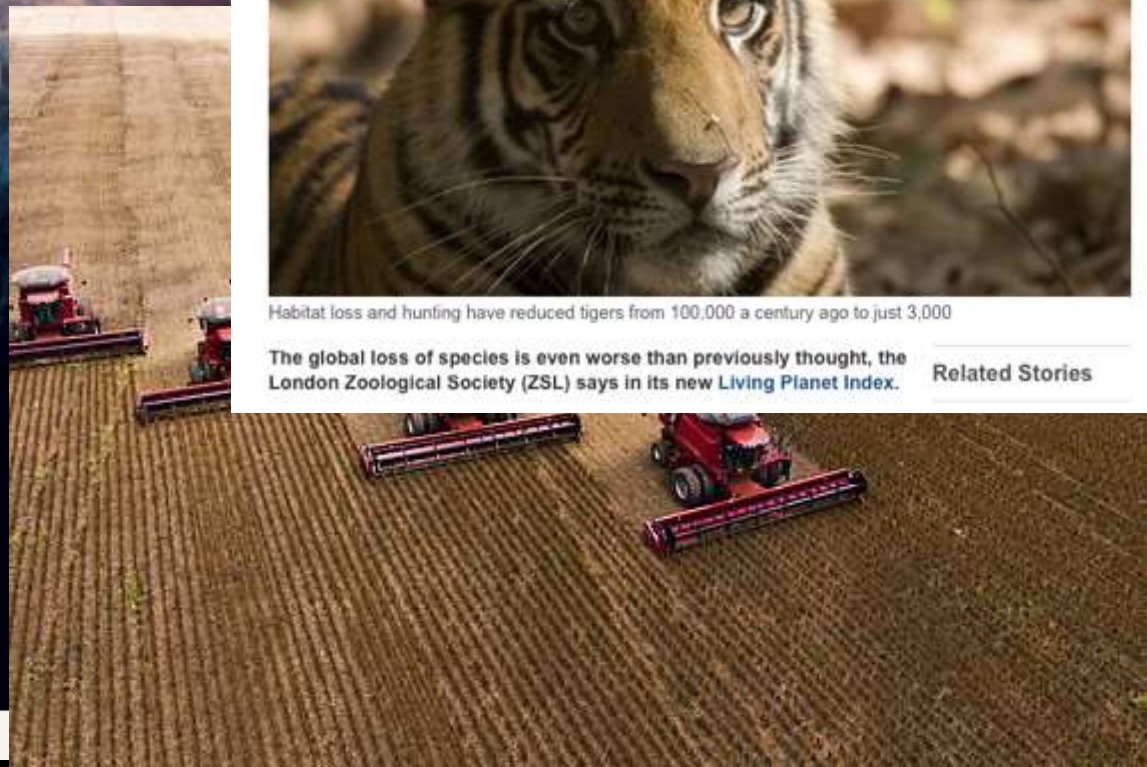
REPORT INT 2016

Living Planet Report 2016

Risk and resilience in a new era



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30 September 2014 Last updated at 08:20 GMT

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World wildlife populations halved in 40 years - report

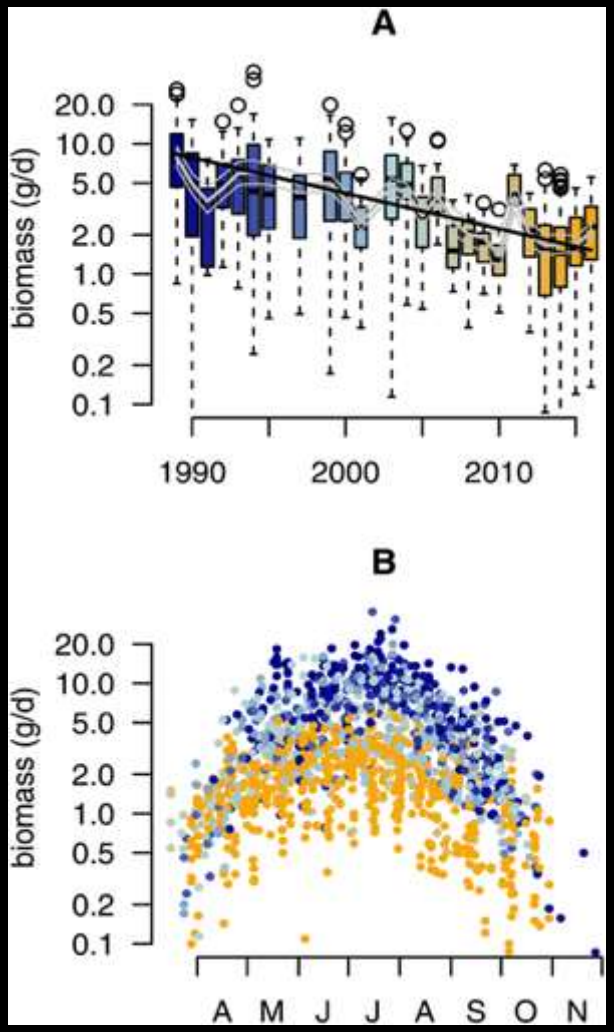
COMMENTS (657)

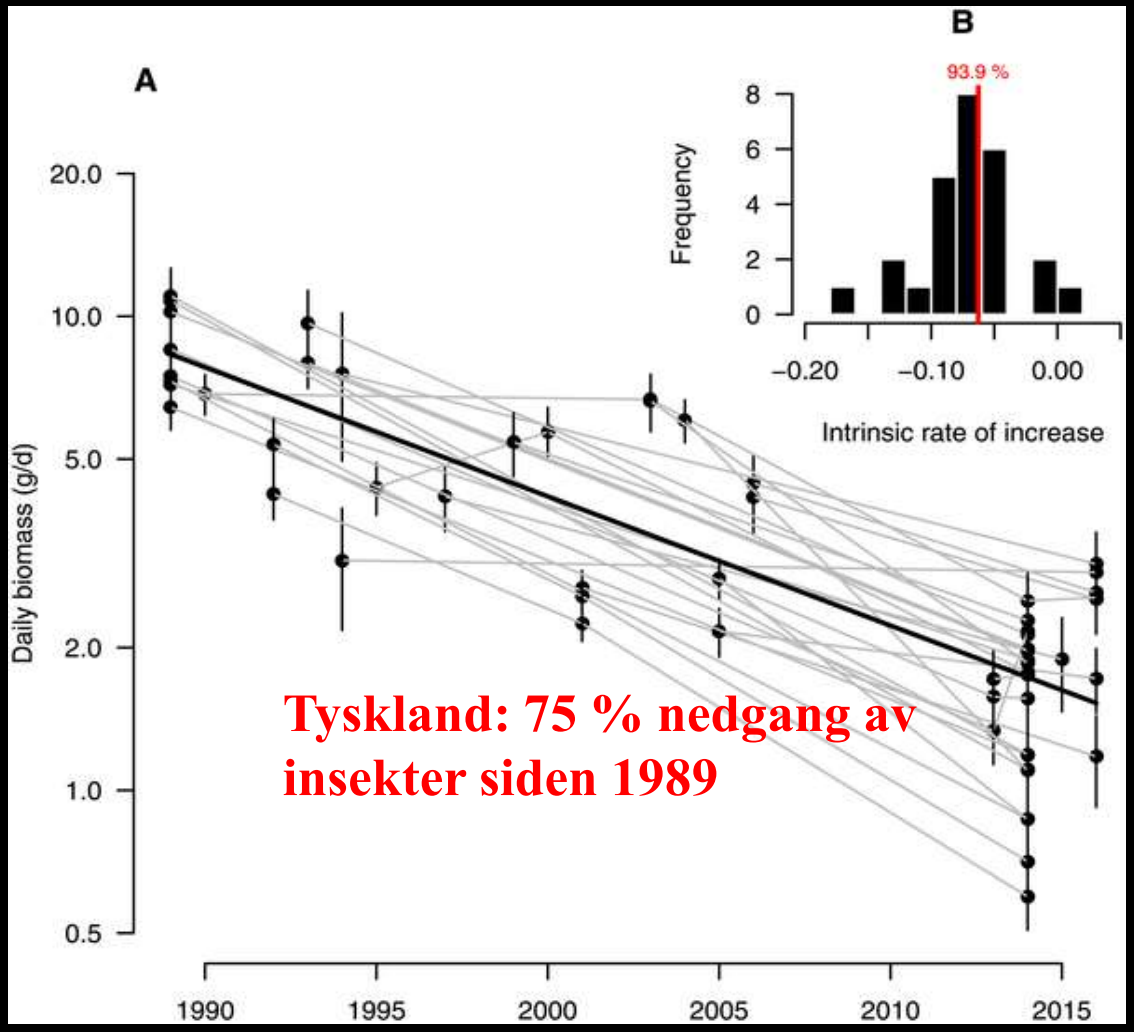
By Roger Harrabin
BBC environment analyst

Habitat loss and hunting have reduced tigers from 100,000 a century ago to just 3,000

The global loss of species is even worse than previously thought, the London Zoological Society (ZSL) says in its new Living Planet Index.

