

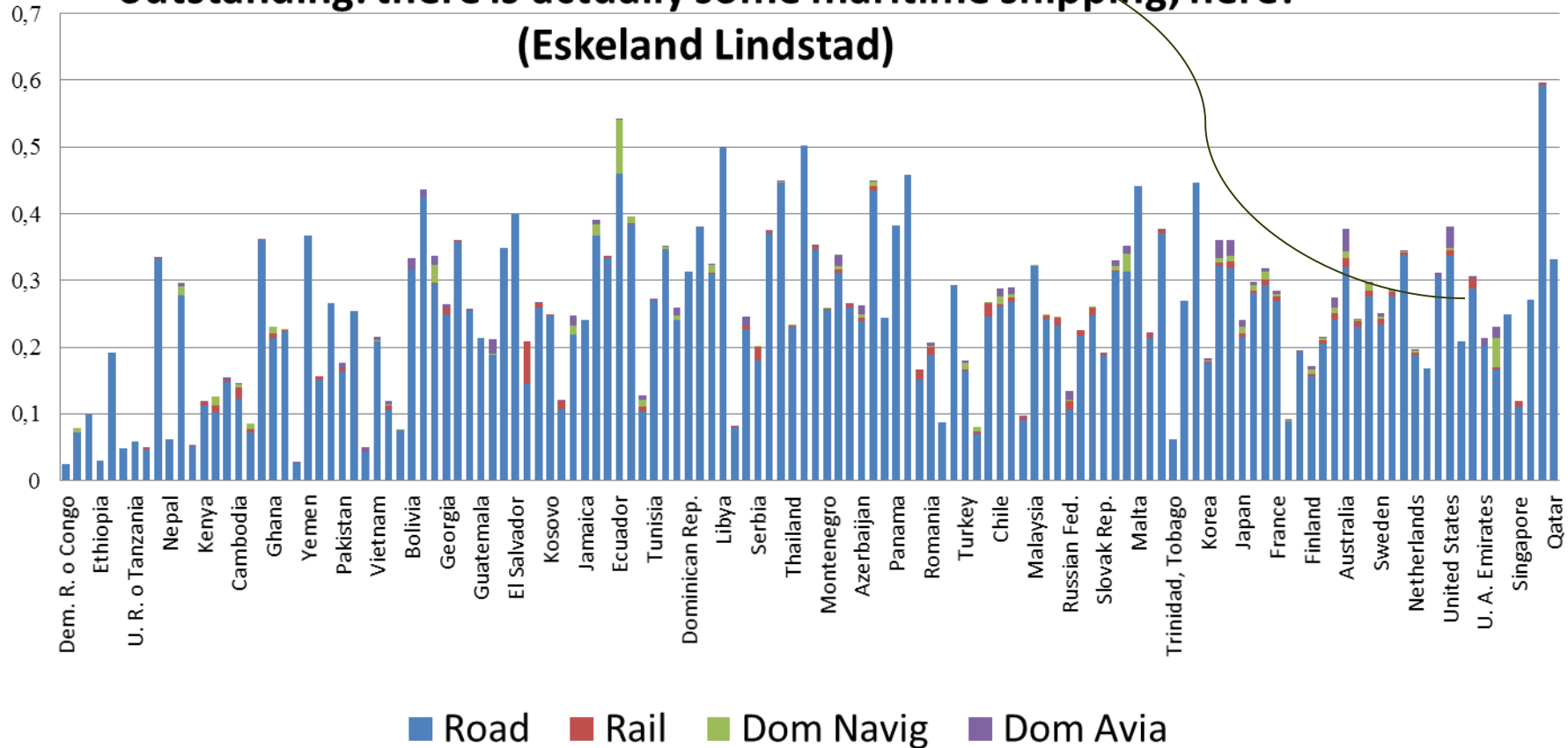
Biofuels: The Whys and Whynots 4Norway, and the 'How Much'