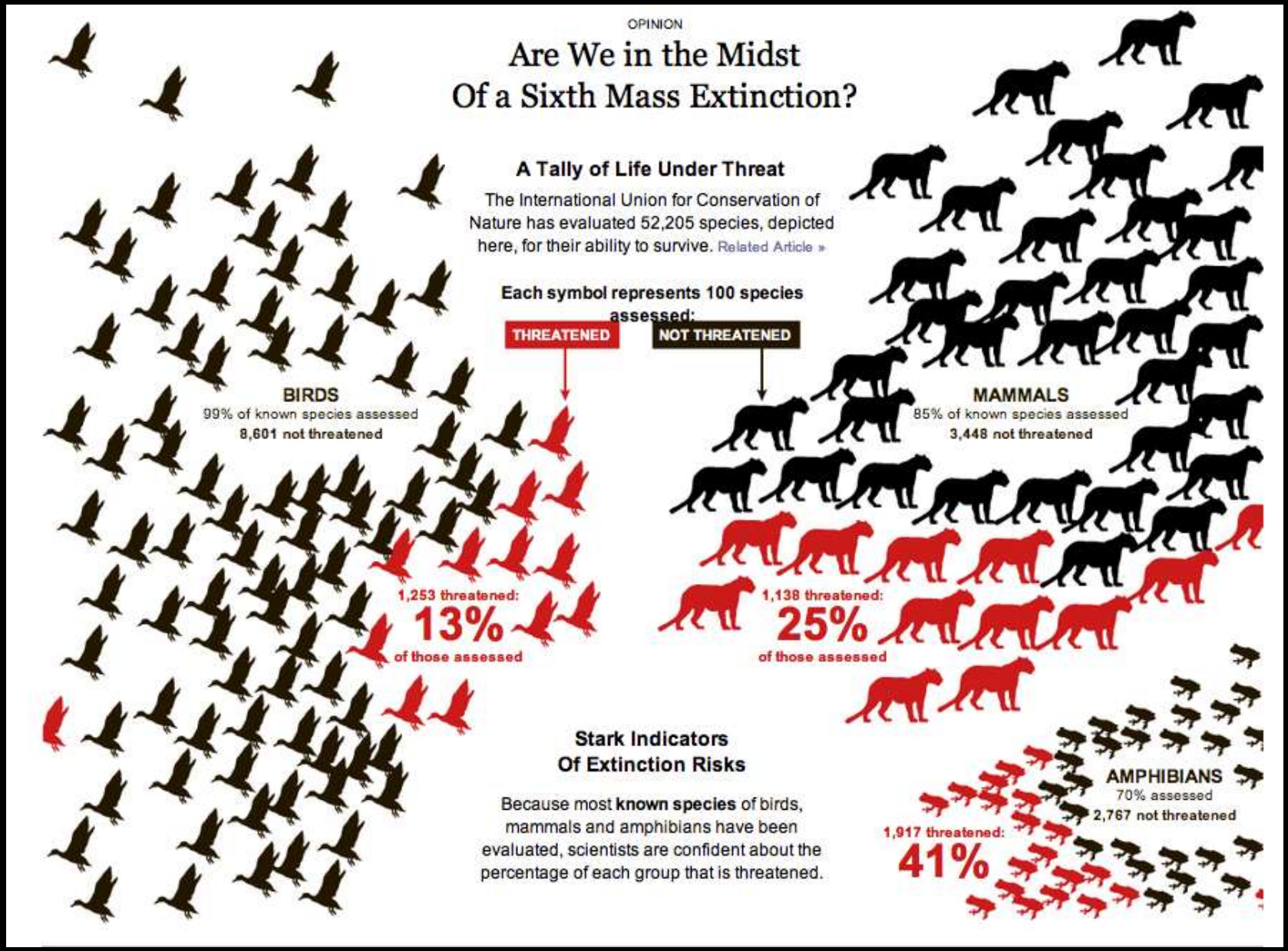
Related Stories



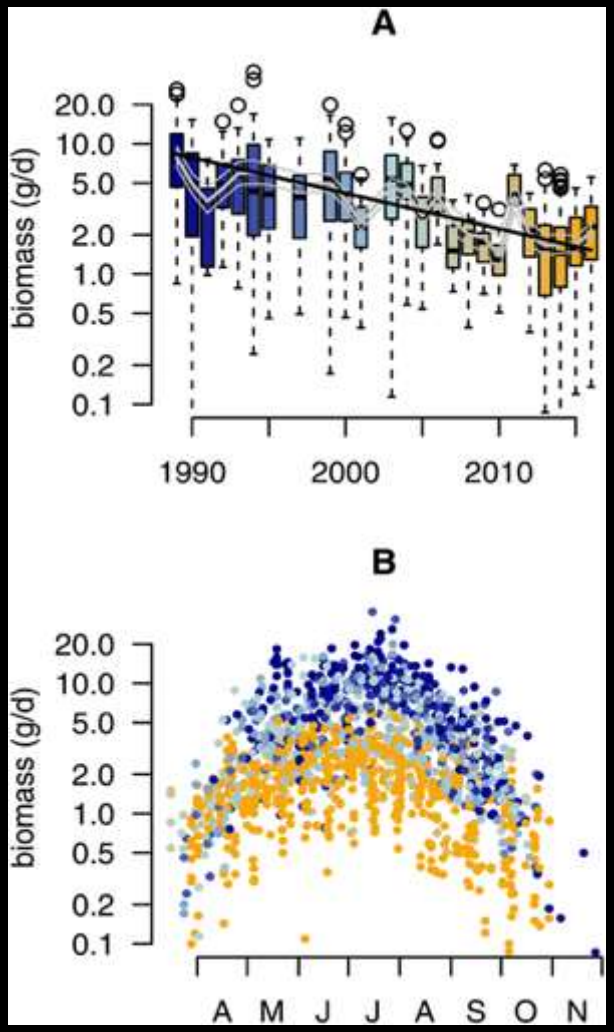


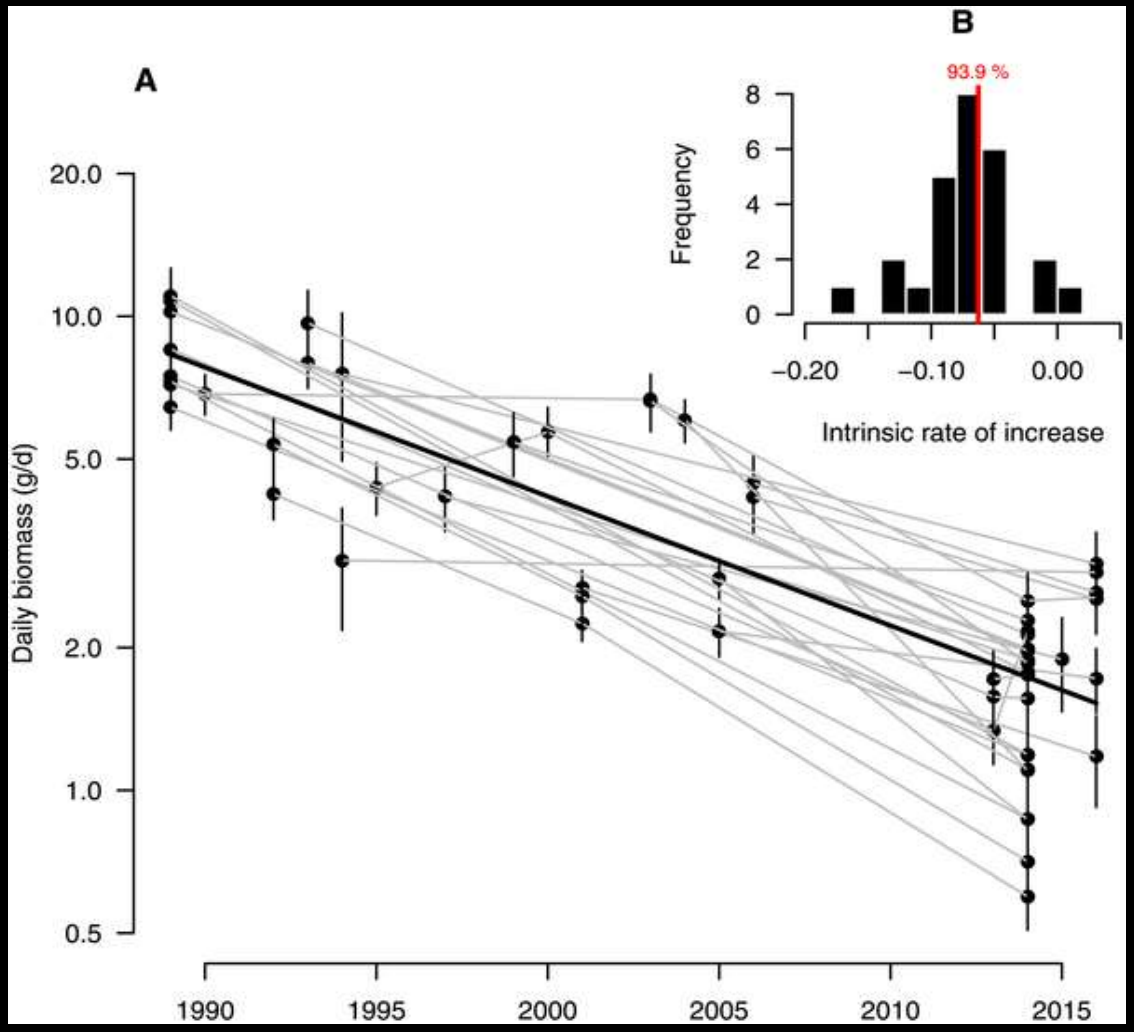
Hallmann CA, Sorg M, Jongejans E, Siepel H, Hofland N, et al. (2017) More than 75 percent decline over 27 years in total flying insect biomass in protected areas. PLOS ONE 12(10): e0185809. https://doi.org/10.1371/journal.pone.0185809
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0185809

Og hvor mange kan dø ut?



Nedgang av de vingede skarer...





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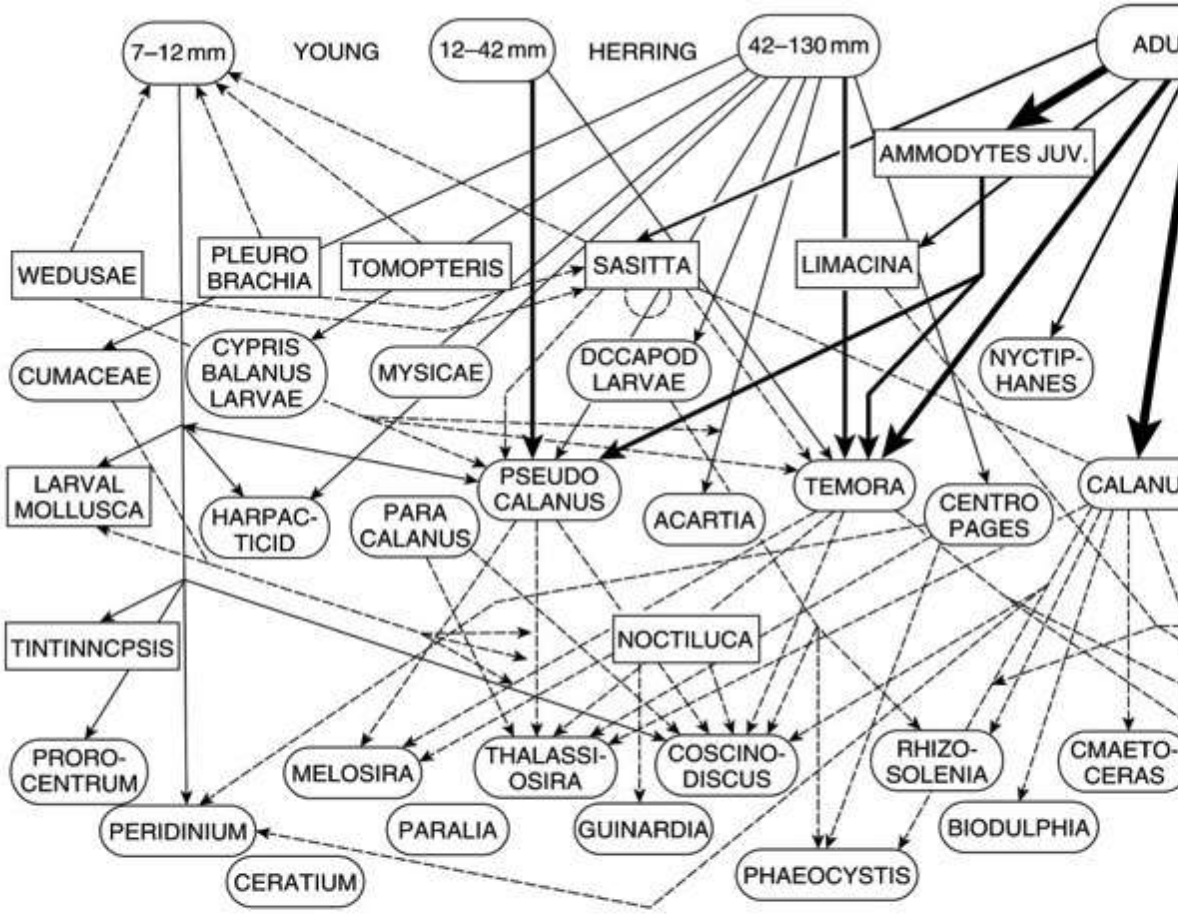
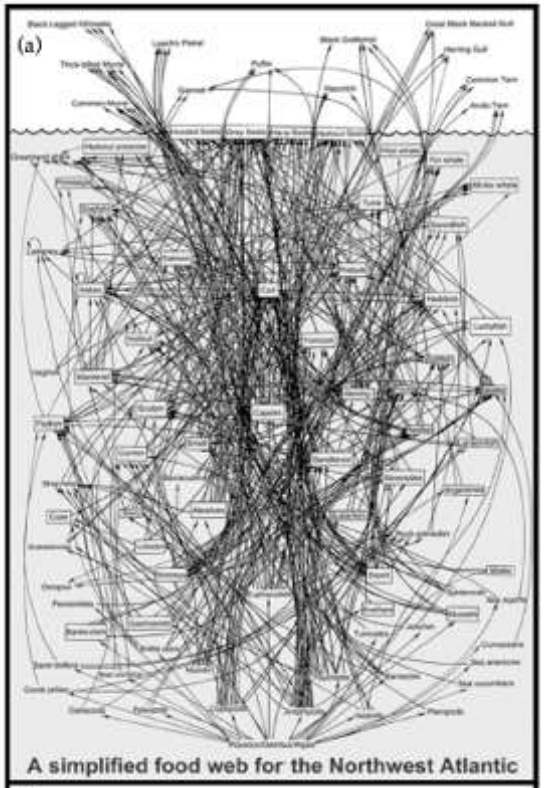
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0185809

Alt henger sammen...?

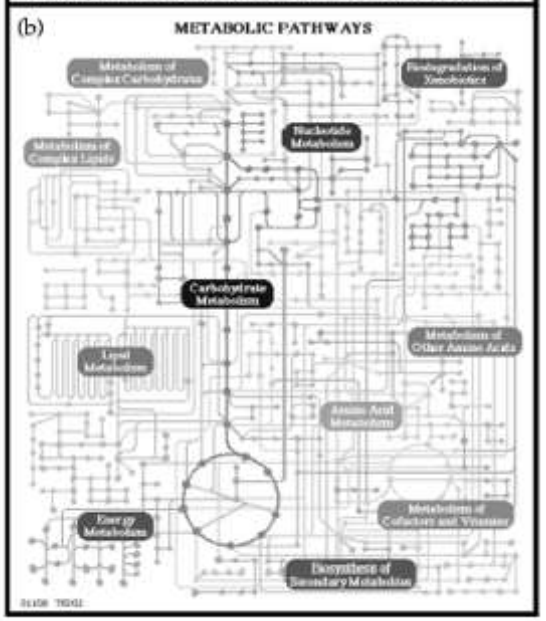


Biological Oceanography, Second Edition. Charles B. Miller, Pat
© 2012 John Wiley & Sons, Ltd. Published 2012 by John Wiley

Fig. 9.1 Alister Hardy's (1924) classic pelagic food-web diagram from large phytoplankton to herring. All of these li herring (and trophic levels above those) were also known in 1924. Recent insights introduce much more complexity at th (After Hardy 1924.)