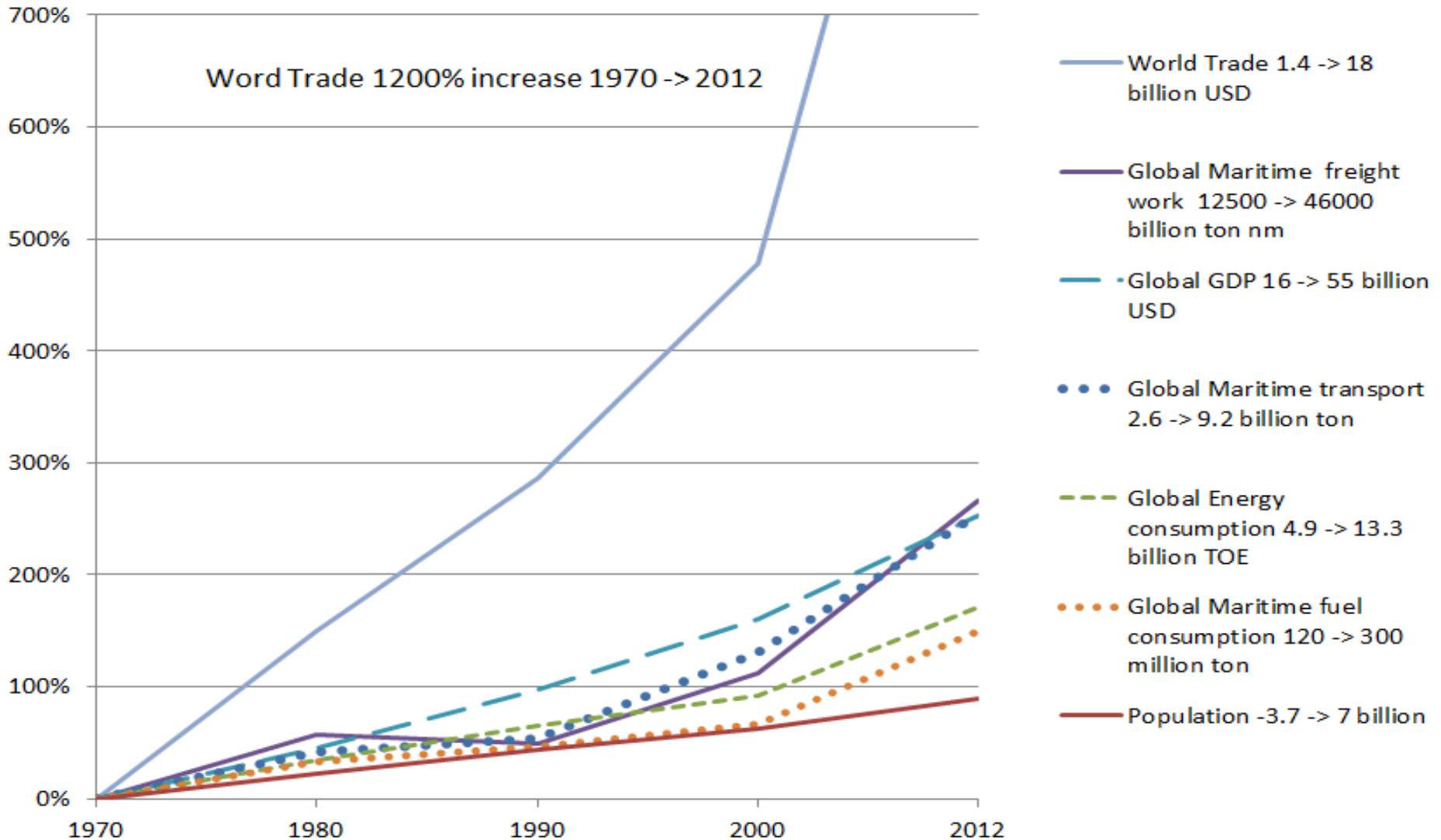
www.shutterstock.com · 221879803

Energilab Wedn Feb 8, Kronstad Campus, D113;
Professor Gunnar S. Eskeland, NHH, SNF
CenSES

Domestic transport's share in country's energy use: Norway outstanding: there is actually some maritime shipping, here!