A simplified food web for the Northwest Atlantic



Bier, blomster og økosystemtjenester

- Blomster og bier:
  - $153 milliarder per år globalt
- *Coffea arabica* (C=0,39)

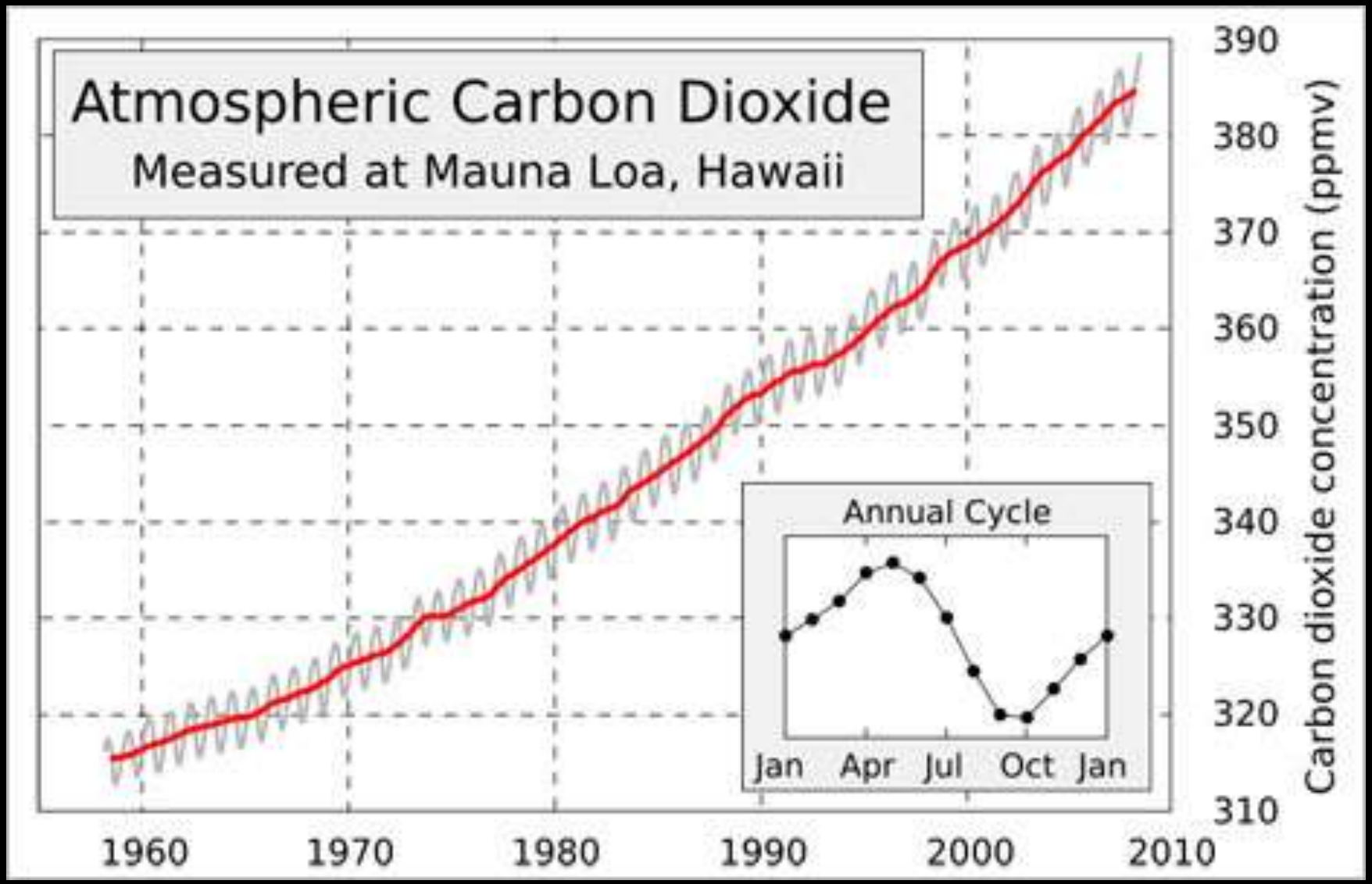
  Uganda $227.000.000 * 0,39 = $88.500.000
- *Coffea canephora* (robusta)

  Vietnam €450.000.000 * 1 = €450.000.000

En overordnet trussel - klima

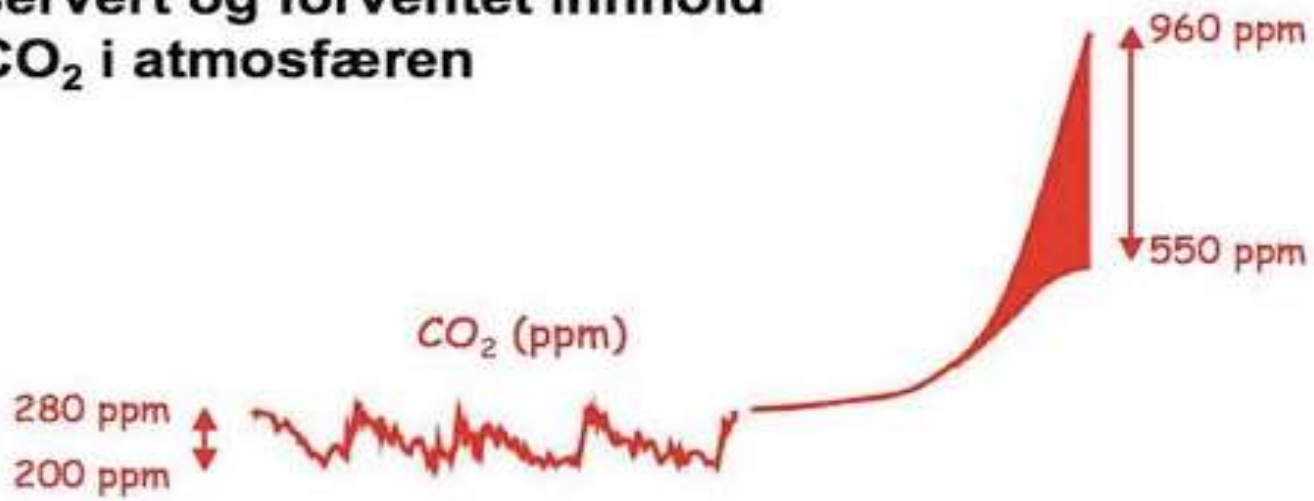
- Drivhuseffekten: Skyer og gasser slipper gjennom kortbølget innstråling, bremser langbølget utstråling
- Uten denne effekten ville jordas gjennomsnitts-temperatur vært -20 i stedet for + 15.

Hva *vet* vi, og hva *tror* vi?



Inn i ukjent territorium

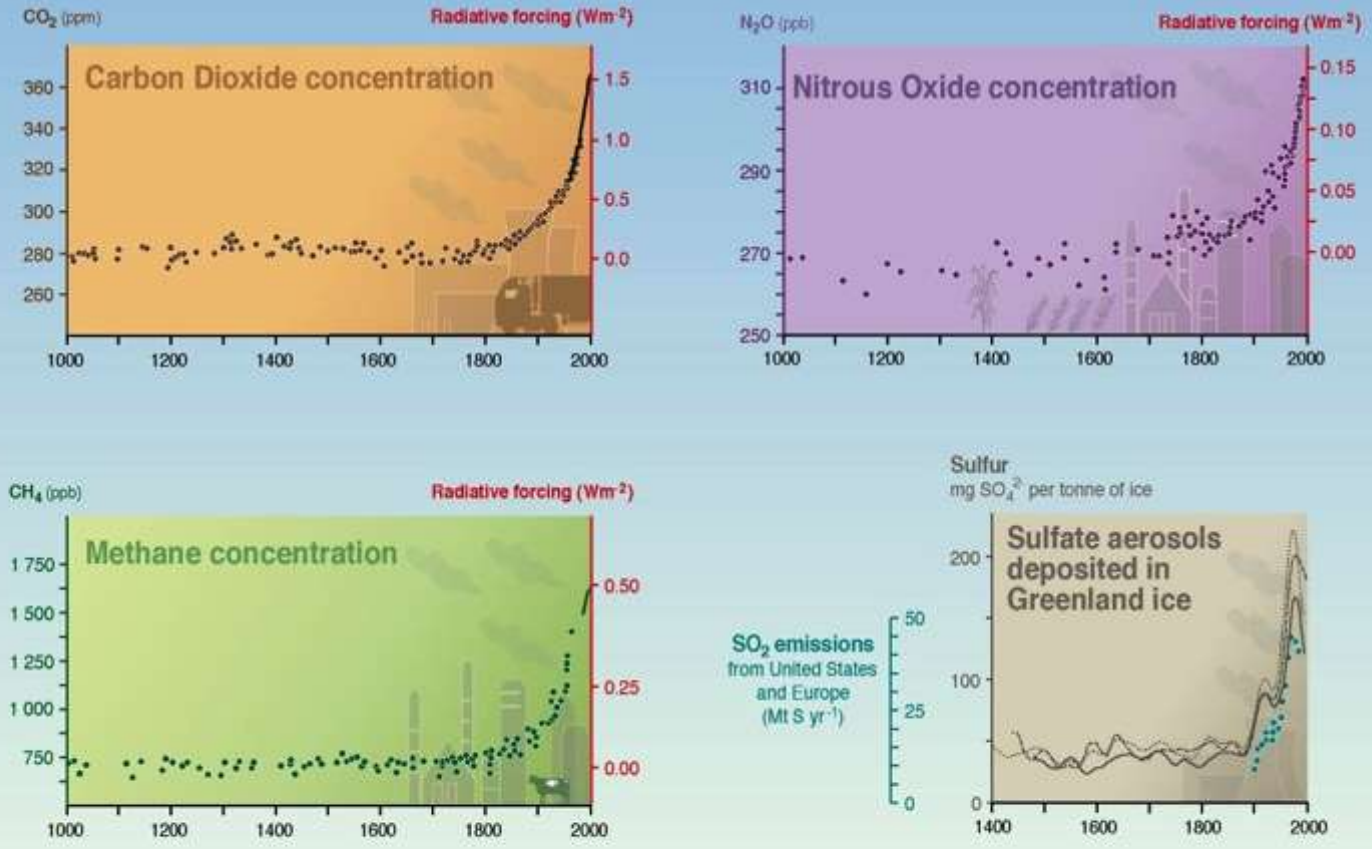
Observert og forventet innhold av CO_2 i atmosfæren