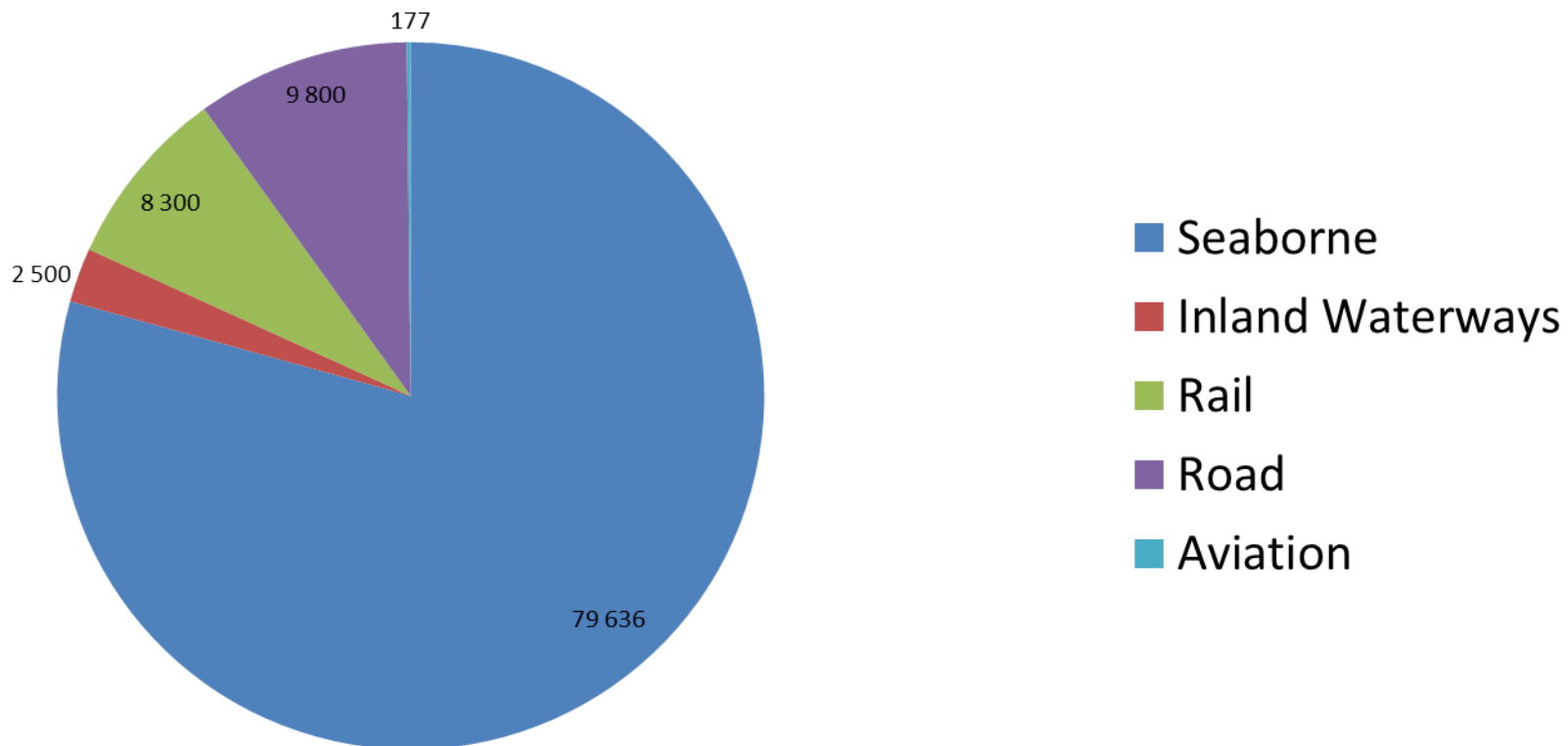


In tonmiles, maritime transport grows as fast as GDP worldwide: not faster



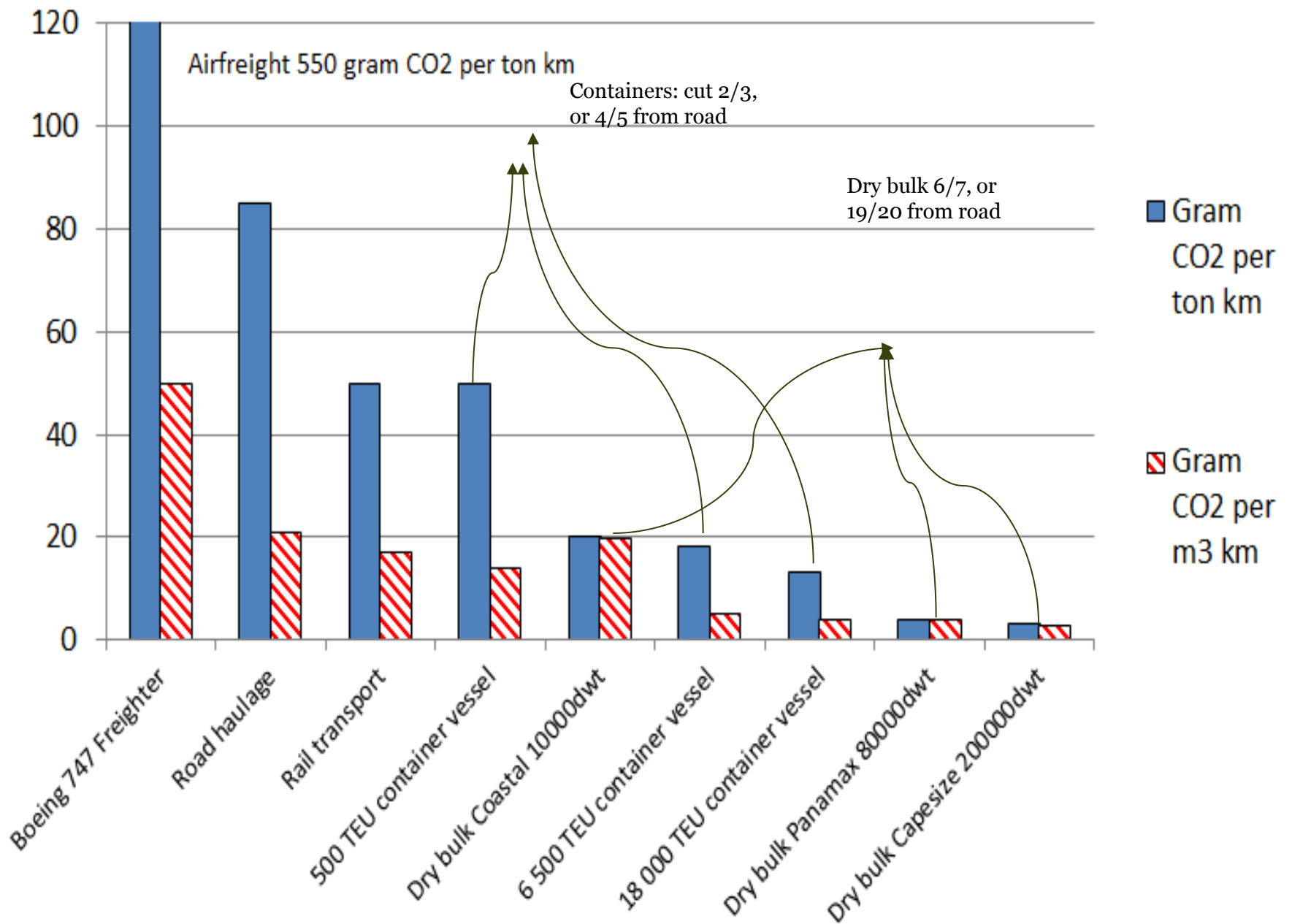
And *International freight is* maritime shipping