- I dag: Høyeste nivå på **850.000 år**
- År 2100: Høyeste nivå på opptil **20 millioner år**

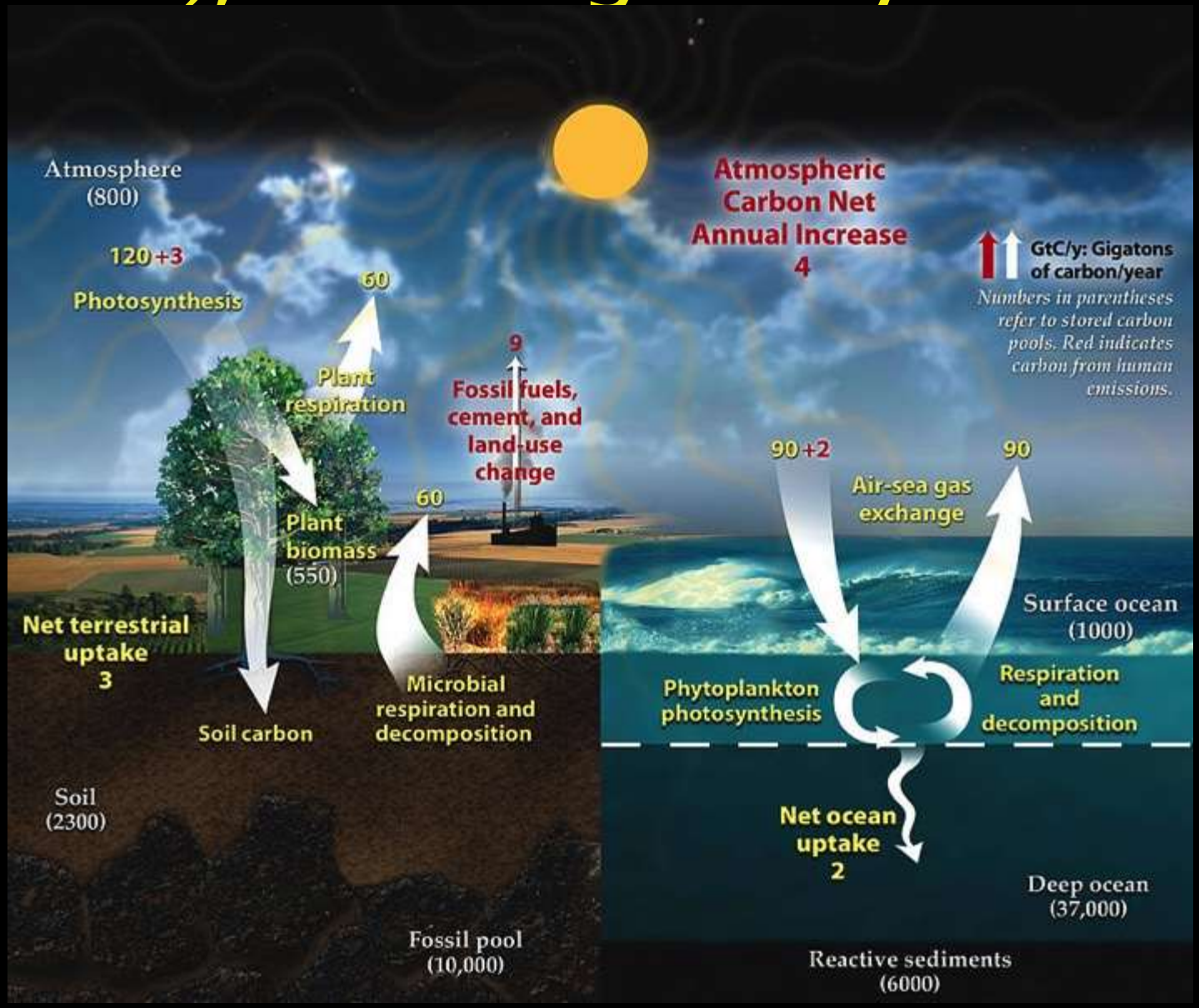
Økningen skyldes i hovedsak forbrenning av kull, olje og gass