Global Cargo Freight Work Billion ton kilometers

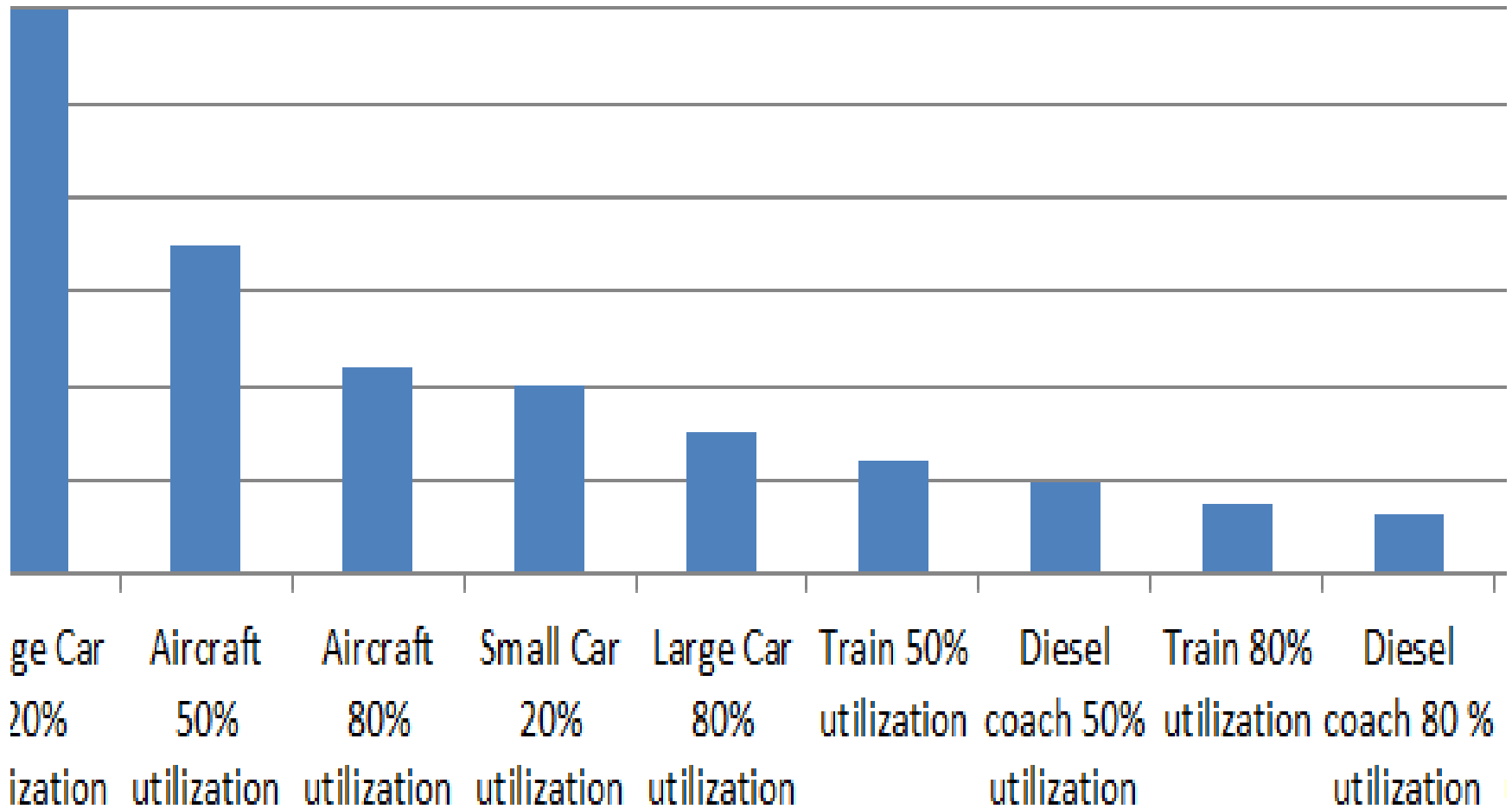


Big picture: an tough climate policy can be envisaged as high fuel prices:

- Takes transport
 - from air to surface (in principle: in practice not important, sometimes wrong: infrastructure weighs heavily)
 - From road to rail
 - From rail to sea
- Slows speed
- Ships larger, more slender (and new tech).
- Maritime transport is an energy intensive activity, but is also energy and emission efficient, with great potential to improve further. More, in fact, and at moderate costs, than most other sectors.



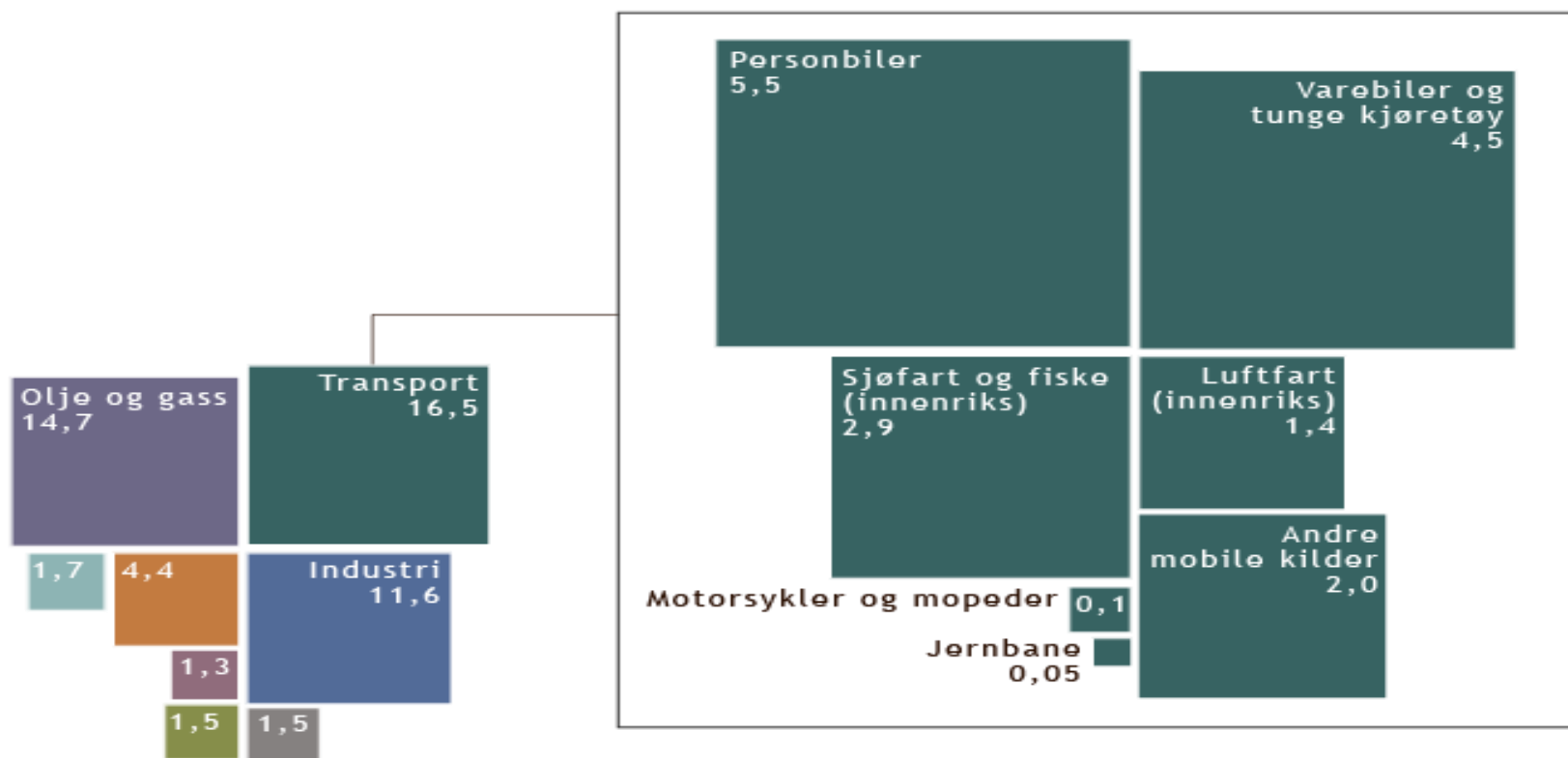
Gram CO2 per passenger km



Highlights: Motivation: Norway: transport is almost a third of greenhouse gas emissions