Indicators of the human influence on the atmosphere during the Industrial era



SYR - FIGU
WG1 FIGU

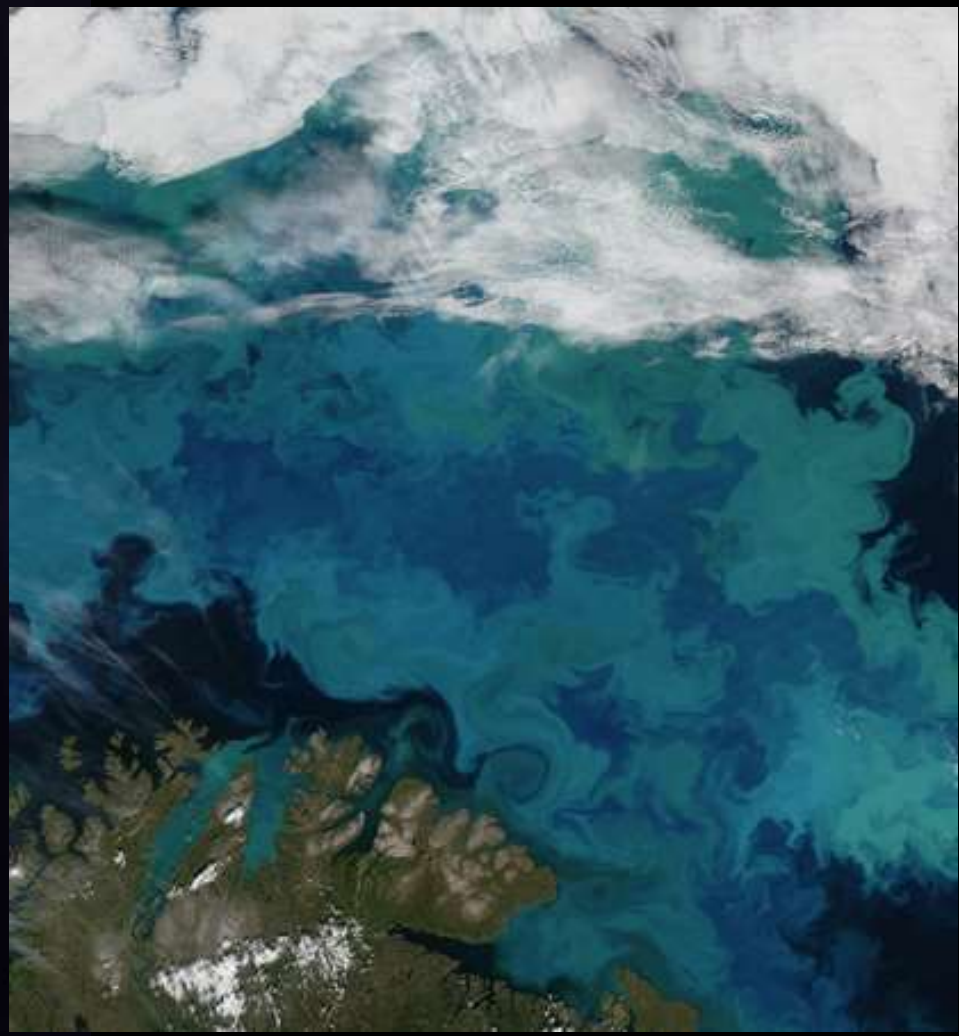
CO_2, klima og økosystemer



Selvforsterkende tilbakekoblinger

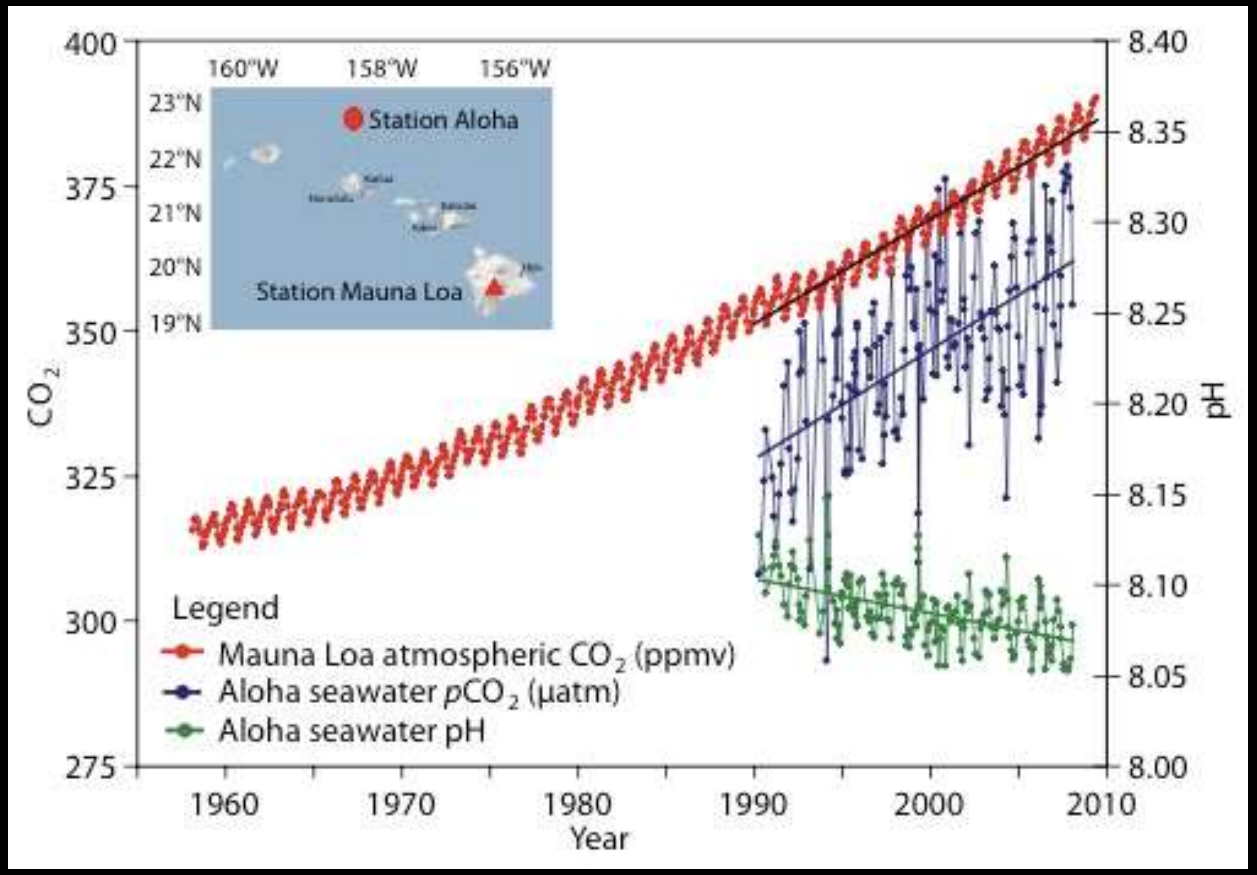
- Redusert is og snødekke gir redusert tilbakestråling (redusert albedo) = økt varmeabsorbsjon
- Redusert albedo pga vegetasjonsendringer
- Økt opptining av permafrost, mer metan og CO_2
- Oppvarming av jord gir økt oksidasjon av organisk C til CO_2.
- Økt havforsuring pga økt CO_2 gir redusert CO_2-opptak av kalsifiserte organismer
- Økt oppvarming av hav gir redusert opptak av CO_2.

Størrelse er ikke alt…

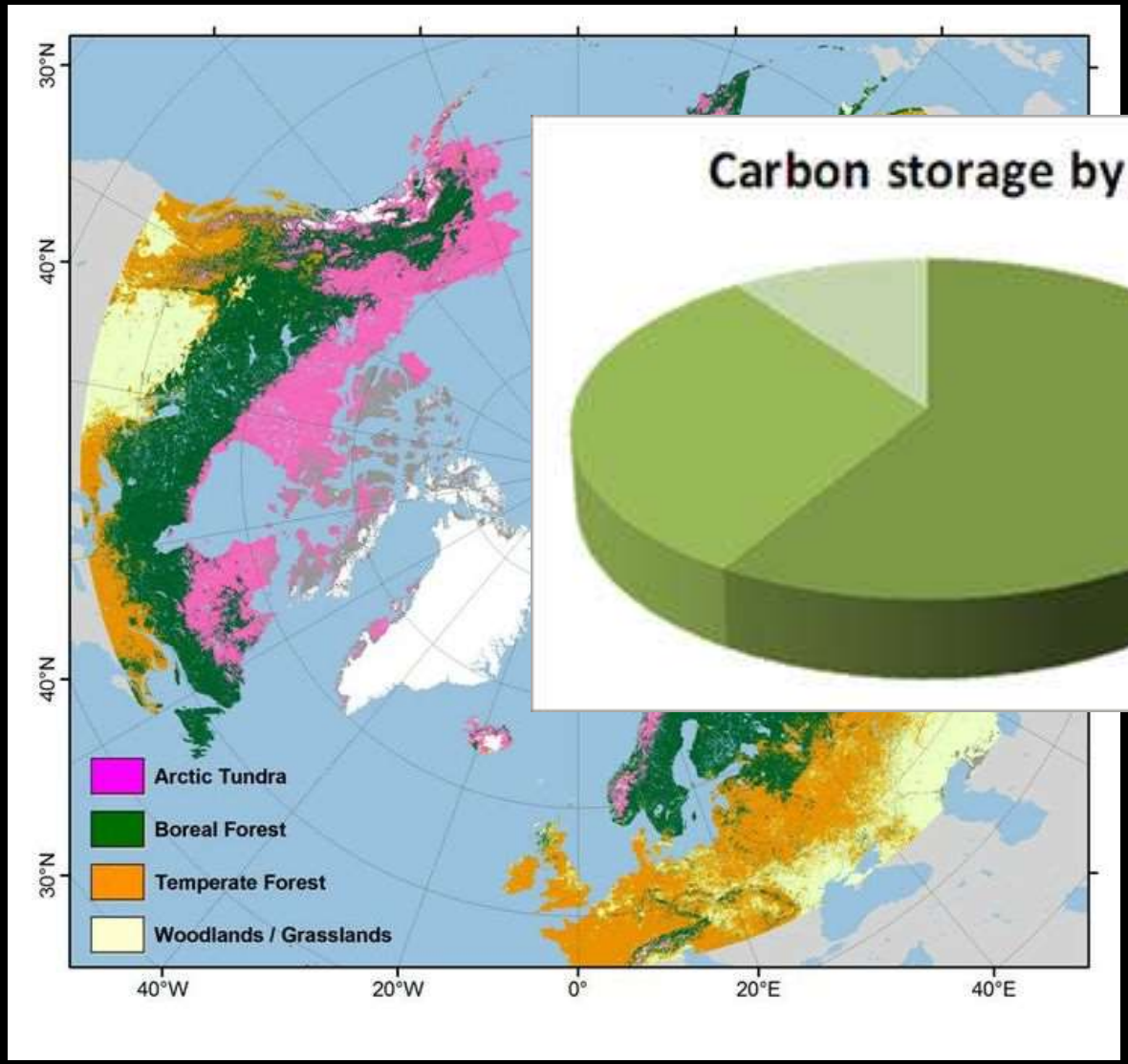


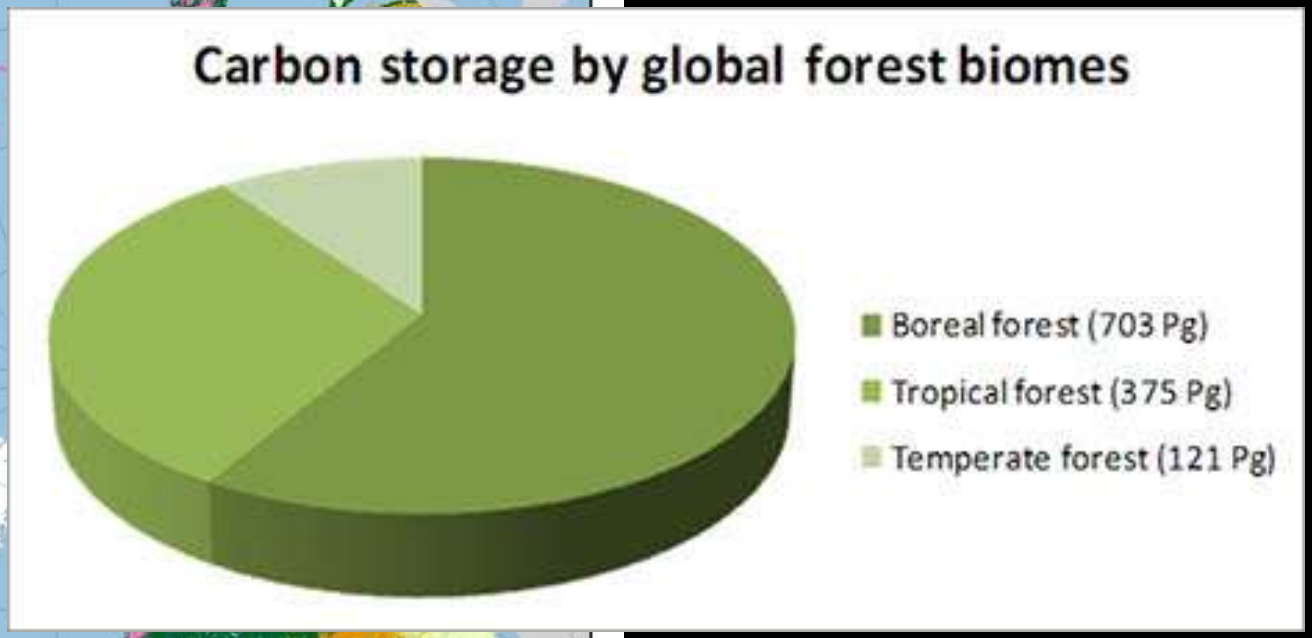
Havforsuring

Raskeste forsuringstakt på > 800 000 år
Vil biologien henge med?