Utslipp av klimagasser fra transport i 2014

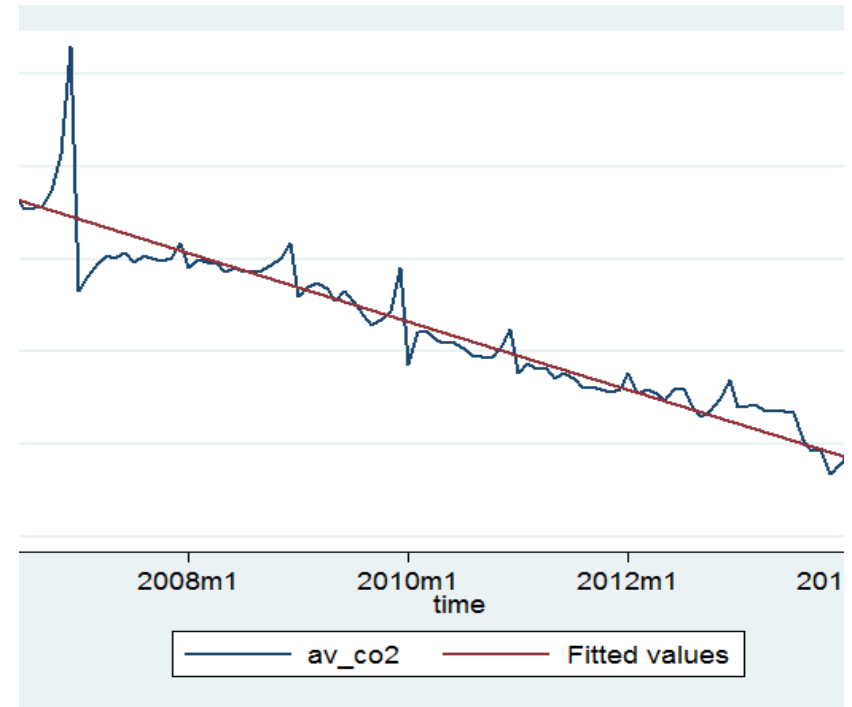
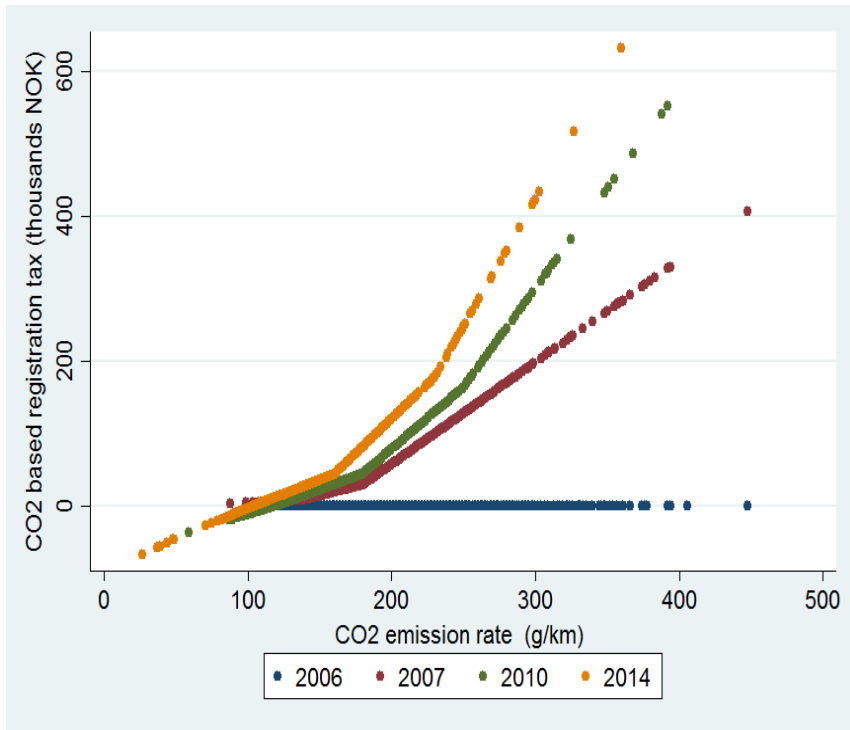
Utslipp til luft (millioner tonn CO₂-ekvivalenter)

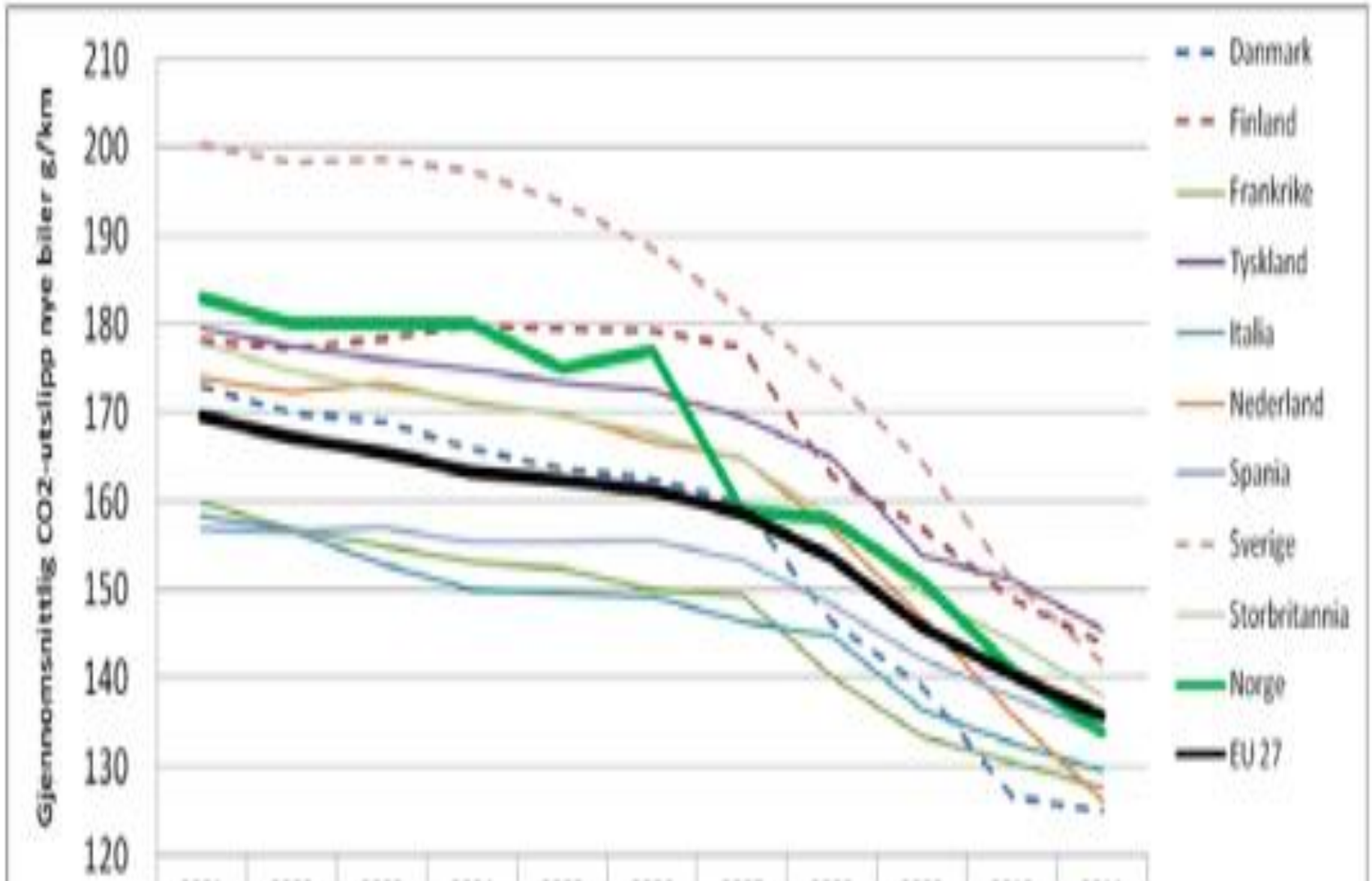


Highlights 2: Norway will focus on road transport because of its dominance *domestically* and – for cargo – on maritime because it is a sector we can influence *globally*

Cargo movements domestically	Ton Km	Output share
Maritime	15 714	39 %
Railroad	4 662	12 %
Road	19 867	49 %
Aviation	16	0,04 %
Sum These	40 259	100 %