Boreal skog, landjordas største C-lager

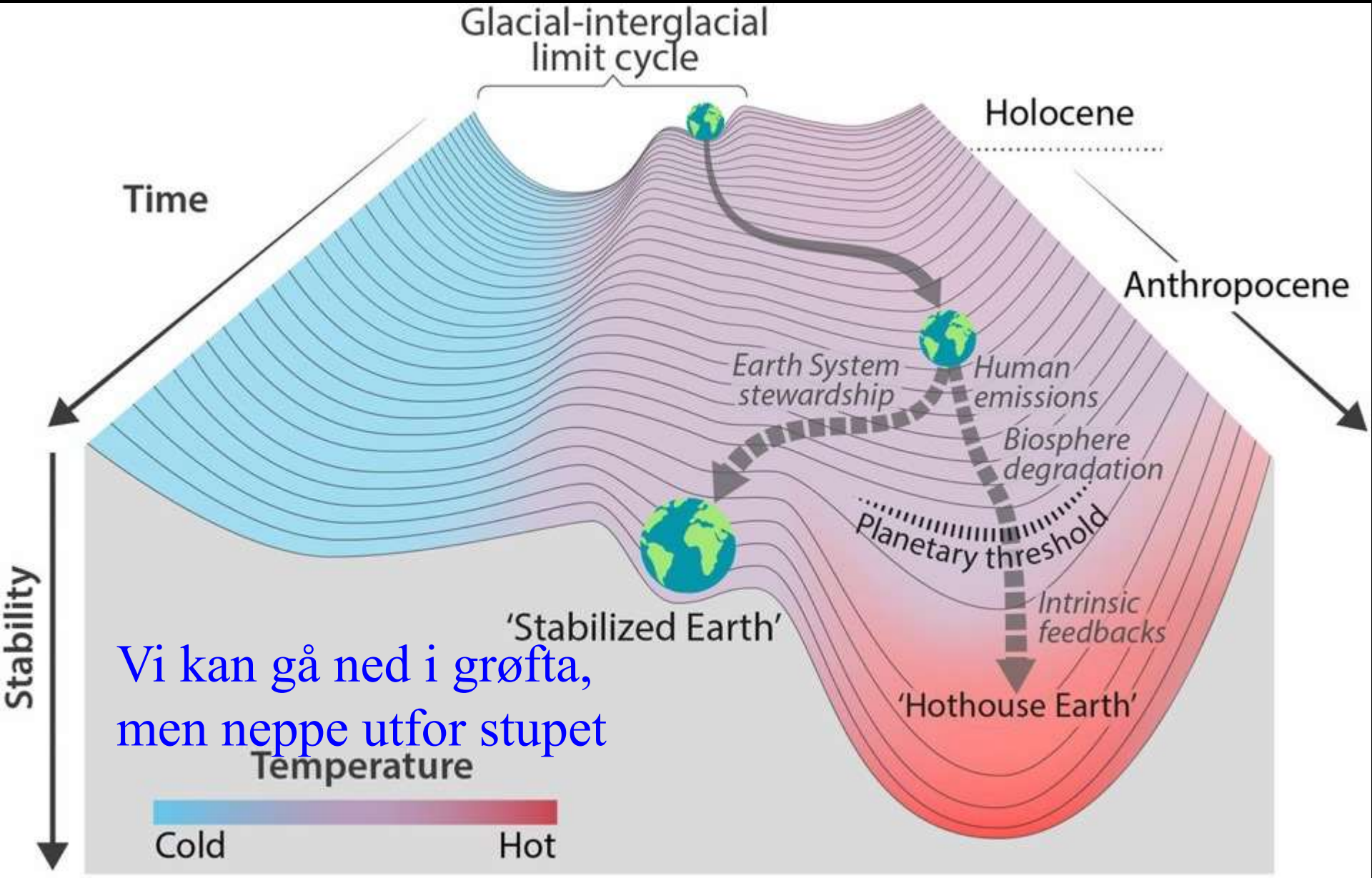




Fasiten?

- Dersom vi skal ha 66 % sjanse til å holde oss under 2 ^{o}C økning kan vi maks slippe ut 2900 milliarder tonn (Gt) CO_2. Høres mye ut, men…
- … vi har siden 1880 allerede sluppet ut 1900 Gt
- Restkapasiteten er 800 Gt. Med dagens utslipp er grensen nådd om 20 år.
- Det er allerede investert i fossile reserver tilsvarende 2 795 Gt CO_2 (“stranded assets”)

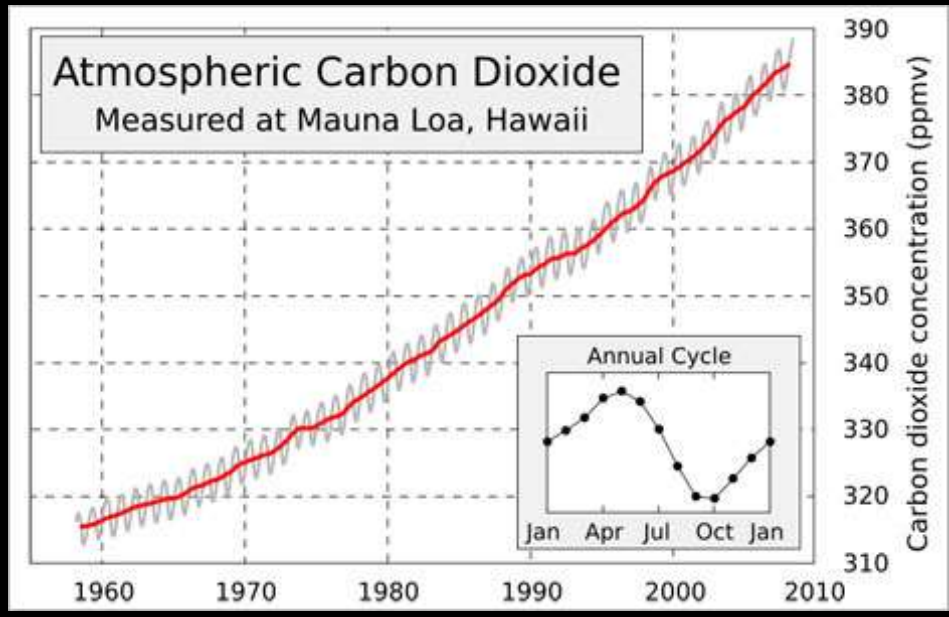
Kan klimaet "bikke over"?



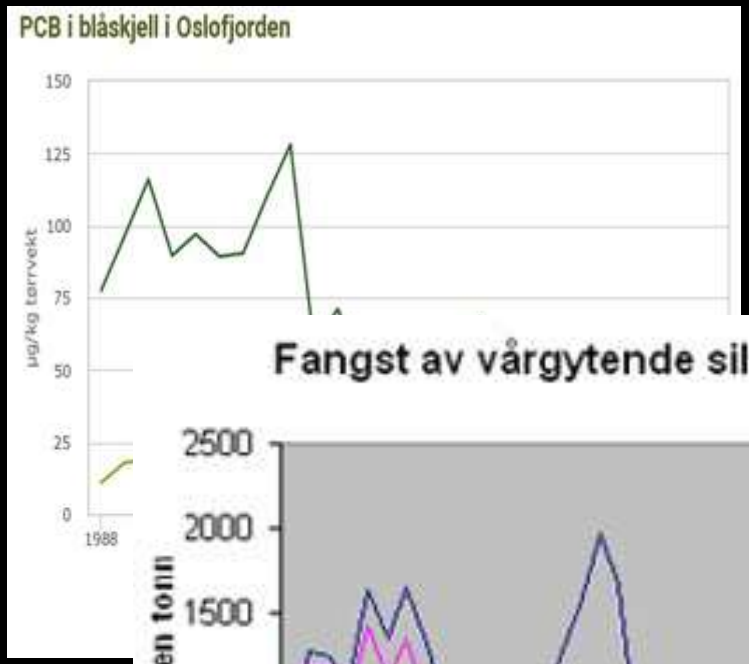
Vi kan gå ned i grøfta,
men neppe utfor stupet