What Norway does with cars: co2 differentiated registration tax: Homo economicus squared





Highlight:

- We find tax responsible for four fifths of co2 slimming of cars
- About as much from within segment (between SUVs, say) as from between segments (from midsize to small, say)
- When representative car price is raised 10 percent through co2 price in registration tax, repr car emission intensity is reduced by 5 percent.
- The policy works, but it is costly: 10 to 100 times quota price in Europe
- Policy should move towards neutrality (cancel electricity exceptions) and towards managing user costs (use toll rings) and towards also urban environment and congestion (use toll rings)

Highlight: Electricity is good, but

So is

- walking and nonmotorized
- we may need Hydrogen, rail and sea for goods movements
- we want to watch and coordinate somewhat, what happens in EU and elsewhere
- Norwegian policy instruments are forceful and expensive, so arguments about transition, thresholds, network infrastructure also are arguments favoring transition towards more flexible, neutral policy instruments
- Ambitions for public transport also lead into urban development, density etc
- Travel is expensive, including environmentally – it is possible travel behavior in the future is also part of the solution.

Skogen, fra Trygve Refsdal

- *Den årlige tillväxten av skogsbiomassa är jämförbar med Norges årliga oljeproduktion på 91 megaton. Utgående från tillgänglig statistik var skogstillväxten i 2010 85 megaton torrsubstans.»*
- Svenske skog-energi = norsk oljeproduksjon?
- Men olje inneheld 2,7 gonger så mykje energi som same vekt tre. Då vert dei 85 -> 31,5 megatonn.
- Berre ein del av tilveksten i svensk skog bør nyttast. Berekraftig uttak på 60% av samla strøm over og under jorda=> 19 megatonn.
- Konvertering via Fischer-Tropsch-metoden utnytter 33% (US DoE). -> 6,2 megatonn.
- mellom anna vil transport auka. Kanskje 5 megatonn er eit realistisk tal om Sverige satsar hundre prosent på biodrivstoff?
- For Noreg er talet om lag ein firedel av dette. Altså ned mot en til to prosent av Norsk fossilproduksjon. Norge, riktignok fossilrikt, men også landrikt og skogrikt.

Skogen, Refsdal, forts

- Den norske oljeproduksjonen er enorm. Og om me tek med gassen så må tala om lag doblast, til 180 megatonn oljeekvivalentar per år. (NB den er no ca 200 megatonn)
- Våre ressursar av biomasse er avgrensa, og bør brukast på ein god måte. Som til trelast og til oppvarming, mest for å ta toppar av forbruket i kalde periodar. Bruk til drivstoff står mykje svakare.
- Norsk skog sitt bidrag til fangst og lagring er betydeleg, 26 million tonn CO₂ per år, det same som 26 månelandingar på Mongstad kunne ha levert.

Nøstbakken et al (long term biofuels)

- Biofuels mandates are about as important in pushing up world food prices as are demand-for-food factors: population (people) and income (pork).

DISRUPSJON HVA SKAL FOR Å LY



Hver bil trenger 15 ganger så mye energi som oss, og bilene blir det veldig mange flere av, så det er helt utelukket at disse skal kunne få en betydelig del av sin energiforsyning fra landbruk. Foto: Aleksander Nordahl

Vi kan ikke gi mat til bilen

I miljøpolitikk ser vi mye rart, men noe er enkelt. Vi skal ikke gi mat til biler, og energi må bli dyrere.

- I need 2000kcal/day, or 50 kg oil equiv (kgoe). per year/year
- A car needs 750 kgoe per year
- There are 7bn people, will be 10
- There are 1 bn cars, will be 1 or 10?
- There is not enough fotosynthesis to power cars
- If I bike to work, payload is 90% of workload (tonmiles)
- Alone in car, payload is 5% of workload.
- Much about ghg policy is about energy economy, toe/vkm, toe/pkm, toe/tkm.
- Electricity helps, incl in hybrid setups.

Development as (Carbon) sequestration

- Perhaps there is as much carbon in forests as in oil in the ground, and about as much in the atmosphere, and forty times as much in the ocean.
- Then, about fifty years can be gained if we manage to double the amount of carbon in forests
- And the carbon storage in forests can be extended – quantity wise and duration – in by using forest products in longlasting products.
- World needs schools, homes: should we not learn to build these in longlasting ways using lots of biomass?
- Our paper (Hansen, Ni, Giske, Eske): World Forests and forest products can take 1 to 2 gigatons per year for many decades.

Highest 'treehouse' house next is BB: Buchardt, Brummundal (Beating Bergen)

Brummundal

- Dette er bare lokalpatriotisme, sier Arthur Buchardt. Nå er kontrakten delt ut.





Any
questions?