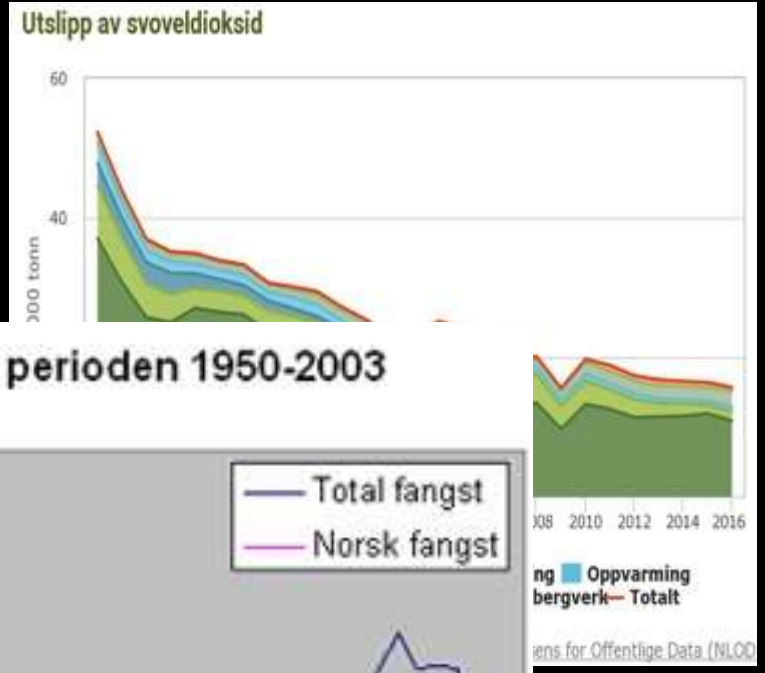
Kunnskap siden 1962 – men laaangsom prosess….

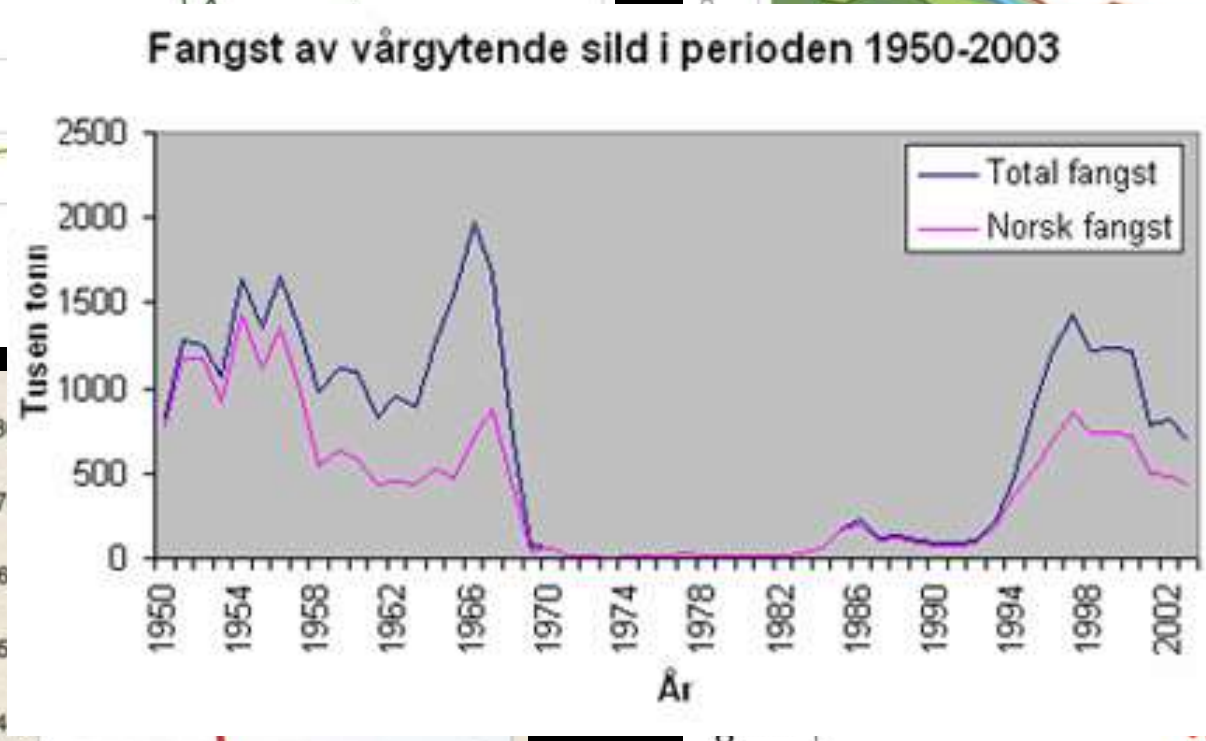
- Kunnskapsmangel
- Ideologisk motstand
- Vi vil ikke vite…
- Rasjonalisering av egen atferd
- Shifting baselines
- Vi er ikke evolvert for langsiktighet

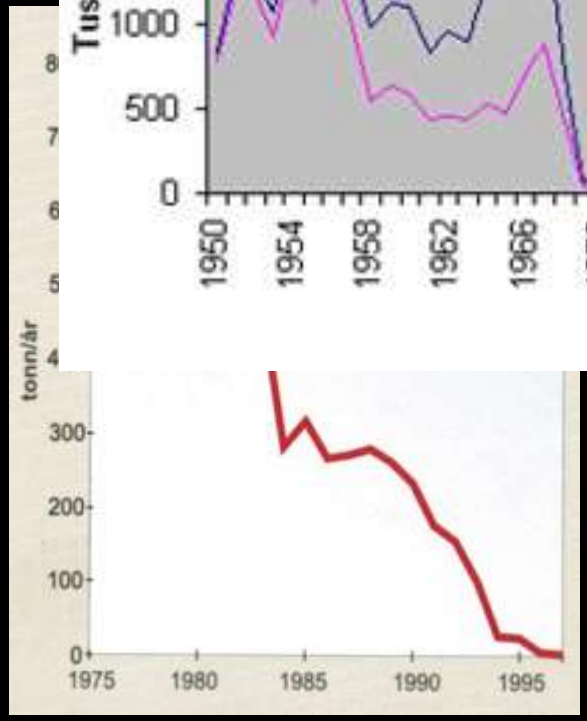


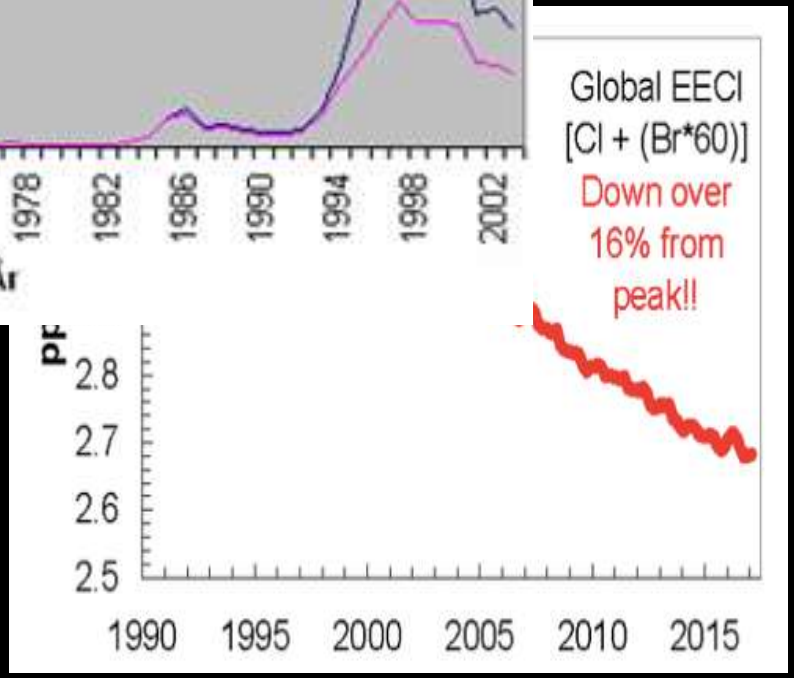
Bedre uten oss?


PCB i blåskjell i Oslofjorden
µg/kg tørrvekt
150
125
100
75
50
25
0
1988


Utslipp av svoveldioksid
60
40
2010
2012
2014
2016
Oppvarming
Totalt


Fangst av vårgytende sild i perioden 1950-2003
Tusen tonn
2500
2000
1500
1000
500
0
Total fangst
Norsk fangst
1950
1954
1958
1962
1966
1970
1974
1978
1982
1986
1990
1994
1998
2002
År


tonn/år
300
200
100
0
1975
1980
1985
1990
1995


Global EECl
[Cl + (Br*60)]
Down over
16% from
peak!!
2.8
2.7
2.6
2.5
1990
1995
2000
2005
2010
2015

Hvem har skylda - eller løsningen?